

# Chronic Hepatitis B

## 1. DISEASE REPORTING

### 1.1 Purpose of Reporting and Surveillance

1. To determine whether or not cases may have exposed others or may be likely to do so in future.
2. To recommend appropriate preventive measures, including screening of close contacts and immunization of all susceptible contacts.
3. To facilitate case management and education.
4. To guide intervention planning by characterizing disease distribution and sources of infection.

### 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 chronic cases (see definitions below) to the Acute and Communicable Disease Program (ACDP) as soon as possible, but no later than the end of the calendar week of initial physician/lab report. Unless they have been previously reported in Oregon for chronic hepatitis B, all persons testing positive for HBsAg must be reported and investigated. ACDP staff can search for reports back through 1988.
2. Begin follow-up investigation within one working day. Use the chronic hepatitis B case investigation form. Submit all case data electronically to ACDP within seven days of initial report.
3. At time of initial report, and **upon receipt of new lab results for previously investigated cases**, verify the pregnancy status on women of child-bearing age (15–44 years).
4. A pregnant woman positive for HBsAg, HBeAg, or HBV DNA must be enrolled *with each pregnancy* into the Oregon Perinatal Hepatitis B Prevention Program (971-673-0300).

## 2. THE DISEASE AND ITS EPIDEMIOLOGY

### 2.1 Etiologic Agent

The hepatitis B virus (HBV) is one of several viruses known to cause hepatitis in humans. 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.

### 2.2 Description of Illness

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.

### 2.3 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 for are shown in Table 1 on the next page.

Patients are most commonly identified as chronic HBV carriers based on their HBsAg or HBV DNA results. 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.

### 2.4 Reservoir

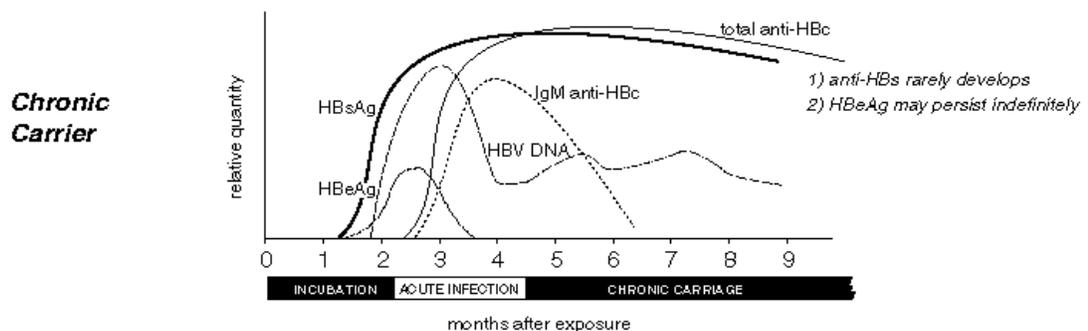
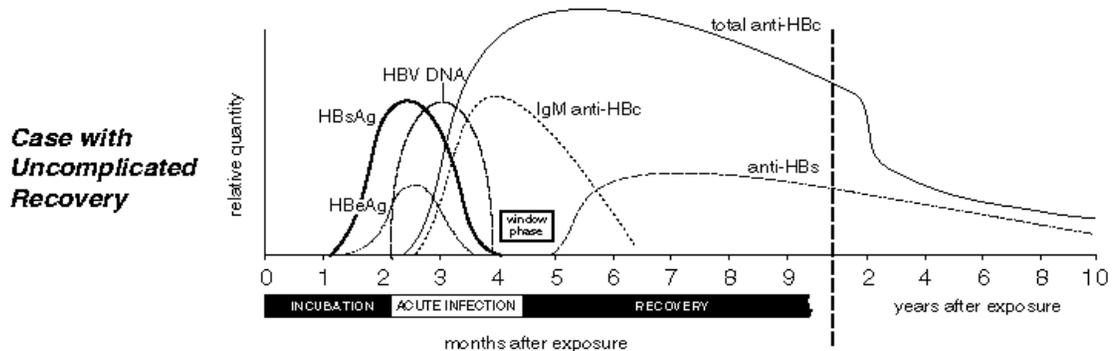
Infected humans. While relatively few infected persons become chronic carriers, they are probably the most important sources of HBV transmission, because they are infectious for many years, rather than a few months. Efforts to identify chronic carriers and to offer prophylaxis to their contacts, therefore, is at least as important as follow-up directed towards acute cases. How many of Oregon's other reportable infectious diseases carry a lifetime risk of death of 25%?

