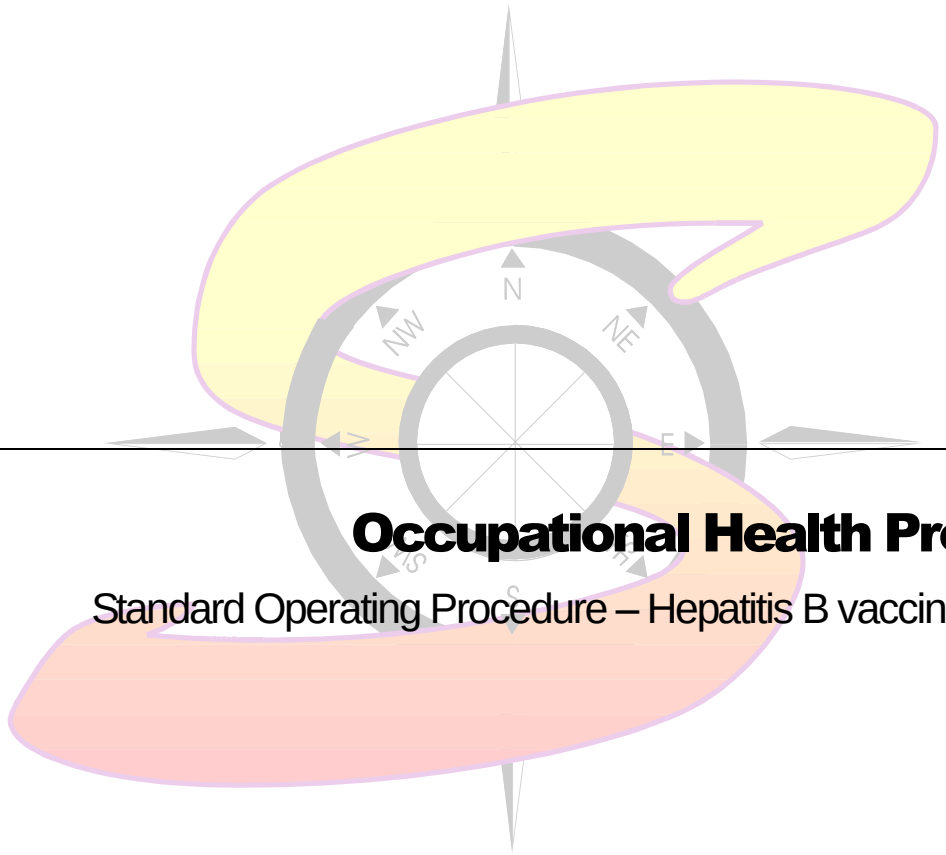


Occupational Health Programme

Standard Operating Procedure – Hepatitis B vaccination Program

Table of Contents

1 INTRODUCTION

Hepatitis B is a viral infection that is of particular importance in occupational health, because:

- It can lead to a carrier state, thereby facilitating further spread of the organism.
- It can lead to serious illness, including cirrhosis, hepatocellular carcinoma and death.
- It is not uncommon in South Africa
- In combination with HIV disease, is potentially even more deadly

Much of this morbidity and mortality is avoidable through pro-active vaccination.

2 PURPOSE

2.1 To protect employees potentially exposed to blood and other human body fluids from hepatitis B infection, though vaccination.

2.2 Specific indications in industry: - employees potentially exposed to human tissues or body fluids:

- Healthcare workers
- First Aiders
- Sewage workers
- Researchers

3 PROCEDURE

3.1 Planning Phase

The Occupational Health Nurse shall:

3.1.1 In consultation with the OMP, identify those employees who are at risk, and who should be offered vaccination.

3.1.2 Purchase the required stocks of Hepatitis B vaccine. She should ensure correct maintenance of the “cold chain”.

3.1.3 Ensure that the vaccine is stored correctly in the refrigerator, as per good pharmacy practice.

3.1.4 Ensure that the OHN who is to be assigned with the task of administering the vaccines is appropriately covered by malpractice insurance, as this is a clinical procedure, with potential professional liability.

3.1.5 Be prepared for management of a medical emergency related to the administration of vaccine (see SOP for medical emergency preparedness).

