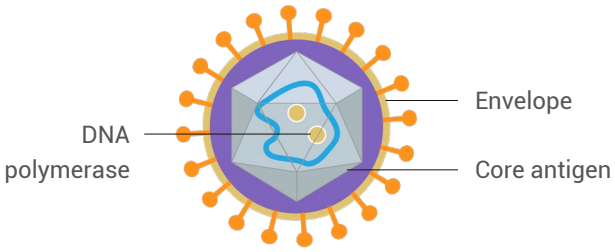
Hepatitis B virus infection

UNDERSTANDING THE PATHOGENESIS AND COURSE OF HBV INFECTION

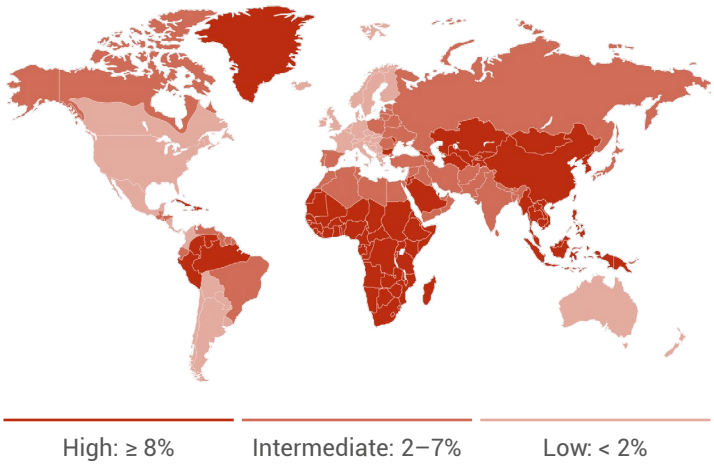
Profile

Hepatitis B virus (HBV) is an enveloped DNA virus. The enveloped surface contains the surface antigen. The inner nucleocapsid core is composed of protein and contains the so-called core antigen. Inside this core you can find the viral DNA and the DNA polymerase, which is needed for virus replication.



Genus: Orthohepadnavirus
Family: Hepadnaviridae
Genotypes: A–J

Prevalence



Transmission

Intravenous drug use: sharing of contaminated needles, syringes, or other injection drug equipment
Occupational exposure: needlesticks or other sharp instrument injuries
Vertical: transmission from mother to child
Sexual contact: unprotected sexual intercourse

Pathogenesis

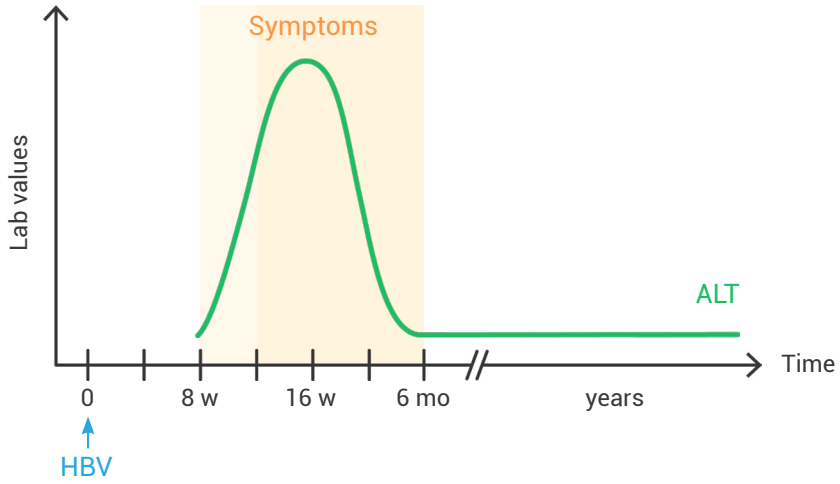
After infection, HBV enters hepatocytes and settles in the cell's nucleus, where it is converted into covalently closed circular DNA (cccDNA). cccDNA is the template for virus transcription. Antibodies against different components of HBV are produced: immunoglobulin M (IgM) antibodies first, followed by immunoglobulin G (IgG) antibodies. This immune activation leads to the damage and destruction of hepatocytes, which results in the clinical symptoms of HBV infection.

