

# Acute hepatitis B

## Investigative Guidelines

### July 2016

## 1. DISEASE REPORTING

### 1.1 Purpose of Reporting and Surveillance

1. To provide data on the temporal, demographic, and geographical distribution of illness to identify sources of major public health concern (for example, a public water supply or a day care facility) to stop transmission from such a source, and prevent future recurrences.
2. To identify whether the case may be a source of infection for other persons (for example, a diapered child or a day care attendee), and if so, to prevent future transmission.

### 1.2 Laboratory and Physician Reporting Requirements

Physicians are required to report suspected or confirmed cases within one working day of identification/diagnosis. Positive tests for IgM core antibody (IgM anti-HBc) or for surface antigen (HBsAg) must be reported by licensed laboratories within one working day.

### 1.3 Local Health Department Reporting and Follow-Up Responsibilities

1. Report all confirmed and presumptive (but not suspect) cases (see definitions below) to the Oregon Health Authority (OHA) as soon as possible, but no later than the end of the calendar week.
2. Begin follow-up investigation within one working day. Submit all case data electronically.
3. Recommend hepatitis B immune globulin (HBIG) or vaccine as indicated within 48 hours.
4. Verify the pregnancy status on women of child-bearing age (15 – 44 years).
5. A pregnant woman positive for HBsAg must be reported **with each pregnancy** to the Immunization Program of the Oregon Health Authority (971.673.0300)

## 2. THE DISEASE AND ITS EPIDEMIOLOGY

### 2.1 Etiologic Agent

The etiologic agent of hepatitis B (HBV) is a hepadnavirus and is one of several viruses known to cause hepatitis in man. Until the 1970s, laboratory tests were not available to distinguish any of these clinically similar infections. HBV is

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completely unrelated to the viruses that cause hepatitis A, C, or other non-A, non-B (NANB) hepatitis.

### 2.2 Description of Illness

Exposure to HBV may result in transient or chronic infections, either of which can be asymptomatic. Onset is usually insidious with loss of appetite, vague abdominal discomfort, nausea, and vomiting, sometimes arthralgias and rash, often progressing to jaundice. Liver enzyme levels are markedly elevated. Fever may be absent or mild. Although often more severe, hepatitis B cannot be reliably distinguished clinically from hepatitis A, C, or other NANB hepatitis. Asymptomatic infections are common among children and adults; less than 10% of children and 30 – 50% of adults show symptoms.

The likelihood of becoming a chronic carrier is affected by age at infection. Chronic carriers are at greatly increased risk of developing life-threatening sequelae (e.g., chronic active hepatitis, cirrhosis, or hepatic cancer) decades later. Fewer than 5% of acutely infected adults in the U.S. become chronic carriers, compared with some 25% (with HBeAg-negative moms) to 90% (HBeAg-positive moms) of perinatally infected infants.

The prevalence of HBsAg-positive persons in the United States continues to decline in the era of hepatitis B vaccination. In NHANES 1996-2006, the overall prevalence of HBV infection in the US was 0.27%.<sup>1</sup> Prevalence among foreign born residents is more than double (0.89%) the prevalence for US born residents, but there has been a statistically significant decrease since NHANES 1988-1994 (1.75%).

### 2.3 Reservoirs

Infected humans. While relatively few infected persons become chronic carriers, they are probably (in the grand scheme of things) the most important sources of HBV transmission, because they are infectious for many years, rather than a few weeks. Efforts to identify chronic carriers and to offer prophylaxis to their contacts, therefore, is at least as important as follow-up directed towards acute cases.

### 2.4 Serologic Markers

Serologic markers of HBV infection are identified by antigen and antibody assays and by nucleic acid amplification test (NAT) for HBV DNA (i.e., PCR). The markers most commonly tested for are shown in Table 1.

The appearance of these markers relative to exposure and subsequent illness in typical infections is illustrated in Figure 1. Occasionally, in the later stages of clinical illness, a person will have neither HBsAg nor anti-HBs detectable in the blood. They may still be infectious, however, for 1–2 weeks. During this so-called “window phase,” the only positive serological test may be for core antibodies (total anti-HBc and IgM anti-HBc).