3.2 Doing Phase

The Occupational Health Nurse shall:

3.2.1 Interview those identified, in which the following is addressed:

- They should be asked as to whether or not they have ever had a course of hepatitis B vaccination before (or had the illness). (see flow chart in the appendix to view the full process)
- If not, they should be offered hepatitis B vaccination. Those who require an offer of vaccination should be asked to sign the acceptance of vaccination form. Those who refuse should sign the refusal form.
- Screen all those who accept the offer of vaccination for contraindications and precautions to hepatitis B vaccine:
    - **Contraindication**: a history of a serious reaction (e.g., anaphylaxis) after a previous dose of hepatitis B vaccine or to a hepatitis B vaccine component.
    - **Precaution**: moderate or severe acute illness with or without fever. Pregnancy is not a contra-indication, but it may be better to defer the vaccine until after delivery (or, at least, until after the first trimester).

3.2.2 Administer hepatitis B vaccine intramuscularly (22-25g, 1–1½" needle) in the deltoid muscle. For persons age 20 years or older, give 1.0 mL dosage; for persons age 19 years or younger, give 0.5 mL dosage.

3.2.3 The following options exist for subsequent doses (adults):

- **Rapid schedule** (ie. For travelers, exceptional circumstances): doses at 7 and 21 days. Booster at 12 months after 1st dose.
- **Accelerated schedule**: 1month and 2 months. Booster at 12 months after 1st dose..
- **Optimum schedule**: 1 month and 6 months. Boosters not usually required, but can be considered in the following settings:
    - For hemodialysis patients, the need for booster doses should be assessed by annual testing for antibody to hepatitis B surface antigen (anti-HBs). A booster dose should be administered when anti-HBs levels decline to <10 mIU/mL.
    - For other immunocompromised persons (e.g., HIV-infected persons, hematopoietic stem-cell transplant recipients, and persons receiving chemotherapy), the need for booster doses has not been determined. When anti-HBs levels decline to <10 mIU/mL,

annual anti-HBs testing and booster doses should be considered for those with an ongoing risk for exposure.

3.2.4 Follow the flow chart in appendix 1.

3.2.5 Ultimately, it is essential to document the successful seroconversion to positive immunity, or, if not successful, the reason(s).

3.3 Follow-up Phase

The Occupational Health Nurse shall:

3.3.1 Document each patient's vaccine administration information and follow up in the following places:

- **Medical chart**: Record the date the vaccine was administered, the manufacturer and lot number, the vaccination site and route, and the name and title of the person administering the vaccine. If vaccine was not given, record the reason(s) for non-receipt of the vaccine (e.g. medical contraindication, patient refusal).
- **Personal immunization record card**: Record the date of vaccination and the name/location of the administering clinic.
- **IT system**. Record that the vaccine was given, and the date, so as to schedule the next dose.

