

What is Hepatitis B?

Hepatitis B is caused by the hepatitis B virus. The virus primarily affects the liver. The infection can cause quick, life-threatening liver inflammation, but this is very rare. For most, hepatitis B infection is not noticeable and may lead to slow, progressive liver damage. The liver damage can include inflammation, liver scarring (fibrosis), severe liver damage (cirrhosis), and even liver cancer (hepatocellular carcinoma). Hepatitis B is the leading cause of liver cancer and 10th leading cause of death in the world.

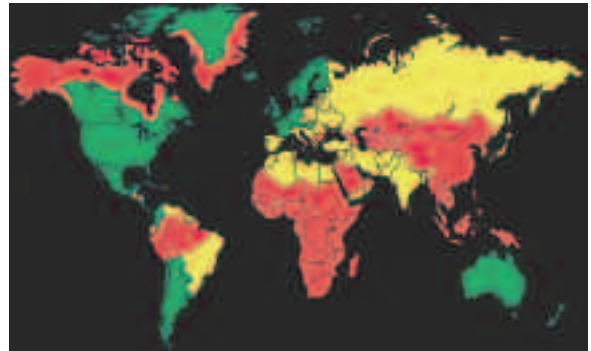
Hepatitis B is called a "**silent infection**" because most infected people have no noticeable symptoms. Some people are able to fight off the virus in the first few months and get better. When a person is first infected, it is called an 'acute' infection. If the virus is detectable in the blood for more than six months, the person is considered to have a 'chronic' infection. The risk of developing a chronic hepatitis B infection is directly related to the age at which one becomes infected with the virus. According to the World Health Organization (WHO):

- ◆ 90% of infants exposed to the hepatitis B virus will develop chronic infections.
- ◆ About 50% of exposed children (ages of 1 to 5 years) will develop chronic infections.
- ◆ 5-10% of healthy adults who are infected will develop chronic infection.

How many people are affected by hepatitis B?

The Centers for Disease Control and Prevention (CDC) report that worldwide, more than 400 million people have chronic hepatitis B infections. Each year, 10 to 30 million new infections occur and about 1 million people die from hepatitis B. The prevalence of hepatitis B varies by region. The WHO diagram indicates that parts of Asia, Africa and South America have high rates of hepatitis B. In areas with high rates of hepatitis B, most new infections occur in newborns.

The CDC reports that more than 1 million Americans are chronically infected with hepatitis B. Each year 100,000 new infections occur and five thousand Americans die as



Geographic Distribution of Chronic HBV Infection

HBsAg Prevalence

■ 8% - High ■ 2-7% - Intermediate ■ <2% - Low

a result of hepatitis B infection. In the U.S., doctors usually screen pregnant women for hepatitis B and if the woman is infected, they make effort to prevent infection of the baby. Maternal screening and recommendations to vaccinate all children have significantly reduced hepatitis B infections in children. Today, the majority of new infections in the U.S. occur in young adults.

Symptoms of hepatitis B

Most people with hepatitis B have **NO** symptoms and have no idea they are infected until they see signs of severe liver damage or a healthcare providers does a hepatitis B blood test.

If symptoms do occur, they can vary in type and severity.

Common symptoms:

- ◆ Fever
- ◆ Fatigue (extreme tiredness)
- ◆ Muscle and joint pain
- ◆ Nausea and vomiting

Rare Symptoms:

- ◆ Severe nausea and vomiting that could lead to dehydration
- ◆ Jaundice (yellowing of the skin and eyes, dark urine)
- ◆ Bloating or swollen abdomen or stomach.



How is hepatitis B transmitted?

Hepatitis B virus is VERY infectious. Hepatitis B is transmitted from person-to-person through contact with infected blood or infected bodily fluids.