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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 some carriers indefinitely. Needlestick exposure data suggest that HBeAg-positive individuals are 3–5x more infectious than HBeAg-negative counterparts.

### Appearance of Serologic Markers in Typical Hepatitis B Infections



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

The most common modes of transmission include:

- 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, inappropriately shared multiuse medication vials;
- sexual contact (homosexual or heterosexual);
- perinatal transmission from an infected mother to the fetus or newborn;
- needlestick or similar accident.

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

- 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);
- contact of infective fluid with a mucosal surface (e.g., a splash of blood to the mouth or eye);
- shared use of tattoo equipment, ear piercing equipment, acupuncture instruments;
- 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);
- biting by an infected person or scratching with saliva-contaminated nails leading to percutaneous introduction of virus.

HBV transmission patterns and the prevalence of chronic HBV infection vary worldwide. Approximately 45% of the world's population lives in regions of high HBV endemicity (i.e., where prevalence of chronic HBV infection is >8%) and 43% live in areas of intermediate endemicity (where prevalence of chronic HBV infection is >2%). Regions of high or intermediate prevalence include much of Eastern Europe, Asia, Africa, the Middle East, and the Pacific Islands. In Oregon, the risks of household, perinatal, and sexual transmission may be elevated among immigrant and refugee populations with origins in these regions.

## 2.6 Incubation Period

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

**Table 2. Estimated prevalence of HBsAg-positive persons by population segment, United States**

Population group	Prevalence of HBsAg (%)
Alaska Natives/Pacific Islanders	5–15 <sup>1</sup>
Injection drug users	7 <sup>1</sup>
Men who have sex with men (HIV-negative)	1–3 <sup>1</sup>
HIV-Positive persons	4%–17% <sup>2</sup>
Sexual contacts and sex partners of HBV carriers	3.5%–9% <sup>3</sup>
Household contacts of HBV carriers	3%–20% <sup>4,5</sup>
Persons incarcerated in correctional institutions	2.2 <sup>6</sup>
“General” U.S-born population, noninstitutionalized	0.3 <sup>1</sup>
U.S. population, foreign-born	1.0–2.6 <sup>7,8</sup>

## 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

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become chronic carriers, indefinitely. A similar period of viremia occurs among asymptomatically infected individuals.

### 2.8 Treatment

Because 15%–25% of persons with chronic HBV infection are at risk for premature death from cirrhosis and liver cancer, persons with chronic HBV infection need medical management to monitor the onset and progression of liver disease and to screen for liver cancer. Currently approved treatment regimens include interferons and nucleoside/nucleotide analogues.

## 3. CASE DEFINITIONS, DIAGNOSIS, AND LABORATORY SERVICES

### 3.1 Confirmed 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. Documented HBsAg positive, HBeAg positive, or HBV DNA positive laboratory result two times at least six months apart. Any combination of these tests is acceptable. An oral patient history of a previous diagnosis is NOT adequate for reporting purposes.

### 3.2 Presumptive Case Definition

An individual with a single HBsAg positive, HBeAg positive, or HBV DNA positive laboratory result and does not meet the case definition for acute hepatitis B.

### 3.3 Suspect Case Definition

These have been defined out of existence.

### 3.4 Services Available at the Public Health Laboratory

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 2010, OSPHL does not yet do PCR testing for hepatitis B virus.

## 4. ROUTINE CASE INVESTIGATION

### 4.1 Using the Case Investigation Form

The hepatitis B case investigation forms are designed to structure your investigation. It is important to distinguish between acute cases of hepatitis B and newly identified chronic carriers and to use the appropriate reporting form. If only a single serology result (HBsAg, HBeAg, or HBV DNA) is available, try to get information from the ordering provider about presence/absence of symptoms, prior history, whether an IgM anti-HBc test has been performed or can be ordered, and other information that may help to establish a diagnosis.

### 4.2 Newly Reported Cases (never before reported in Oregon)

#### Identify the Source of Infection

Identifying a specific source of infection for recently identified carriers may be difficult, if not impossible. The chronic hepatitis B case report form focuses on selected lifetime risk factors, and these data will be used mainly to help inform programmatic efforts towards disease control.

#### Identify Potentially Exposed Persons

The purpose of the current disease investigation is to identify persons who: 1) may be candidates for prophylaxis or 2) are at risk for being chronic carriers themselves, such as long-term sexual partners, household contacts (particularly in immigrants from endemic countries), and offspring. Immunization is recommended for susceptible individuals who anticipate continued sexual contact with an infected person or with multiple partners, and condom use can be recommended until the series is completed. The first dose of hepatitis B vaccine should be administered during the same visit with serologic testing. However, HBsAg testing is not a requirement for vaccination, and in settings where testing is not feasible, vaccination of recommended populations should continue.