Clinical course

Incubation period: 8–21 weeks
Resolution: possible

Acute HBV infection

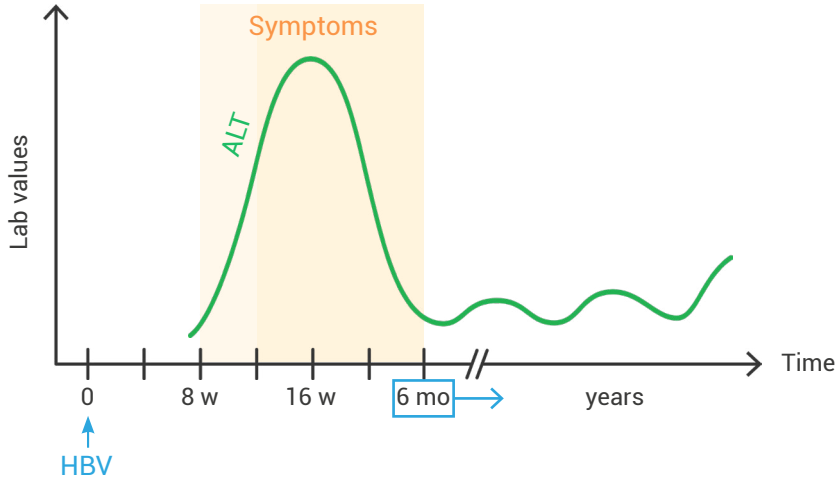
An acute infection occurs when viral DNA is detectable in blood for a maximum of six months. With the resolution of the infection, the levels of the liver enzyme alanine aminotransferase (ALT) decrease to within the normal range.



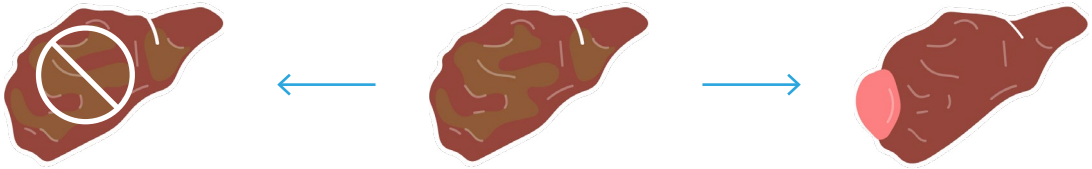
Chronic HBV infection

A chronic infection occurs when viral DNA is detectable in blood for longer than six months. According to the continuing liver damage, ALT levels fluctuate.

In about 5% of adults, an acute HBV infection will become chronic. Therefore, in about 95% of adults HBV infection will be resolved and there will be no chronification of infection. In newborns, almost all HBV infections will become chronic.



After years, chronic HBV infection leads to the development of liver cirrhosis, which in turn can lead to liver failure or hepatocellular carcinoma.



Liver failure | Cirrhosis | Hepatocellular carcinoma

Predictors of disease progression

Predictors of disease progression can be organized into three categories: viral, host, and environmental factors.

Host factors of unfavorable outcomes:
- older age
- male gender
- liver inflammation upon histology
- long duration of disease

Viral factors of unfavorable outcome:
- high viral load
- certain genotypes
- viral mutations that lead to treatment resistance

Environmental factors of unfavorable outcome:
- chronic alcohol use
- coinfections such as hepatitis C, hepatitis D, and HIV infections
- metabolic diseases (e.g., obesity)

Further Reading

License: CC BY-NC-SA 3.0 IGO. 2017. *Global Hepatitis Report 2017.* Geneva: World Health Organization.

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