This can occur during:

- ◆ Unprotected sex
- ◆ Birth -from an infected woman to her newborn
- ◆ Direct blood-to-blood contact
- ◆ Use of unsterile needles for drug use, tattoos, piercing and acupuncture
- ◆ Sharing razors
- ◆ Sharing toothbrushes
- ◆ Sharing pierced earrings
- ◆ Unsterile medical equipment

Hepatitis B is NOT transmitted through casual contact. The virus is not transmitted by coughing, sneezing, hugging, or eating.

Due to the modes of transmission, the **following groups are considered at increased risk** for hepatitis B infection:

- ◆ Health care workers and emergency personnel
- ◆ Infants born to mothers who are infected at the time of delivery
- ◆ People living in close household contact with an infected person
- ◆ Individuals with multiple sex partners, past or present
- ◆ Individuals who have had unprotected sex with a potentially infected person
- ◆ Individuals who have ever been diagnosed with a sexually transmitted disease
- ◆ Illicit drug users (injecting, inhaling, snorting, popping pills)
- ◆ Men who have sex with men
- ◆ Individuals who received a blood transfusion prior to 1992
- ◆ Individuals who get tattoos or body piercing
- ◆ Individuals who travel to countries where hepatitis B is common (Asia, Africa, South America, the Pacific Islands, Eastern Europe, and the Middle East)

- ◆ Individuals born to parents who emigrated from these areas (see above)
- ◆ Families adopting children from areas where hepatitis B is common (see above)
- ◆ Individuals with kidney disease or undergoing kidney dialysis
- ◆ Individuals who use blood products for medical conditions (such as hemophilia)
- ◆ Residents and staff of correctional facilities and group homes

How can hepatitis B infection be prevented?

The hepatitis B virus is a tough, hardy virus. It can remain infectious outside the body, even in dried blood or body fluids, for up to two weeks. The BEST way to prevent infection is vaccination. Avoiding exposure to infected blood and bodily fluids can reduce the risk of acquiring a hepatitis B infection.

Hepatitis B vaccine

Hepatitis B vaccine is safe, effective and available for children and adults. Three doses of the vaccine are required for optimal protection. The schedule for the vaccinations is:

- ◆ First Injection - At any given time
- ◆ Second Injection - At least one month after the first dose
- ◆ Third Injection - Six months after the first dose

If the schedule is interrupted, it can be resumed at any time. There is no need to restart the series. There is an accelerated 4 month vaccination schedule that is sometimes used for travelers or healthy adolescents.

The CDC recommends that all infants be vaccinated. Most school districts require proof of hepatitis B vaccination prior to school entry. Some colleges and universities also require proof of vaccination. The vaccine doesn't help those already infected by hepatitis B. It also won't hurt. High-risk individuals can be vaccinated, and should also be tested to make sure they were not infected prior to immunization.

The following list is a general guide for **who should be vaccinated**. Everyone is at some risk for infection, these guidelines should be individualized for each situation.



- ◆ All infants at birth and all children up to age 18
- ◆ Health care professionals and emergency personnel
- ◆ Sexually active teens and adults
- ◆ Men who have sex with men
- ◆ Sex partners or close family/household members living with an infected person
- ◆ Families considering adoption, either domestic or international
- ◆ Travelers to countries where hepatitis B is common (Asia, Africa, South America, the Pacific Islands, Eastern Europe, and the Middle East)
- ◆ Patients with kidney disease or undergoing dialysis
- ◆ Residents and staff of correctional facilities and group homes

Insurance companies will usually cover the cost of vaccines for infants, children and SOME adults. There is also a federal program to help cover the cost of children's vaccines. Contact your local health department about the vaccines for children program (VFC).

If an adult is in a high-risk group, the cost may be covered by insurance, but typically the healthcare provider must document the risk factor. Some patients are not comfortable disclosing this information. Insurance companies may not cover the cost of vaccination for travelers and those with occupational risk for infection (such as healthcare workers and emergency personnel). These individuals should ask their employer about receiving the hepatitis B vaccine. If a person has a risk factor or wants to be vaccinated, they should ask their doctor or contact a local health department.

Remember that hepatitis B vaccine does not protect against hepatitis A or hepatitis C viruses!