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In the event that the case has had sexual contact with a new partner in the past two weeks, hepatitis B immune globulin (HBIG) is recommended. Partners whose sexual history with the case goes back more than two weeks are unlikely to benefit from prophylaxis, but they should be informed of their exposure and tested by LHD staff or encouraged to seek testing elsewhere.

In the unlikely event that someone has had permucosal or percutaneous contact with the case's body fluids (e.g., by needle sharing, blood splashes) within the last 7 days, HBIG is recommended (see *Acute HBV Investigative Guidelines* for dosage information). Those exposed >7 days ago should be advised of their exposure.

If the case is a dentist, surgeon, or other health care worker, evaluate the potential for exposing patients (see §6.1).

If the case has donated blood or plasma in the 8 weeks before onset, see §6.3.

If the patient is pregnant, see §6.4.

### 4.3 Cases Previously Reported as Acute Hepatitis B

Individuals who have been reported in the past as acute HBV cases and contacted for case investigation need not be re-interviewed for risk factor information. However, these cases should be contacted to ensure that they have been notified of their chronic status and likely lifetime infectivity. HBsAg testing (and, if appropriate, immunization) should be offered to any new household or sexual contacts. Case education should reinforce bloodborne pathogen precautions (see §5.1). Women of childbearing age should be checked for pregnancy status (via a call to provider or to the case herself); cases who are pregnant should be enrolled in the Perinatal Hepatitis B Prevention Program (see §6.4) within two weeks of receipt of report. If the case cannot be reached directly, a letter should be sent reviewing basic information about HBV transmission and offering contact screening at LHD.

### 4.4 Cases Previously Reported as Chronic Hepatitis B

For individuals previously reported and investigated as chronic cases, a re-interview is not necessary. Updated lab results and demographic/ contact information should be entered into the state communicable disease database. HBsAg testing (and, if appropriate, immunization) should be offered to any new household and sexual contacts. Case education should reinforce bloodborne pathogen precautions (see §5.1). Women of childbearing age should be checked for pregnancy status (via a call to provider or to the case herself); cases who are pregnant should be enrolled in the Perinatal Hepatitis B Prevention Program (see §6D) within two weeks of receipt of report. If diagnosis status has changed from Presumptive to Confirmed, this should be reflected in the case record.

### 4.5 Cases who are Institutionalized or Incarcerated

If the case cannot be interviewed because he/she is a jail or prison inmate or resides in a drug treatment facility, mental health treatment center, or other residential institution, case investigation can be completed by facility staff using the case report form. Completed forms should be forwarded to the local health department. See §6.1.

## 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; chronic carriers usually are infectious for life. (A few do lose measurable HBsAg over time.)

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. Cuts and skin lesions should be covered to prevent the spread of infectious secretions or blood.

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 "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 for partners found to be susceptible.

Persons who are HBV DNA or HBsAg-positive should be advised not to donate blood, plasma, tissue, or semen.

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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.

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 §6.4.

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.

To protect the liver from further harm, HBsAg-positive persons should be advised to:

- seek health-care services from a provider experienced in the management of hepatitis B;
- avoid or limit alcohol consumption because of the effects of alcohol on the liver, with referral to care provided for persons needing evaluation or treatment for alcohol abuse; and
- obtain vaccination against hepatitis A (2 doses, 6–18 months apart) if chronic liver disease is present.
- HBsAg-positive persons who seek medical or dental care should notify involved personnel of their hepatitis B status.

Other counseling messages include the following:

- HBV is not spread by breastfeeding, kissing, hugging, coughing, ingesting food or water, sharing eating utensils or drinking glasses, or casual touching.
- Persons should not be excluded from school, play, child care, work, or other settings on the basis of their HBsAg status, unless they are prone to biting.
- HBV-infected health-care workers should follow published guidelines and applicable state laws and regulations regarding recommended practices to reduce the risk of HBV transmission in the workplace. See §6.1

### 5.2 Isolation and Work or School/Day Care Restrictions

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, see §6.1.

The risk of transmission of HBV in the school or 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 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. ACDP epidemiologists are available for consultation; refer also to OAR 333-019-0010 and the Oregon School Health Services Manual.<sup>10</sup> Ultimately, the local health officer has the authority to exclude children from day care or school.

