Vulnerable Populations
Children & Adolescents
Disclosures

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Research grants from Gilead and Roche
Speaker for BMS
Hepatitis B & C – in children and adolescents (case studies)

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HBV in children and adolescents

- Perinatal transmission (mother-to-child transmission = MTCT)
- Blood-to-blood transmission
- Sexual transmission
Spectrum of disease

Acute HBV infection
- 90% neonates
- 25–30% children
- <10% adults

Chronic infection
- 15–40%

Fulminant hepatic failure

Progressive chronic hepatitis

Inactive carrier state

Cirrhosis
- Decompensated cirrhosis
- Death

HCC

Outcome of HBV infection according to age at time of infection

Out of infections with outcome

<table>
<thead>
<tr>
<th>Age at infection</th>
<th>% of infections with outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth</td>
<td>100</td>
</tr>
<tr>
<td>1–6 months</td>
<td>90</td>
</tr>
<tr>
<td>7–12 months</td>
<td>80</td>
</tr>
<tr>
<td>1–4 years</td>
<td>70</td>
</tr>
<tr>
<td>Older children and adults</td>
<td>60</td>
</tr>
</tbody>
</table>
HBV infection stages

Changes in the balance between HBV replication and HBV-specific immune reactivity influence the course of disease

<table>
<thead>
<tr>
<th>Immune tolerance</th>
<th>Immune activity</th>
<th>HBeAg negative Low replication</th>
<th>Reactivation phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBeAg +ve</td>
<td>HBeAg -ve/ anti-HBe +ve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HBV-DNA</td>
<td>10^8–10^9 IU/mL</td>
<td>&lt;10^4 IU/mL</td>
<td>&gt;10^4 IU/mL</td>
</tr>
<tr>
<td>ALT</td>
<td>10^6–10^7 IU/mL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Normal/mild CH
- Moderate/severe CH
- Cirrhosis
- Chronic hepatitis
- Low replication
- Inactive cirrhosis
- HBeAg +ve
- HBeAg -ve

Fattowich G, Semin Liver Disease 2003
Hiba’s story (1)

- 2 years 7 months old girl
- Born 38 weeks gestation to HBsAg+, HBeAg+ mother, found positive during pregnancy, but no referral to liver service
- Birth weight 2300 g, Agpar scores 8, 9, 10
- Only vaccination, no HBIg
- Exclusively breastfed up to 6 months
- Diagnosed HBsAg+ after 12 months HBV booster vaccination
- Weight and height 50th percentile
Hiba’s story (2)

Clinical assessment

- HBsAg+, HBsAg level 120 000 IU/ml
- HBeAg+
- HBV DNA > 178 million IU/ml
- Genotype D
- ALT 11 IU/l, AST 12 IU/l
- Bilirubin 4 μmol/l
- Albumin 49 g/l
- INR 1.0
- Normal liver and spleen on liver US
- HAV, HCV, delta and HIV all negative
Hiba’s story (3)

Mother’s clinical assessment

- HBsAg+, HBsAg level 108 000 IU/ml, HBeAg+
- HBV DNA > 178 million IU/ml
- Genotype D
- ALT 14 IU/l, AST 16 IU/l
- Bilirubin 6 µmol/l
- Albumin 48 g/l
- INR 1.05
- Normal liver and spleen on liver US
- Fibroscan 3.2 kPa
- HAV, HCV, delta and HIV all negative
Hiba’s story (4)

What went wrong?

- Mother’s assessment by liver specialist after diagnosed HBsAg+ at 12 weeks of gestation by screening
- Therapy in 3rd trimester to prevent transmission
- Mode of delivery?
- HBIg application within 12 hrs after delivery
- Breastfeeding?
Mother to child transmission (MTCT) Prevention (1)

Mother’s assessment by liver specialist after diagnosed HBsAg+ at 12 weeks of gestation by screening

Viral load $>1\,000\,000$ copies/ml = $200\,000$ IU/ml associated with HBV transmission to infant, all received vaccination and all HBeAg+ mothers received HBlg

9.26% vs. 0.26% transmission rate

(data analysis of 2356 infants born to HBsAg+ mothers)

Chen HL et al Gastroenterology 2012
Pan et al. Clin Gastroenterol Hepatol 2012
Mother to child transmission (MTCT) Prevention (2)