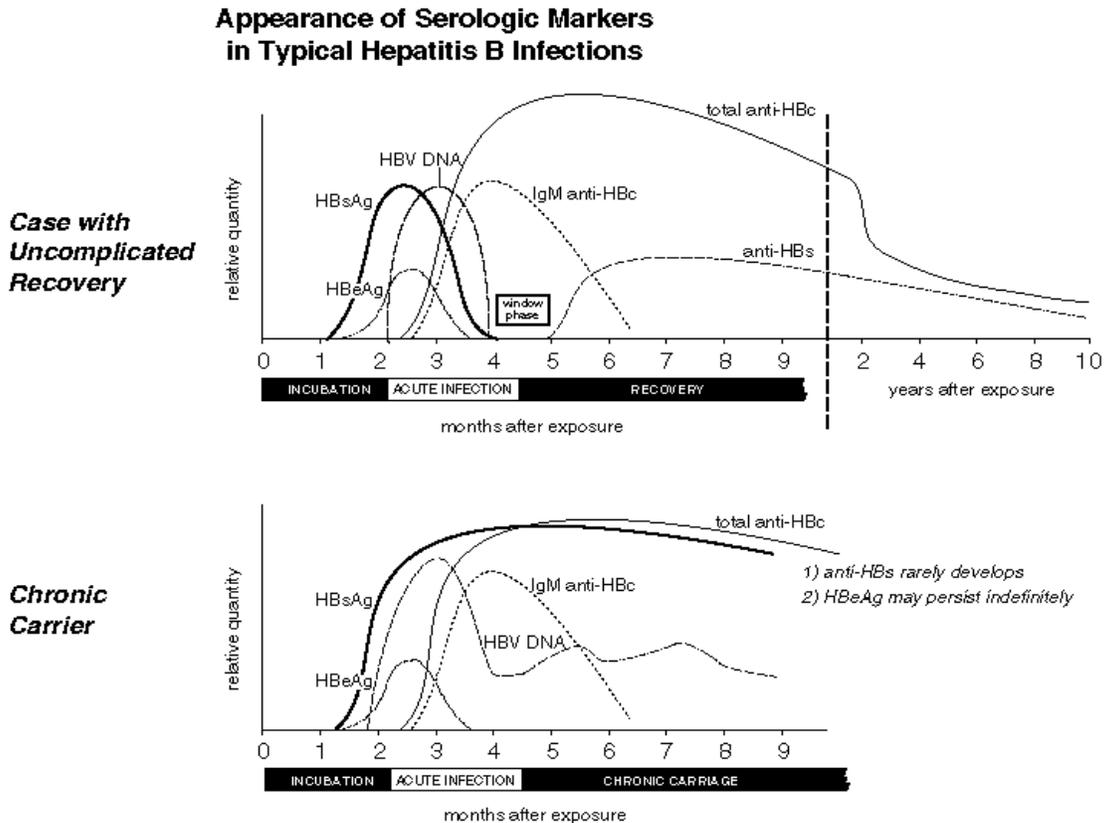
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**Table 1. Selected Serologic Markers of hepatitis B**

<b>Marker</b>	<b>Abbreviation(s)</b>	<b>Significance/Interpretation</b>
Surface antigen	HBsAg	Marker of infectivity. Persists indefinitely in chronic carriers.
Surface antibody	anti-HBs	Usually indicates the development of immunity, either from past infection or immunization. Most carriers never develop anti-HBs (but if they do, they remain HBsAg positive as well). Anti-HBs levels may decline to undetectable levels over time (years), especially if resulting from immunization and not infection.
Viral DNA	HBV DNA/HBV NAT	Marker of infectivity. Rises to high concentrations during incubation and falls with the onset of hepatic disease in transient infection. Detectable in about 50% of chronic carriers; can be present when HBsAg is undetectable.
Core antibody (total)	anti-HBc total anti-HBc core anti-HBc	Marker of past infection. Generally remains elevated for at least two years after transient infection and may remain elevated for life. Vaccination does not produce anti-HBc.
Core antibody (IgM)	IgM anti-HBc	Indicative of infection in the recent past (usually <6 months).
e antigen	HBeAg	Marker of enhanced infectivity. Seen transiently in most infections, and persists in some carriers indefinitely. Needlestick exposure data suggest that HBeAg-positive individuals are 3-5x more infectious than HBeAg-negative counterparts.
e antibody	HBeAb	Antibody to HBeAg

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Figure 1. Serologic Markers



### 2.5 Sources and Routes of Transmission

HBV is usually transmitted by contact with the blood, semen or vaginal secretions of an infected (HBV DNA or HBsAg-positive) person. Because of the high concentration of virus in blood, an extremely small inoculum is sufficient to transmit infection. The virus must be introduced through broken skin or come into contact with mucous membranes for infection to occur. HBV may also be found in saliva and other body fluids. (Breastfeeding is not a significant route of transmission, however.) HBV can remain viable on environmental surfaces for up to a week (e.g., in dried blood).

