

Hepatitis B

1. DISEASE REPORTING

A. Purpose of Reporting and Surveillance

1. To identify sources of infection.
2. To determine whether or not cases may have exposed others or may be likely to do so in future.
3. To recommend appropriate preventive measures, including immunization.

B. 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, and sera that are positive for IgM anti-HBc should be submitted to the OSPHL.

C. Local Health Department Reporting and Follow-Up Responsibilities

1. Report all confirmed and presumptive acute cases to OHS (see definitions below) as soon as possible, but no later than the end of the calendar week of initial physician/lab report. Confirmed and presumptive chronic carriers must also be reported. Unless they have been previously reported in Oregon, all persons testing positive for HBsAg must be reported and investigated. OHS staff can search for reports back through 1988.
2. Begin follow-up investigation within one working day. Use the hepatitis B case investigation form. Send a copy of the completed form to OHS within seven days of initial report.
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 (15–55 years).
5. A pregnant woman positive for HBsAg must be reported *with each pregnancy* to the Immunization Program of the Oregon Health Services (971-673-0300).

2. THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

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

B. 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 the rule in young children, and are not uncommon even among adults.

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.

C. Serologic Markers

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

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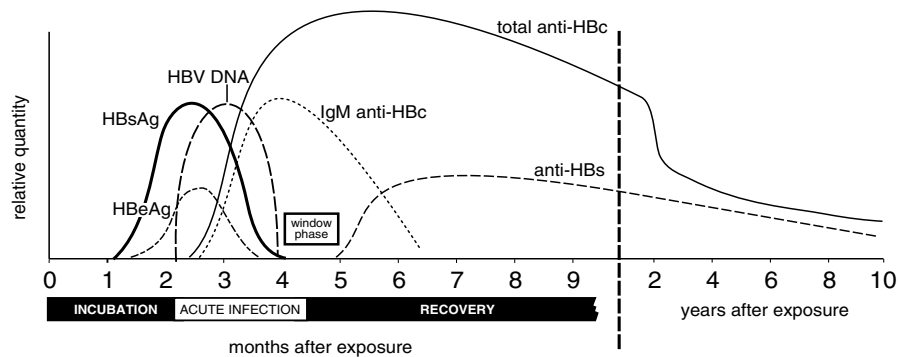
Table 1. Selected Serologic Markers of Hepatitis B

Marker	Abbreviation	Significance
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	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	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). This is the best test to diagnose acute hepatitis B.
e antigen	HBeAg	Marker of enhanced infectivity. Seen transiently in most infections, and persists in <i>some</i> carriers indefinitely. Needlestick exposure data suggest that HBeAg-positive individuals are 3-5x more infectious than HBeAg-negative counterparts.

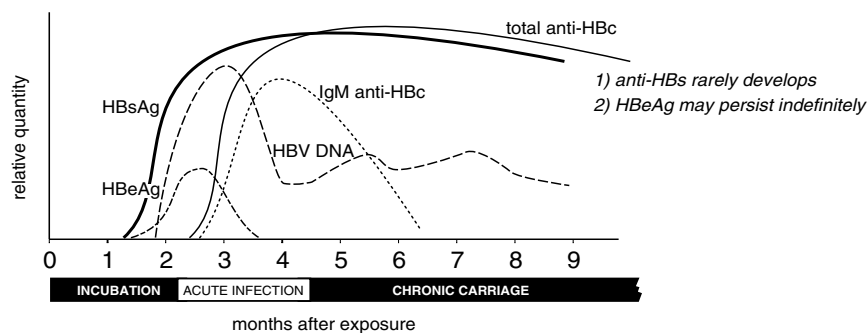
The appearance of these markers relative to exposure and subsequent illness in typical infections is illustrated in the figure. Occasionally, in the later stages of clinical illness, a person will have neither HBsAg nor anti-HBs detectable in the blood. They may still be infectious, however, for 1–2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

Appearance of Serologic Markers in Typical Hepatitis B Infections

Case with Uncomplicated Recovery



Chronic Carrier



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Table 2. Population prevalence of serologic markers of HBV exposure

Population group	HBsAg (%)	Any marker (%)
U.S. immigrants/refugees from areas of high HBV endemicity	13	70-85
Alaska Natives/Pacific Islanders	5-15	40-70
Clients in institutions for the developmentally disabled	10-20	35-80
Injection drug users	7	60-80
Sexually active homosexual men	6	35-80
Household contacts of HBV carriers	3-6	30-60
Hemodialysis unit patients	3-10	20-80
Health-care workers with frequent blood contact	1-2	15-30
Male prisoners	1-8	10-80
Staff of institutions for the developmentally disabled	1	10-25
Heterosexuals with multiple partners	0.5	5-20
Health-care workers with little or no blood contact	0.3	3-10
“General” U.S. population—black	0.9	14
“General” U.S. population—white	0.2	3

Many infections are asymptomatic, including the great majority of persons infected at an early age. A surprisingly high proportion of people have been exposed to hepatitis B, many of them without ever being sick or diagnosed, much less reported (table 2).