4 FORMS

4.1 Acceptance of offer for vaccination form

4.2 Rejection of offer for vaccination form

5 REFERENCES

5.1 See Management Guide on Hazardous Biological Agents

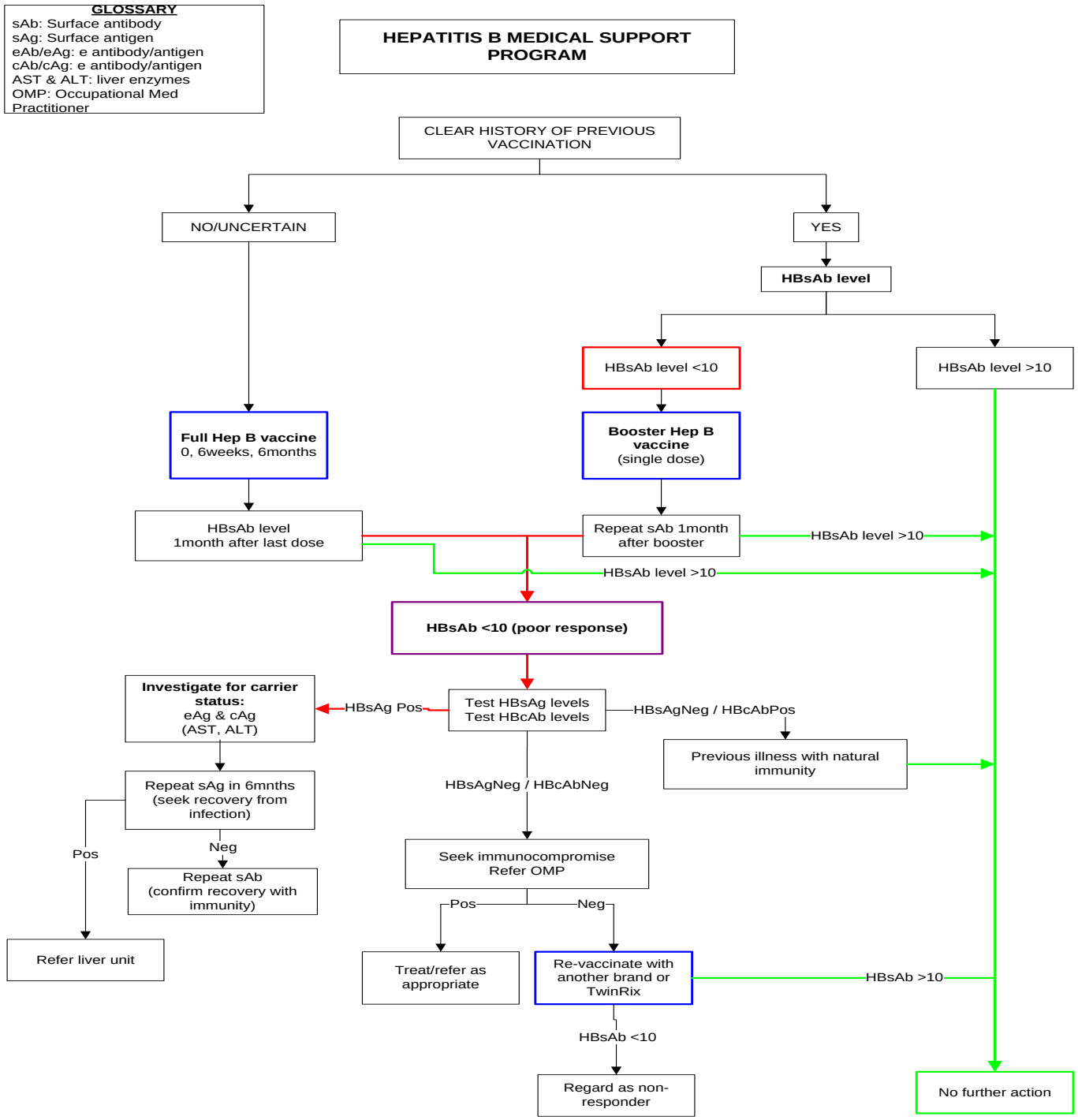
5.2 Appendix 2: Extracts from a statistics document provided by the SA Department of Health ("Statistical Notes", Aug 2005), and an information document from the Centre for Disease Control (CDC), USA.

6 Document History

Version Number	Change	Date
01	Change of flow chart to include interview right at the beginning,	14 Sep 2009

	regarding previous vaccination.	
02	Improvements in the procedure section, including the addition of the three phases of the program. Addition of headings for forms.	15 Sep 2009
03	Addition of pregnancy as a precaution.	21 Sep 2009
04	Correction of flow chart (>10 to >5)	29 Sep 2009
05	Correction of flow chart (back to >10)	13 May 2010
06	Correction of schedule	

7 Appendix 1: Flow chart



8 Appendix 2: Information on Hepatitis B

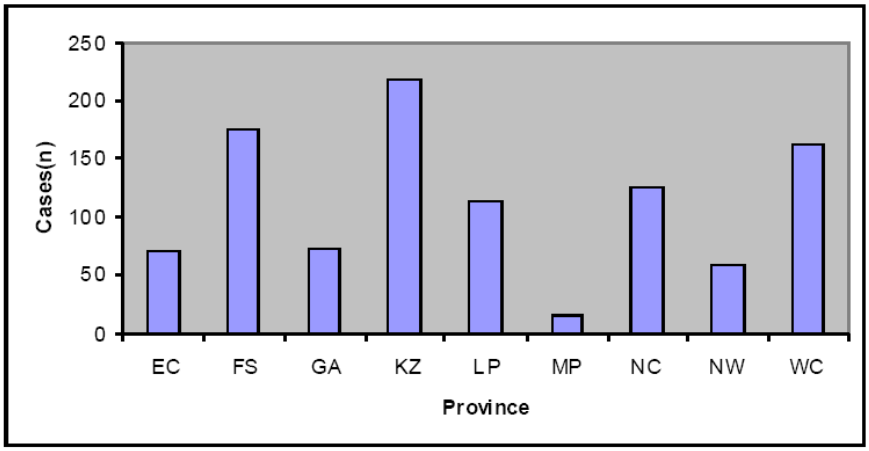
Overview and Statistics

How common is chronic HBV infection in South Africa?