The most common modes of transmission include:

1. Sharing of contaminated objects or use of contaminated equipment that may penetrate the skin, for example: hypodermic needles and other injection paraphernalia, razor blades, renal dialysis machines, blood glucose monitoring equipment, and inappropriately shared multiuse medication vials;
2. Sexual contact (homosexual or heterosexual);
3. Perinatal transmission from an infected mother to the fetus or newborn;
4. Needlestick or similar accident.

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The following are some of the less common routes, but have been documented in the literature:

1. Transfusion, infusion or inoculation of blood or blood products from an infected person or plasma pool (in the U.S., however, all blood is routinely screened for HBV markers [HBsAg, HBV DNA and anti-HBc] before use, so this risk is now extremely low);
2. Contact of infective fluid with a mucosal surface (e.g., a splash of blood to the mouth or eye);
3. Contact of lacerated, scratched, or otherwise broken skin with blood or contaminated environmental surfaces (for example, countertops, blood-smear slides or specimen tubes in laboratories);
4. Biting by an infected person or scratching with saliva-contaminated nails leading to percutaneous introduction of virus.

### 2.6 Incubation Period

Varies from 45 to 180 days—usually between 60 and 90 days.

### 2.7 Period of Communicability

A person is infectious as long as HBsAg or HBV DNA is detectable in the blood. Viremia begins several weeks before the onset of symptoms and persists for several months (in most instances), or, for those who become chronic carriers, indefinitely. A similar period of viremia occurs among asymptotically infected individuals.

### 2.8 Treatment

Supportive only during the acute phase. Persons who progress to chronic HBV infection need medical management to monitor the onset and progression of liver disease and screen for liver cancer.

## 3. CASE DEFINITIONS, DIAGNOSIS AND LABORATORY SERVICES

### 3.1 Confirmed Case Definition

An individual with:

1. A documented negative HBsAg laboratory test results within 6 months prior to a positive test (either HBsAg, HBeAg, or hepatitis B virus NAT (HBV PCR, including genotype); OR
2. An illness with discrete onset of any sign or symptom consistent with acute viral hepatitis (e.g., fever, headache, malaise, anorexia, nausea, vomiting, diarrhea and abdominal pain); and
3. Jaundice or elevated serum alanine aminotransferate (ALT) levels >100 IU/L; and
4. HBsAg positive and IgM anti-HBc positive (if done).

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### 3.2 Presumptive Case Definitions

1. An illness with discrete onset of any sign or symptom consistent with acute viral hepatitis (e.g., fever, headache, malaise, anorexia, nausea, vomiting, diarrhea and abdominal pain); and
2. Jaundice or elevated serum alanine aminotransferase (ALT) levels >100 IU/L; and
3. An epidemiological link with a person who has confirmed hepatitis B (i.e., household or sexual contact with an infected person during the 45 – 180 days before the onset of symptoms).

### 3.3 Suspect Case (*not reportable to PHD*)

Anyone with discrete onset of symptoms or elevated liver enzymes without epi-linkage to a confirmed case, and no available laboratory information or lab confirmation.

### 3.4 Services Available at the Oregon State Public Health Laboratories

The OSPHL offers serologic testing for HBsAg, anti-HBs, anti-HBc, and IgM anti-HBc. E antigen testing is not routinely available, but may be arranged under special circumstances. Consult with ACDP. For more information, refer to the Lab's Guide to Services. As of July 2016, OSPHL does not yet do PCR testing for hepatitis B virus.

## 4. ROUTINE CASE INVESTIGATION

### 4.1 Confirming the Diagnosis

It is important to distinguish between acute cases of hepatitis B and newly identified chronic carriers. Try to get information from the ordering provider about presence/absence of symptoms, LFTs, and prior history.