D. Reservoir

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.

E. 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. (Breast feeding is *not* a significant route of transmission, however.)

Under some conditions, HBV can remain viable on environmental surfaces for up to a week (e.g., in dried blood).

Well documented modes of transmission include:

1. sharing of contaminated objects or use of contaminated equipment that may penetrate the skin, for example: hypodermic needles, tattoo equipment, ear piercing equipment, acupuncture instruments, razor blades, renal dialysis machines;
2. sexual contact (homosexual or heterosexual);
3. perinatal transmission from an infected mother to the fetus or newborn;
4. needlestick or similar accident;
5. 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);

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6. contact of infective fluid with a mucosal surface (e.g., a splash of blood to the mouth or eye);
7. 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);
8. biting by an infected person or scratching with saliva-contaminated nails leading to percutaneous introduction of virus.

F. Incubation Period

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

G. 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.

H. Treatment

Supportive only during the acute phase. Recent evidence suggests that interferon may be of value for *some* carriers with chronic liver diseases.

3. CASE DEFINITIONS, DIAGNOSIS, AND LABORATORY SERVICES

The diagnosis is easy to confirm with currently available tests. Every acute case should be confirmed. If necessary, bug the private doc to do the IgM test that is necessary to separate the men from the boys.

A. Confirmed Acute Case Definition

An individual with:

- 1) discrete onset of symptoms (i.e., nausea, vomiting, abdominal discomfort, pale stools, dark urine) and
- 2) jaundice or elevated serum ALT or AST levels and
- 3) IgM antibody to hepatitis B core antigen (anti-HBc) positive or hepatitis B surface antigen (HBsAg) positive and
- 4) IgM anti-HAV negative (if done).

B. Presumptive Case Definition

An individual with:

- 1) discrete onset of symptoms *and*
- 2) jaundice or elevated serum ALT or AST levels *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).

C. Suspected Acute Case (*not reportable to OHS*)

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.

D. Confirmed Chronic Case Definition

An individual with:

- 1) IgM anti-HBc negative *and* a positive result on one of the following tests: HBsAg, HBeAg, or HBV DNA; *or*
- 2) HBsAg positive or HBV DNA positive or HBeAg positive two times at least 6 months apart. Any combination of these tests are acceptable.

E. Presumptive Chronic Case Definition

An individual with a single HBsAg positive or HBV DNA positive or HBeAg positive laboratory result when no IgM anti-HBc results are available.

F. Suspect Chronic Case Definition/Indeterminate Infection

These have been defined out of existence.

G. Services Available at the Public Health Lab

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 the Communicable Disease Section. For more information, refer to the Lab's *Guide to Services*. As of August, 2004, OSPHL does not yet do PCR testing for hepatitis B virus.

4. ROUTINE CASE INVESTIGATION

A. Using the Case Investigation Form

The hepatitis B case investigation form is designed to structure your investigation. It is important to distinguish between acute cases of hepatitis B and newly identified chronic carriers.

B. Acute Symptomatic Cases

1. 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;
- history of tattooing, ear or body piercing, or acupuncture;
- needlestick or similar injury;
- 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, or mortuary work, or employment in facilities for mentally disabled persons);
- residence in a facility for the mentally disabled;
- incarceration;
- sexual contact (homosexual or heterosexual) with multiple sex partners or a sex partner who uses IV drugs.

2. Identify Potentially Exposed Persons

- a. 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 §5D). Partners whose most recent sexual contact is more than two weeks ago

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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 continued sexual contact with an infected person or with multiple partners, and condom use can be recommended until the series is completed.

- b. Identify persons who may have been exposed within the past six weeks to potentially infectious body fluids by percutaneous or permucosal means (e.g., by needle sharing, blood splashes). Those persons exposed within the last 7 days should receive HBIG if susceptible to HBV infection (See §5D). 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 other ongoing risk of exposure (see §5D).
- c. If the case is a dentist, surgeon, or other health care worker, evaluate the potential for exposing patients (see §6A).
- d. If the case has donated blood or plasma in the 8 weeks before onset, see §6C.
- e. If the patient is pregnant, see §6F.

