

Preventing Hepatitis B: Focus On Women And Their Families

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Background: Infections contracted during infancy or childhood are responsible for 42 percent of cases of chronic hepatitis B disease, and in 25 percent or more these infections result in death from hepatoma or cirrhosis during adulthood. Hepatitis B vaccine and immune globulin provide the means of preventing the disease and its sequelae, but their proper use requires clinical strategies for deciding which patients are at risk and which responses are appropriate for family practice.

Methods: A MEDLINE search of the literature pertaining to hepatitis B and its prevention, a review from the Centers for Disease Control (CDC), and critique by both practitioners and members of the CDC Hepatitis Branch led to the development of the clinical guidelines reported in this review.

Results and Conclusions: Women at high risk for hepatitis B should be screened, including during pregnancy, by testing for hepatitis B core antibody. Those at low risk should be screened by testing for hepatitis B surface antigen. Susceptible high-risk women should be vaccinated; pregnancy is not a contraindication. Administration of hepatitis B immune globulin and vaccine to newborns is 95 percent effective in preventing transmission from a hepatitis B-infected mother. Follow-up vaccination is critical. Prophylaxis of contacts can include hepatitis B immune globulin and vaccination with or without previous testing, depending on age group and risk. Testing for hepatitis B surface antibody to assess development of immunity after vaccination is indicated only for those with ongoing exposure. (J Am Board Fam Pract 1993; 483-491.)

Each year about 300,000 new cases of acute hepatitis B virus (HBV) infection occur. One quarter of those infected become ill and jaundiced, 10,000 are hospitalized, and 250 die. About 5 percent of persons in the United States get an acute HBV infection at some time during their lives. In urban areas 1 to 2 percent of women are acutely infected with HBV or are HBV carriers.^{1,2} Among all healthy adults in the US, about 0.3 percent, or 1,000,000 to 1,250,000, are chronic HBV carriers. Direct medical costs related to hepatitis B in the US exceed \$1 million per day.^{3,4}

An estimated 18,000 births occur annually to women who are positive for HBV surface antigen (HBsAg). Although about one-half of such births

will have no risk factors for HBV infection, among substance-abusing women in labor who have not had prenatal care, more than 30 percent could be HBsAg positive.⁵ Without treatment, approximately 4,300 newborns annually would acquire HBV infection. Of offspring infected in utero, 35 percent are born premature or have low birth weight. About 1 percent of infected infants will develop a fulminant, often fatal, infection.

Even though 16 percent of acute HBV infections occur during infancy through adolescence, they account for 42 percent of chronic HBV disease in adults.⁶ Infants and children younger than 6 years who are acutely or chronically infected usually do not have symptoms. In Asian countries one-quarter to one-half of the children who become carriers die of cirrhosis or primary liver cancer during their adult years.⁷ Each year in the US, more than 5,000 deaths result from these sequelae of chronic HBV disease.³ Hepatitis B vaccine and immunoglobulin provide the means of preventing the disease and its sequelae, but their proper use requires clinical strategies for deciding which patients are at risk and which responses are appropriate for family practice.

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Methods

A MEDLINE search was performed using the key words "hepatitis B" and any of the following terms: "prevention," "immunization," "prophylaxis," "obstetrics," "maternal," "pediatric," or "infancy." Articles from 1984 to 1992 that assessed preventive strategies targeting women or children, as well as individuals with sexual exposure, were identified from their abstracts. Additional articles were accessed from cross-reference of the citations in the initial set of articles. In addition, publications related to hepatitis B from the Centers for Disease Control (CDC) from 1979 to the present were reviewed. A draft guideline for clinical practice was prepared and reviewed by faculty of the Department of Family Medicine at Brown University and by medical, nursing, and social work staff of the Blackstone Valley Perinatal Network. A revised draft guideline was reviewed by staff of the Hepatitis Branch of the Communicable Disease Center. This review incorporates the results of this process.

Clinical Markers of Hepatitis B

The course of infection usually is accompanied by an evolving pattern of detectable antigens and antibodies. Table 1 describes the various HBV antigens and antibodies and their clinical importance. This review does not address treatment of acute or chronic hepatitis.