### 4.2 Identify the Source of Infection

Collect information about possible exposures, including high risk behavior, during the period 45– 180 days before the onset of illness. **Particular emphasis should be placed on the 60–90 days before onset.** This should include:

- Close contact with any household member, sexual partner or acquaintance with recent hepatitis or known to be a chronic carrier (get names, phone numbers and addresses);
- Receipt of blood transfusion or other blood products;
- History of dental or surgical care;
- History of renal dialysis;
- Use of shared needles;
- Use of shared blood glucose monitor;
- History of tattooing, ear or body piercing, or acupuncture;
- Needlestick or similar injury;

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- Accidental exposure of skin, eyes, mucous membranes or a wound to blood of another person;
- Work in occupational settings with elevated risk of exposure (e.g., dental, laboratory, mortuary work, or employment in facilities for mentally disabled);
- Residence in a facility for the mentally disabled;
- Incarceration;
- Sexual contact (heterosexual or homosexual) with multiple sex partners or a sex partner who uses IV drugs.

### 4.3 Identify Potentially Exposed Persons

1. Identify persons with whom the case has had sexual contact from six weeks before onset to present. HBIG should be recommended for the sexual partner(s) who had intercourse with the case during the past two weeks (see §5.4). Partners whose most recent sexual contact is more than two weeks ago are unlikely to benefit from prophylaxis, but they should be informed of their exposure and encouraged to seek medical care should they develop signs or symptoms of hepatitis. Immunization is recommended for those who anticipate continuing sexual contact with an infected person or with multiple partners, and condom use can be recommended until the series is completed.
2. Identify person who may have been exposed within the past six weeks to potentially infectious body fluids by percutaneous or permucosal means (e.g., needle sharing, body splashes). Those persons exposed within the last 7 days should receive HBIG if susceptible to HBV infection (see §5.4). Those exposed >7 days ago should be advised of their exposure and encouraged to seek medical care if they develop symptoms of hepatitis. Recommend hepatitis B immunization to those with occupational or ongoing risk of exposure (see §5.4).
3. If the case is a dentist, surgeon or other health care worker, evaluate the potential for exposing patients (see §6.1).
4. If the case has donated blood or plasma in the 8 weeks before onset, see §6.3.
5. If the patient is pregnant, see §6.6

### 4.4 Environmental Evaluation

Usually none, unless transmission occurs in a dialysis center or health care facility by means of environmental surfaces or inanimate objects. If this type of transmission is suspected, contact ACDP's on-call epidemiologist (971.673.1111).

## 5. CONTROLLING FURTHER SPREAD

### 5.1 Education

Persons who are HBV DNA or HBsAg-positive should be instructed that their blood and other secretions are infectious to others until the HBV DNA or HBsAg

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has cleared, typically within two or three months. Chronic carriers usually are infectious for life. (A few do lose measurable HBsAg over time.)

Scrupulous attention to standard precautions is important while the case is positive. Surfaces contaminated with saliva and blood should be cleaned and properly disinfected. Objects potentially contaminated with blood (e.g., razors, toothbrushes) should not be shared with other people. Contaminated sharps should be discarded in an approved sharps container.

Infected persons (among others) should not share hypodermic needles with other people. Disposable needles should be used only once. As a last resort, undiluted household bleach can be used to clean syringes and needles.

Persons who are HBV DNA or HBsAg-positive should be advised that the virus may be transmitted through sexual contact. Patients should be educated to practice abstinence, use condoms, or otherwise practice “safer” sex. Sex partners who are anti-HBc positive (from previous infection) are not at risk; vaccination has an estimated 95% efficacy and should be recommended to sexual partners of cases.

Pregnant or sexually active women should be told about the risk of hepatitis B infection to newborns of infected mothers, and of the importance of prophylaxis for such newborns. If the woman is pregnant, see §6.5.

Parents or guardians of HBV DNA or HBsAg-positive persons with functional disabilities should be alerted to the risk of HBV infection associated with excessive drooling or aggressive behavior, such as biting and scratching.

Instruct persons with acute HBV infections to postpone non-emergency dental care and surgery until their viremia has cleared, which may be as long as 6 months. HBsAg-positive persons who seek medical or dental care should notify involved personnel of their hepatitis B status.

### 5.2 Isolation and Work or Day Care Restrictions

Standard precautions (hand washing) are adequate to minimize the risk of further transmission.

Hospitalized patients with acute or chronic HBV infections pose a minimal risk to staff or other patients, given the implementation of standard precautions, and the appropriate pre-exposure use of hepatitis B vaccine.