C. Carriers

1. Identify the source of infection

Identifying a specific source of infection for recently identified carriers may be difficult, if not impossible. For example, a history of injection drug use and needle sharing 20 years previously, while a likely source of infection, cannot be considered a hot investigative lead. Possible sources should be pursued if there is a good chance of identifying additional hepatitis carriers. For example, if the carrier is a child, it would be reasonable to screen parents and other household members for evidence of infection. Otherwise, a history of past high risk behavior is primarily of interest for statistical analyses. The investigation should follow the recommendations for acute symptomatic hepatitis B cases, but extend further back in time.

2. Identify Potentially Exposed Persons

Same as for acute symptomatic hepatitis B cases.

D. Environmental Evaluation

Usually none, unless transmission occurs in a day care center, dialysis center, or health care facility by means of environmental surfaces or inanimate objects.

5. CONTROLLING FURTHER SPREAD

A. Education

1. 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 has cleared, typically within two or three months. Chronic carriers usually are infectious for life. (A few do lose measurable HBsAg over time.)
2. 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 stored in an approved sharps container.
3. Infected persons (among others) should not share hypodermic needles with other people. Disposable needles should only be used once. As a last resort, undiluted household bleach can be used to clean syringes and needles.
4. 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.
5. 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 §6F.

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6. 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.
7. 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.

B. Isolation and Work or Day Care Restrictions

1. 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.
2. If the case is a health care worker with potential for exposing patients, see §6A.
3. The risk of transmission of HBV in the 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. The risk is greatest if the individual is a HBeAg-positive carrier, or is a child under three with excessive drooling, or who has open skin lesions, demonstrates aggressive scratching or biting behavior, has a bleeding disorder, or manifests frank breaches of personal hygiene. In these cases, the health department should carefully evaluate the situation to determine whether or not exclusion of the child from day care or vaccination of classroom contacts is indicated. The Communicable Disease Section is available for consultation. Refer also to the *OHS Guidelines for Schools with Children who have Hepatitis B or HIV Infections*, which are appended at the end of this chapter.

C. Follow-Up

1. Cases

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.

2. Carriers

Household contacts of carriers should be screened to determine persons susceptible to HBV infection; these individuals should be immunized. When appropriate, follow-up calls should be made to ensure that household contacts begin and complete their immunization series.

D. Prophylaxis

1. Post-Exposure

Passive immunization with HBIG and active immunization with hepatitis B vaccine are both used to prevent 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:

- a. perinatal exposure to HBV DNA or HBsAg-positive mother (table 3; see §6F).
- b. percutaneous or permucosal exposure to blood (table 4). For greatest effectiveness, prophylaxis should be given as soon as possible after exposure. There are no data to indicate that HBIG is of any value more than 7 days after percutaneous exposure.
- c. sexual exposure to a HBV DNA or HBsAg-positive individual (if within two weeks; see table 3).
- d. household exposure of an infant less than 12 months old to a primary care giver who has acute hepatitis B (see table 5).

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Table 3. Postexposure prophylaxis for perinatal and sexual exposures

Exposure	HBIG		Vaccine	
	Dose	Recommended timing	Dose	Recommended timing
Perinatal	0.5 ml IM	within 12 hours of birth	0.5 ml IM	within 12 hours of birth
Sexual	0.06 ml/kg IM	single dose ASAP, but not more than 14 d after last sexual contact	varies**	first dose at same time as HBIG; but give in a different site

* For premature infants born to positive Moms, see §6F.

** For age-specific doses, see table 5.

Table 4. Postexposure prophylaxis following a percutaneous or permucosal exposure

Treatment when source is found to be HBsAg...			
Exposed person	Positive	Negative	Status unknown
Unvaccinated	HBIG x 1* and start HB vaccine [§]	Start vaccine	Start vaccine
Previously vaccinated			
Documented responder	No treatment	No treatment	No treatment
Documented non-responder to single series	HBIG x1 plus 1 dose of vaccine; test for anti-HBs 4–6 mo. later. If inadequate titer, give additional 2 doses of vaccine	No treatment	If known high-risk source, may treat as if source were HBsAg-positive
Documented non-responder to 4 or more doses	HBIG x 2 (1 month apart) <i>and hope for the best</i>	No treatment	If known high-risk source, may treat as if source were HBsAg-positive
Response never documented	Test exposed for anti-HBs: <i>If adequate</i> , no treatment; <i>If inadequate</i> , HBIG x 1 plus HB vaccine booster dose; test 4–6 mo later. If still inadequate, complete 2nd series (i.e., 2 more doses)	No treatment	Test <i>exposed</i> for anti-HBs: <i>If adequate</i> , no treatment; <i>If inadequate</i> , HB vaccine booster dose.

