Hepatitis B

By Elisa Gomez

Hepatitis B Virus (HBV) is a viral disease that is transmitted through the bodily fluids, such as blood or semen, of an infected person to an uninfected person. The virus is able to enter a new host through a puncture wound or through direct contact of mucosa. Some ways the disease can be transmitted is sexually, through direct contact of blood or open sores, from mother to baby during birth, or by sharing needles, toothbrushes and razors. The reservoir of the virus is the human host [1].

The name hepatitis refers to the primary symptom of infection: inflammation of the liver. It has been recognized as a disease since the ancient times, without knowing the etiologic agent. Baruch Blumberg identified HBV when he discovered a surface antigen for Hepatitis B named Australia antigen in 1967. This antigen was the first marker used in assays for screening and HBV detection. In 1970, David S. Dane discovered the “Dane particle” that were larger virus-like particles that contained the Australia antigen and a visible inner core. It was later confirmed by June Almeida that the Dane particle was the hepatitis virus itself. William S. Robinson identified the viral DNA of HBV in 1974. By 1978, the hepatitis B virus was cloned and sequenced, which allowed Blumberg to understand the viral life cycle and develop a vaccine [9].

The etiologic agent of hepatitis B is the hepatitis B virus. It is part of the family Hepadnaviridae, which contain different genotypes that are delineated by letters (A-H). HBV is a DNA virus that consists of a “lipid envelope containing HBsAg [filaments] that surrounds an inner nucleocapsid composed of hepatitis B core antigen (HBcAg) complexed with virally encoded polymerase and the viral DNA genome” [4]. The DNA of hepatitis B is circular and partially double stranded. The core antigens and the lipid bilayer provides the virus with protection while in the extracellular space. One the virus enters a host cell, the DNA replication mechanism allows the viral genes to persist in the host cell, which may lead to chronic infection [4]. The incubation period varies from 30 to 180 days. The average period is 75 days [6]. HBV is able to stay virulent outside of the body for at least 7 days [1]. The virus can be seen in serum through electron microscopy. Serologic tests, such as direct and indirect ELISAs, can be conducted to identify HBV by the presence of antigens or their respective antibodies [4].

Those infected by HBV may or may not show signs and symptoms. Children under the age of 5 and adults that are immunosuppressed generally do not have any symptoms of disease. 30%-50% of people above the age of 5 do have signs and symptoms during the initial infection. These include fever, nausea, vomiting, loss of appetite, jaundice, dark urine, clay-colored bowel movement, fatigue, joint pain and abdominal pain. The virus is categorized into acute and chronic infection. If a person has an acute infection, the duration of signs and symptoms is between several weeks to 6 months before full recovery. The person is then immune to future infections. If the infection becomes chronic, the health risk becomes more serious as the virus may lead to cirrhosis and liver cancer [1].
There is no direct treatment for an acute HBV infection. Only the signs and symptoms can be treated to ensure the infected person maintains a nutritional balance. However, there are antiviral medications available for chronic HBV infections to inhibit the progression of cirrhosis and/or liver cancer. Generally, the treatment cannot cure the infection, but prevent the virus from replicating. Therefore, those with chronic Hepatitis B can take one pill orally for all of their life [6].

The best method of combating this virus is to prevent infection altogether. Simple methods such as practicing safe sex and not sharing needles and other objects that contain bodily fluid can reduce the risk of infection. The HBV vaccine has been available since 1982 and can be administered to people of all ages, preferably during infancy [6]. The vaccines require 3-4 injections over a 6 month period. It is recombinant and only contains the pathogenic proteins of the virus [5]. HBV vaccines are induce cellular immunity to produce antibodies and form memory cells. Some offer passive immunity by introducing anti-HB antibodies. There are currently 5 licensed vaccines in the United States: ENGERIX-B® and RECOMBIVAX HB® are single antigen vaccines, and PEDIARIX®, TWINRIX® and COMVAX® are combination vaccines that are combined with vaccines of other diseases [1]. According to one study, the HBV vaccination creates immune memory that can outlast the antibodies produced from vaccine and no booster shot is necessary for at least 30 years after the initial vaccination [4]. Vaccination can also reduce the risk of newborns acquiring the virus from their infected mother as long as the vaccination is administered within the first 12 hours of birth [3]. The vaccine even prevents infection for those who have recently been exposed to HBV.

There has been a new advancement in HBV vaccines in the past year. HEPLISAV-B is a new vaccine for adults that has been approved by the FDA in November of this year. This vaccine only requires 2 doses instead of 3-4 like the others. Thus, the new HPV is more effective since many adults are more likely to complete the shorter vaccination series. The new vaccine also confers a higher rate of protection relative to ENGERIX-B®, an older vaccine. It is scheduled to be released for commercial use in the first quarter of 2018 [8].

Figure 1 depicts the prevalence hepatitis B throughout the world, measured in 2017. The prevalence of HBV is highest in the Western Pacific and African regions. The WHO region of the Americas has the lowest prevalence in the world [6]. The estimated number of chronic cases in the United States is between 850,000 and 2 million. There were 2,953 acute cases in America as of 2014. As seen in Figure 2, the prevalence of acute hepatitis B cases in the United States has declined over the past 15 years. More locally, Texas had 159 new cases of acute HBV infection, according to a 2015 report. Texas meets the national goal for Acute Hepatitis B incidences (less than 1.5/100,000) [2].
VIRAL HEPATITIS B IN THE WORLD

257m GLOBAL

21m EASTERN MEDITERRANEAN

39m SOUTH-EAST ASIA

115m WESTERN PACIFIC

60m AFRICA

15m EUROPE

7m AMERICAS
Globally, there is a low incidence of chronic infections in children under the age of relative to the period of time before widespread vaccine administration [6]. In the United States, the amount of new cases of acute hepatitis B increased by 20% in 2015 [8]. The outbreaks that occur in America are generally in healthcare settings. There were a total of 24 outbreaks of Hepatitis B virus in the United States in healthcare settings. The most recent outbreaks reported to the CDC from Texas was in 2010: one from an outpatient hemodialysis facility and two from patients “served by the same home health agency for diabetic care” [7].

Works Cited