If the case is a health care worker with potential for exposing patients, he/she should be discouraged from working until the acute clinical illness has resolved. Upon return to work, special precautions should be practiced until the worker is no longer infectious (see §6.1).

The risk of transmission of HBV in the school day care setting is usually low, and can be reduced through sound infection control procedures and environmental cleanliness. Toiletry items that could be contaminated with blood or saliva should not be shared. Toys and other contaminated objects should be cleaned and disinfected as soon as possible to prevent transmission. Children in the

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communicable stages of hepatitis B infection may be excluded from attending school or child care if, in the opinion of the local health officer, the child poses an unusually high risk to other children (e.g., exhibits uncontrollable biting or spitting).” See Oregon Administrative Rule 333-019-0010:

<http://public.health.oregon.gov/DiseasesConditions/CommunicableDisease/ReportingCommunicableDisease/Pages/rules.aspx>.

### 5.3 Case Follow-up

A repeat test for HBV DNA or HBsAg should be obtained after six months to determine the clearance or continued presence of viremia. Those still HBV DNA-positive or HBsAg-positive are considered confirmed chronic carriers, and should be counseled accordingly.

### 5.4 Prophylaxis

1. Post-exposure prophylaxis – Passive immunization with HBIG and active immunization with hepatitis B vaccine are both used to pre-vent infection or modify illness due to infection with HBV. To be effective, HBIG must be given as soon as possible after exposure. [Due to current screening practices, the titer of anti-HBs in garden-variety IG is so low that it is worthless in prophylaxis of hepatitis B.] The exposed person’s prior history of hepatitis B infection, vaccination, and vaccine response status (if known) should always be considered, but treatment should not be unduly delayed whilst awaiting test results. Post-exposure prophylaxis should be considered in the following situations:
  - Perinatal exposure to HBV DNA- or HBsAg-positive mother (table 3; see §6.6)
  - Percutaneous or permucosal exposure to blood. For greatest effectiveness, prophylaxis should be given as soon as possible after exposure (table 3). There are no data to indicate that HBIG is of any value more than 7 days after percutaneous exposure.
  - Sexual exposure to a HBV DNA- or HBsAg-positive individual (if within 2 weeks; see table 3).
  - Household exposure of an infant less than 12 months old to a primary care giver who has acute hepatitis.
2. Pre-exposure prophylaxis – Universal infant immunization has been recommended since early 1992. Hepatitis B vaccination is also indicated for anyone at increased risk of infection because of lifestyle, medical history, occupation, or on- going intimate contact with a HBV carrier. Vaccination should be recommended to persons at risk who are identified in the course of routine public contacts, in addition to those identified in the course of a HBV case investigation. Vaccination is also recommended for nonsexual household contacts of acute HBV cases, especially children and adolescents. Questions about vaccine availability should be directed to the Immunization Program. Pre-exposure prophylaxis is recommended for the following persons:
  - Sex partners of HBsAg-positive persons

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- Sexually active persons who are not in a long-term, mutually monogamous relationship (e.g., persons with more than one sex partner during the previous 6 months)
  - Persons seeking evaluation or treatment for a sexually transmitted disease
  - Men who have sex with men
  - Current or recent injection drug users
  - Household contacts of HBsAg-positive persons
  - Residents and staff of facilities for developmentally disabled persons
  - Healthcare and public safety workers with reasonably anticipated risk for exposure to blood or blood-contaminated body fluids
  - Persons with end-stage renal disease, including dialysis, hemodialysis, peritoneal dialysis and home dialysis patients
  - International travelers to regions with high or intermediate levels (HBsAg prevalence of >2%) of endemic HBV infection
  - Persons with chronic liver disease
  - Persons with HIV infection
  - All other persons seeking protection from HBV infection.
3. Alternative schedules – For a variety of reasons, some individuals cannot be immunized on the recommended 0, 1, 6 month schedule. In fact, many alternatives work almost as well (and some conceivably better). An interrupted vaccination schedule can be resumed at any time without modifying the number or timing of subsequent doses. In other words, there is no problem (other than delayed benefit) with giving the second “one-month” dose at two months (or later), or the third “six-month” dose at eight months (or eight years). If an accelerated schedule is considered, the third dose should not be given <2 months after the second, unless a fourth dose is scheduled >4 months after the third dose.
4. Occupational risks – Persons with jobs that put them at risk for occupational exposures may be eligible for vaccination at their employer’s expense. For more information, contact OR-OSHA (main office, Salem, 503-378-3272; field offices in Bend, 541-388-6066; Eugene, 541-686-7562; Medford, 541-776-6030; Pendleton, 541-276-9175; and Portland, 503-229-5910).
5. Testing for Seroconversion – Vaccinees with a defined, ongoing risk should be tested for seroconversion 1–6 months after completion of the original 3-dose schedule. For perinatal exposures, see §6.6. A minority of persons do not seroconvert after immunization, and they continue to be at risk for infection. Although not “required,” consider additional doses if seroconversion is not demonstrated after an initial series; as many as half of these individuals may seroconvert if given a repeat series. Smoking, obesity, and age (declining by 30s already!) may be associated with decreased response to hepatitis B immunization. Studies of small numbers of non-responders have shown that intradermal administration of hepatitis B vaccine can induce protective antibody levels. This route of administration is not approved by FDA. A study demonstrated protective anti-HBs levels in previous non-responders after