* HBIG dose = 0.06 ml/kg IM

[§] For vaccine doses, see table 5.

[†] “Adequate” means positive by EIA, or >10 SRU by RIA.

2. Pre-exposure

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 ongoing 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. Questions about vaccine availability should be directed to the Immunization Program.

Pre-exposure prophylaxis is recommended for the following persons:

- household and sexual contacts of HBsAg and HBV DNA positive persons;
- users of illicit IV drugs and their regular sexual partners;
- persons with multiple sex partners (homo- or heterosexual);
- persons seeking evaluation or treatment for a sexually transmitted disease;

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- clients and staff of institutions for the developmentally disabled;
- inmates of long-term correctional facilities;
- health-care and public safety workers with reasonably anticipated risk for exposure to blood or blood-contaminated fluids;
- susceptible immigrants, refugees, and others in households with persons from ethnic or racial groups with high prevalence of HBV infection, including Alaskan Natives, Pacific Islanders, and persons from China, Southeast and South Asia, and sub-Saharan Africa (persons from endemic countries require screening prior to vaccination);
- persons with end-stage renal disease, including predialysis, hemodialysis, peritoneal dialysis, and home dialysis patients;
- persons with chronic liver disease;
- persons with HIV infection;
- persons who will be traveling or residing for >6 months in highly endemic areas and who anticipate sexual or other forms of intimate contact with the local population;
- all other persons seeking protection from HBV infection (regardless of risk factors).

The basic recommended vaccine doses and schedules are shown in table 5, but be aware of alternate schedules for hemodialysis patients and immunocompromised patients. Vaccine schedules and doses may change as new products are licensed. Always check the package insert to make sure you are using the current regimen. Should you have any lingering confusion, contact the Immunization Program office.

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 Portland, 503/229-5910; Eugene, 541/686-7562; Bend, 541/388-6066; and Medford, 541/776-6030). For obvious reasons, questions about what OR-OSHA recommends or requires should be referred to OR-OSHA, *not* DHS Health Services.

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.

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 §6F. 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.

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Table 5. Hepatitis B vaccines: recommended doses and schedules*

<i>Vaccine and Group</i>	<i>Dose (μg)</i>	<i>Dose (ml)</i>	<i>Schedules/Notes</i>
Recombivax HB (single antigen vaccine)			
0 –19 years †	5	0.5	0,1, 6 months
11 – 15 years 20 years and older	10	1.0	Adolescents: 0, 4-6 months Adults: 0, 1, 6 months
Dialysis patients and other immunocompromised persons [¶]	40	1.0	0, 1, 6 months
Engerix-B (single antigen vaccine)			
0 – 19 years	10	0.5	Infants: birth, 1-4, 6-18 months Older children: 0, 1-2, 4-6 months
20 years and older	20	1.0	0, 1, 6 months
Dialysis patients and other immunocompromised persons [¶]	40	2.0	0, 1, 2, 6 months
Comvax (combination Hep B + Hib vaccine)			
6 weeks through 4 years	Recombivax HB (5 μ g) + PedvaxHib	0.5	2, 4, 12-15 months A single antigen hep B dose should be given at birth
Pediarix (combination Hep B, DTap, and IPV vaccine)			
6 weeks through 6 years	Engerix-B (10 μ g), Infanrix, and IPV	0.5	2, 4, 6 months A single antigen hep B dose should be given at birth
Twinrix (combination Hep B and Hep A vaccine)			
18 years and older	Engerix-B (20 μ g) + Havrix	1.0	0, 1, 6 months

* 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. Schedules are given in months (e.g., 0, 1, 6 means second dose 1 month after start and third dose 6 months after start).

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

¶ Special vaccine formulation

6. MANAGING SPECIAL SITUATIONS

A. 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 other body fluids,

1. the person should be discouraged from working until the acute clinical illness has resolved;
2. upon return to work, special precautions should be practiced until the HCW is no longer infectious, including:
 - a. wearing gloves for all procedures during which the hands will be in contact with the patients' mucosal surfaces or broken skin;
 - b. avoiding situations involving sharps that could lead to exposures of susceptibles to blood or objects contaminated with blood of the case;
 - c. careful and frequent hand washing.
3. Carriers, particularly those who may be HBeAg-positive, should be encouraged to voluntarily seek confidential counseling from Health Services regarding risk reduction strategies, which evaluation would include a review of their practice by an expert panel.

B. Case is a Suspected Iatrogenic Infection

If two or more iatrogenic cases occur in patients of the same dental or health care provider, and the cases have no other identified plausible source of infection, or other circumstances suggest the possibility of iatrogenic infection, notify the Communicable Disease Section.

