HEPATITIS B

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INTRODUCTION

- The term hepatitis describes inflammation of the liver. Hepatitis may caused by alcohols, drugs, certain medical conditions and viruses.
- Viral hepatitis is a systemic infection affecting the liver predominately with primary inflammation of the liver by any one of the heterogenous group of hepatotropic viruses.
- Viral infections accounts for more than half of the cases of acute hepatitis.
- Example of hepatitis viruses:

  Hepatitis A, Hepatitis B, Hepatitis C and etc.

OVERVIEW

- Hepatitis B is the most common serious liver infection in the world.
- It caused by the hepatitis B virus (HBV) that attacks and injures in liver.
- In first phase of disease which is the first 6 month after infected, is called as acute hepatitis B infection. It may be symptomatic and asymptomatic course.
- The immune system cannot clear the virus and hepatitis B infection persists past 6 months, known as chronic hepatitis B infection.

ACUTE INFECTION

- Acute HBV infection typically last 2 to 4 months.
- Approximately 30 to 50 percent of children 5 years and older, and most adults are symptomatic.
- Infants, children younger than 5 years, and immunosuppressed adults are more likely to be asymptomatic.
- In adults with healthy immune systems, approximately 95 percent of acute infections are self-limited, with patients recovering and developing immunity.
- Fewer than 5 percent of adults acutely infected with HBV progress to chronic infection.