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receiving a double dose of Twinrix™ at 0, 1, and 6 months. Among non-responders, 95% had protective anti-HBs levels after the third dose.<sup>2</sup>

**Table 2. Recommended Post-exposure Prophylaxis for Occupational Exposure to hepatitis B Virus<sup>3</sup>**

Vaccination and antibody response status of exposed workers*	Treatment		
	Source HBsAg positive	Source HBsAg negative	Source unknown or not available for testing
Unvaccinated	Hepatitis B immune globulin (HBIG) <sup>†</sup> x 1 and initiate HB vaccine series	Initiate HB vaccine series	Initiate HB vaccine series
Previously Vaccinated			
Known responder <sup>§</sup>	No treatment	No treatment	No treatment
Known nonresponder <sup>**</sup>	HBIG x 1 and initiate revaccination or HBIG x 2 <sup>¶</sup>	No treatment	If known high risk source, treat as if source were HBsAg positive
Response unknown	Test exposed person for anti-HBs 1. If adequate, no treatment is necessary 2. If inadequate, administer HBIG x 1 and vaccine booster	No treatment	Test exposed person for anti-HBs 1. If adequate, no treatment is necessary 2. If inadequate, administer vaccine booster and recheck titer in 1-2 months

\*Persons who have previously been infected with HBV are immune to reinfection and do not require post-exposure prophylaxis.

† Dose is 0.06 mL/kg intramuscularly

§ A responder is a person with adequate levels of serum antibody to HBsAg (i.e., anti-HBs ≥10 mIU/mL).

\*\* A non-responder is a person with inadequate levels of serum antibody to HBsAg (i.e., anti-HBs <10 mIU/mL).

¶ The option of giving one dose of HBIG and reinitiating the vaccine series is preferred for nonresponders who have not completed a second 3-dose vaccine

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**Table 3. Recommended Post-exposure prophylaxis\* for Non-occupational Exposure to hepatitis B virus<sup>4</sup>**

Exposure	Treatment	
	Unvaccinated person <sup>†</sup>	Previously vaccinated person <sup>§</sup>
Percutaneous (e.g., bite or needlestick) or mucosal exposure to HBsAg- <i>positive</i> blood or body fluids Sex or needle-sharing contact of an HBsAg- <i>positive</i> person Victim of sexual assault/abuse by a perpetrator who is HBsAg- <i>positive</i>	Administer hepatitis B vaccine series and hepatitis B immune globulin (HBIG). HBIG dose is 0.06 mL/kg intramuscularly	Administer hepatitis B vaccine booster dose
Perinatal exposure to HBsAg- <i>positive</i> mother	Initiate hepatitis B vaccine series and hepatitis B immune globulin (HBIG) within 12 hours of birth	Not applicable
Percutaneous (e.g., bite or needlestick) or mucosal exposure to potentially infectious blood or body fluids from a source with <i>unknown</i> HBsAg status Sex or needle-sharing contact of a person with <i>unknown</i> HBsAg status Victim of sexual assault/abuse by a perpetrator with <i>unknown</i> HBsAg status	Administer hepatitis B vaccine series	No treatment

\*When indicated, immunoprophylaxis should be initiated as soon as possible, preferable within 24 hours. Studies are limited on the maximum interval after exposure during which postexposure prophylaxis is effective, but the interval is unlikely to exceed 7 days for percutaneous exposures or 14 days for sexual exposures. The hepatitis B vaccine series should be completed.