Therapy in the 3\textsuperscript{rd} trimester of pregnancy to suppress HBV viral replication (viral load > 200 000 IU/ml)

- Nucleos(t)ide analogues – tenofovir as a drug of choice (B class FDA pregnancy safety), but good data with telbivudine (class B)\textsuperscript{1,2}
- Lamivudine (class C) used in past, some data from ultra-deep pyrosequencing showing low frequencies mutation within rtM204I/V and/or rtA181T\textsuperscript{3}
- Mutation in polymerase 181 codon linked with stop codon 172 mutation in surface gene due to overlap (rtA181T /sW172*) = risk of emergence of antiviral drug resistance associated potential vaccine escape mutants (ADAP-VEMs)\textsuperscript{4}

1 Celen MK et al World J Gastroetnerol 2013
2 Deug M et al Virol J 2012
3 Ayeres A et al. J Viral Hep 2013
4 Clements CJ et al. Bull World Health Organ 2010
Antiviral drug resistance associated potential vaccine escape mutants (ADAP-VEMs)

Overlap between polymerase and surface genes of HBV

Antiviral drug resistance associated potential vaccine escape mutants (ADAP-VEMs)

Overlap between polymerase and surface genes of HBV
Stop codon 172 leads to 55 amino acids truncation for HBsAg
Mother to child transmission (MTCT) Prevention (3)

Mode of delivery

HBsAg+ mothers < 200 000 IU/ml – no transmission
Data on 1409 infants

- Vaginal delivery – infected **3.4%** infants
- Elective C-section – infected **1.4%** infants
- Urgent C-section – infected **4.2%** infants
- But **RR 2.2** for vaginal delivery vs. elective C-section

Amniocentesis in HBsAg+ mothers

Transmission rate overall: in amniocentesis mothers **6.4%** vs. **2.5%** in mothers without amniocentesis, p=0.23

Transmission rate in HBV DNA > 7.0 log_{10} copies/ml: in amniocentesis mothers **50%** vs. **7.5%** in mothers without amniocentesis, p=0.006, **OR 21.3**

1 Yi W et al J Hepatol 2014
2 Xu H et al. Dig Dis Sci 2014
3 Pan et al. Clin Gastroenterol Hepatol 2013
Mother to child transmission (MTCT) Prevention (4)

**HBIG** – hepatitis B immunoglobulin i.m. application in all children on HBsAg+ with birth weight < 1 500g and all HBeAg+ mothers irrespective of weight (200 IU)

- Meta-analysis data\(^1\)
  \[ RR = 0.44 \text{ vs. therapy} \quad RR = 0.06 \]

- Taiwan data on 2356 infants, all vaccinated\(^2\)
  - 583 HBeAg positive (+) mothers, all HBIG
  - 1773 HBeAg negative (-) mothers, 723 received HBIG
  - HBV transmission was **9.2%** HBeAg+ vs. **0.3%** HBeAg-
  - HBeAg- transmission in HBIG+ was **0.14%** vs. **0.29%** in HBIG- (p=0.65)

1 Ramsey M et al. www.hpa.org.uk 2008
2 Chen HL et al. Gastroenterology 2012
Breastfeeding – breast milk contains HBV DNA

- Data from observational Chinese study\(^1\)
  1186 HBsAg+ HBeAg+ mothers
  HBV transmission in \(8.3\%\) breastfed vs. \(9.3\%\) formula fed

- Chinese data on 546 infants, all vaccinated\(^2\)
  HBV transmission in \(1.5\%\) breastfed vs. \(4.7\%\) formula fed
  \((p=0.06)\), but only 16% HBV infected mothers are exclusively breastfeeding vs. 49% formula feeding \((p<0.01)\)

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1 Zhang L et al J Matern Fetal Neonatal Med 2014
2 Chen X et al. PloS One 2013
Ellis’s story (1)

- 18 years old girl
- HBV diagnosed at age 4 after mother had episode of acute HBV infection (cleared spontaneously), mother was HBsAg- during pregnancy – acute hepatitis ‘by proxy’?
- No universal vaccination in the UK
- Brain and face injury age 9 months old, multiple surgeries and blood products
- All family members and childminders are HBV negative
Hepatitis infection ‘by proxy’

Horizontal intra-familiar transmission

- Italian study of acute HBV infection in adult family member after child adoption\(^1\)
  