Acute Infection

The incubation period between exposure and clinically symptomatic illness varies from 4 weeks to 6 months, with an average of about 50 days. Two-thirds of those with acute HBV infections never develop symptoms severe enough to lead to a diagnosis being made. Newly infected individuals usually become HBsAg positive 4 weeks following exposure and then remain infectious for about 2 to 4 months, although a few remain HBsAg negative throughout the acute illness.

Chronic Carriers

Following an acute HBV infection, the risk of developing chronic infection is inversely related to age; 90 percent of infants become chronic carriers; this rate declines to about 30 to 60 percent among those 1 to 5 years old. About 6 to 10 percent of adults with acute HBV infection become chronic carriers.^{4,6} Development of a chronic in-

Table 1. Meaning of Hepatitis B Virus (HBV) Terms.

Term	Description
Hepatitis B surface antigen (HBsAg)	A protein fragment that is part of the HBV outer surface. Its detection indicates that HBV is present. In acute cases it usually appears about 4 weeks after the initial exposure and persists for 2 to 4 months. If the infected person becomes a HBV carrier, HBsAg is detectable in the circulation and other body fluids indefinitely.
Hepatitis B e antigen (HBeAg)	A protein HBV makes when it is actively reproducing. Its presence means the patient is highly contagious. It appears about 6 to 8 weeks after the initial exposure and persists for 2 to 3 months. If an individual becomes a HBV carrier, HBeAg can persist in the circulation and other body fluids indefinitely. Because all patients with HBsAg should be considered contagious regardless of whether HBeAg is present, testing for it is not clinically useful for the management of infants of infected mothers.
Hepatitis B surface antibody (anti-HBs)	Made as part of the immune response 5 to 6 months following a HBV infection or vaccination. Its presence, when accompanied by the absence of HBsAg, indicates that the individual has developed immunity, is <i>not</i> a carrier, and can neither get nor infect others with HBV.
Hepatitis B core antibody (anti-HBc)	Made as part of the immune response by 6 to 10 weeks following a HBV infection. Because HBV vaccine is composed of HBsAg fragments only, vaccination does not result in the production of anti-HBc; the presence of anti-HBc <i>only</i> indicates previous HBV infection. Unlike anti-HBs, anti-HBc is present in <i>both</i> carriers and noncarriers.

fection is marked by the presence of both HBsAg and hepatitis B core antibody (anti-HBc).

Based on liver biopsy, chronic carriers can be divided into two groups: those with chronic persistent hepatitis and those with chronic active hepatitis.⁸ Those with chronic active hepatitis have evidence of ongoing liver damage. These two forms of chronic hepatitis are distinguished

by the presence, or perhaps the level, of HBV replication. Those with hepatitis B e antigen (HBeAg), a marker of active viral replication, have ongoing hepatocellular damage and might benefit from interferon therapy.⁸⁻¹⁰ Those without detectable HBeAg might have ongoing viral replication, although at a much lower rate, as demonstrated by sensitive research tests.¹¹ Both those with chronic active and those with chronic persistent hepatitis can infect others.

Transmission

Individuals with acute HBV infection and chronic carriers can transmit HBV to others through sexual intercourse, by sharing needles, by transfusion, or by other contact with infectious blood. Transmission can occur through percutaneous or permucosal contact with infectious body fluids. Blood and semen from HBsAg-positive individuals have high concentrations of HBV. Saliva of infected individuals does carry HBV, but in much lower concentrations. HBV is not transmitted by the fecal-oral route.⁴

Transmission from Mother to Baby

For women with acute HBV infection in the first trimester, 10 percent will have infants that are infected in utero or at delivery. Throughout pregnancy this percentage increases so that for mothers with acute infections in the third trimester, 75 percent of infants will be infected if steps are not taken to prevent transmission. Much of this increase in risk is related to the likelihood of women being HBeAg positive at delivery.^{12,13} Contact with maternal blood during delivery is the most frequent route of infection for infants.