Distribution by province, 2001-2004

During this period, the majority of cases (n=219, 25%) were reported from Kwa-Zulu Natal. Free State and Western Cape also accounted for many cases reported (Fig. 2).

Distribution of hepatitis B cases by province in 2001-2004



*Data from GA and MP is incomplete

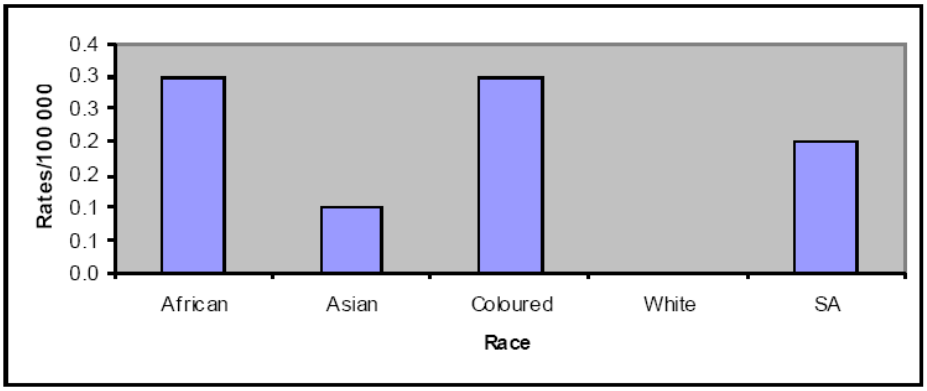
Source: Epidemiology and Surveillance, NDOH

Notified hepatitis B cases in South Africa 2005

In 2005, a total 112 cases of hepatitis B were reported during the period of Jan-July. The case fatality rate (CFR) is 4%. In 2005, the majority of cases were reported from Kwa-Zulu Natal (n=36, 32%) and Free State (n=23, 21%), during the period of Jan-July Eastern Cape and Northern Cape reported 6 cases each during the same period.

Distribution of hepatitis B by racial groups, Jan-Jul 2005

The prevalence of HBV in 2005 for the Jan-Jul period, is presented as rates per 100 000 using the population estimates from Statistics South Africa (2005). The highest rate of disease occurred in Africans and Coloureds (0.3 per 100 000 in populations). The prevalence of HBV in 2005 for South Africa is 0.2 per 100 000 for the same period.



*Data from GA and MP is incomplete

Source: Epidemiology and Surveillance Directorate, NDOH

Transmission, Symptoms, and Treatment

How is HBV transmitted?

HBV is transmitted through activities that involve percutaneous (i.e., puncture through the skin) or mucosal contact with infectious blood or body fluids (e.g., semen, saliva), including

- Sex with an infected partner
- Injection drug use that involves sharing needles, syringes, or drug-preparation equipment
- Birth to an infected mother
- Contact with blood or open sores of an infected person
- Needle sticks or sharp instrument exposures
- Sharing items such as razors or toothbrushes with an infected person

HBV is not spread through food or water, sharing eating utensils, breastfeeding, hugging, kissing, hand holding, coughing, or sneezing.

How long does HBV survive outside the body?

HBV can survive outside the body at least 7 days and still be capable of causing infection.

What should be used to remove HBV from environmental surfaces?

Any blood spills — including dried blood, which can still be infectious — should be cleaned using 1:10 dilution of one part household bleach to 10 parts of water for disinfecting the area. Gloves should be used when cleaning up any blood spills.

Who is at risk for HBV infection?

