

## INFORMATION PAPER

DHA-IHB  
3 November 2015

SUBJECT: Hepatitis B Infection and Hepatitis B Vaccines

1. Purpose. To describe hepatitis B virus and the vaccines to prevent it.

2. Facts.

a. Microbiology. Hepatitis B virus (HBV) is a non-enveloped, partially double-stranded DNA virus in the hepadnaviridae family. The life cycle of an HBV virus begins with attachment of the viral cell to the host cell which is generally the liver cell. HBV infection begins when the relaxed circular viral DNA (rcDNA) is brought into the nucleus where it is repaired to the covalently closed-circular form (cccDNA). This step is essential and is a prerequisite for the establishment of a productive infection by hepadnaviruses, since cccDNA is the central template for viral transcription and replication. The virus contains multiple antigenic components and there is no apparent difference in infectivity or virulence of the subtypes. HBV is particularly tenacious and, in some instances, remains infectious on surfaces for more than 7 days.

b. Disease. The incubation period for HBV ranges from 6 weeks to 6 months and averages 120 days. HBV replicates in the liver and causes hepatic dysfunction. Clinical symptoms occur more often in adults than infants or children, who are usually asymptomatic, but are much more likely to remain persistently infected and become at risk of developing serious chronic liver disease. Initial symptoms may include loss of appetite, diarrhea, vomiting, redness, jaundice (yellow skin or eyes) and pain in the muscles, joints, and stomach. At onset of jaundice a change in stools, liver tenderness and swelling may be noted. Approximately 5% of all acute HBV infections will result in chronic HBV infection. Chronic infections are responsible for most cirrhosis (scarring of the liver), liver cancer, liver failure, and even death.

c. Epidemiology. Humans are the only natural reservoir of the virus and transmission occurs by contact with contaminated secretions, including semen, vaginal secretions, blood, and saliva; through percutaneous inoculation (e.g., accidental needle sticks or sharing of needles with infected people); or by maternal-neonatal transmission. About 1/3 of people who are infected with the hepatitis B virus in the United States are unaware of it. At-risk groups include: people traveling to high-risk areas; healthcare personnel; laboratory workers handling blood and body fluids; people with diabetes; police, fire and emergency medical personnel who give first-aid treatment; people with blood-clotting disorders (e.g., hemophilia); people who have household contacts infected with the virus; people with multiple sex partners; men who have sex with men; and people who have a sexually transmitted disease. Hepatitis B vaccine is 80% to 95% effective in preventing HBV infection and clinical hepatitis among susceptible children and adults. If a protective antibody response develops after vaccination, vaccine recipients are virtually 100% protected against clinical illness.

d. Vaccines.

(1) COMVAX<sup>®</sup> produced by Merck is a pediatric combination vaccine that contains Hep B and Hib. It should not be used for the Hep B birth dose. The vial stopper contains latex. The vaccine is preservative free. COMVAX is approved for use in children as early as 6 weeks of age through 15 years of age.

(2) PEDIARIX<sup>®</sup> produced by GlaxoSmithKline is a pediatric combination vaccine that contains DTaP-Hep B-IPV. The prefilled syringe tip caps contain latex while the rubber stopper does not. The vaccine is preservative free. PEDIARIX is approved for use in children as early as 6 weeks of age through 6 years of age.

(3) TWINRIX<sup>®</sup> produced by GlaxoSmithKline is an adult bivalent vaccine of inactivated hepatitis A virus and the purified surface antigen of the hepatitis B virus. The prefilled syringe tip caps may contain latex while the rubber stopper does not. All formulations of the vaccine are preservative free. TWINRIX is approved for use in person 18 years of age or older.

(4) Engerix-B<sup>®</sup> produced by GlaxoSmithKline has both pediatric and adult formulations. The prefilled syringe tip caps contain latex while the rubber stopper does not. All formulations of the vaccine are preservative free. Engerix-B is approved for use in individuals of all ages.

(5) Recombivax-HB<sup>®</sup> produced by Merck has pediatric, adult, and dialysis formulations. The prefilled syringe tip caps and rubber stopper contain latex. All formulations of the vaccine are preservative free. Recombivax-HB is approved for use in individuals of all ages.

e. Immunization.

(1) Routine infant vaccination occurs at birth, 1-2 and 6-18 months after the initial dose. People typically receive three intramuscular doses over a 6- to 12-month period. The second dose should be given 1 month after the first dose; the third dose should be given at least 2 months after the second dose and at least 4 months after the first dose.