Reduce exposure to the virus

You can also prevent infection by minimizing or eliminating exposure to infected blood and bodily fluids.

- ◆ Practice safer sex- use condoms, don't touch sexual fluids
- ◆ Do not touch other's blood. Wear latex or rubber gloves. Use universal precautions!
- ◆ NEVER share needles or any injection drug equipment

- ◆ Get only sterile, professional tattoos, piercings, and acupuncture
- ◆ Cover all wounds
- ◆ If you believe you may have been exposed to the virus, call your doctor or health department immediately - they can help prevent infection.
- ◆ Report any occupational needle sticks to health officials immediately

Diagnosis of hepatitis B

A simple blood test can diagnose hepatitis B infection. All pregnant women should be tested for hepatitis B. Unfortunately, few others are routinely tested. Tests must be ordered by a healthcare provider, so it is important to discuss potential risk factors for infection with a provider. Patients may need to specifically request a test if they believe they may be infected. All blood donations are tested and some life insurance companies test for hepatitis B and C.

Laboratory tests for hepatitis B

Blood tests are used to diagnose hepatitis B and to determine appropriate treatment. The tests are usually repeated after 6 months to see if the person fought off the virus or is chronically infected. Interpreting the blood tests can be confusing, even for doctors and nurses. Anyone tested for hepatitis B should request a copy of the laboratory report and discuss it carefully with a healthcare provider. Important terms that appear in hepatitis B lab reports include:

- ◆ **Antigen** - a foreign substance in the body, such as proteins of the hepatitis B virus.
- ◆ **Antibody** - a protein made by the immune system in response to antigens. Different types of antibodies (IgM - produced in response to a new exposure, and IgG - produced for long-term, lasting immunity) are often considered in hepatitis B tests.

The following antigens and antibodies are considered in the diagnosis of hepatitis B:

- **HBsAg (hepatitis B surface antigen):** A specific antigen found on the surface of the hepatitis B virus. A "positive" or "reactive" test indicates a current, active hepatitis B infection. This antigen is the earliest indicator of acute hepatitis B and frequently identifies infected people before symptoms appear. HBsAg disappears from the blood if the

Interpretation of the Diagnostic Hepatitis B Blood Test Results+

Tests	Results	Interpretation
HBsAg anti-HBc anti-HBs	negative negative negative	Susceptible to infection
HBsAg anti-HBc anti-HBs	negative negative positive with >10mIU/mL*	Immune due to vaccination
HBsAg anti-HBc anti-HBs	negative positive positive	Immune due to natural infection Person 'fought off' the infection
HBsAg anti-HBc IgM anti-HBc anti-HBs	positive positive positive negative	Newly infected
HBsAg anti-HBc IgM anti-HBc anti-HBs	positive positive negative negative	Chronically infected
HBsAg anti-HBc anti-HBs	negative positive negative	Four interpretations possible See below*

- *1. May be recovering from acute HBV infection.
 2. May be distantly immune and the test is not sensitive enough to detect a very low level of anti-HBs in serum.
 3. May be susceptible with a "false positive" anti-HBc.
 4. May be chronically infected and have an undetectable level of HBsAg present in the serum.

+(Chart reproduced from the Hepatitis B Foundation website. www.hepb.org)

infected person successfully fights off the infection.

- **HBcAg (hepatitis B core antigen):** A specific antigen found on the hepatitis B virus. The core antigen is found on virus particles but not in the hepatitis B vaccine. Presence of this antigen indicates a current infection.
- **Anti-HBs [or HBs-Ab] (antibody to hepatitis B surface antigen):** The body produces this antibody when exposed to the hepatitis B surface antigen. A positive test can indicate a previous infection or successful vaccination. The antibody also protects the body from future HBV infection.
- **Anti-HBc [or HBc-Ab] (antibody to hepatitis B core antigen):** The body produces this antibody when exposed to the hepatitis B virus core antigen. A "positive" or "reactive" test may mean the person has had contact with HBV. There are

false positives for this test, so interpretation usually depends on the results of the other HBV tests. Vaccination will NOT result in production of Anti-HBc antibodies. So, this test can help distinguish between previously infected and previously vaccinated individuals. Blood banks routinely run the anti-HBc test rather than the anti-HBs test.

