Hepatitis Viruses
(An overview)

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Viral Hepatitis - Historical Perspectives

"Infectious"

Viral hepatitis

"Serum"

A

B

C

D

E

NANB

F, G, TTV

? other

Parenterally transmitted

Enterically transmitted
## Types of Hepatitis

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source of virus</td>
<td>feces</td>
<td>blood/ blood-derived body fluids</td>
<td>blood/ blood-derived body fluids</td>
<td>blood/ blood-derived body fluids</td>
<td>feces</td>
</tr>
<tr>
<td>Route of transmission</td>
<td>fecal-oral</td>
<td>percutaneous permucosal</td>
<td>percutaneous permucosal</td>
<td>percutaneous permucosal</td>
<td>fecal-oral</td>
</tr>
<tr>
<td>Chronic infection</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
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<tr>
<td>Prevention</td>
<td>pre/post-exposure immunization</td>
<td>pre/post-exposure immunization</td>
<td>blood donor screening; risk behavior modification</td>
<td>pre/post-exposure immunization; risk behavior modification</td>
<td>ensure safe drinking water</td>
</tr>
</tbody>
</table>
Hepatitis A Virus
Hepatitis A etiology

- HAV: Identified in 1973
- A 27 nm, positive stranded RNA, non-enveloped, icosahedral virus of the heparnavirus genus of the picornaviridae
- 7474 nucleotides, 11 proteins (4 structural and four non-structural)
- Four distinct genotypes in human being
Hepatitis A epidemiology

- **HAV**: Identified in 1973
- A 27 nm, positive stranded RNA, non-enveloped, icosahedral virus of the heparna virus genus of the picornaviridiae
- 7474 nucleotides, 11 proteins (4 structural and four non-structural)
- Four distinct genotypes in human being
Hepatitis A epidemiology

- Worldwide distribution (sporadic or epidemic)
- 1.4 million cases per year
- Higher prevalence in low socioeconomic status (inadequate sanitation or hygienic practices)
Hepatitis A epidemiology:

Transmission routes

- Fecal – oral route: 3-10 days before to 1-2 wks after onset of jaundice, longer in children and in immunocompromised persons (up to 4-5 months after infection)
  - Person-to-person contact
  - Contaminated food or water
  - Sexually via analingus
Hepatitis A epidemiology:  

Transmission routes (Cont’d) 

- Parenteral transmission via IDU or transfusion of blood: is rare due to short period of HAV viremia 

- Mother-To-Child Transmission (MTCT): has not been reported
Hepatitis A epidemiology:

At risk populations (Cont’d)

- Persons in psychiatric institutions
- Persons in day-care centers
- Health care providers
- Military personnel
- Men who have Sex with Men (MSMs)
- Travellers
# Hepatitis A Epidemiology

(Cont’d)

<table>
<thead>
<tr>
<th>Endemicity</th>
<th>Disease Rate</th>
<th>Peak Age of Infection</th>
<th>Transmission Patterns</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Low to High</td>
<td>Early childhood</td>
<td>Person to person; outbreaks uncommon</td>
</tr>
<tr>
<td>Moderate</td>
<td>High</td>
<td>Late childhood/young adults</td>
<td>Person to person; food and waterborne outbreaks</td>
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<tr>
<td>Low</td>
<td>Low</td>
<td>Young adults</td>
<td>Person to person; food and waterborne outbreaks</td>
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<tr>
<td>Very low</td>
<td>Very low</td>
<td>Adults</td>
<td>Travelers; outbreaks uncommon</td>
</tr>
</tbody>
</table>
Hepatitis A clinical features

- **Incubation period:** Average 30 days (Range 15-50 days)

- Asymptomatic to clinical infection to cholestatic presentation or even to fulminant liver failure

- In children most infections are asymptomatic, while in adults 70% show clinical illness

- Anicteric symptomatic >>> icteric disease (only 30% develop jaundice)
Hepatitis A clinical features

