

Viral Hepatitis Compendium

Included under the broad umbrella of viral hepatitis are several distinct viruses with unique modes of transmission, clinical outcomes, and strategies for prevention. This compendium of resources on hepatitis A virus (HAV), hepatitis B virus (HBV), and hepatitis C virus (HCV) was compiled to clarify distinctions between the viral hepatitides and to facilitate diagnostic testing, reporting, and disease prevention and control activities. These resources were derived from recommendations and guidelines published by the Centers for Disease Control and Prevention (CDC), the Advisory Committee on Immunization Practices, and the American Academy of Pediatrics Committee on Infectious Diseases. Additional information sources are listed below.

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* Fact sheets on viral hepatitis D, E, G are not included here but can be found on the Minnesota Department of Health (MDH) website (<http://www.health.state.mn.us/hepatitis.htm>).

Hepatitis Resources

Minnesota Department of Health Immunization, Tuberculosis & International Health Section

(612) 676-5237 or 1-877-676-5414
<http://www.health.state.mn.us/hepatitis.htm>

Hepatitis Foundation International

1-800-891-0707 or (301) 622-4200
<http://www.hepatitisfoundation.com>

Immunization Action Coalition

(651) 647-9009
<http://www.immunize.org>

National Digestive Diseases Information Clearinghouse

1-800-891-5389 or (302) 654-3810
<http://www.niddk.nih.gov/health/digest/digest.htm>

National Clinicians' Post-Exposure Prophylaxis Hotline

(PEPLINE): 1-888-448-4911

Centers for Disease Control and Prevention Hepatitis Division

1-888-4HEP-CDC or 1-888-443-7232
<http://www.cdc.gov/hepatitis>

National Foundation for Infectious Diseases

(301) 656-0003
<http://www.nfid.org>

American Liver Foundation

1-800-GO-LIVER (1-800-465-4837) or
1-888-4HEP-ABC (1-888-443-7222)
<http://www.liverfoundation.org>

"Waa Maxay Cagaarshow B" or "What is Hepatitis B?"

A 12-minute videotape presents a series of four, 3-minute vignettes focusing on the importance of screening and vaccination for hepatitis B virus. The videotape is in Somali and comes with an English translation. To order a free copy, contact Jeanne Watson at (612) 676-5530 or by e-mail (Jeanne.Watson@health.state.mn.us).

Hepatitis A Virus (HAV) Fact Sheet

(adapted from materials developed by the Centers for Disease Control and Prevention)

Report to Minnesota Department of Health	Acute HAV infection (positive anti-HAV IgM)
Etiology	HAV is an RNA virus in the picornavirus group.
Signs and Symptoms	<ul style="list-style-type: none"> • May be asymptomatic • Older persons are more likely to have symptoms. Symptoms usually occur abruptly and may include fever, tiredness, loss of appetite, nausea, abdominal discomfort, dark urine, or jaundice. • Symptoms generally last less than 2 months; occasionally, prolonged or relapsing illness can last up to 6 months. • Average incubation period is 28 days (range: 15-50 days)
Long-Term Effects	<ul style="list-style-type: none"> • Chronic infection does not occur. • HAV infection confers life-long immunity. • 15% of HAV-infected persons will have prolonged or relapsing symptoms over a 6-month period.
Transmission	Fecal-oral transmission by: <ul style="list-style-type: none"> • person-to-person contact or • ingestion of contaminated food or water
Communicability	14 days before to 7 days after onset of symptoms
Risk Groups	<ul style="list-style-type: none"> • Household contacts of infected persons • Sexual contacts of infected persons • Persons, especially children, living in regions of the United States with high rates of HAV infection • Travelers to regions where HAV is common, including Central and South America, Africa, and Asia • Men who have sex with men • Injection and non-injection drug users
Prevention	<ul style="list-style-type: none"> • HAV vaccine is the best protection. • Immune globulin (IG) provides short-term protection against HAV. IG is appropriate for both pre- and post-exposure prophylaxis; post-exposure prophylaxis can be given within 14 days after exposure to HAV. • Hand washing with soap and water after using the bathroom or changing diapers and before preparing or eating food
Vaccine Recommendations*	HAV vaccine is recommended for: <ul style="list-style-type: none"> • travelers to areas with increased rates of HAV infection • men who have sex with men • injection and non-injection drug users • persons with chronic liver disease • persons with clotting-factor disorders (e.g., hemophilia) • children living in regions of the U.S. with high rates of HAV infection • anyone who wants to be protected from contracting HAV * HAV vaccine is licensed only for persons 2 years of age or older
Medical Management	Supportive care
Post-Exposure Management	IG for contacts of cases within 14 days of exposure. Contacts determined case-by-case, based on potential for transmission.
Trends and Statistics	<ul style="list-style-type: none"> • Occurs in epidemics nationally and locally • During epidemic years, the number of HAV cases reported in the U.S. has reached 35,000. • Since the HAV vaccine was licensed in 1995, vaccine use has increased in the U.S. and morbidity has reached historic lows. One-third of persons in the U.S. are immune to HAV (i.e., have evidence of past infection). Approximately one-third of reported cases occur among children less than 15 years of age. • HAV incidence rates in Minnesota have declined since peaking in 1992.