(2) The dosage is age and brand dependent. See each vaccine's recommended dosage and administration schedule, which are based on maternal hepatitis-B infection status, age, and individual's health condition (e.g., hemodialysis, diabetes). Review the Advisory Committee on Immunization Practices (ACIP) guidelines for unique requirements for serology testing of individual's pre and post vaccination. See age and brand specific dosage at: <http://www.health.mil/hepB>

(3) See the additional information paper on completing vaccine series with either Hep A/Hep B combination vaccine or the monovalent hepatitis A and hepatitis B vaccines at: [www.health.mil/hepB](http://www.health.mil/hepB)

(4) Special Situations: Ideally, hepatitis B vaccination should begin  $\geq 6$  months before travel so the full vaccine series can be completed before departure. Because some protection is provided by 1 or 2 doses, the vaccine series should be initiated, if indicated, even if it cannot be completed before departure. Optimal protection, however, is not conferred until after the final vaccine dose is received, and travelers should be advised to complete the vaccine series. An approved accelerated vaccination schedule can be used for people traveling on short notice that faces imminent exposure or for emergency responders to disaster areas. The accelerated vaccination schedule calls for vaccine doses administered at days 0, 7, and 21–30; a booster should be administered at 12 months to promote long-term immunity. A combined hepatitis A and hepatitis B vaccine can also be used on the same 3-dose schedule (0, 7, and 21–30 days), with a booster at 12 months. Recombivax-HB and Engerix-B can also be given SQ in patients with severe bleeding disorders. However, the subcutaneous route is less effective, so post-series titer checks are recommended.

f. Precautions. The following people should not receive hepatitis B vaccine: those with known severe hypersensitivity to the vaccine or to one of its components (e.g., baker's yeast); those who have a moderate to severe acute illness should be deferred until illness resolves. Vaccination is not contraindicated in persons with a history of multiple sclerosis (MS), Guillain-Barre syndrome (GBS), autoimmune disease (e.g. systemic lupus erythematosus or rheumatoid arthritis). Pregnancy is not a contraindication since the vaccines contain non-infectious HBsAg and cause no risk of infection to the fetus.

g. Adverse Events. The most common adverse reactions after hepatitis B vaccination are irritation, redness, swelling, warmth, itching, and bruising at the injection site; and mild systemic complaints include headache, fever, myalgia, and malaise. More rare serious reactions include tingling of the hands or feet, difficulty moving, stiffness, skin rash, difficulty breathing, chest pain, or vision problems.

h. DoD Policy. Unless seroimmune, administer hepatitis B vaccine to military personnel at initial entry training or upon deployment to HBV endemic areas. Personnel who do not respond to the first series of hepatitis B vaccine should complete a second three-dose vaccine series. The second vaccine series should be given at the usual 0, 1, 6-month schedule. Approximately 5-15% of individuals will not show protective titers following a second series of vaccine. In this situation, no further hepatitis B immunization attempts are recommended. Non-responders exposed to hepatitis B should receive a single dose of HBIG and restart the hepatitis B vaccine series with the first dose of the hepatitis B vaccine as soon as possible after exposure.

DHA-IHB

Subject: Hepatitis B Infection and Hepatitis B Vaccines

Alternatively, they should receive two doses of HBIG, one dose as soon as possible after exposure and the second dose 1 month later. Healthcare personnel and others for whom post vaccination serologic testing is recommended should be retested 1 to 2 months after completion of the second vaccine series.

### 3. References.

a. Centers for Disease Control and Prevention. A Comprehensive Immunization Strategy to Eliminate Transmission of Hepatitis B Virus in the United States. Recommendations of the Advisory Committee on Immunization Practices (ACIP). Part I. MMWR 2005; 54(RR-16):1- 23.

b. Centers for Disease Control and Prevention. A Comprehensive Immunization Strategy to Eliminate Transmission of Hepatitis B Virus the United States. Recommendations of the Advisory Committee on Immunization Practices (ACIP). Part II. MMWR 2006; 55(RR-16):1- 33.

c. Centers for Disease Control and Prevention. Epidemiology and Prevention of Vaccine Preventable Diseases, 13<sup>th</sup> Edition (2015), retrieved from: <http://www.cdc.gov/vaccines/pubs/pinkbook/downloads/hepb.pdf>

d. Multiple resources (e.g., product insert, Vaccine Information Statements) assembled by MILVAX - VHCN: [www.health.mil/hepB](http://www.health.mil/hepB)

IHB Education Office/ (877) 438-8222

Approved by: Chief, Clinical Services Office