### 5.3 Follow-Up

A repeat test for HBV DNA or HBsAg should be obtained after six months in persons who only have a single positive test documented to determine the clearance or continued presence of viremia. Those still HBV DNA-positive or HBsAg-positive are considered confirmed chronic 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.

### 5.4 Prophylaxis

#### Post-Exposure

HBIG is rarely indicated for contacts of chronic carriers due to the difficulty of determining onset date (see §4.2).

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### 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. 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 (971-673-0300).

Pre-exposure prophylaxis is recommended for the following persons:<sup>11</sup>

- sex partners of hepatitis B surface antigen (HBsAg) positive persons;
- sexually active persons who are not in a long-term, mutually monogamous relationship (e.g., persons with more than one sex partner during the previous 6 months);
- persons seeking evaluation or treatment for a sexually transmitted disease; and
- men who have sex with men.

**Table 3. Hepatitis B vaccines: recommended doses and schedules (April 2009)**

Vaccine and Group	Dose (µg)	Dose (ml)	Schedules/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 Hep B + Hib vaccine)</b>			
6 weeks through 4 years	Recombivax HB (5 µg) + PedvaxHib	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 through 6 years MVAX	Engerix-B (10 µg), 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 (20 µg) + 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. 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).

† 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

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Persons at risk for infection by percutaneous or mucosal exposure to blood:

- current or recent injection-drug users;
- household contacts of HBsAg-positive persons;
- residents and staff of facilities for developmentally disabled persons;
- health-care and public safety workers with reasonably anticipated risk for exposure to blood or blood-contaminated body fluids; and
- persons with end-stage renal disease, including predialysis, hemodialysis, peritoneal dialysis, and home dialysis patients.
- Others:
- 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; and
- all other persons seeking protection from HBV infection.

**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).

**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 §6.4. 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.

## 6. MANAGING SPECIAL SITUATIONS

### 6.1 Case is a Health Care Worker

HBV-infected health care providers should not be prohibited from participating in patient-care activities solely on the basis of their HBV infection; they should, however, be tested for HBeAg and to have their viral load measured. Health care providers who test either HBeAg positive or have circulating HBV burdens greater than or equal to  $10^4$  genome equivalents (GE) per milliliter of blood should routinely use double-gloving for all invasive procedures, for all contact with mucous membranes or non-intact skin, and for all instances in patient care for which gloving is recommended. Additionally, health care providers who are HBeAg positive or who have titers greater than or equal to  $10^4$  GE/ml should not perform Category III procedures (see SHEA guidelines)<sup>8</sup> which include many surgical procedures or nonelective procedures in the emergency department such as open resuscitation efforts.

If a patient is exposed to potentially infectious bodily fluids via percutaneous or permucosal means, the patient should be notified of this exposure within two days; the hospital or health care facility may request LHD assistance in making this notification (refer to OAR 33-012-0267).

### 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 nonhospital 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 at 971-673-1111.

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### 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, notify ACDP at 971-673-1111.

### 6.4 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 but are summarized below.

- **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 ACDP. A Perinatal Hepatitis B Prevention Program Case Management Form ([www.oregon.gov/DHS/ph/acd/reporting/forms/hepbperi.pdf](http://www.oregon.gov/DHS/ph/acd/reporting/forms/hepbperi.pdf)) should also be submitted via fax (971-673-0278) to the Immunization Program of the Oregon Public Health Division by the local health department. The Immunization Program can be reached at 971-673-0300 for questions.
- **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 receive 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 be given divided or reduced doses. The second and third dose of vaccine should be given at 1–2 months and 6 months of age; it is the local health department's responsibility to encourage providers to use the schedule as much as possible.
- **Infant weight.** Infants with birth weights <2 kg should also be given HBIG (0.5 ml IM) and hepatitis B vaccine (0.5 ml IM) within 12 hours of birth. The 3-dose hepatitis B vaccine series should be officially started when the child reaches one month of age. These children 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. However, if the mom turns out to be HBsAg-positive, HBIG should be given before discharge and no later than seven days after birth.
- **Test Infants.** Perinatally-exposed infants should be tested for both anti-HBs and HBsAg 1-3 months after completion of the series but not before they reach 9 months old. The presence of Hepatitis B surface antibody indicates immunity to hepatitis B. Hepatitis B-immunized children who are not anti-HBsAb-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 is considered to be infected with hepatitis B, and infectious to others through the usual modes of transmission. The HBsAg-positive child must be reported to the local health department and the Hepatitis B Case Report Form submitted to ACDP.