The following populations are at increased risk of becoming infected with HBV:

- Infants born to infected mothers
- Sex partners of infected persons
- Sexually active persons who are not in a long-term, mutually monogamous relationship (e.g., >1 sex partner during the previous 6 months)
- Men who have sex with men
- Injection drug users
- Household contacts of persons with chronic HBV infection
- Healthcare and public safety workers at risk for occupational exposure to blood or blood-contaminated body fluids
- Hemodialysis patients
- Residents and staff of facilities for developmentally disabled persons
- Travelers to countries with intermediate or high prevalence of HBV infection

Are international travelers at risk for HBV infection?

The risk for HBV infection in international travelers is generally low, except for certain travelers to regions where the prevalence of chronic HBV infection is high or intermediate (i.e., hepatitis B surface antigen prevalence of ≥2%). Hepatitis B vaccination should be administered to unvaccinated persons traveling to those countries.

What are the signs and symptoms of HBV infection?

The presence of signs and symptoms varies by age. Most children under age 5 years and newly infected immunosuppressed adults are asymptomatic, whereas 30%–50% of persons aged ≥5 years have initial signs and symptoms. When present, signs and symptoms can include

- Fever
- Fatigue
- Loss of appetite
- Nausea
- Vomiting
- Abdominal pain
- Dark urine
- Clay-colored bowel movements
- Joint pain
- Jaundice

Persons with chronic HBV infection might be asymptomatic, have no evidence of liver disease, or have a spectrum of disease ranging from chronic hepatitis to cirrhosis or hepatocellular carcinoma (a type of liver cancer).

What is the incubation period for hepatitis B?

Symptoms begin an average of 90 days (range: 60–150 days) after exposure to HBV.

When symptoms of acute hepatitis B occur, how long do they usually last?

Symptoms typically last for several weeks but can persist for up to 6 months.

How serious is acute HBV infection?

Acute infection ranges from asymptomatic or mild disease to — rarely — fulminant hepatitis. Disease is more severe among adults aged >60 years. The fatality rate among acute cases reported to CDC is 0.5%–1%.

How serious is chronic HBV infection?

Approximately 25% of those who become chronically infected during childhood and 15% of those who become chronically infected after childhood die prematurely from cirrhosis or liver cancer, and the majority remain asymptomatic until onset of cirrhosis or end-stage liver disease. In the United States, chronic HBV infection results in an estimated 2,000–4,000 deaths per year.

How likely is HBV infection to become chronic?

The risk for chronic infection varies according to the age at infection and is greatest among young children. Approximately 90% of infants and 25%–50% of children aged 1–5 years will remain chronically infected with HBV. By contrast, approximately 95% of adults recover completely from HBV infection and do not become chronically infected.

How is HBV infection treated?

For acute infection, no medication is available; treatment is supportive.

For chronic infection, several antiviral drugs (adefovir dipivoxil, interferon alfa-2b, pegylated interferon alfa-2a, lamivudine, entecavir, and telbivudine) are available. Persons with chronic HBV infection require medical evaluation and regular monitoring to determine whether disease is progressing and to identify liver damage or hepatocellular carcinoma.

Hepatitis B Serology

What do the different hepatitis B serologic markers mean?

Hepatitis B surface antigen (HBsAg): A protein on the surface of HBV; it can be detected in high levels in serum during acute or chronic HBV infection. The presence of HBsAg indicates that the person is infectious. The body normally produces antibodies to HBsAg as part of the normal immune response to infection. HBsAg is the antigen used to make hepatitis B vaccine.

Hepatitis B surface antibody (anti-HBs): The presence of anti-HBs is generally interpreted as indicating recovery and immunity from HBV infection. Anti-HBs also develops in a person who has been successfully vaccinated against hepatitis B.

Total hepatitis B core antibody (anti-HBc): Appears at the onset of symptoms in acute hepatitis B and persists for life. The presence of anti-HBc indicates previous or ongoing infection with HBV in an undefined time frame.

IgM antibody to hepatitis B core antigen (IgM anti-HBc): Positivity indicates recent infection with HBV (≤6 months). Its presence indicates acute infection.

Hepatitis B e antigen (HBeAg): A secreted product of the nucleocapsid gene of HBV that is found in serum during acute and chronic hepatitis B. Its presence indicates that the virus is replicating and the infected person has high levels of HBV.