- Fatigue, malaise
- Nausea, vomiting
- Anorexia
- Fever
- Abdominal discomfort and RUQ pain
- Darkened urine, light color acholic stool
- Jaundice; usually 2 wks
- Pruritus
Hepatitis
Hepatitis A clinical features (Cont’d)

- Jaundice and hepatomegaly are two main features on P/E (70-80%)
- Splenomegaly
- Evanescent rash
- Cervical and other LAPs
Jaundice

Jaundice by age group:

- <6 yrs: <10%
- 6-14 yrs: 40%-50%
- >14 yrs: 70%-80%
Hepatitis A clinical features

Extra hepatic manifestations (Cont’d)

- Cutaneous vasculitis
- Arthritis
- Transverse myelitis
- Cryoglobulinemia
- Optic neuritis
- Polyneuritis
- Thrombocytopenia
- Aplastic anemia
- Red cell aplasia
Complications:

- Fulminant hepatitis
- Cholestatic hepatitis
- Relapsing hepatitis (Biphasic H.): 6-10%, lasts for 16-40 wks after 4-5 wks remission

Chronic sequelae: None
RFs for fulminant hepatitis: (0.1% of Ch, 0.4% of persons aged 14-39 y/o, 1.1% of older than 40s)
- HCV co-infection
- HBV co-infection: less
- Age
- Malnutrition
- immunosuppression

Pregnancy: ? Gestational complications and premature birth
HAV as a trigger for chronic AIH:

A defective immune response to the asialoglycoprotein receptor with ongoing Th cell activation after the clearance of HAV
Hepatitis A lab. findings

- ALT and AST rise (ALT > AST): >1000 IU/ml
- Serum Bil. Rise (usually > 10 mg/dl)
- Rise in ESR, APRs, and immunoglobulins
Hepatitis A Infection

Typical Serological Course

- Fecal HAV
- Symptoms
- ALT
- Total anti-HAV
- IgM anti-HAV

Months after exposure

<table>
<thead>
<tr>
<th>Months after exposure</th>
<th>Titre</th>
<th>ALT</th>
<th>Total anti-HAV</th>
<th>IgM anti-HAV</th>
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<tbody>
<tr>
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</table>
Hepatitis A lab. Diagnosis (cont’d)

- **HAV-IgM (EIA):** is present in 99% of patients at the time of appearance of clinical symptoms. It lasts usually for 6 to 12 months, so detection in asymptomatic patients does not necessarily indicate acute infection.

- **HAV-IgG (EIA):** Past infection and immunity

- Electron microscopy (EM)

- **HAV – RNA PCR**
Hepatitis A treatment

- Self limited: 85% resolve within 3 months. After 6 months almost all
- No specific therapy
- Treatment is based on monitoring
- Rarely fulminant hepatitis: needs aggressive monitoring and liver transplantation
Hepatitis A prevention

Pre-exposure:

- **Travelers to intermediate and high HAV-endemic regions**: peel it, cook it, boil it, or forget it!

- **Immunization**: vaccine and Ig
  - **Vaccination**: two doses (0, 6-18 months): high protection
    - Also, HAV/HBV vaccine (0, 1, 6 mo), duration: 27 years!

**Indications:**

- Travellers to high endemic areas
- HCWs
- MSMs
- Close contacts of HAV pt.
- ? CHC pts
Hepatitis A prevention

(Cont’d)

Post-exposure (within 14 days)

- Routine
  - household and other intimate contacts

- Selected situations
  - institutions (e.g., day care centers)
  - common source exposure (e.g., food prepared by infected food handler)
Hepatitis B Virus
Hepatitis B etiology

- HBV (Australian antigen, serum hepatitis) is a 42-47 nm, circular partially double stranded DNA, enveloped virus of the family of hepadnaviridae virus (two genera: Orthohepadnavirus (mammalians) and avihepadnaviruses (birds))
- Uses a unique replication strategy (including a reverse transcription step!) although it is a DNA virus Four distinct genotypes in human being
Hepatitis B etiology