† A person who is in the process of being vaccinated but who has not completed the vaccine series should complete the series and receive treatment as indicated.

§ A person who has written documentation of a complete hepatitis B vaccine series and who did not receive post-vaccination testing.

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**Table 4. Hepatitis B vaccines: recommended doses and schedules**

Vaccine and Group	Dose (µg)	Dose (ml)	Schedule/Notes
<b>Recombivax HB (single antigen vaccine)</b>			
0 – 19 years*	5	0.5	0, 1, 6 months
11 – 15 years	10	1.0	0, 4 months
≥20 years	10	1.0	0, 1, 6 months
<b>Engerix-B (single antigen vaccine)</b>			
0 – 19 years†	10	0.5	0, 1, 6 months
≥20 years†	20	1.0	0, 1, 6 months
Dialysis patients and other immunocompromised persons‡	40	2.0	0, 1, 2, 6 months
<b>Comvax (combination HepB and Hib vaccine)</b>			
6 weeks through 4 years	Recombivax HB (5 µg) and Pedvax Hib	0.5	2, 4, 12 – 15 months. A single antigen hep B dose should be given at birth
<b>Pediarix (combination Hep B, DTap and IPV vaccine)</b>			
6 weeks – 6 years	Engerix-B (10µg), Infanrix and IPV	0.5	2, 4, 6 months. A single antigen hep B dose should be given at birth
<b>Twinrix (combination Hep B and Hep A vaccine)</b>			
18 years and older	Engerix-B (20µg) and Havrix	1.0	0, 1, 6 months

\* Yes, including kids born to positive moms. Note that an alternative, 2-dose, schedule is also available for children 11–15 years old.

† The package inserts for the various licensed formulations, particularly for Engerix-B, are maddeningly convoluted. This is our best effort to distill them into a (relatively) simple table. Remember that for any “low risk” patient, the schedule can be stretched out if necessary to accommodate other medical visits. The only downside is delayed benefit. Schedules are given in months (e.g., 0, 1, 6 means second dose 1 month after start and third dose 6 months after start).

‡ Special vaccine formulation

## 6. MANAGING SPECIAL SITUATIONS

### 6.1 Case is a Health Care Worker

If the case is a dentist, physician, nurse or other health care worker with potential for exposing patients by blood or body fluids:

- The person should be discouraged from working until the acute clinical illness has resolved
- Upon return to work, special precautions should be practiced until the health care worker is no longer infectious, including:
  - Wearing gloves for all procedures during which the hands will be in contact with the patients' mucosal surfaces or broken skin;
  - Avoiding situations involving sharps that could lead to exposures of susceptibles to blood or objects contaminated with blood of the case;
  - Careful and frequent handwashing.

### 6.2 Case is a Suspected Iatrogenic Infection

If two or more iatrogenic cases occur in patients of the same dental or health care provider, residential care facility or non-hospital health care facility (i.e., dialysis center); and the cases have no other identified plausible source of infection; or if other circumstances suggest the possibility of iatrogenic infection, notify ACDP.

### 6.3 Case is a Recent Blood Donor

If the case has donated blood or plasma within the eight weeks prior to onset of symptoms, the agency that received the blood or plasma should be notified so that any unused product can be recalled.

### 6.4 Case is a Recent Transfusion Recipient

If transfused blood or blood products are suspected as the possible source of infection, the blood bank or other agency that provided the implicated lot should be notified so that aliquots of the blood still on hand, or the donors themselves, can be retested for HBsAg or tested for anti-HBc. Lot numbers for tracing are usually available through the blood bank at the hospital where the units were transfused.

### 6.5 Case is Pregnant or has just Delivered

Preventing perinatal transmission is perhaps the most important part of case follow-up, and for this reason the Oregon Immunization Program has an official Perinatal Hepatitis B Prevention Program. Participation in this program is mandatory for local health departments. Case management activities and requirements for reporting these activities are described in detail in the Oregon Perinatal Hepatitis B Prevention Program Guidelines and are summarized in ACDP's investigative guidelines for chronic HBV.