Hepatitis B e antibody (HBeAb or anti-HBe): Produced by the immune system temporarily during acute HBV infection or consistently during or after a burst in viral replication. Spontaneous conversion from e antigen to e antibody (a change known as seroconversion) is a predictor of long-term clearance of HBV in patients undergoing antiviral therapy and indicates lower levels of HBV.

How do I interpret hepatitis B serologic test results?

The following table provides interpretations for hepatitis B serologic markers. A PDF version is also available.

Interpretation of Hepatitis B Serologic Test Results		
Tests	**Results**	**Interpretation**
HBsAg anti-HBc anti-HBs	negative negative negative	Susceptible
HBsAg anti-HBc anti-HBs	negative positive positive	Immune due to natural infection
HBsAg anti-HBc anti-HBs	negative negative positive	Immune due to hepatitis B vaccination
HBsAg anti-HBc IgM anti-HBc anti-HBs	positive positive positive negative	Acutely infected
HBsAg anti-HBc IgM anti-HBc anti-HBs	positive positive negative negative	Chronically infected
HBsAg anti-HBc anti-HBs	negative positive negative	Interpretation unclear; four possibilities: 1. Resolved infection (most common)

Interpretation of Hepatitis B Serologic Test Results		
		2. False-positive anti-HBc, thus susceptible 3. "Low level" chronic infection 4. 4. Resolving acute infection

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IgM antibody to hepatitis B core antigen (IgM anti-HBc): Positivity indicates recent infection with HBV (≤6 months). Its presence indicates acute infection.

Adapted from: A Comprehensive Immunization Strategy to Eliminate Transmission of Hepatitis B Virus Infection in the United States: Recommendations of the Advisory Committee on Immunization Practices. Part I: Immunization of Infants, Children, and Adolescents. MMWR 2005;54(No. RR-16).

How long does it take for blood to test HBsAg-positive after exposure to HBV?

HBsAg will be detected in an infected person's blood an average of 4 weeks (range: 1–9 weeks) after exposure to the virus. About 1 of 2 patients will no longer be infectious by 7 weeks after onset of symptoms, and all patients who do not remain chronically infected will be HBsAg-negative by 15 weeks after onset of symptoms.

Hepatitis B Vaccination

Who should be vaccinated against hepatitis B?

The Advisory Committee on Immunization Practices recommends that the following persons be vaccinated against hepatitis B:

- All infants, beginning at birth
- All children aged <19 years who have not been vaccinated previously
- Healthcare and public safety workers at risk for exposure to blood or blood-contaminated body fluids
- Travelers to regions with intermediate or high rates of endemic HBV infection
- Persons with HIV infection
- Other:
    - Susceptible sex partners of hepatitis B surface antigen (HBsAg)-positive persons

- Sexually active persons who are not in a long-term, mutually monogamous relationship (e.g., >1 sex partner during the previous 6 months)
- Persons seeking evaluation or treatment for a sexually transmitted disease
- Men who have sex with men
- Injection drug users
- Susceptible household contacts of HBsAg-positive persons
- Persons with end-stage renal disease, including predialysis, hemodialysis, peritoneal dialysis, and home dialysis patients
- Residents and staff of facilities for developmentally disabled persons
- Persons with chronic liver disease

All other persons seeking protection from HBV infection — acknowledgment of a specific risk factor is not a requirement for vaccination.

Is hepatitis B vaccination recommended in certain settings?

Yes. In certain healthcare, evaluation, or treatment settings, a high proportion of clients have known risk factors for HBV infection. The Advisory Committee on Immunization Practices recommends universal vaccination of adults who receive care in those settings, including

- Sexually transmitted disease treatment facilities
- HIV testing and treatment facilities
- Facilities providing drug-abuse treatment and prevention services
- Healthcare settings targeting services to injection drug users
- Correctional facilities
- Healthcare settings targeting services to men who have sex with men
- Chronic hemodialysis facilities and end-stage renal disease programs
- Institutions and nonresidential day care facilities for developmentally disabled persons.

What are the hepatitis B vaccines licensed for use?

Two single-antigen vaccines and three combination vaccines are currently licensed in the South Africa.

Single-antigen hepatitis B vaccines

- ENGERIX-B®
- HEBER-BIOVAC HB®

Combination vaccines

- TWINRIX®: Combined hepatitis A and hepatitis B vaccine. recommended for persons aged ≥18 years who are at increased risk for both hepatitis A virus and HBV infections.