  6 adopted children cases
  
  Adult family members non vaccinated

- Acute hepatitis B infection due to intra-familiar horizontal transmission in relation to HBV reactivation after chemotherapy for lymphoma\(^2\)

- Intra-familiar horizontal transmission of HBV vaccine escape mutations (VEM) sG145S – HBsAg negative, but HBV DNA positive in vaccinated family\(^3\)

1 Scivere SM et al JPGN 2007
Ellis’s story (2)
Clinical assessment at diagnosis (age 4)

- HBsAg+, HBsAg level 180 000 IU/ml
- HBeAg+
- HBV DNA > 178 million IU/ml
- Genotype D
- ALT 23 IU/l, AST 25 IU/l
- Bilirubin 7 µmol/l
- Albumin 48 g/l
- INR 1.0
- Normal liver and spleen on liver US
- Liver biopsy – Ishak NI2 F0
- HAV, HCV, delta and HIV all negative
Ellis’s story (3)
Therapy round 1

Treatment within the investigator initiated study with lead-in lamivudine and add-on interferon-α

23 HBsAg+/HBeAg+ children, all normal AST
(8 males, median age 10.2 years, range 2.9-16.8)
5 children (22%) – HBsAg loss during therapy and within 1-year after stopping therapy

Ellis’s story (4)
Therapy round 1

Treatment within the investigator initiated study with lead-in lamivudine and add-on interferon-α

Goals of HBV treatment

• **Ultimate goal of treatment is HBsAg loss**
  this is not achieved in the majority of cases, but normalisation of ALT levels and DNA suppression is achievable.

• Suppression of HBV replication reduces the activity of chronic HBV, lowering risk of clinical endpoints, e.g. cirrhosis and HCC.

• Improvement in quality of life and survival.

EASL guidelines. J Hepatol 2012
## Treatment options for HBV infection

<table>
<thead>
<tr>
<th>Pegylated interferon alpha</th>
<th>Nucleos(t)ide analogues</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Benefits</strong></td>
<td><strong>Risks</strong></td>
</tr>
<tr>
<td>Finite duration</td>
<td>Subcutaneous injections</td>
</tr>
<tr>
<td>Absence of resistance</td>
<td>Poor tolerance</td>
</tr>
<tr>
<td>Higher rate of seroconversion</td>
<td>Only moderate antiviral effect</td>
</tr>
</tbody>
</table>
Chronic hepatitis B therapy
Drugs available for children

• Interferon
• Lamivudine
• Adefovir
• Entecavir

Jonas MM et al Hepatology 2010
Abdel-Hady M et al. Pediatr Drugs 2013
Pawlowska M et al Gastroenterol 2008
Chu M et al JPGN 2012
Chronic hepatitis B therapy in children
European consensus

Only children with biochemical and histological evidence of active disease respond to IFN-α and should be offered treatment.
# Chronic hepatitis B therapy in children

**IFN-α for active disease**

<table>
<thead>
<tr>
<th></th>
<th>Treated n=70</th>
<th>Untreated n=74</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HBeAg neg/ HBV DNA neg</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>at 24 weeks</td>
<td>18 (26%)</td>
<td>8 (11%)</td>
<td>0.029</td>
</tr>
<tr>
<td><strong>HBsAg neg</strong></td>
<td>7 (10%)</td>
<td>1 (1.2%)</td>
<td>0.03</td>
</tr>
</tbody>
</table>

After 5-year observation (107 treated vs. 59 untreated):

**HBeAg clearance:**

65% treated patients vs. 60% controls

**but**

**HBsAg clearance:**

25% treated patients vs. 0% controls

All patients were early responders = cleared HBeAg during treatment

Chronic hepatitis B therapy in children
Lamivudine therapy for 52 weeks

52 weeks therapy with **lamivudine** 3mg/kg/day (n=191) vs. **placebo** (n=95)

HBeAg clearance and HBV DNA negative by hybridisation at the end of therapy:

- **23%** lamivudine vs. **13%** placebo (p=0.04)

*but*

- **19%** YMDD mutation in lamivudine treated patients

Chronic hepatitis B therapy in children
Entecavir therapy no finite duration

No finite duration – median 23 months (15-45 months) therapy with entecavir 0.5 mg/day (n=8)¹