The likelihood of a chronic carrier mother transmitting HBV to her offspring is directly related to her level of HBV replication. The presence of HBeAg is associated with higher concentrations of HBV circulating in the blood. Consequently, carriers with HBeAg present have a 90 percent chance of transmitting HBV to their infants. In the absence of maternal HBeAg, while transmission is much less likely, HBV is still present in the mother. Fulminant newborn HBV infections resulting in death have occurred as a result of transmission from HBeAg-negative carrier mothers. (This group might include infants infected with a mutant HBV strain.¹⁴) Thus, while HBeAg is of research interest, testing for its

presence is rarely indicated in this clinical setting, and its presence or absence should not determine treatment of a newborn of a carrier mother.^{3,6,15,16}

In the US and Europe, because of the low rates of HBeAg positivity, the likelihood of a carrier mother infecting her newborn is low (best estimates are less than 15 percent). In Asia, the rate of HBeAg positivity is much higher, and consequently the transmission rate is between 40 and 70 percent. Infected women from this region who emigrate to the US also have high rates of HBeAg positivity.³

Screening and Case Identification

Prevention

Women, including those pregnant, who are at high risk of acquiring HBV include intravenous drug users, sexual partners of HBsAg-positive individuals or of intravenous drug users, prostitutes, and institutionalized women. At initial contact, both pregnant and nonpregnant women at high risk should be screened by testing for anti-HBc; if the test is positive, the women should be tested for HBsAg (Table 2). Women whose tests are positive for anti-HBc and HBsAg and who are not acutely ill are chronic HBV carriers. Anti-HBc-positive and HBsAg-negative women have developed immunity following an acute HBV infection, and neither need nor would benefit from HBV vaccination. Such women who are pregnant or become pregnant will not infect their newborns, and no special care or testing of their newborns is necessary.

Testing to determine HBV carrier status should be part of the initial laboratory assessment in all pregnant women without regard to risk status (Table 2).³ Women at high risk should be screened as indicated above. For those at low risk, testing for HBsAg is sufficient; additional components of the hepatitis panel are expensive, of no value for screening to detect carriers, and should not be ordered. Screening all pregnant women to prevent HBV perinatal infections in their infants is cost-effective.^{17,18}

Physicians, nurses, phlebotomists, laboratory technicians, and others with occupational contact with infected blood are at moderate risk and should be vaccinated. Testing for anti-HBc before vaccination is optional, depending on individual risk; those working in urban practices could be at higher risk than others.

Table 2. Guide to Screening and Prophylaxis for Exposure to Hepatitis B Virus.*

Type of Exposure	Screening Test	Immunoprophylaxis
Pregnant women [†]		
Low risk	HBsAg	None
High risk	Anti-HBc	Vaccination
Sexual contact		
Acute infection	Anti-HBc	HBIG and vaccination [‡]
Chronic carrier	Anti-HBc	Vaccination
Perinatal (newborn of HBsAg positive mother)	None	Vaccination and HBIG [‡]
Household contact ≤ 12 months old		
Acute infection	None	HBIG and vaccination [‡]
Chronic infection	HBsAg	HBIG and vaccination [‡]
Household contact > 12 months old		
Acute infection, no blood exposure	None	None
Acute infection, possible blood exposure	None	HBIG and vaccination [‡]
Chronic infection	Anti-HBc	Vaccination

*From Immunization Practices Advisory Committee.³

[†]Risk refers to the likelihood of exposure during pregnancy or thereafter.

[‡]When hepatitis B immune globulin (HBIG) and vaccine are given at the same time, they should be injected at different sites.

Vaccination

Women at high risk who are both HBsAg and anti-HBc negative have never had a HBV infection and are susceptible. Women continuing high-risk behaviors should receive the first dose of HBV vaccine immediately (Tables 3 and 4). If such women are lost to follow-up for an extensive interval before vaccination, repeated screening might be warranted.³

Pregnancy Is Not a Contraindication to HBV Vaccination³

Because recombinant vaccine contains only non-infectious HBsAg particles, vaccination entails no infectious risk to either the woman or the fetus. Of note, pregnancy could be one of the few times women at high risk are accessible for a complete vaccination series, and they might have third-party coverage to pay for the vaccination. Vaccination protects the woman, her fetus, future babies, and sexual contacts. If not vaccinated, these women should be screened again by testing only for HBsAg late in pregnancy or at delivery.