If a person is diagnosed with a hepatitis B infection, additional tests may be performed. These tests will measure the 'amount' of virus present in the blood, and look for hepatitis B e-antigens and antibodies. Information about e-antigens and antibodies is sometimes used in treatment decisions.

- **HBV DNA:** This tests looks for DNA of the hepatitis B virus in the blood. The test is usually used in conjunction with the diagnostic tests mentioned above. It is often used to monitor antiviral treatment in patients with chronic HBV infections.
- **HBeAg (Hepatitis B e-antigen):** The e-antigen is only found in the blood when HBV virus is present in the blood. In treatment of strains that do make e-antigen, some doctors will monitor treatment effectiveness by measuring HBe-antigen. Some types (strains) of HBV do not make e-antigen; these strains are especially common in the Middle East and Asia.
- **Anti-HBe [HBe-AB] hepatitis B virus e antibodies:** The body produces this antibody when exposed to the hepatitis B e antigen. Some doctors look for the presence of this antibody to determine if treatment is successful.

Hepatitis B Management and Treatment

Being diagnosed with hepatitis B can be upsetting, but the good news is that *most people with chronic hepatitis B can expect to live a long and healthy life.*

There is much to consider in the management and treatment of hepatitis B and new advances occur each year. Finding a doctor that is up-to-date and easy to communicate with is essential. The best ways to check for liver damage are liver function blood tests and liver biopsy. These two topics are discussed elsewhere in this kit. Ultrasound tests are frequently used to screen for liver cancer.

Since people with hepatitis B likely have, or will have, some liver damage from their infection, it is VERY important to prevent additional liver damage. Many substances



can irritate or damage the liver. In people with healthy livers, they are usually not a big problem, but people who have chronic hepatitis B need to be extra careful. Remember that all substances ingested, inhaled, or absorbed through the skin will pass through the liver. Some things that patients can do to reduce the possibility of additional liver damage include:

- **Avoid alcohol!** Alcohol will accelerate liver damage
- Get tested for hepatitis A and, if susceptible, get vaccinated!
- Get tested for hepatitis C
- Maintain a healthy body weight
- Eat a healthy, balanced diet - excess fat can impact the liver
- Remember the rest of your body. Get regular check ups
- Talk to a doctor about all medications used (including prescription, over-the-counter, and herbal medications). Some may interact to damage the liver.
- Avoid toxic chemicals at home and in the workplace. (including herbicides, pesticides, and some cleaning products) Wear protective clothing if you use them.
- See a doctor regularly to be monitored for liver damage and liver cancer. Early diagnosis is essential!

Treatment

Today, there are no complete 'cures' for chronic hepatitis B. There are five FDA-approved drugs for adults, two approved drugs for children, and a number of new drugs under development. These medications are designed to reduce the amount of virus in the body either by boosting the immune response or by interfering with replication of the virus. Reducing the amount of virus decreases the risk of liver damage from hepatitis B and can even help the liver recover from damage.

It is important to recognize that not everyone with hepatitis B needs to be on medication. Each treatment has risks and benefits, or pros and cons. Treatment decisions should be made on an individual basis. It is important to discuss the pros and cons with a doctor knowledgeable about hepatitis B treatment. Each person has a unique medical history and personal preferences. These should be considered when making treatment decisions.

The approved medications include injectable interferon, which is also one of the drugs used in hepatitis C treatment, and pills similar to the drugs used for HIV management.



FDA-approved medications for hepatitis B treatment (as of May 2006):

Lamivudine (Epivir-HBV, Zeffix, or Heptodin) is an oral medication (a pill) taken once a day. Treatment usually lasts

one year or longer. While there are almost no side effects, the virus can mutate and become resistant to this drug and possibly others. FDA approved this drug for use in hepatitis B in 1998.