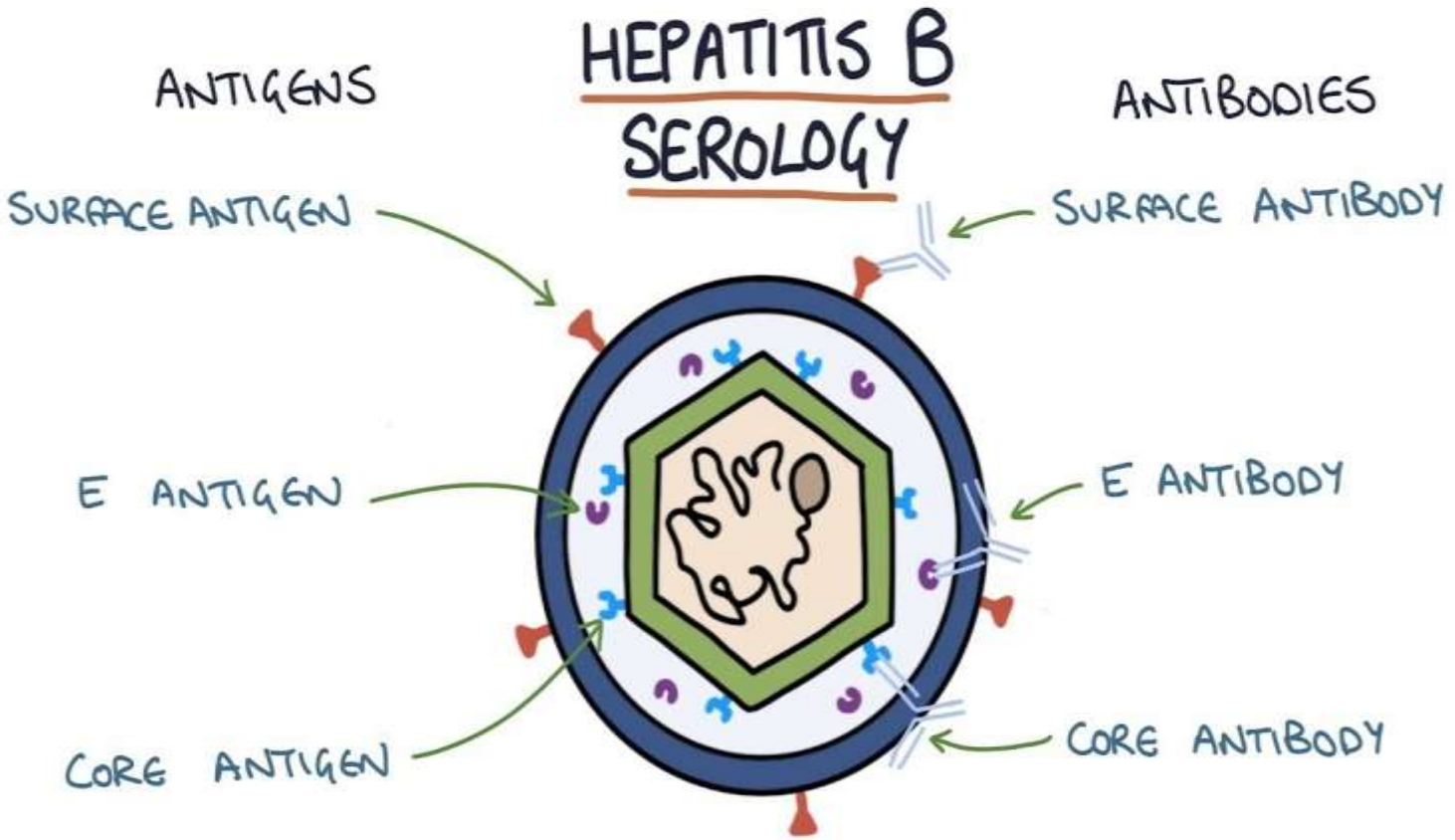
CHRONIC INFECTION

- HBV infection is considered chronic when it persists longer than six months.
- Risk of chronic HBV infection is inversely related to age, with 30 percent of children younger than 5 years, and less than 5 percent in all other person.
- Chronic HBV infection and lead to serious complications, such as cirrhosis, liver failure and liver cancer.
- Coinfection with Human immunodeficiency virus (HIV) or hepatitis C can occur.
- In this condition, patient should evaluated for treatment.

STRUCTURE

- HBV is a small (diameter of 42nm), incompletely double-stranded DNA hepadnavirus.
- The HBV genome produces a nucleocapsid that contains the hepatitis B core antigen (HBcAg).
- The nucleocapsid is encompassed with an outer envelope, known as hepatitis surface antigen (HBsAg).
- One segment of HBcAg results in the production of the hepatitis B e antigen (HBeAg), which is associated with viral replication and high infectivity.

HEPATITIS B SEROLOGY



LIFE CYCLE

- Hepatitis B virus enters the host liver cell and is transported into the nucleus of the liver cell.
- Once inside the nucleus, the viral DNA is transformed into a covalently closed circular DNA (cccDNA), which serves as a template for viral replication.
- Creation of new hepatitis B virus is packaged and leaves the liver cell, with the stable viral cccDNA remaining in the nucleus.
- It later integrate into the DNA of the host liver cell, and continue to create new hepatitis B virus.

CAUSES

- Hepatitis B infection is caused by hepatitis B virus (HBV) through blood, semen or other body fluids.
- Common ways that HBV can spread are
  - Sexual contact
  - Mother to child during delivery
  - Sharing of needles
  - Needle stick injury

SIGN AND SYMPTOMS

- They usually appear about 1 to 4 months after infection.
- Sign and symptoms may include
  - Abdominal pain
  - Dark urine
  - Fever
  - Joint pain
  - Loss of appetite
  - Nausea and vomiting
  - Weakness and fatigue
  - Jaundice

DIAGNOSIS

Test	Purpose
HBsAg	Used as general marker of infection
HBsAb	Used to record recovery and/or immunity to infection
Anti-HBc IgM	Marker of acute infection
Anti-HBc IgG	Past or chronic infection
HBeAg	Indicates active replication of virus
Anti-Hbe	Correlates lower level of replication
HBV-DNA	Measure disease activity, used for monitoring

- HBsAg
  - HBsAg is the first virology marker detectable within 1 to 12 weeks after exposure to HBV.
  - Indicator of active HBV infection and usually disappears in 3 to 6 months.
  - Its persistence for more than 6 months implies a carrier state.
  - In typical cases, HBsAg become undetectable 1 to 2 month after the onset of jaundice.

- Anti-HBs
  - Anti-HBs persists to provide protection against infection or reinfection with HBV.
  - It appears about 3 months after the onset.
  - Anti-HBs response may be both IgM and IgG type.