Teenagers at high risk of acquiring HBV include those at risk of or who have initiated sexual activity at an early age and those engaging in or at high risk of intravenous drug use or other high-risk behaviors. They can be targeted for vaccination either individually or through population-based screening of high-risk communities. In these circumstances testing for susceptibility is not indicated prior to vaccination except in those with known sexual or blood exposure to HBV.³

For maximum protection three injections at 0, 1-, and 6-month intervals must be given. Women in high-risk populations might not return for the second and third doses. More than 90 percent of individuals receiving three doses develop immunity. As with all immunizations, written informed consent is required if the vaccine is provided using public funds.

Women continuing high-risk behaviors should be tested for hepatitis B surface antibody (anti-HBs) 3 to 9 months after the third dose to determine that they have developed immunity (indicated by a titer of ≥ 10 mIU/mL). Because the recombinant vaccine is made from viral surface antigen particles only, vaccination does not result in the production of anti-HBc. If anti-HBs testing yields a titer of less than 10 mIU/mL, an additional vaccine dose (or doses) should be given. Older persons and those who smoke are somewhat less likely to develop immunity and in some studies have needed additional doses. Routinely testing such individuals to determine immune response, however, is not recommended unless they continue to engage in high-risk behaviors.³

Assessment of HBsAg-Positive Women

Women, including those pregnant, who are HBsAg positive should have the following:

1. Further evaluation (not covered in this review) to determine whether they have acute or chronic active hepatitis or are carriers

2. Testing for other sexually transmitted diseases
3. Assessment for psychosocial risks, including high-risk behaviors, and other problems amenable to intervention
4. A plan, if pregnant, for care of the newborn (see below)
5. Counseling regarding contraception
6. Screening of household members and sexual partners and prophylaxis using hepatitis B immune globulin (HBIG), HBV vaccination, or both of those at high risk (see below)
7. Their medical records (including prenatal) marked so that health care workers, including those involved in the delivery and in the care of a pregnant woman's newborn, are alerted to provide appropriate care for the infant and to assure that universal precautions in the handling of blood products are followed

8. A report made to the state department of health as required by law

Newborn Care

Infants born to mothers who are HBsAg positive should be bathed promptly. Aspiration of the baby's gastric contents is not necessary for HBV prevention. Babies should not be isolated, because routine nursery contact does not involve blood exposure and the associated risk of HBV transmission. HBsAg-positive women can have normal contact with their newborns so long as they observe proper hand washing techniques (to protect from vaginal or other blood contamination).¹⁹ HBsAg-positive women can breast-feed if the infant is being vaccinated; similarly, maternal vaccination is not a contraindication to breast-feeding.³

Perinatal Prophylaxis

Infants born to mothers who are known carriers or who have acute HBV infections (both indicated by HBsAg positivity) should receive HBIG and HBV vaccine (with informed consent) immediately after birth (Tables 3 and 4). Of note, the dosage of recombinant hepatitis B vaccine (Recombivax) for infants of HBsAg-positive mothers is *twice* the dose used for universal vaccination of other infants. The infants should receive follow-up vaccine doses at 1 and 6 months. Receipt of the second dose at no later than 2 months of age is critical to the infant developing a protective immune response following HBV exposure at time of delivery.³ These infants should *not* be screened for HBV using cord blood.

Cord blood testing for HBsAg is of no value. Intrauterine infection of the fetus occurs rarely, and most positive cord blood samples reflect contamination of transient leakage of blood across the placenta induced by labor and delivery. Most infected infants do not become HBsAg positive until 2 to 4 months of age.^{3,19} Because up to one-half of cord blood samples of maternal HBsAg carriers will be positive for HBsAg, cord blood drawn for other purposes should be clearly marked to reinforce observation of universal precautions by laboratory personnel. Because transient neonatal HBV viremia is common during labor and delivery among offspring of HBV infected women, scalp electrode placement is not likely to increase the risk of neonate HBV infec-