### 6.5 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.

### 6.6 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).

### 6.7 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.

**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/acdl/diseases/reporting/forms/hepb.pdf>).

- **Test Infants.** Perinatally-exposed infants should be tested for both anti-HBs and HBsAg 1–3 months after completion of the series but not before they reach 9 months old. The presence of hepatitis B surface antibody indicates immunity to hepatitis B. Hepatitis B-immunized children who are not anti-HBsAb-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 is considered to be infected with hepatitis B and infectious to others through the usual modes of transmission. The HBsAg-positive child must be reported to the local health department and the Hepatitis B Case Report Form submitted to ACDP.
- **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 and the post series serology is done. Establish your own tickler file for follow-up, and notify the Immunization Section using the Perinatal Hepatitis B Prevention Program Case Management Form. 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.

### 6.8 Case is a Co-infected or Superinfected with hepatitis D

If the patient’s serology results include antibody to hepatitis D virus (HDV) or another marker of HDV infection, create a separate case report for this disease. Hepatitis D, an unrelated virus whose modes of transmission are similar to HBV, affects only persons with HBV (approximately 10–15 million worldwide)<sup>12</sup> and is not routinely screened for in the United States. No special investigative measures are called for, assuming that the patient has been investigated according to the HBV guidelines.

### 6.9 Possible Common-source Outbreaks

Contact communicable disease epidemiologists at ACDP 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.

**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.

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**HBeAg:** 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.

**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.

**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.

**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 (15–44 years).

April 2009: New chronic-HBV-specific document adapted from previous hepatitis B (acute and chronic) guidelines. Expanded (4.A-E) contact investigation and (5.E) case education sections; (4.B-D) added specific procedures for investigation of previously reported cases; updated (2.E) population prevalence table and (5.D) pre-exposure prophylaxis guidelines to reflect CDC recommendations issued September 2008.

April 2011: Updated guidelines for cases who are institutionalized or incarcerated. (Van Ness and Cunningham).

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### REFERENCES

1. Centers for Disease Control and Prevention. Recommendations for identification and public health management of persons with chronic hepatitis B virus infection. MMWR 2008; 57 (No. RR08): <http://cdc.gov/mmwr/preview/mmwrhtml/rr5708a1.htm>
2. Alter, MJ. Epidemiology of viral hepatitis and HIV co-infection. J Hepatol 2006; 44 (1 Suppl): S6-9.
3. Heathcote, J., Gateau P, Sherlock S. Role of hepatitis B- antigen carriers in non-parenteral transmission of hepatitis B virus. Lancet 1974; 2:370-1. Cited in <http://cdc.gov/mmwr/preview/mmwrhtml/rr5708a1.htm>
4. Bernier RH, Sampliner R, et al (1982) Hepatitis B infection in households of chronic carriers of hepatitis B surface antigen. Am J Epidemiology 116: 199-211. Cited in <http://cdc.gov/mmwr/preview/mmwrhtml/rr5708a1.htm>
5. Irwin GR, Allen AM, et al. (1974). Hepatitis B antigen and antibody. Occurrence in families of asymptomatic HB surface antigen carriers. JAMA 227: 1042-43. Cited in <http://cdc.gov/mmwr/preview/mmwrhtml/rr5708a1.htm>
6. CDC. National Health and Nutrition Examination Survey, unpublished data, 1999–2003.
7. American Community Survey, US Census Bureau, 2006. Cited <http://cdc.gov/mmwr/preview/mmwrhtml/rr5708a1.htm>.
8. Henderson DH, Dembry L, Fishman NO, et al. SHEA guideline for management of healthcare workers who are infected with hepatitis B virus, hepatitis C virus, and human immunodeficiency virus. Infect Control Hosp Epidemiol 2010;31:203–32.
9. “Children in the 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).” Oregon Administrative Rule 333-019-0010. <http://arcweb.sos.state.or.us/banners/rules.htm>.
10. Oregon Department of Education, Oregon School Health Services Manual. <http://www.ode.state.or.us/groups/supportstaff/hklb/schoolnurses/commdisease.pdf>.
11. CDC (2006). A comprehensive immunization strategy to eliminate transmission of hepatitis B virus infections in the United States: Recommendations of the Advisory Committee on Immunization Practices, Part II. MMWR 55: 15–17.
12. World Health Organization, 2007. <http://www.who.int/csr/disease/hepatitis/whocdscsrncs20011/en/index3.html>.