HBeAg clearance 37.5% and HBV DNA negative (<20 IU/ml)
37.5% at the last visit

No finite duration – results after 24 weeks of therapy with entecavir 0.5 mg/day (n=30)² (22 HBeAg+ and 8 HBeAg-)

HBV DNA negative (<20 IU/ml) 37.5% at 24 weeks:
HBeAg- 88% vs. HBeAg+ 23%

¹ Sadaah Ol et al. Arab J Gastroenetrol 2012
Ellis’s story (5)

Post-therapy with LAM+IFN

Patient was followed up every 6-12 months after completing therapy for 3.5 years
Ellis’s story (6)

Pegylated IFN therapy

Liver biopsy showed mild progression: NI3F1

Pegylated IFN 180 mcg/week for 48 weeks
Hepatitis B – stopping rules

- **HBeAg-positive patient**
  - **Genotype A**
    - No decline
    - NPV: 100%
  - **Genotype B**
    - >20,000 IU/mL
    - NPV: 92%
  - **Genotype C**
    - >20,000 IU/mL
    - NPV: 98%
  - **Genotype D**
    - No decline
    - NPV: 97%

- **Week 12**
  - **or**
  - >20,000 IU/mL
    - NPV: 96%
- **Week 24**
  - **or**
  - >20,000 IU/mL
    - NPV: 100%
  - **or**
  - >20,000 IU/mL
    - NPV: 100%
  - **or**
  - >20,000 IU/mL
    - NPV: 100%

Predictors of Response to PEG-IFN ± LAM: HBV Genotype

Probability of response by HBV genotype, presence of mutants, and baseline ALT and HBV DNA

- **HBeAg (+):**
  - **Genotype A**
  - **Genotype non-A**

  - **WT**
  - **Non-WT**

  - **ALT ≥ 2 and HBV DNA < 9**
    - **63%**
    - **ALT < 2 and/or HBV DNA ≥ 9**
    - **40%**
    - **ALT ≥ 2 and HBV DNA ≥ 9**
    - **18%**

  - **ALT < 2 and HBV DNA < 9**
    - **33%**
    - **ALT ≥ 2 and HBV DNA ≥ 9**
    - **40%**
    - **ALT < 2 and/or HBV DNA ≥ 9**
    - **10%**

  - **ALT ≥ 2 and HBV DNA ≤ 9**
    - **ALT < 2 and/or HBV DNA ≥ 9**
    - **ALT ≥ 2 and HBV DNA ≥ 9**
    - **ALT < 2 and/or HBV DNA ≥ 9**

  - **ALT < 2 and/or HBV DNA ≥ 9**
    - **ALT ≥ 2 and HBV DNA < 9**
    - **ALT < 2 and/or HBV DNA ≥ 9**
    - **ALT ≥ 2 and HBV DNA ≤ 9**

  - **ALT < 2 and/or HBV DNA ≥ 9**
    - **ALT ≥ 2 and HBV DNA < 9**
    - **ALT < 2 and/or HBV DNA ≥ 9**
    - **ALT ≥ 2 and HBV DNA ≤ 9**

- **Conclusion:**
  Best predictor of response to PEG-IFN is HBV GT A and lack of core and precore mutations; this may affect future strategies to achieve anti-HBs seroconversion.

Ellis’s story (7)

ETV + Pegylated IFN therapy

- Liver biopsy showed progression: NI3F3
- Combination therapy with lead-in entecavir 0.5 mg/day for 8 weeks with add-on Pegylated IFN 180 mcg/week for additional 48 weeks = 52 weeks in total, but only 6 doses of peg-IFN due to neutropenia, ETV was continued for 72 weeks in total)
Ellis’s story (8)

What next?