Table 3. Recommended Schedules of Infant Hepatitis B Immunization.*

Infant Status	Vaccine Dose [†]	Age of Infant [‡]
Born to mother known to be HBsAg-positive	Dose 1 (accompanied by HBIG)	Birth (within 12 hours)
	Dose 2	1 month
	Dose 3	6 months
Born to mother not screened for HBsAg before delivery	Dose 1 (accompanied by HBIG)	Birth (within 12 hours). If mother is found to be HBsAg positive, give HBIG dose to infant as soon as possible, not later than 1 week after birth [§]
	Dose 2	1 month
	Dose 3	6 months
Born to mother known to be HBsAg-negative	Option 1: Dose 1	Birth (before hospital discharge)
	Dose 2	1-2 months
	Dose 3	6-18 months
	Option 2: Dose 1	1-2 months
	Dose 2	4 months
	Dose 3	6-18 months

*From Immunization Practices Advisory Committee.³

[†]See Table 4 for appropriate vaccine dose.

[‡]The first two doses should be at least 1 month apart; increasing the interval beyond 1 month adds no immunogenic advantage. The second and third doses should be at least 2 months apart; 4 months is optimum.

[§]The first dose should be the dose for infant of HBsAg-positive mother (Table 3). If mother tests HBsAg positive, continue that dose; if mother is HBsAg negative, use appropriate dose from Table 4. HBIG = hepatitis B immune globulin.

Table 4. Recommended Doses of Currently Licensed Hepatitis B Vaccines.*

Group	Recombivax HB [†]		Enerix-B [†]	
	Dose (μg)	(mL)	Dose (μg)	(mL)
Infants of HBsAg-negative mothers and children < 11 years	2.5	(0.25)	10	(0.5)
Infants of HBsAg-positive mothers; prevention of perinatal infection	5	(0.5)	10	(0.5)
Children and adolescents 11–19 years	5	(0.5)	20	(1.0)
Adults ≥ 20 years	10	(1.0)	20	(1.0)
Dialysis patients and other immunocompromised persons	40	(1.0) [‡]	40	(2.0) [§]

*From Immunization Practices Advisory Committee.³

[†]Both vaccines are routinely administered in a 3-dose series. Enerix-B has also been licensed for a 4-dose series administered at 0, 1, 2, and 12 months, although this series provides no particular advantage.

[‡]Special formulation.

[§]Two 1.0-mL doses administered at one site, in a 4-dose schedule at 0, 1, 2, and 6 months.

Notes: **Hepatitis B immune globulin (HBIG)** — For infants, a dose of 0.5 mL should be given intramuscularly at a site different from that used for vaccine. For children and adults, the dose is 0.06 mg/kg.

Confirmation of immunity — Testing for anti-HBs 1 to 6 months after the third dose is not recommended *except* for (1) infants of mothers HBsAg positive at delivery, and (2) individuals continuing high-risk behaviors.

tion (assuming that newborns are treated appropriately with HBIG and HBV vaccine). Therefore, scalp electrode placement or scalp pH sampling as obstetrically indicated is appropriate even if the mother is HBsAg positive.

For newborns of HBsAg-positive mothers, the administration of HBIG should occur as soon as possible after birth, preferably within 12 hours (Table 3). The effectiveness of HBIG declines progressively following birth, but it could be protective at least up to 1 week after birth. The HBV vaccine also should be given routinely as soon as possible after birth. If not, the vaccine should be administered as soon as possible, even if delayed several weeks.⁴

Women not screened prenatally or whose test results are not available at the time of delivery should be tested for HBsAg on delivery admission. If results are not available within 12 hours

after delivery, the infant should receive HBV vaccine by that time. This first vaccine dose should be that used for infants of HBsAg-positive mothers. If test results will not be known by 24 to 48 hours after delivery, HBIG should be given as well.^{3,4}

The offspring of women not screened for HBV until delivery admission could be at high risk of not receiving vaccine boosters, particularly if the woman received little or no prenatal care. Reporting positive HBV screening results by hospital personnel to the practice accepting responsibility for follow-up and, if appropriate, to the local visiting nurses service is essential. A linked hospital-community practice surveillance and follow-up system is critical.