- Three viral surface pr.s:
  - Small pr. (HBsAg): PreS1 Ag
  - Midle pr. (HBmAg): PreS2 Ag
  - Large pr. (HBlAg): S Ag
  - X Pr. (role: ? Nucleus and Cytoskeleton)

- Four distinct genotypes in human being
Hepatitis B epidemiology

- 40% of the world population are affected
- Estimated 350 million carriers of HBV
- Around one million persons die of HBV-related causes annually
- Prevalence: 0.1% up to 20%
- Chronicity: 90% in perinatally to as low as 5% in adults
- Incidence is decreasing and mortality is increasing!
Hepatitis B Epidemiology

(Cont’d)

- **High** (10-20%): 45% of global population
  - Lifetime risk of infection >60%
  - Perinatal infections common

- **Intermediate** (3-5%): 43% of global population
  - Lifetime risk of infection 20%-60%
  - Horizontal transmissions (minor skin breaks, mucose membrane or close bodily contact, razors, tooth brush, even toys)

- **Low** (0.1-2%): 12% of global population
  - Lifetime risk of infection <20%
  - Most infections occur in adult risk groups: sexual contact and IDU
Geographic Distribution of Chronic HBV Infection

HBsAg Prevalence
- ≥8% - High
- 2-7% - Intermediate
- <2% - Low
Hepatitis B epidemiology:

Transmission routes

- **Sexual T.**: 40% heterosexual, 25% MSMs i

- **Percutaneous T.**: IDU: 15%

- **Perinatal T.**: rate of transmission as high as 90%, however neonatal vaccination is as efficacious as 95% (so, most infections occur at or shortly after birth). In high DNA level up to 85-90% is transmissible and almost no transmission with less than 10^5 copy/ml.

?LMD. , LdT
Outcome of Hepatitis B Virus Infection by Age at Infection

Chronic Infection (%)

Symptomatic Infection
Hepatitis B epidemiology:

Transmission routes

- **Horizontal T.**

- **Transfusion T.**: low P. area: 1-4/1000000 and in high P. area: 1/20000. Screening test: HBsAg, ?HBcAb, NAT

- **Nosocomial T.**: HBeAg +: 30-50%
  
  HBeAg -: 1-6%

- **Organ Transplantation**: Kidney, cornea and so on. Screening test: HBsAg, ?HBcAb
**Hepatitis B epidemiology**

Concentration of Hepatitis B Virus in Various Body Fluids

<table>
<thead>
<tr>
<th>High</th>
<th>Moderate</th>
<th>Low/Not Detectable</th>
</tr>
</thead>
<tbody>
<tr>
<td>blood</td>
<td>semen</td>
<td>urine</td>
</tr>
<tr>
<td>serum</td>
<td>vaginal fluid</td>
<td>feces</td>
</tr>
<tr>
<td>wound exudates</td>
<td>saliva</td>
<td>sweat</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tear</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Breast milk</td>
</tr>
</tbody>
</table>
Hepatitis B clinical features

- **Incubation period:** Average 60-90 days (Range 45-180 days)

- **Clinical illness (jaundice):**
  - <5 yrs, <10%
  - 5 yrs, 30%-50%

- **Acute case-fatality rate:** 0.5%-1%
Hepatitis B clinical features

Extra hepatic manifestations (Cont’d)

- 10- 15% of HBV patients
- Polyarthritis nodosa
- Nephropathy/ Glomerulonephritis
- Thrombocytopenia
- DM type II
- Porphyria cutanea tarda
- Lichen planus
Acute Hepatitis B Virus Infection with Recovery

Symptoms

HBeAg

anti-HBe

Total anti-HBc

HBsAg

IgM anti-HBc

anti-HBs

Weeks after Exposure

0 4 8 12 16 20 24 28 32 36 52 100

Titre
Chronic HBV Hepatitis

Stages of liver damage

- **Fatty Liver**: Deposits of fat cause liver enlargement.
- **Liver Fibrosis**: Scar tissue forms.
- **Cirrhosis**: Growth of connective tissue destroys liver cells.
Spectrum of Chronic Hepatitis B Diseases