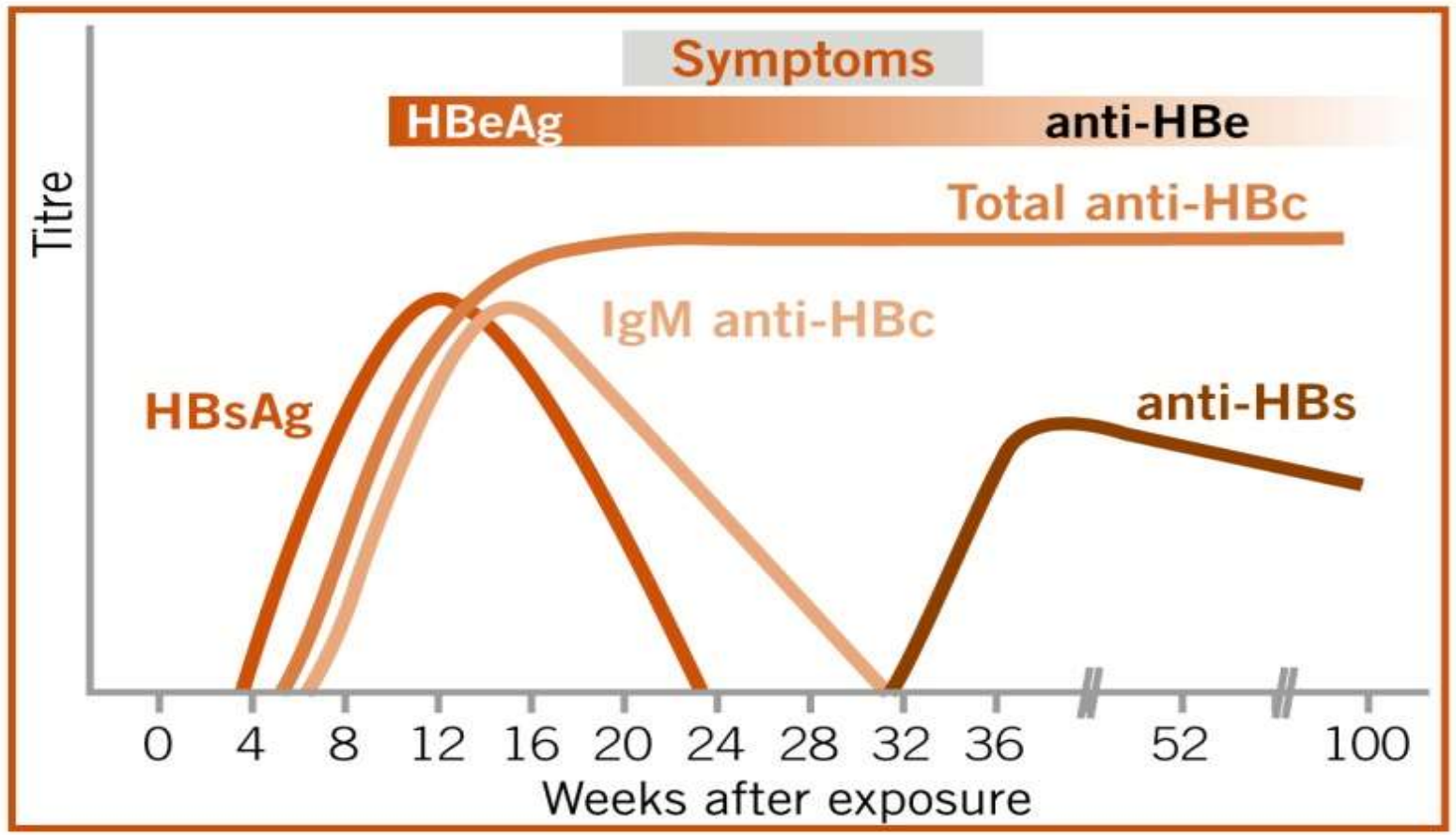
- HBcAg
  - HBcAg is the marker of replication of HBV.
  - It can be demonstrated in the nuclei of hepatocytes in carrier state and in chronic hepatitis patients but not in liver cells during acute stage.