Hepatitis B Virus (HBV) Fact Sheet

(adapted from materials developed by the Centers for Disease Control and Prevention)

Report to Minnesota Department of Health	<ul style="list-style-type: none"> • Acute HBV infection • Chronic HBV infection • Hepatitis B surface antigen (HBsAg)-positive women of childbearing age
Report to Local Health Department	HBsAg-positive pregnant women (include vaccination dates, serology dates and test results for infants born to HBsAg-positive mothers)
Etiology	HBV is a DNA-containing virus classified as a hepadnavirus. Important components include HBsAg, hepatitis B core antigen (HBcAg), and hepatitis B e antigen (HBeAg).
Signs and Symptoms	<ul style="list-style-type: none"> • May be asymptomatic • Older persons are more likely to have symptoms; however, 50% of adults with acute infection are asymptomatic. Onset of symptoms is insidious and may include fever, tiredness, loss of appetite, nausea, abdominal discomfort, dark urine, or jaundice. • Average incubation period is 90 days (range: 45-160 days)
Long-Term Effects	<ul style="list-style-type: none"> • Cirrhosis and hepatocellular carcinoma due to chronic infection. A person is considered to have chronic HBV infection if HBsAg-positive for 6 months or longer or IgM anti-HBc-negative and HBsAg-positive. Chronic infection occurs in: <ul style="list-style-type: none"> - 90% of infants infected at birth - 30% of children infected at 1-5 years of age - 6% of persons infected after 5 years of age • Death from chronic liver disease occurs in 15-25% of chronically infected persons.
Transmission	<ul style="list-style-type: none"> • Transmitted in blood or body fluids (e.g., wound exudates, semen, cervical secretions, or saliva of HBsAg-positive persons) via: <ul style="list-style-type: none"> - unprotected sex with an infected person - sharing needles or "works" when "shooting" drugs - needlesticks or sharps exposure on the job - sharing personal care items that could be contaminated with blood (e.g., razor, toothbrush) - infected mother to baby during birth • Blood and serum contain the highest concentrations of virus. • The risk of transmission via saliva is unknown and not common.
Communicability	Anyone who is HBsAg-positive can transmit the virus. Persons with chronic HBV infection are considered infectious and are the primary reservoirs of infection.
Risk Groups	<ul style="list-style-type: none"> • Persons with multiple sex partners or sexually transmitted disease(s) • Men who have sex with men • Sex contacts of infected persons • Household contacts of chronically infected persons • Injection drug users • Infants born to HBV-infected mothers • Infants/children born to women from areas with high rates of HBV infection • Health care and public safety workers • Hemodialysis patients
Prevention	<ul style="list-style-type: none"> • HBV vaccine is the best protection. • Latex condoms are recommended for sexually active individuals, especially those who have sex with more than one partner. The efficacy of latex condoms in preventing HBV infection is unknown, but their proper use may reduce transmission. • Pregnant women should be tested for HBV. Infants born to HBV-infected mothers should receive HBIG (hepatitis B immune globulin) and vaccine within 12 hours after birth. • Injection drug users should be encouraged: to discontinue injection drug use and to enroll in a treatment program; to never share needles, syringes, water, or "works," and to receive HAV and HBV vaccines. • Do not share personal care items that may be contaminated with blood (e.g., razor, toothbrush). • Persons should be encouraged to consider risks associated with tattoos and body piercings before receiving either. • Persons who have had HBV infection should not donate blood, organs, or tissue. • Health care or public safety workers should receive HBV vaccine, follow routine barrier precautions, and handle needles and other sharps safely.