1. Chronic Persistent Hepatitis - asymptomatic
2. Chronic Active Hepatitis - symptomatic exacerbations of hepatitis
3. Cirrhosis of Liver
4. Hepatocellular Carcinoma
**Progression to Chronic Hepatitis B Virus Infection**

- **IgM anti-HBc**
- **Total anti-HBc**
- **HBsAg**
- **HBeAg**
- **anti-HBe**

**Titre**

- **Acute (6 months)**
- **Chronic (Years)**

**Weeks after Exposure**

0 4 8 12 16 20 24 28 32 36 52  Years
Hepatitis B clinical features (Cont’d)

- **Chronic infection:** <5 y/o: 30%-90%, 5 y/o: 2%-10%
- **Prognosis of chronic HBV infection:**
  - CHB to cirrhosis: 10- 20%
  - Compensated cirrhosis to H. decompensation: 20- 30%
  - Compensated cirrhosis to HCC: 5- 15%
Survival rate:

- **Compensated cirrhosis:** 85% at 5 years
- **Decompensated cirrhosis:** 55-75% at one year and 15-35% at five years
- **Compensated cirrhosis to HCC:** 5-15%
Hepatitis B lab. diagnosis

- A battery of serological tests are used for the diagnosis of acute and chronic hepatitis B infection.

- **HBsAg** - used as a general marker of infection.

- **HBsAb** - used to document recovery and/or immunity to HBV infection.

- **anti-HBc IgM** - marker of acute infection.

- **anti-HBcIgG** - past or chronic infection.

- **HBeAg** - indicates active replication of virus and therefore infectiveness.

- **Anti-Hbe** - virus no longer replicating. However, the patient can still be positive for HBsAg which is made by integrated HBV.

- **HBV-DNA** - indicates active replication of virus, more accurate than HBeAg especially in cases of escape mutants. Used mainly for monitoring response to therapy.
Hepatitis B treatment

- **Interferon** - for HBeAg +ve carriers with chronic active hepatitis. Response rate is 30 to 40%.

- **Lamivudine** - a nucleoside analogue reverse transcriptase inhibitor. Well tolerated, most patients will respond favorably. However, tendency to relapse on cessation of treatment. Another problem is the rapid emergence of drug resistance.

- Successful response to treatment will result in the disappearance of HBsAg, HBV-DNA, and seroconversion to HBeAg.
Hepatitis B prevention

- **Vaccination** - highly effective recombinant vaccines are now available. Vaccine can be given to those who are at increased risk of HBV infection such as healthcare workers. It is also given routinely to neonates as universal vaccination in many countries.

- **Hepatitis B Immunoglobulin** - HBIG may be used to protect persons who are exposed to hepatitis B. It is particularly efficacious within 48 hours of the incident. It may also be given to neonates who are at increased risk of contracting hepatitis B i.e. whose mothers are HBsAg and HBeAg positive.

- **Other measures** - screening of blood donors, blood and body fluid precautions.
100-200 HCWs die annually because of complications of occupationally acquired HBV

In general, HCWs have a lower HBV incidence rate than that of general population due to routine vaccination.
Definition of occupational exposure

- Per cutaneous injury (needle stick, cut with a sharp object)
- Mucous membrane
- Non intact skin
- Contact intact skin when the duration of contact is prolonged or involves an extensive area
Sources of Exposure

- Blood
- Bloody fluids
- Tissues
- Semen
- Vaginal secretion
- CSF
- Pleural fluids
- Pericardial fluids
- Amniotic fluids
- Peritoneal fluids
Risk of acquiring Blood Borne Pathogens

- Significant exposure
  - Type of exposure
  - Type of fluid
- Prevalence of infection
## Risk for occupational transmission