- Anti-HBc
  - Antibody to HBcAg
  - It can be detect during pre-icteric stage on acute hepatitis B patients.
  - IgM anti-HBc appears 2 weeks after HBsAg and up to 6 months, indicative of recent stage.
  - It later followed by IgG anti-HBc which suggests HBV infection in the remote past.

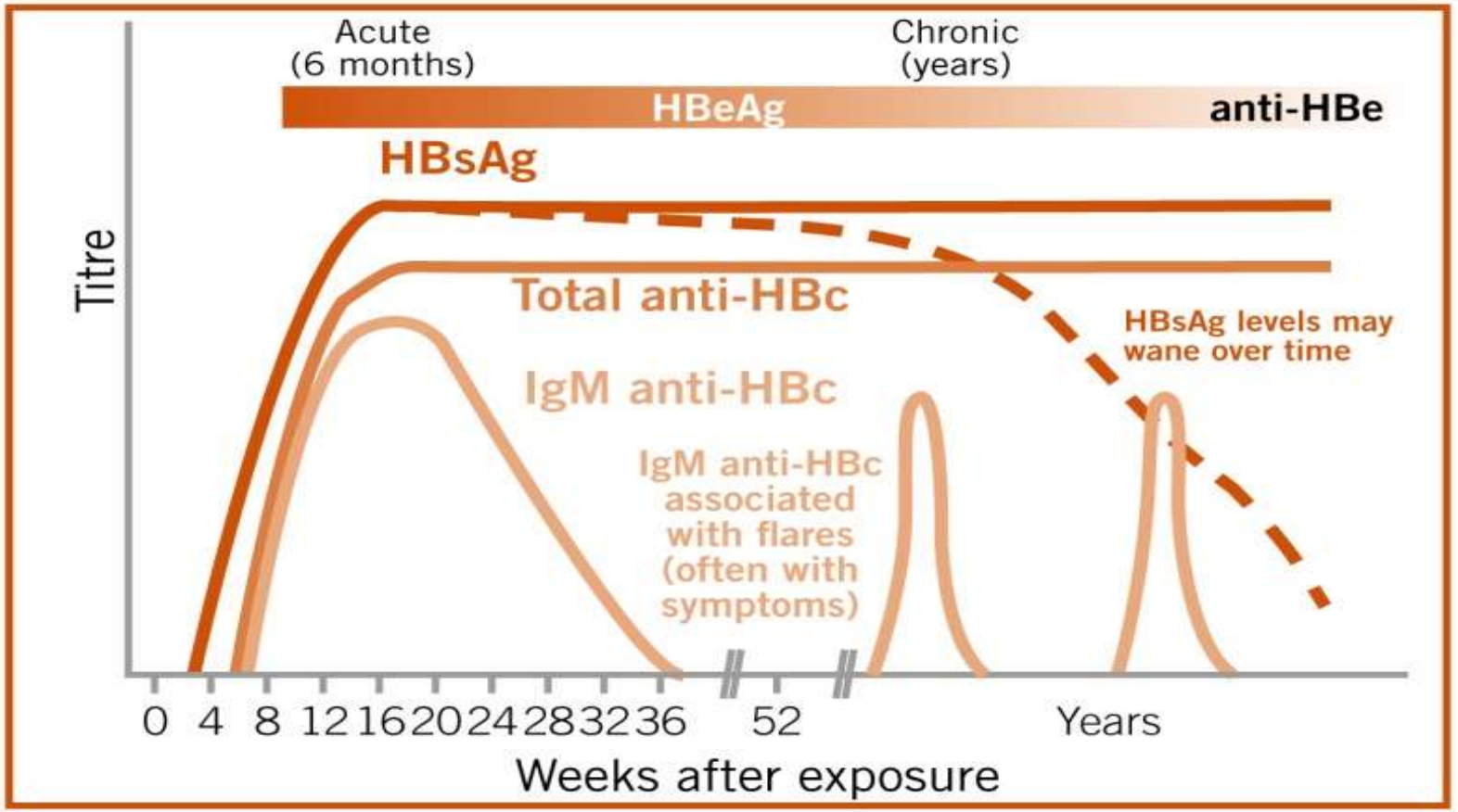
- HBeAg
  - Second marker appeared after HBsAg.
  - It is a soluble antigen and indicator of replication of HBV.
  - HBeAg derived from core protein is present transiently (3-6 weeks) during acute attack.
  - In self-limited HBV infections, HBeAg becomes undetectable shortly, before the disappearance of HBsAg, and anti-Hbe then become detectable.