Hepatitis B Virus (HBV) Fact Sheet (cont.)	
Vaccine Recommendations	<ul style="list-style-type: none"> • HBV vaccination for persons 0-18 years of age • Vaccination of high-risk persons of all ages
Medical Management	<ul style="list-style-type: none"> • HBV-infected persons should be evaluated for liver disease and receive HAV vaccine, if indicated. • Alpha interferon and lamivudine are licensed for the treatment of persons with chronic HBV infection; these drugs are effective in up to 40% of patients. Alpha interferon and lamivudine should not be used by pregnant women. • Advise against alcohol consumption and, if necessary, provide counseling for alcohol abuse.
Post-Exposure Management	<ul style="list-style-type: none"> • See Tables on pages 48 and 49
Trends and Statistics	<ul style="list-style-type: none"> • Number of new infections per year in the U.S. has declined from an average of 450,000 in the 1980s to approximately 80,000 in 1999. • Highest rate of disease occurs in persons 20-49 years of age. • Greatest decline in incidence has occurred among children and adolescents, due to routine HBV vaccination. • An estimated 1.25 million persons in the U.S. are chronically infected; 20-30% acquired their infection in childhood.

Post-Exposure Guidelines Following Sexual Contact with a Hepatitis B Surface Antigen (HBsAg)-Positive Person

Vaccination Status of Person Exposed	Time of Exposure(s)	Hepatitis B Virus (HBV) Status of Source Case:		
		Acute Infection	Chronic Infection	Unknown
Unvaccinated	within past 0-14 days	Test for HBsAg and anti-HBs. If either is positive, no vaccine needed; otherwise, administer HBV vaccine at 0, 1, 6 months. HBIG* 0.06 ml/kg, IM	Test for HBsAg and anti-HBs. If either is positive, no vaccine needed; otherwise, administer HBV vaccine at 0, 1, 6 months. Consider testing for anti-HBs at 1-2 months post-vaccination	Test for HBsAg and anti-HBs. If either is positive, no vaccine needed; otherwise, administer HBV vaccine at 0, 1, 6 months.
Unvaccinated	more than 14 days ago	Test for HBsAg and anti-HBs. If either is positive, no vaccine needed; otherwise, administer HBV vaccine at 0, 1, 6 months.	Test for HBsAg and anti-HBs. If either is positive, no vaccine needed; otherwise, administer HBV vaccine at 0, 1, 6 months. Consider testing for anti-HBs at 1-2 months post-vaccination	Test for HBsAg and anti-HBs. If either is positive, no vaccine needed; otherwise, administer HBV vaccine at 0, 1, 6 months.
Previously vaccinated		No follow-up indicated	No follow-up indicated	No follow-up indicated

*Hepatitis B immune globulin (HBIG): do not wait for serology results > 14 days post-exposure to give HBIG; timing of HBIG does not affect vaccine efficacy.

Post-Exposure Prophylaxis Following Percutaneous Exposure to Hepatitis B Virus (HBV)*†

Vaccination and Antibody Status of Person Exposed		Hepatitis B Surface Antigen (HBsAg) Status of Source Case		
		Positive	Negative	Not tested/Unknown
Unvaccinated		HBIG [‡] x 1; initiate HBV vaccine series	initiate HBV vaccine series	initiate HBV vaccine series
Previously Vaccinated	Vaccine responder [§]	no follow-up	no follow-up	no follow-up
	Vaccine non-responder, no revaccination	HBIG [‡] x 1; re-initiate HBV vaccine series	no follow-up; consider revaccination	if high-risk source case, follow-up as if source case were HBsAg-positive
	Vaccine non-responder to initial and revaccination series	HBIG [‡] x 2; second dose 1 month after first dose	no follow-up	if high-risk source case, follow-up as if source case were HBsAg-positive
	Antibody response unknown	test for anti-HBs; [¶] if ≥ 10 mIU/ml, no follow-up; if < 10 mIU/ml, HBIG [‡] x 1 and HBV vaccine booster	no follow-up	test for anti-HBs [¶] if ≥ 10 mIU/ml, no follow-up; if < 10 mIU/ml, HBV vaccine booster

* Modified from: 1) Pickering L, et al, eds. Red Book 2000: Report of the Committee on Infectious Diseases, 25th ed. 2000 American Academy of Pediatrics, 302 and 2) Atkinson W, Wolfe C, eds. Epidemiology and Prevention of Vaccine-Preventable Diseases, 7th ed. 2002 DHHS-CDC, 185.

† Post-exposure recommendations apply ≤ 7 days after exposure.