What are the recommended schedules for hepatitis B vaccination?

The vaccination schedule most often used for children and adults is 3 intramuscular injections, the second and third doses administered 1 and 6 months, respectively, after the first dose. Alternate schedules have been approved for certain vaccines and/or populations.

What are the recommended doses of hepatitis B vaccines?

Recommended doses of currently licensed formulations of hepatitis B vaccine, by age group and vaccine type

Age Group		Single-antigen vaccine		Combination vaccine	
		Engerix-B		Twinrix§	
		Dose (µg)¶	Vol(mL)	Dose (µg)¶	Vol (mL)
Infants (<1 yr)		10	0.5	NA**	NA
Children (1–10 yrs)		10	0.5	NA	NA
Adolescents	11–15 yrs	NA	NA	NA	NA
	11–19 yrs	10	0.5	NA	NA
Adults (≥20 yrs)		20	1.0	20§	1.0
Hemodialysis patients and other immuno-compromised persons	<20 yrs§§	10	0.5	NA	NA
	≥20 yrs	40***	2.0	NA	NA

§ Combined hepatitis A and hepatitis B vaccine. This vaccine is recommended for persons aged ≥18 years who are at increased risk for both hepatitis B virus and hepatitis A virus infections.
¶ Recombinant hepatitis B surface antigen protein dose.
** Not applicable.
†† Adult formulation administered on a 2-dose schedule.
§§ Higher doses might be more immunogenic, but no specific recommendations have been made.
¶¶ Dialysis formulation administered on a 3-dose schedule at 0, 1, and 6 months.
*** Two 1.0-mL doses administered at one site, on a 4-dose schedule at 0, 1, 2, and 6 months.

Who should not receive hepatitis B vaccine?

Anyone who has had a serious allergic reaction to a prior dose of hepatitis B vaccine, a component of the hepatitis B vaccine, or yeast should not receive hepatitis B vaccine.

Can a patient receive the first dose of hepatitis B vaccine from one manufacturer and subsequent doses from another manufacturer?

Yes. No differences in immune response are observed when vaccines from different manufacturers are used to complete the vaccine series.

If there is an interruption between doses of hepatitis B vaccine, does the vaccine series need to be restarted?

No, the series does not need to be restarted.

If the vaccine series was interrupted after the first dose, the second dose should be administered as soon as possible.

The second and third doses should be separated by an interval of at least 8 weeks.

If only the third dose is delayed, it should be administered as soon as possible.

Is it harmful to administer an extra dose(s) of hepatitis A or hepatitis B vaccine or to repeat the entire vaccine series if documentation of vaccination history is unavailable?

No. If necessary, administering extra doses of hepatitis A or hepatitis B vaccine is not harmful.

Can hepatitis B vaccine be administered concurrently with other vaccines?

Yes. When hepatitis B vaccine has been administered at the same time as other vaccines, no interference with the antibody response of the other vaccines has been demonstrated. Separate body sites and syringes should be used for simultaneous administration of injectable vaccines.

How long does protection from hepatitis B vaccine last?

Studies indicate that immunologic memory remains intact for at least 20 years among healthy vaccinated individuals who initiated hepatitis B vaccination >6 months of age. The vaccine confers long-term protection against clinical illness and chronic hepatitis B virus infection. Cellular immunity appears to persist even though antibody levels might become low or decline below detectable levels.

Among vaccinated cohorts who initiated hepatitis B vaccination at birth, long-term follow-up studies are ongoing to determine the duration of vaccine-induced immunity.

Why should an infant receive hepatitis B vaccine at birth before hospital discharge, even if the mother is negative for hepatitis B surface antigen (HBsAg)?

Infants born to HBV-infected mothers require hepatitis B vaccine and hepatitis B immune globulin (HBIG) within 12 hours of birth to protect them from infection. However, because errors or delays in documenting, testing, and reporting maternal HBsAg status can and do occur, administering the first dose of hepatitis B vaccine soon after birth to all infants acts as a safety net, reducing the risk for perinatal infection when maternal HBsAg status is either unknown or incorrectly documented at delivery. Also, initiating the hepatitis B vaccine series at birth has been shown to increase a child's likelihood of completing the vaccine series on schedule.