• Liver biopsy showed progression: NI3F3
• Fibroscan LSM 7.8 kPa
• Non-responder to pegylated IFN therapy
• Genotype D, pre-core mutation 1896 codon
• Long-term therapy vs. finite duration with NAs
• Screened for the phase III clinical trial with tenofovir alafenamide (TAF) vs. tenofovir disoproxil fumarate (TDF) (Gilead GS-US-320-110)
HCV in children and adolescents

- Perinatal transmission (mother-to-child transmission = MTCT)
- Blood-to-blood transmission
- Sexual transmission
Tiffany’s story (1)

- 3 years 10 months old girl
- Born at 41 weeks gestation to HCV RNA positive mother, known to be positive prior to pregnancy
- Asked for elective C-section, but delivered vaginally after > 6 hours since rupture of membranes
- Birth weight 3300 g, Agpar scores 7, 10, 10
- Formula fed since birth
- Persisted to be HCV RNA positive at age 12 months, 18 months and 36 months of age
- Referral to liver services
Tiffany’s story (2)
Clinical assessment age 4 years

- Genotype 3a
- HCV RNA 268 000 IU/ml
- IL28B genotype CT
- ALT 51 IU/l, AST 32 IU/l
- Bilirubin 7 μmol/l
- Albumin 48 g/l
- INR 1.0
- Normal liver and spleen on liver US
- HAV, HBV, delta and HIV all negative
- No autoimmunity, normal thyroid
Tiffany’s story (3)
Mother’s clinical assessment

- Infected via blood transfusion in childhood
- HCV genotype 3a, HCV RNA 452 000 IU/ml
- IL28B TT genotype
- ALT 74 IU/l, AST 30 IU/l, g-GT 56 IU/l
- Bilirubin 10 μmol/l, Albumin 49 g/l, INR 1.0
- Normal liver and spleen on liver US
- Fibroscan 4.6 kPa
- HAV, HBV, delta and HIV all negative
- No autoimmunity, no alcohol
- Responder relapser to 6 months of Peg-IFN/Ribavirin therapy 1 year ago
Mother to child transmission (MTCT)

- HCV pregnant women prevalence 1-8%
- HCV children prevalence 0.05-5%
- No vaccination
- No safe perinatal therapy
- Only low rate transmission 3-5%
- High spontaneous clearance in children 25-50%
- Delayed morality/slow disease progression of liver damage in children
- Diagnosis in children after 12 months of age, 2 consecutive HCV RNA positive tests 6 months apart
- Role of IL28B in spontaneous clearance

Ashrad M et al J Viral Hepat 2011
Ruitz-Extramera et al. Hepatol 2011
Prasad M et al. Am J Perinatol 2013
Mother to child transmission (MTCT)

Risk factors for transmission

• High viral load (> 200 000 IU/ml) **OR 4.0**
• HIV co-infection **OR 2.8**
• Active IDU **OR 8.6**
• Prolonged membrane rupture (> 6 hrs) **OR 9.3**
• Amniocentesis
• Peri-partum lacerations **6-fold higher risk**
• Elective C-section vs. vaginal delivery **OR 1.1** p=0.35, but other other study showed positive impact in mothers with high viral load (0% vs. 41%)
• Breastfeeding not contraindicated

Valladares G et al Ann Hepatol 2010
Syriopolou V et al. Scand J Infect Dis 2005
Ghamar Chekreh ME at al. Arch Gynecol Obstetr 2011
Prasad M et al. Am J Perinatol 2013
Hepatitis C therapy in children – current NICE

NICE National Institute for Health and Care Excellence

This guidance updates and replaces:

- section 1.7, bullet 2 only, of NICE technology appraisal guidance 75 (TA75) 'Interferon alfa (pegylated and non-pegylated) and ribavirin for the treatment of chronic hepatitis C'
- part of section 1.6 of NICE technology appraisal guidance 106 (TA106) 'Peginterferon alfa and ribavirin for the treatment of mild chronic hepatitis C'.

1.1 Peginterferon alfa in combination with ribavirin is recommended, within its marketing authorisation, as an option for treating chronic hepatitis C in children and young people.

The Committee discussed whether, for patients who do not have a sustained virological response to peginterferon alfa plus ribavirin, subsequent treatment in adulthood with the second-generation technologies boceprevir (see Boceprevir for the treatment of genotype 1 chronic hepatitis C, NICE technology appraisal 253) and telaprevir (see Telaprevir for the treatment of genotype 1 chronic hepatitis C, NICE technology appraisal 252) should have been included in the economic models. It was
Chronic hepatitis C therapy in children
Pegylated IFN + Ribavirin (n=75)

<table>
<thead>
<tr>
<th></th>
<th>Genotype 1</th>
<th>Genotype 2/3</th>
<th>Genotype 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of patients</strong></td>
<td>34</td>
<td>39</td>
<td>2</td>
</tr>
<tr>
<td><strong>EVR</strong></td>
<td>71%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>SVR</strong></td>
<td>65%</td>
<td>89%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Tiffany’s story (4)