Adefovir dipivoxil (Hepsera) is an oral medication (a pill) taken once a day. Treatment usually lasts for a year or longer. There are few side effects, the most serious side effect is potential kidney problems, so doctors need to monitor patients carefully. FDA approved the use of this drug for hepatitis B treatment (in adults) in 2002.

Entecavir (Baraclude) is an oral medication (a pill) taken once a day. Treatment typically lasts for one year. There are few, if any, side effects. FDA approved this drug for hepatitis B treatment (in adults) in 2005.

'Off-label' drugs. Some doctors prescribe drugs that have not been FDA approved for the specific use. Typically, the drugs are available and approved for other uses. Such medications may not be covered by insurance and patients should discuss such treatments carefully with their doctor.

Interferon-alpha (Intron A) is an injected medication that is administered three times each week. The medication helps the body to fight off viruses. Treatment usually lasts 6 months to one year. The drug can cause side effects such as flu-like symptoms, depression, and headaches.* FDA approved use of this drug for hepatitis B in 1991.

Pegylated Interferon (Pegasys) is a modified version of interferon. Pegasys is also administered by injection, but only one injection per week is required. Treatment typically lasts 6 months to one year. The drug can cause side effects such as flu-like symptoms, and depression.*



FDA approved use of Pegasys for hepatitis B (in adults) in 2005.

* **Managing side effects of interferon**

therapy. Interferon therapy can be very effective in the treatment of chronic hepatitis B. Interferon can produce side effects in some people and at this time, we have no way to predict who will and who will not experience side effects. The number and severity of side effects vary from person to person. Side effects range from very mild and slight discomfort, to moderate effects that are inconvenient, to severe side effects that can lead to temporary disability. Most side effects can be prevented or managed, so don't let fear of side effects prevent you from considering the option of interferon therapy.

Early Side Effects

- Flu-like (Inflammatory) symptoms including fever, chills, body aches, headache, and nausea.

TIPS: Taking anti-inflammatory medications like Ibuprofen and Naproxyn BEFORE the interferon can help prevent these symptoms. Taken at anytime, these medications can help reduce the flu-like symptoms. Also, staying hydrated can help reduce side effects. DRINK PLENTY OF WATER. Avoid caffeine and other diuretics.

Persisting Side Effects

The side effects that appear later in interferon use can be difficult to deal with. They usually begin a couple of weeks or several months into treatment. The side effects are usually not severe enough to stop therapy and these side effects can be relieved with use of other medications. Talk with a doctor about the side effects and try not to reduce or stop therapy.

- Thinning hair or change in hair texture – this effect is temporary and stops when therapy is over.
- Weight loss – this effect will also stop when treatment is over. Make sure to eat a healthy diet when on therapy!
- Neutropenia (suppression of neutrophils, a type of white blood cell). Neutrophils are a very important part of the immune system. A medication called Neupogen can help reduce neutropenia.
- Depression – interferon therapy can cause depression as well as depression-related symptoms like

insomnia, irritability, fatigue, crying episodes, and loss of appetite. Anti-depressants work very well against interferon-induced depression. Some doctors recommend taking an antidepressant BEFORE starting interferon treatment. This should prevent depression from occurring. The dose of antidepressants can be modified to handle depression symptoms. If serious depression occurs, it helpful to work with a psychologist or psychiatrist.

New medications for hepatitis B are under development. The Hepatitis B Foundation, a nonprofit organization, provides a listing of approved drugs and clinical trials for new hepatitis B medications on the HBF Drug Watch section of their website (www.hepb.org). To learn more about how clinical trials are conducted, Visit the National Institutes of Health at www.clinicaltrials.gov.

Patient assistance

There are numerous organizations offering assistance and support for people with hepatitis B and those who just want to learn more about hepatitis B.

The resource section of this kit provides links for government, nonprofit, and corporate information and support programs.