<table>
<thead>
<tr>
<th>Condition</th>
<th>Needle stick</th>
<th>mucous membrane</th>
</tr>
</thead>
<tbody>
<tr>
<td>HB s+, e Ag +</td>
<td>22 - 40%</td>
<td>Lower</td>
</tr>
<tr>
<td>HB s+, e Ag -</td>
<td>1-6%</td>
<td>Lower</td>
</tr>
<tr>
<td>HCV</td>
<td>0-10%</td>
<td>?</td>
</tr>
<tr>
<td>HIV</td>
<td>0.3%</td>
<td>0.09%</td>
</tr>
</tbody>
</table>
High risk groups for HBV infection

- Nurses
- Lab workers
- Physicians
- Dentists
- Dialysis workers
- Cleaning service employees
Prevention & Control

I - Standard Precautions

II - Pre-exposure prophylaxis

III - Post-exposure prophylaxis
Pre-exposure prevention of HBV

- **Pre-exposure**: HBV vaccination:
  - 3 doses 0, 1, 6 mo
  - 4 doses: Renal failure, HIV, Other immunosuppressants
    - HBs Ab ≥ 10 miu/ml
    - Those with older age, obesity, heavy smoking, immunosuppressant users have lower Responses.
- **Post-vaccination** HBsAb titer is Recommended
Post-exposure management
Assessment of transmission Risk:

- Type of body substance
- Route and severity of the exposure
- HBs Ag, HCV Ab, HIV status of source case
- Susceptibility of exposed person
Post-exposure work up

H.C.Ws

- HBs Ab & Ag
- HIV Ab
- HCV Ab

Source (if available)

- HIV
- HBs Ag
- HCV Ab
- ALT/ AST/ Alk ph.
Other measures

- **Exposure site**: washing the area with soap and water
- **Open wound**: irrigation with sterile saline
- **Mucous membrane**: flashed with copious amounts of water
# Post-exposure prophylaxis for Hepatitis B

<table>
<thead>
<tr>
<th>HCW</th>
<th>HBS Ag+</th>
<th>HBS Ag-</th>
<th>Status</th>
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<tr>
<td>Unvaccinated Vaccine</td>
<td>HBIG +</td>
<td>Vaccine</td>
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</tr>
<tr>
<td>Vaccinated</td>
<td>No</td>
<td>No</td>
<td></td>
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<tr>
<td>No Responder</td>
<td>Antibody test</td>
<td>No Treatment</td>
<td></td>
</tr>
</tbody>
</table>

High Risk source HBIG +vaccine
Exposure to HCV source

- Baseline & follow up (at 6 mo) HCV Ab test
- ALT test
Post-exposure prevention

- HIV testing: Baseline, 6wk, 12 wk, 24wk after exposure
  - Exposure reporting
  - Immediate Decontamination
  - Source & HCWs Evaluation
  - Chemoprophylaxis
  - Monitoring chemoprophylaxis
  - Counseling
Exposure Code (EC)

**Less severe:**
- Solid needle
- Superficial scratch

**More severe:**
- Large hollow needle,
- Device with visible blood
- Needle used in a vein or artery
Blood and Infectious material

Yes

Mucous membrane or skin, integrity compromised

No PEP needed

Intact skin only

No PEP Needed

Percutaneous exposure

Severity

Less Severe

Ec 2

More Severe

Ec 3

Volume?

Small

Ec 1

Large

Ec 2
DETERMINE THE HIV STATUS CODE (HIV SC)

What is the HIV Status of the Exposure Source?