Can hepatitis B vaccine be given during pregnancy or lactation?

Yes. Hepatitis B vaccine contains no live virus, so neither pregnancy nor lactation should be considered a contraindication to vaccination of women. On the basis of limited experience, there is no apparent risk of adverse effects to developing fetuses when hepatitis B vaccine is administered to pregnant women. Meanwhile, new HBV infection in a pregnant woman might result in severe disease for the mother and chronic infection for the newborn.

Can hepatitis B vaccine be given to immunocompromised persons, such as persons on hemodialysis or persons with HIV infection?

Yes, although a larger vaccine dose is required to induce protective antibody in hemodialysis patients. Larger doses or additional doses might also be necessary for other immunocompromised persons. Serologic testing of hemodialysis patients and other immunocompromised persons is recommended 1–2 months after administration of the final dose of the primary vaccine series to determine the need for revaccination. Detailed guidance on vaccination of hemodialysis patients and other immunocompromised persons is available from the Advisory

Can hepatitis B vaccine be given after exposure to HBV?

Yes. After a person has been exposed to HBV, appropriate prophylaxis, given as soon as possible but preferably within 24 hours, can effectively prevent infection. The mainstay of postexposure immunoprophylaxis is hepatitis B vaccine, but in certain circumstances the addition of HBIG will provide increased protection.

Should persons be tested for immunity to hepatitis B before being vaccinated?

Historically, routine prevaccination testing has not been recommended because it has not generally been found to be cost-effective with regard to vaccination. However, with the availability of antiviral agents to treat chronic HBV infection, new recommendations for identifying persons with chronic HBV infection are being developed. CDC currently recommends that certain populations undergo testing for HBV infection, including

- Hemodialysis patients
- Pregnant women
- Persons with known or suspected exposure to HBV including:
- infants born to HBV-infected mothers
- household contacts of HBV-infected persons
- persons with known occupational or other exposures to infectious blood or body fluids
- Foreign-born persons from countries of high HBV endemicity
- HIV-positive persons

For these populations, serologic assays for HBsAg and anti-HBs should be used to determine infection or immunity prior to vaccination.

Is there any benefit or risk in vaccinating a person who has been infected with HBV?

Persons who have already been infected with HBV will receive no benefit from vaccination. However, there is no risk to a previously infected person who receives vaccination.

Who should receive postvaccination testing?

Testing for immunity is advised only for persons whose subsequent clinical management depends on knowledge of their immune status, including

- Infants born to HBsAg-positive mothers
- Healthcare workers and public safety workers at high risk for continued percutaneous or mucosal exposure to blood or body fluids

- Chronic hemodialysis patients, HIV-infected persons, and other immunocompromised persons (e.g., hematopoietic stem-cell transplant recipients or persons receiving chemotherapy)
- Sex partners of persons with chronic HBV infection

When should postvaccination testing be done?

When necessary, postvaccination testing for antibody to hepatitis B surface antigen (anti-HBs) should generally be performed 1–2 months after completion of the vaccine series.

For infants born to HBsAg-positive mothers, postvaccination testing should be performed 1–2 months after completion of ≥3 doses of a licensed hepatitis B vaccine series (i.e., at age 9–18 months, generally at the next well-child visit). To avoid detection of anti-HBs from hepatitis B immune globulin administered during infancy and to maximize detection of late HBV infection, testing should not be performed before age 9 months nor within 4 weeks of the most recent vaccine dose.

Are booster doses of hepatitis B vaccine recommended?

Booster doses of hepatitis B vaccine are recommended only in certain circumstances:

For **hemodialysis patients**, the need for booster doses should be assessed by annual testing for antibody to hepatitis B surface antigen (anti-HBs). A booster dose should be administered when anti-HBs levels decline to <10 mIU/mL.

For **other immunocompromised persons** (e.g., HIV-infected persons, hematopoietic stem-cell transplant recipients, and persons receiving chemotherapy), the need for booster doses has not been determined. When anti-HBs levels decline to <10 mIU/mL, annual anti-HBs testing and booster doses should be considered for those with an ongoing risk for exposure.

For persons with **normal immune status who have been vaccinated**, booster doses are not recommended.