- Anti-Hbe
  - Antibody to HBeAg known as anti-Hbe appears after disappearance of HBeAg.
  - Seroconversion from HBeAg to anti-Hbe is an early indication of recovery.

ACUTE INFECTION



CHRONIC INFECTION



INTERPRETATION

HBsAg	HBeAg	Anti-HBc	Anti-HBe	Anti HBs	Interpretation
-	-	-	-	-	No evidence of present or past HBV infection
+	-	-	-	-	Incubation Period of HBV
+	+	+	-	-	Early acute infection with HBV with high infectivity
+	-	+	+	-	Late acute HBV infection or chronic HBV infection with lower infectivity
-	-	+	+	-	"Window" period in late acute HBV infection
-	-	+	+	+	Convalescent from HBV
-	-	+	-	+	Late phase of convalescence (anti-HBe has waned)
-	-	-	-	+	Response to HBV vaccine or recent administration of hyperimmune anti- HBs immune globulin.

LIVER RELATED BLOOD TEST

There are some other blood test to monitor the condition of liver for HBV patient, such as

- ALT (Alanine aminotransferase)
  - Found exclusively in the liver.
  - Most common to monitor treatment for chronic hepatitis B virus infection.
- AST (Aspartate aminotransferase)
  - Found in liver, heart and muscle.
  - To help monitor liver damage.
- AFP
  - Used to screen for primary liver cancer patients with chronic hepatitis B.

PREVENTION

Hepatitis B infections can be prevent by:

- Never sharing personal care items like toothbrushes or razors.
- Practicing safe sex.
- Not sharing needles to use drugs.
- Get hepatitis B vaccine.

VACCINATION

- Hepatitis B vaccine is the one of the best ways to control the disease.
- The hepatitis B vaccine is recommended for
  - Newborns
  - Healthcare workers
  - People who live with hepatitis B patient
  - People with chronic liver disease, end-stage kidney disease or with HIV/AIDS
  - Travelers to and from areas of the world that have high rates of HBV infection
- People who exposed to virus, suggest to get antibody injection within 12 hours of exposure.

Anti-HBs level in vaccinated patients :

Test result	Interpretation
< 10 IU/L	Not vaccinated, or vaccines have not been effective
10 – 1000 IU/L	Partial vaccine response
> 1000 IU/L	Patient fully immunized

PREGNANCY

- Every pregnant woman suggest to test for HBsAg at first prenatal visit.
- Pregnant woman who has hepatitis B can pass the infection to her baby when delivery.
- There are 80 to 90 percent of risk that infant acquiring HBV virus from mother.
- Infants have to get intramuscular injection within the first 12 to 24 hour of birth to ensure protection from HBV infection.
- Breastfeeding is safe in women who are HBsAg positive. However, it not recommended for mother who undergoing treatment for HBV infection.

TREATMENT

- The goals for treatment of chronic HBV infection are to reduce inflammation of the liver.
- It helps to prevent condition like liver failure and cirrhosis and reduce the risk of hepatocellular carcinoma by suppressing HBV replication.
- Normalization of alanine transaminase (ALT), loss of HBeAg due to seroconversion, decrease in serum HBV DNA level, and improvement in liver histology indicate treatment effectiveness.
- Seroconversion predicts long-term reduction in viral replication and is used as a response marker to therapy.

CONCLUSION

- Hepatitis B virus is transmitted in blood and secretions.
- Fewer than 5 percent of adults acutely infected with hepatitis B virus progress to chronic infection.
- The diagnosis of Hepatitis B virus infection requires the evaluation of the patient's blood for hepatitis B surface antigen and antibody, hepatitis B e-antigen and antibody, hepatitis B core antibody, and HBV DNA.
- Hepatitis B vaccination is the most common way to prevent from HBV infection.
- The goals of treatment for chronic hepatitis B virus infection are to reduce inflammation of the liver and to prevent complications by suppressing viral replication.