- HIV negative
  - No PEP needed

- HIV positive
  - Low titer exposure
  - High titer HIV exposure

- Status unknown
- Source unknown
  - HIV SC Unknown

- HIV SC1
- HIV SC2
Prophylaxis is recommended for all:

Per-cutaneous exposure to HIV and for large-volume or long-duration mucosal and non-intact skin exposure that involves higher titer HIV exposures
Prophylaxis should be considered for:

Small volume, short duration mucosal and non-intact skin exposure when the source is known or high HIV titer.
### DETERMINE THE PEP RECOMMENDATION

<table>
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<th>HIV SC</th>
<th>PEP</th>
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<tr>
<td>1</td>
<td>1</td>
<td>Consider basic regimen</td>
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<td>1</td>
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<td>Recommend basic regimen</td>
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<tr>
<td>2</td>
<td>1</td>
<td>Recommend basic regimen</td>
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<tr>
<td>2</td>
<td>2</td>
<td>Recommend expanded regimen</td>
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<td>3</td>
<td>1 or 2</td>
<td>Recommend expanded regimen</td>
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<tr>
<td>1,2,3</td>
<td>Unknown</td>
<td>If exposure setting suggests risk of HIV, consider basic regimen</td>
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</table>

**Explanation:**
- **EC** stands for Exposure Classification.
- **HIV SC** stands for HIV Serologic Classification.
- **PEP** stands for Post-Exposure Prophylaxis.

- **Consider basic regimen**
- **Recommend basic regimen**
- **Recommend expanded regimen**

If the exposure setting suggests risk of HIV, consider basic regimen.
Prior to initiating Antiretroviral

- Pregnancy test
- CBC
- Bun/ Creatinine
- U/A
- AST/ALT, Bilirubin
RECOMMENDED PEP REGIMENS

Basic regimen = 4 weeks of ZDV 600mg/day in two or three divided doses, and 3TC, 150 mg, BID

Expanded regimen = Basic regimen plus either Indinavir 800 mg qh8 or Nelfinavir 750mg, TID
Hepatitis C Virus

capsid envelope protein

protease/helicase

RNA-dependent RNA polymerase

core E1 E2 NS 2 NS 3 NS 4 NS 5

hypervariable region

c22 33c c-100
Hepatitis C etiology

- A small enveloped virus with one ss-positive sense RNA molecule of approximately 9.6 kb
- A member of flaviviridae
- Error prone RNA polymerase, lack of PR
- Six genotypes: 1-6 (just genotypes 1-4 reported from Iran)
Hepatitis C epidemiology

- 170 million people infected worldwide
- Prevalence: 3% of the world population
- HCV ARNA positives are around 80-90% of the HCV Ab positives
Prevalence of HCV Infection Among Blood Donors*

Anti-HCV Prevalence

- High: >5%
- Intermediate: 1.1%-5%
- Low: 0.2%-1%
- Very Low: ≤0.1%
- Unknown

* Anti-HCV prevalence by EIA-1 or EIA-2 with supplemental testing; based on data available in January, 1995.
Hepatitis C epidemiology

Transmission routes (Cont’d)

- IDU
- Blood transfusion
- Sex with an IDU!
- Having been in jail more than 3 days
- Religious scarification
- Cut by bloody object
- Piercing ears or body parts
- Ig injection
- MTCT
Hepatitis C Clinical Features

**Incubation period:**
- Average 6-7 wks
- Range 2-26 wks

**Clinical illness (jaundice):**
- 30-40% (20-30%)

**Chronic hepatitis:**
- 70%

**Persistent infection:**
- 85-100%

**Immunity:**
- No protective antibody response identified
Fewer than 25% of HCV patients are symptomatic

Disease o decades
Hepatitis C Virus Infection

Typical Serologic Course

Symptoms

<table>
<thead>
<tr>
<th>Titre</th>
<th>Months</th>
<th>Years</th>
<th>Time after Exposure</th>
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<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>Exposure</td>
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<td>6</td>
<td>1</td>
<td>First peak</td>
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<td>1</td>
<td>2</td>
<td>Second peak</td>
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<td>2</td>
<td>3</td>
<td>Third peak</td>
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<tr>
<td></td>
<td>3</td>
<td>4</td>
<td>Fourth peak</td>
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</tbody>
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ALT

Normal
Chronic Hepatitis C Infection

- The spectrum of chronic hepatitis C infection is essentially the same as chronic hepatitis B infection.