**Therapy**

Treatment with pegylated IFN-α 90 mcg/week s.c. + Ribavirin 200 mg BD for 6 months
Natalie’s story (1)

- 18 years old girl
- Hx of IDU (heroin) sharing needles since age 15 years old
- Rehabilitation programme at age 17 years old, no drugs since
- Diagnosed with HCV during rehabilitation
- Pregnant shortly after time in rehabilitation
- Referral to liver services
- Seen at 20 weeks of gestation
Natalie’s story (2)
Clinical assessment age 17 – gestation week 20

- Genotype 1a
- HCV RNA 54 000 IU/ml
- IL28B genotype CC
- ALT 25 IU/l, AST 22 IU/l, g-GT 16 IU/l
- Bilirubin 8 μmol/l
- Albumin 51 g/l
- INR 1.04
- Normal liver and spleen on liver US
- HAV, HBV, delta and HIV all negative
- No autoimmunity, normal thyroid
Natalie’s story (3)

Clinical assessment during and post pregnancy

- Baby boy delivered at 39 weeks of gestation by elective C-section (breach position)
- Baby negative for HCV, bottle fed
- Close follow up in post-partum (PP)
Spontaneous clearance of viral hepatitis in relation to pregnancy

- State of immune tolerance during pregnancy
- Restoration of immune system post delivery
- 25-30% ALT/AST flares in HBV and autoimmune hepatitis after delivery
- Role of innate and adaptive immune responses
- Th1 type cytokine profile prevails
- Role of IL28B genotype
- More data/research needed

Ruiz-Extramera A et al. PLOS One 2013
Hattori Y et al J of Medical Vrol 2003
Alexander’s story (1)

- 18 years old male
- Sexually active since age 17 years old
- Male partners
- No alcohol
- No IDU
- No tattoo
- No piercing
- No Hx of blood products
- Acute episode of jaundice – found anti-HCV positive – referral to liver service
Alexander’s story (2)
Clinical assessment 1st visit

- HCV-Ab positive
- HCV RNA 1500 IU/ml
- IL28B genotype CC
- ALT 425 IU/l, AST 222 IU/l, g-GT 165 IU/l
- Bilirubin 46 μmol/l
- Albumin 51 g/l
- INR 0.99
- Normal liver and spleen on liver US
- HAV, HBV, delta and HIV all negative
- No autoimmunity, normal thyroid
- Fibroscan LSM 15.0kPa
Clinical assessment 2\textsuperscript{nd} visit (2 weeks later)

- HCV-Ab positive
- HCV RNA < 30 IU/ml detected
- ALT 212 IU/l, AST 118 IU/l, g-GT 72 IU/l
- Bilirubin 28 μmol/l
- Albumin 48 g/l
- INR 1.1
- HAV, HBV, delta and HIV all negative
- No autoimmunity, normal thyroid
- Fibroscan LSM 9.8kPa
Alexander’s story (4)
Clinical assessment 3rd visit (2 months later)

- HCV-Ab positive
- HCV RNA not detected
- ALT 22 IU/l, AST 23 IU/l, g-GT 22 IU/l
- Bilirubin 12 µmol/l
- Albumin 51 g/l
- INR 1.04
- HAV, HBV, delta and HIV all negative
- No autoimmunity, normal thyroid
- Fibroscan LSM 4.5kPa
Spontaneous clearance of HCV

• 15-30% patients clear HCV infection spontaneously
• Strong immune responses – innate and adaptive
• Th1 type cytokine profile prevails
• Role of IL28B genotype
• More data/research needed

HCV transmission in MSM

- Swiss cohort from gay health centres
- 840 men (median age 33, range 17-79 years)
- 19 HIV positive
- 7 found HCV RNA positive (6 in HIV+ patients) = 0.37% prevalence

Other risk factors:
- HIV+ OR 72.7
- Tattoo OR 10.4
- IDU OR 8.8
- Born abroad OR 8.5

Schmidt et al. BMC Public Health 2014
Summary (PAT)

- **PREVENT** preventable
- **AVERT** avertable (learn from AIDS Education and Research Trust)
- **TREAT** treatable