Although testing for HBsAg and its antibody (anti-HBs) at least 6 months after completion of the three-dose vaccine series will determine the effectiveness of newborn therapy, such testing is expensive, of marginal benefit, and should not be done routinely except for infants of mothers who were HBV carriers or acutely infected at time of delivery. If testing is done, and HBsAg is not detected but anti-HBs is, the child has developed protective immunity. If HBsAg is detected, the infant has been infected and has become a HBV carrier. If neither is detected (< 10 mIU/mL), the vaccine did not lead to an immune response. Such infants should be revaccinated. Fifteen to 25 percent will develop an adequate antibody response (≥ 10 mIU/mL) after one further dose, and 30 to 50 percent will do so after three more doses. Testing for anti-HBc might be misleading, because maternal anti-HBc passively transferred to the fetus before birth can persist for more than 1 year in an infant.^{3,20} Because the vaccine is made of surface antigen particles, it does not stimulate production of anti-HBc.

Universal Infant Hepatitis B Vaccination

The Centers for Disease Control Immunization Practices Advisory Committee and the American Academy of Family Physicians now recommend universal vaccination, with informed consent, of all infants following one of the schedules in Tables 3 and 4.³ This recommendation does not alter the recommendation that all pregnant women be screened for HBV. All practices in a community should follow the same schedule to avoid confusion. For example, in Rhode Island, option 1 (Table 3) schedule has been chosen, and family

physicians can expect that all infants born in the state after December 1992 will have been immunized in the nursery before hospital discharge.

Prophylaxis Effectiveness and Side Effects

The newborn prophylaxis protocol will protect about 95 percent of infants born to HBsAg-positive mothers. Failures can result from in utero infections of the fetus.¹² The administration of either HBIG or HBV vaccine alone will prevent approximately 75 percent of perinatal HBV infections.^{21,22} Vaccination provides long-term protection, and booster doses beyond the initial series currently are not recommended for immune-competent individuals. Delivery by Cesarean section does not offer any protection to the newborn. Guillain-Barré syndrome has been reported in 1 out of 200,000 adults following HBV vaccination; it has not been reported in infants or children. Fifteen percent of recipients of HBV vaccine develop mild symptoms (e.g., fever, headache, fatigue, nausea, and soreness at the injection site).³

The site of administration is important. For neonates and infants, use the anterolateral thigh muscle; for children and adults use the deltoid muscle (upper outer arm). Buttock injection often does not induce immunity. HBIG and HBV vaccination can be given with any combination of routine immunizations (diphtheria-pertussis-tetanus, oral polio vaccine, hemophilus influenza B, measles-mumps-rubella) without compromising immune response to any of the vaccines given. HBV vaccine, including opened multidose vials, remains stable until the expiration date if stored at between 36° to 43°F (2° and 6°C). If frozen, discard; freezing destroys vaccine potency. If the vaccination schedule is interrupted (for infants or adults), it should be resumed as soon as possible. Any previously administered dose does not need to be repeated. Change in vaccine manufacturer between doses is not a problem.³

Household Contacts

Even with universal vaccination, ongoing surveillance for unimmunized infants and children at special risk is necessary. Determining the infants who are at high risk is based on the hepatitis risk status of household contacts. Infants whose parents engage in high-risk behaviors (particularly intravenous drug use or prostitution) should be considered at high risk themselves. In such situa-

tions, the most appropriate screening (and vaccination) target is the household member who engages in the high-risk behavior. If this person is not anti-HBc positive, screening other household members, including the infant, is not indicated. Nevertheless, such infants should be vaccinated according to the universal vaccination recommendations.

Previously unvaccinated infants less than 1 year of age whose mothers or other primary caregivers are newly discovered to be HBV carriers should be screened by testing for HBsAg. If the test is negative, they are susceptible and should receive HBIG and HBV vaccinations. Unvaccinated infants less than 1 year of age whose mothers or other primary caregivers develop an acute HBV infection should receive HBIG and begin HBV vaccination immediately without testing. Infants who have already begun routine HBV vaccination at the time a primary caregiver is discovered to be acutely or chronically infected should continue the regular vaccination schedule. Postvaccination testing to assess immune status in these situations is indicated only if the infant's exposure is to a mother who might have been HBsAg positive during labor and delivery.