- All the manifestations of chronic hepatitis B infection may be seen, albeit with a lower frequency i.e. chronic persistent hepatitis, chronic active hepatitis, cirrhosis, and hepatocellular carcinoma.
Hepatitis C lab. diagnosis

- **HCV antibody** - generally used to diagnose hepatitis C infection. Not useful in the acute phase as it takes at least 4 weeks after infection before antibody appears.

- **HCV-RNA** - various techniques are available e.g. PCR and branched DNA. May be used to diagnose HCV infection in the acute phase. However, its main use is in monitoring the response to antiviral therapy.

- **HCV-antigen** - an EIA for HCV antigen is available. It is used in the same capacity as HCV-RNA tests but is much easier to carry out.
Hepatitis C treatment

- **Interferon** - may be considered for patients with chronic active hepatitis. The response rate is around 50% but 50% of responders will relapse upon withdrawal of treatment.

- **Ribavirin** - there is less experience with ribavirin than interferon. However, recent studies suggest that a combination of interferon and ribavirin is more effective than interferon alone.
Prevention of Hepatitis C

- Screening of blood, organ, tissue donors
- High-risk behavior modification: HR
- Blood and body fluid precautions
Hepatitis D (Delta) Virus

- δ antigen
- HBsAg
- RNA
Hepatitis D etiology

- A defective RNA virus which requires the HBsAg for complete replication and transmission
Geographic Distribution of HDV Infection

**HDV Prevalence**
- Red: High
- Yellow: Intermediate
- Green: Low
- Orange: Very Low
- Beige: No Data
Hepatitis D Virus Modes of Transmission

- Percutaneous exposures
  - injecting drug use
- Permucosal exposures
  - sex contact
Hepatitis D Clinical Features

- HDV/HBV simultaneous infection: 95% recovery, more frequent fulminant
- HDV on HBV super infection: 90% chronic, more severe disease
HBV - HDV Coinfection

Symptoms

ALT Elevated

Titre

IgM anti-HDV

HDV RNA

HBsAg

anti-HBs

Total anti-HDV

Time after Exposure
HBV - HDV Superinfection

Jaundice

Symptoms

ALT

Total anti-HDV

HBsAg

HDV RNA

IgM anti-HDV

Time after Exposure

Titre
Hepatitis D - Prevention

- **HBV-HDV Coinfection**
  
  Pre or postexposure prophylaxis to prevent HBV infection.

- **HBV-HDV Superinfection**
  
  Education to reduce risk behaviors among persons with chronic HBV infection.
Hepatitis E Virus
Hepatitis E Epidemiologic

- Most outbreaks associated with faecally contaminated drinking water.
- Several other large epidemics have occurred since in the Indian subcontinent and the USSR, China, Africa and Mexico.
- In the United States and other nonendemic areas, where outbreaks of hepatitis E have not been documented to occur, a low prevalence of anti-HEV (<2%) has been found in healthy populations. The source of infection for these persons is unknown.
- Minimal person-to-person transmission.
Hepatitis E Clinical Features

- **Incubation period:** Average 40 days
  Range 15-60 days

- **Case-fatality rate:**
  Overall, 1%-3%
  Pregnant women, 15%-25%

- **Illness severity:** Increased with age

- **Chronic sequelae:** None identified
Hepatitis E Virus Infection

- **Symptoms**
- **ALT**
- **IgG anti-HEV**
- **IgM anti-HEV**
- **Virus in stool**

*Weeks after Exposure*
Prevention and Control Measures for Travelers to HEV-Endemic Regions

- Avoid drinking water (and beverages with ice) of unknown purity, uncooked shellfish, and uncooked fruit/vegetables not peeled or prepared by traveler.

- IG prepared from donors in Western countries does not prevent infection.

- Unknown efficacy of IG prepared from donors in endemic areas.

- Vaccine?
Thanks for your kind attention!