Hepatitis B and Pregnancy

The hepatitis B virus can be transmitted from mother to infant during birth. Previously in this section we described how age at infection is related to the likelihood that the body can fight off the infection. Infants infected at birth are likely to remain infected throughout their lives. Because of this fact and the availability of vaccines and medication to prevent infection, all pregnant women in the US should be screened for HBV.

If a pregnant woman tests positive for HBV, her health-care provider and the health department will contact her about ways to prevent transmission to her baby and to other family members. Family members will likely be screened for HBV and if they susceptible, they will be vaccinated against hepatitis B. When the baby is born, it should receive hepatitis B vaccine immediately and perhaps anti-HBV immunoglobulin as well. These precautions prevent almost all transmission of HBV to babies. This tool kit contains a CDC produced handout about HBV and pregnancy.



Hepatitis B in Men Who Have Sex with Men (MSM)

Hepatitis B virus can be sexually transmitted. It is present in both blood and semen. HBV is reportedly 100 times more infectious than HIV, so it is easier to catch. The CDC reports that 1 in 3 MSM are exposed to HBV by the age of 29. An HBV-infected man can spread the virus to another person by:

- having unprotected anal or vaginal sex
- coming in contact with semen from used condoms
- sharing needles for drugs, piercing, or tattooing
- coming in contact with the infected person's open sores or blood
- sharing toothbrushes, razors, nail clippers, etc.
- biting another person

The CDC and other health official recommend hepatitis B (and hepatitis A) vaccination for all MSM. Vaccination for MSM should be covered by insurance companies (though disclosure of MSM status may be required) and is also available at most public health departments.

Tattoos and Hepatitis B

HBV infection can occur when blood or bodily fluids from an infected person get under the skin of another person. Since blood is present during the tattooing process, it is possible to be infected with HBV while getting or giving a tattoo.

HepTREC recommends using only professional, commercial tattoo parlors that follow safety procedures. BEFORE getting a tattoo, talk to the staff about safety. Check to make sure that the establishment:

- Is clean and surfaces are disinfected
- Uses a new, sterile needle for each client
- Uses separate ink pots for each client
- Does NOT put ink from used pots back in the bottle
- Uses new, clean latex gloves for each client
- Sterilizes all equipment that is in contact with clients
- Covers new tattoos with a fresh, sterile bandage
- Disposes of all materials properly.

HepTREC believes all people should avoid street and prison tattoos. It is difficult or impossible to sterilize

tattoo ink and equipment in prisons, jails, on the street, or at home. HBV, HCV, and HIV can be transmitted in very small, invisible amounts of blood.

HIV and HBV

Because HIV and HBV are spread in similar ways, most people with HIV have been exposed at some time to HBV. Depending on geographic location, 8-11% of HIV patients are also infected with HBV. Now that people with HIV are living for long periods of time, the hepatitis B virus has time to slowly attack the liver. A significant percentage of HIV-positive people are hospitalized with or die from liver disease related to HBV infection.

Generally, people with HIV have weakened immune systems and may not be able to fight the HBV virus as well as people without HIV. The result is that people co-infected with HIV and HBV may develop HBV-related liver disease more quickly, may have more extensive scarring of the liver, and may be more likely to develop liver cancer than people infected with HBV alone.

Since such a large proportion of HIV patients also are HBV positive, more and more healthcare providers are learning how to help their patients stay healthy and alive with HBV. Many of the medications used to treat HIV are also effective against HBV. Some HIV medications, however, may damage the liver. It is important for HIV providers to consider possible liver damage when prescribing medications.

People with HIV/HBV co-infection should:

- Receive tests for and/or vaccinations against hepatitis A
- Get tested for hepatitis C
- Limit or eliminate alcohol use
- Take steps to prevent the spread of HIV and HCV

The journal article in *Clinical Infectious Diseases* by M. Nunez provides more detail about treatment of HBV/HIV co-infected patients. (*Nunez M et al. Treatment of Chronic Hepatitis B in the Human Immunodeficiency Virus-Infected Patient: Present and Future. Clin Infect Dis 2003;37:1678-1685*).