C. 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.

D. 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.

E. Case is IgM anti-HBc Positive, without documented HBsAg

The physician ordering the test should be contacted about additional tests performed. It is important to rule out HBsAg antigenemia. Persons who are in fact HBsAg-negative may be in the window period. Otherwise, they most likely have acute infection (with or without symptoms).

F. 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, who are paid for their "case management" activities by the Immunization Program. Case management activities and requirements for reporting these activities are described in detail in Appendix 2 of these *Guidelines* and are summarized below.

1. Test Pregnant Women

Pregnant women that have been identified as HBV DNA or HBsAg-positive during prenatal care should have a complete hepatitis panel done that includes HBeAg testing, since this is a marker of infectivity. High risk women who are HBsAg-negative early in pregnancy should be tested late in pregnancy so that results are available at the time of delivery. All positive maternal test results must be reported (by both clinicians and laboratories) to the local health department and the Hepatitis B Case Report Form must be submitted to DHS Health Services (<http://oregon.gov/DHS/ph/acd/diseases/reporting/forms/hepb.pdf>).

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2. Treat Infants

Intervention to prevent perinatal hepatitis B infection begins just after delivery and is not, strictly speaking, a local health department responsibility. Within 12 hours of birth, both full term and premature infants with HBV DNA or HBsAg-positive moms should have received hepatitis B immune globulin [HBIG] (0.5 ml IM) and, like all other newborns, the first dose in the hepatitis B vaccination series (0.5 ml IM). HBIG and vaccine should be given at the same time but at different sites. Premies should not have been given divided or reduced doses. The second and third dose of vaccine should be given at one month and six months of age; it is the local health department's responsibility to encourage providers to use the schedule as much as possible.

Infants with birth weights <2 kg should be given HBIG (0.5 ml IM) and hepatitis B vaccine (0.5 ml IM) at or shortly after birth. The 3-dose hepatitis B vaccine series should be officially started when the kid reaches 2 kg of weight or two months of age, whichever comes last (these kids will get four doses of vaccine all together).

Infants with mothers whose HBsAg status is unknown at the time of delivery should receive the hepatitis B vaccine within 12 hours of birth. Vaccine alone is very effective at preventing infection, and HBIG is expensive enough that one should wait for test results. If the mom turns out to be HBsAg-positive, HBIG should be given before discharge and no later than seven days after birth.

3. Test Infants

Perinatally-exposed infants should be tested for both anti-HBs and HBsAg 3-9 months following the last dose of vaccine. The sero-presence of anti-HBs indicates immunity to hepatitis B. Hepatitis B-immunized children who are not anti-HBsAg-positive should repeat the 3-dose series; 15-25% will have an antibody response after the fourth dose and 30-50% will respond after the sixth dose. Children who don't respond to six doses of vaccine probably never will.

A perinatally-exposed infant who is HBsAg-positive 45 days or more after birth is considered to be infected with hepatitis B, and infectious to others through the usual modes of transmission. The HBsAg-positive kid must be reported to the local health department and the Hepatitis B Case Report Form submitted to Health Services (<http://www.healthoregon.org/odpe/guidln/forms/hepb.pdf>).

4. Track the Delivery

It is standard of care for mothers to be screened as part of prenatal care. Work with the OB/GYN to ensure that HBIG and vaccine are available (and given) at birth; work with the pediatrician to ensure that subsequent vaccine doses are given. Establish your own tickler file for follow-up, and notify the Immunization Section so that they can do the same. Redundancy is good. Try to get back-up phone numbers for friends or relatives who may be able to help you locate the family over the 6 months following delivery, should they move. The parents must understand what is going on.

G. Possible Common-source Outbreaks

Contact communicable disease epidemiologists at OHS immediately.

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). In acute hepatitis A or B, an elevation in either one is required to meet the case definition, while the hepatitis C case definition requires an elevation in the ALT to over 400 IU/L.

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.

Hepatitis B

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.

HBe Ab: 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.

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. As seen in the Table, each test kit or assay has a signal-cutoff ratio above which the client has a 95% probability of being HCV-positive. If a client's signal-cutoff ratio is equal or above the ratios listed in the Table, they can be counseled that they have antibodies to HCV. However, they would still need a PCR test to determine if they are chronically infected. For surveillance purposes, a patient reported with low signal-cutoff ratio (i.e., their Abbott HCV EIA 2.0 test result is above the threshold for a positive test, but the signal-cutoff ratio is below 3.8) would not be considered a case (and thus does not have to be reported).

UPDATE LOG

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.

March 2008 IC.4 LHDs encouraged to verify pregnancy status on women of child-bearing age (15–55 years).