‡ Hepatitis B immune globulin (0.06 ml/kg, administered intramuscularly)

§ Anti-HBs antibody level of ≥ 10 mIU/ml

¶ Antibody to hepatitis B surface antigen

|| Evaluate for antibody response after booster dose of vaccine. If HBIG was administered, perform anti-HBs testing when passively acquired antibody from HBIG is no longer detectable (i.e., 4-6 months); if HBIG was not administered, perform anti-HBs testing 1-2 months after booster dose of vaccine. If anti-HBs is inadequate (< 10 mIU/ml) after the booster dose of vaccine, administer two additional doses to complete a three-dose series.

Hepatitis D, Hepatitis E, and Hepatitis G

Hepatitis D virus (HDV) is a defective, single-stranded RNA virus that requires the helper function of HBV to replicate. Since HDV cannot produce infection in the absence of HBsAg, HDV causes hepatitis only in persons with acute or chronic HBV infection. The average incubation period for HDV co-infection (simultaneously acquired with HBV) is 90 days (range, 45-160 days). HBV-HDV co-infection can be prevented with either pre- or post-exposure prophylaxis for HBV; however, no products exist to prevent

HDV superinfection of persons with chronic HBV infection. Thus, prevention of HDV superinfection depends primarily on education to reduce risk behaviors.

Hepatitis E virus (HEV) is a spherical, non-enveloped, positive-strand RNA virus transmitted through fecal-oral routes. The average incubation period for HEV is 40 days (range, 15-60 days). Although the period of communicability after acute infection is unknown, viremia and fecal shedding of the virus

commonly occur for at least 2 weeks. As HEV is not endemic in the U.S., reported cases tend to occur among travelers to endemic regions in the world. There is no known chronic infection with HEV.

Hepatitis G virus (HGV) is a rare cause of hepatitis. Although chronic infection and viremia have been documented, histologic evidence is rare, and serum aminotransferase levels usually are normal. Currently, HGV is not reportable in Minnesota.

Hepatitis B Virus (HBV) Vaccination Schedule for Infants and Household Contacts of HBsAg-Positive Mother*

HBIG and HBV Vaccine Schedule					
Patient History	HBIG	HBV vaccine, 1st dose [†]	HBV vaccine, 2nd dose [†]	HBV vaccine, 3rd dose [†]	HBV vaccine, 4th dose [†]
Infant born to HBsAg-positive mother	give within 12 hours of birth	give within 12 hours of birth	give at 1-2 months of age	give at 6 months of age	not indicated
Pre-term infant [‡] born to HBsAg-positive mother	give within 12 hours of birth	give within 12 hours of birth	give at 1 month of age	give 1 month following 2nd dose	give 6 months following 2nd dose
Infant born to HBsAg-negative mother and at high risk for early childhood infection [§]	not indicated	give at birth, preferably, but no later than 2 months of age	give at 1-4 months of age	give at 6 months of age or no later than 12 months of age	not indicated
Infant born to mother not tested for HBsAg [¶] and mother later found to be HBsAg-positive	give ASAP before 7 days of age	give within 12 hours of birth	give at 1-2 months of age	give at 6 months of age	not indicated
Infant born to mother not tested for HBsAg [¶] and mother later found to be HBsAg-negative	not indicated	give within 12 hours of birth	give at 1-2 months of age	give at 6-18 months of age	not indicated
Infant born to mother not available for HBsAg testing	give ASAP before 7 days of age	give within 12 hours of birth	give at 1-2 months of age	give at 6 months of age	not indicated
Pre-term infant [‡] born to HBsAg-negative mother	not indicated	give at 1 month of age	give at 2-4 months of age	give at 6-18 months of age; infants at high risk of infection need 3rd dose, preferably no later than 12 months of age	not indicated
Infant born to HBsAg-negative mother and at low risk for early childhood infection	not indicated	give at birth to 2 months of age	give at 1-4 months of age	give at 6-18 months of age	not indicated
Household contact of HBsAg-positive mother	Contacts should be tested and vaccinated; post-vaccination testing is not indicated, unless the contact is immunocompromised or a sexual partner of the mother.				