Household contacts older than 12 months of persons with acute HBV do not need HBIG or HBV vaccine unless any blood exposure can be discovered (e.g., shared toothbrush or razors). If at 3 months following the onset of symptoms the index case is still HBsAg positive and is thus likely to become an HBV carrier, then all household contacts should be vaccinated. Testing is not indicated either before or after vaccination. Household contacts of those newly discovered to be chronic carriers (e.g., contacts of women tested prenatally) should be tested for anti-HBc, and if negative, vaccinated.^{3,4}

Adopted children from countries where HBV infection is endemic should be screened for HBsAg. If positive, other family members should be vaccinated without testing.

HBV transmission has rarely been reported between a chronic carrier child and other children or staff in child-care settings. Testing contacts or removing carriers from day-care settings is not indicated, although it might be necessary if special circumstances, such as behavioral problems (e.g., biting or scratching) or medical conditions that increase the risk of transmission (e.g., severe skin

infection or recurrent nose bleeds), occur.⁴ The fecal-oral route does not carry risk of transmission, and special care of diapers of infected infants is not necessary. Staff of day-care programs for the developmentally disabled have a risk of HBV infection comparable with health care workers and should be vaccinated.

Care of Sexual Partners

HBsAg-positive men, as well as women, should be educated about the risk that sexual contact can hold for their susceptible partners and future offspring. They should be advised to discuss this risk with their partners and those with whom they initiate sexual activity, to use condoms, and to encourage their partners to get medical care.²³

Potentially susceptible sexual partners of individuals with an acute HBV infection should receive HBIG immediately and begin the vaccination series. For such individuals, a single dose of HBIG (0.06 mL/kg) is recommended if it can be given within 14 days of the last sexual contact. Testing for HBV status before vaccination is not indicated nor is testing to confirm immunity following vaccination.

If the infected individual is still HBsAg-positive at 3 months, and thus likely to become a carrier, then sexual partners should be vaccinated and their immune statuses confirmed at least 3 months after vaccination.^{3,4} At least until immunity is confirmed, condoms should be used.

The sexual partners of those found to have a chronic HBV infection should be tested for anti-HBc (and other sexually transmitted diseases). Those positive for anti-HBc have been infected with HBV at some time and might be carriers. If subsequent testing for HBsAg is negative, the individual has had HBV at some time in the past, has recovered, and is not a carrier. In one study 27 percent of regular heterosexual partners of HBV-positive patients had been infected by the time they sought health care.²⁴ Couples in which both partners are positive for anti-HBc (or anti-HBs or HBsAg) do not need to use protective measures with each other (but if HBsAg positive, they could transmit HBV to additional sexual contacts through unprotected intercourse).^{3,21}

Partners who are anti-HBc negative do not have evidence of current or past infection and thus are susceptible. They should receive HBIG if it can be given within 14 days of the last sexual

contact. Such couples also should be advised to use condoms. If ongoing exposure is anticipated, HBV vaccine should be given, and condoms used until immunity is confirmed (anti-HBs positivity 3 months after the third dose). All bisexual or homosexual men and promiscuous women should get the HBV vaccine following confirmation of susceptibility (anti-HBc negative).⁴

Reproductive Care for HBV-infected Women

Preventing pregnancy during acute HBV infections is an important way of preventing HBV in utero infections and other infant and family morbidity. The steroids in oral contraceptives are involved in a number of hepatic pathways, however, which makes oral contraceptive use during an HBV infection problematic. For example, ethinyl estradiol and its metabolites lead to the destruction of cytochrome P-450, the decrease in which could impair other hepatic metabolic processes.²⁵ Consequently, during an acute HBV infection, women taking oral contraceptives should be advised to stop their use. Women with chronic active hepatitis also should not use oral contraceptives. Such women should be counseled regarding other birth control methods. A barrier method (condoms and foam) also might protect the partner.³ Before prescribing oral contraceptives for women with chronic persistent hepatitis, the family physician should discuss the case with a hepatologist. Liver function tests might help in the evaluation of the risk involved in the use of oral contraceptives. Whether a woman with chronic hepatitis should be counseled not to become pregnant is a complex question and might be addressed best with input from a hepatologist.

This guideline was reviewed by Drs. Shapiro and Desade for the Centers for Disease Control, Hepatitis Branch, and is in compliance with CDC recommendations.

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