

VIROLOGY LECTURE

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Hepatitis B Virus

Virology:

- Family: Hepadnaviridae
- The complete virus particle is 42-nm in diameter
- Enveloped, spherical
- Consists of outer envelope containing HBs-Ag particles
- And internal nucleocapsid (**core**) containing ds-DNA genome
- The core (**nucleocapsid**) consists of two antigens HBc-Ag and HBe-Ag.
- The serum of infected individual shows large number of free spherical HBs-Ag particles.
- Some of HBs-Ag particles are linked together to take the form of filaments.

Hepatitis B Virus (Continued)

Transmission:

- Parenterally
 - Direct exposure to infected blood and body secretions
 - Use of contaminated needles, syringes, surgical and dental instruments.
 - Use of contaminated instruments in the practice of Tattooing and folk medicine.
 - Sharing contaminated razors or tooth brushes
- From mother to child:
 - Mainly perinatally during labour and delivery
- Sexually
 - By having sexual contact with infected person.

Hepatitis B Virus (Continued)

I.P.:

- 60 days
- Types of infection:
 1. Acute hepatitis B with full recovery
 2. Chronic hepatitis B infections
 3. Fulminant hepatitis
- Acute hepatitis B:
 - Approximately 90% of infected individuals develop acute hepatitis B and recover completely.
 - Acute hepatitis B is characterized by the presence of HBs-Ag in the blood for less than 6-months.
 - HBs-Ag is the first marker that appears in circulation and persists for 4-12 weeks (less than 6 months), then disappears.

Hepatitis B Virus (Continued)

- Acute hepatitis B: (Continued)
 - HBe-Ag is the second marker that appear in circulation
 - It appears after HBs-Ag and disappears before the surface antigen.
 - Antibody to the core (**anti-HBc**) is the first Ab that appear in the blood and usually persists for several years.
 - With the disappearance of HBe from circulation, Anti-HBe appears and usually persists for several weeks to months.
 - Anti-HBs is the last marker that appears in the blood. It appears few weeks after disappearance of HBs-Ag.
 - Anti-HBs usually persists for several years
 - It is the only marker that indicates immunity to HBV infection.

Hepatitis B Virus (Continued)

Chronic hepatitis B:

- Characterized by the presence of HBsAg in the blood for more than 6-months.
- About 5-10% of acutely infected adults, 50% of infected children and 90% of infected neonates will become chronically infected.
- Chronic hepatitis B varies from asymptomatic, mild liver disease to severe chronic hepatitis B
- About 20-30% of all chronic hepatitis B patients will progress to cirrhosis.
- Chronic hepatitis has three phases
 - The replicative phase
 - The inflammatory phase
 - And the inactive phase

Hepatitis B Virus (Continued)

The replicative phase:

- The patient is positive for both HBe-Ag and HBV-DNA
- ALT is normal or nearly normal
- Liver biopsy is relatively inactive

The inflammatory phase:

- For unknown reasons, patients may enter this phase
- The immune system attacks those hepatocytes harboring the virus
- ALT elevated
- Liver biopsy shows damage to hepatocytes
- Decline in the HBV-DNA in the blood

Hepatitis B Virus (Continued)

The inactive phase:

- The patient successfully clear viral replication
 - Normal ALT
 - Clearance of HBe-Ag and anti-HBe will form
- Based on the result of liver biopsy patients with chronic hepatitis are classified into three groups
1. Mild chronic hepatitis
 2. Moderate to severe chronic hepatitis
 3. Severe chronic hepatitis
 - Confluent necrosis
 - Much more likely to progress to cirrhosis

Hepatitis B Virus (Continued)

Hepatitis B vaccine:

- It contains highly purified preparation of HBsAg particles.
- HBs-Ag particles produced by genetic engineering in yeast
- It is a recombinant and subunit vaccine
- It is not live attenuated or killed vaccine
- The vaccine is administered in three doses at 0,1 & 6 months
- The vaccine is protective

Hepatitis B Virus (Continued)

Hepatitis B Markers:

1. HBsAg

- Marker of infection

2. HBeAg

- Marker of active virus replication in the liver
- High level of HBV-DNA in the patient serum
- Highly infectious

3. Anti-HBe

- Marker of low infectivity
- No active virus replication
- Less infectious

Hepatitis B Virus (Continued)

Hepatitis B Markers:

4. Anti-HBs

- Marker of immunity
- Clearance of HBV - infection

5. Anti-HBc IgG

- Marker of previous exposure to HBV

6. Anti-HBc IgM

- Marker of the acute phase of HBV infection.

Hepatocellular Carcinoma (HCC):

- One of the most common cancer in the world
- One of the most deadly cancer if not treated
- Hepatitis B and C viruses are the leading cause of chronic liver diseases, cirrhosis and HCC.

Symptoms:

- Abdominal pain
- Abdominal swelling
- Weight loss
- Anorexia
- Vomiting
- Jaundice

Physical Examination Reveals:

- Hepatomegaly
- Splenomegaly
- Ascites

Diagnosis:

- Alfa-fetoprotein measurement with multiple CT-abdominal scan are the most sensitive method for diagnosis of HCC.

Treatment:

- Surgical resection and liver transplant.

Prognosis:

- Without liver transplantation, the prognosis is poor and one year survival is rare.