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### 6.6 Possible Common-source Outbreak

Contact communicable disease epidemiologists at ACDP immediately at 971.673.1111

## 7. GLOSSARY OF TERMS

**ALT/AST:** these are both liver enzymes classified as serum aminotransferases or transaminases and are useful indicators of liver damage. Alanine aminotransferase is usually abbreviated as ALT (or SGOT) and is particularly sensitive for assessing liver damage secondary to HCV. Aspartate aminotransferase is referred to as AST (or SGPT).

**Anti-HCV EIA:** enzyme immunoassay to measure HCV antibody. Indicates presence of antibody only and cannot be used to distinguish between recent and past infection. Additional testing is required to determine if the individual is chronically infected.

**HBsAg:** hepatitis B surface antigen, a marker of replicating virus. It occurs as part of acute infection and persists in chronic infection. Its presence indicates that the patient is considered to be infectious.

**HBeAg:** hepatitis B e antigen, a core protein exported from infected liver cells and a marker of high levels of infectivity. Similar to HBsAg, it occurs (albeit transiently) as part of acute infection and may persist in the chronic carrier state.

**HBeAb:** hepatitis B e antibody is produced by the immune system temporarily during acute HBV infection and may persist in chronic infections. 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. Chronic hepatitis B surface antigen carriers can be positive for either HBeAg or anti-HBe, but are less infectious when anti-HBe is present.

**HBV DNA:** signifies active replication of the virus and indicates that the patient is infectious. It is usually measured to test for chronic infection, and the viral load may be used to decide whether treatment is warranted.

**HCV genotype:** HCV can be divided into at least 6 different genotypes. Genotype 1 is the most common in the US, accounting for 70%-75% of infections.

**IgM anti-HAV:** IgM antibody to HAV. Indicates acute infection with HAV.

**IgM Anti-HBc:** IgM antibody to hepatitis B core antigen, indicative of recent infection with HBV. Antibody to core antigen only occurs following infection, not immunization.

**RIBA:** recombinant immunoblot assay, a more specific test for anti-HCV antibody (in other words, it's good for ruling out false positives). It is not as sensitive as the anti-HCV EIA and should not be used as an initial screening test, but it is useful for ruling out false-positive EIA tests. **This test is no longer available.**

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**PCR:** polymerase chain reaction, used to measure HCV RNA and indicates active replication of the virus (e.g., the chronic carrier state). The qualitative PCR is more sensitive than the quantitative assay and is preferred for the initial test. The quantitative PCR is often used to guide initial treatment decisions and to follow the progress of individuals undergoing treatment.

**Signal-cutoff ratio:** can be used to help determine the likelihood that a positive anti-HCV EIA represents a true positive. Each assay has a cut-off value that is considered a “positive” result; the signal-cutoff ratio can be calculated by dividing the optical density (OD) value of the sample being tested (e.g., the client’s test result) by that particular assay’s cut-off value. Due to the increase in hepatitis C assays available on the market, CDC is unable to validate each test to determine the s/co ratio predictive of a true positive. **As of January 1, 2016, the s/co ratio will no longer be used in the acute or chronic hepatitis C case definitions.**

### REFERENCES

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### UPDATE LOG

- July 2016 – Applied new Word formatting. Updated post-exposure prophylaxis recommendations and estimated prevalence of HBsAg in the US (Poissant)
- October 2012 – Clarified section 4.1. All +anti-HBc IgM results require follow up in order to confirm the diagnosis. (Tasha Poissant)
- January 2012 – Update case definition to reflect CDC/CSTE guidance. ALT levels must now be >100 IU/L and a +HBsAg is required. Asymptomatic seroconverters are now included in the confirmed case definition. (Tasha Poissant)
- April 2011 – Continuing to update new acute-HBV-specific document adapted from previous hepatitis B guidelines. (Tasha Poissant and Grace Van Ness)
- April 2009 – New acute-HBV-specific document adapted from previous hepatitis B guidelines.

## **Acute hepatitis B**

May 2007 – D.2. Pre-exposure vaccination recommendations expanded to include non-sexual household contacts of acute HBV cases, especially children and adolescents, and household and sexual contacts of all HBsAg+ persons. Eliminated “indeterminate” case definition. Expanded the acute case definition to include +HBsAg results.

December 2006 – D.2. Pre-exposure vaccination recommendations expanded to include nonsexual household contacts of acute HBV cases, especially children and adolescents, and household and sexual contacts of all HBsAg+ persons.