*Adapted from: Needle Tips, Immunization Action Coalition, Fall/Winter 1999-2000; <http://www.immunize.org>

[†]Energen-B, Recombivax HB, and Comvax are the HBV vaccine products available in the United States. Energen-B and Recombivax HB (single-antigen vaccines) are used for the dose administered at birth and also can be used for all remaining doses for infants and children. Comvax (a combination vaccine containing HBV vaccine and Hib vaccine) cannot be used for infants <6 weeks of age. The recommended schedule for Comvax is 2, 4, and 12-15 months of age. Comvax also can be used to complete a HBV vaccine series started at birth. An extra dose of HBV vaccine is not harmful.

[‡]Birth weight <2 kg

[§]Infants at high risk for early childhood HBV infection include those with mothers from areas or populations with moderate or high HBV infection rates. Areas with high HBV rates (≥8% HBV carrier rate) include Africa; Southeast Asia including China, Korea, Indonesia, and the Philippines; Middle East, excluding Israel; South and Western Pacific Islands; interior Amazon Basin, and certain parts of the Caribbean (i.e., Haiti and the Dominican Republic). Alaskan Natives also are at high risk. Areas with moderate HBV rates (2%-7% HBV carrier rate) include South Central and Southwest Asia, Israel, Japan, Eastern and Southern Europe, Russia, and most of Central and South America. Any infant who lives in a household with a HBV carrier should be considered high-risk for HBV infection.

[¶]Mother should have blood drawn for HBsAg testing as soon as possible.

Hepatitis C Virus (HCV) Fact Sheet

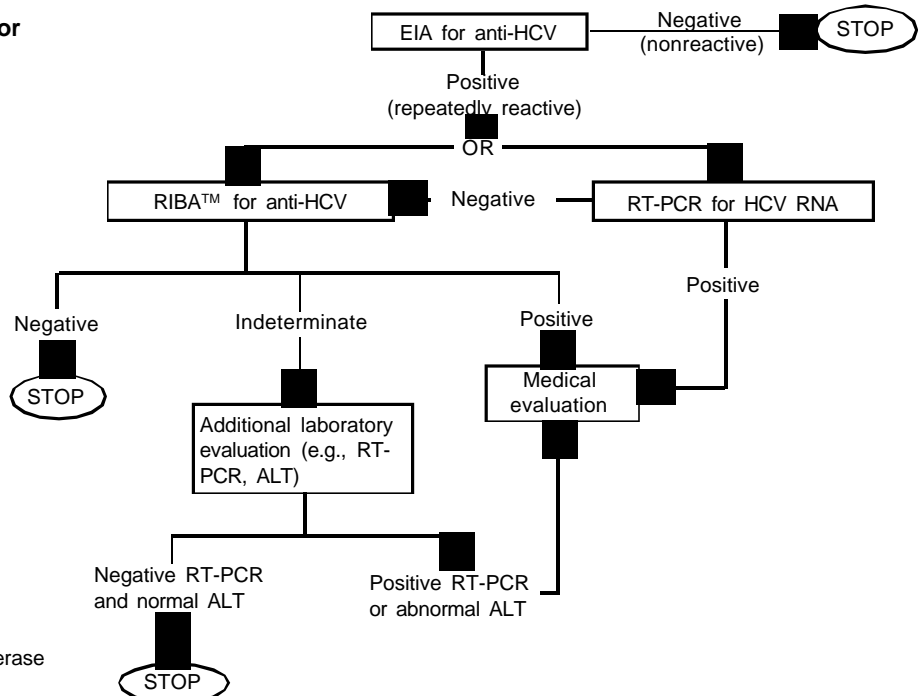
(adapted from materials developed by the Centers for Disease Control and Prevention)

Report to Minnesota Department of Health	<ul style="list-style-type: none"> • Acute HCV infection (i.e., newly acquired symptomatic HCV infection) • Chronic and past HCV infection (i.e., persistent infection with HCV, characterized by detection of HCV RNA >6 months after newly acquired infection) • All available positive serology and nucleic PCR testing results (i.e., EIA with signal-to-cutoff ratio, RIBA, qualitative and quantitative PCR)
Etiology	HCV is a small single-stranded RNA virus in the flavivirus family.
Signs and Symptoms	<ul style="list-style-type: none"> • 60-70% of patients are asymptomatic. • Symptoms may include fever, abdominal pain, anorexia, nausea, jaundice, or dark urine. • Jaundice occurs in 25% of patients; liver function test results generally are less pronounced than with HBV infection. • Acute disease tends to be mild and insidious in onset. • Average incubation period is 6-7 weeks (range: 2 weeks to 6 months).
Long-Term Effects	<ul style="list-style-type: none"> • Chronic infection: 75-85% of HCV-infected persons • Chronic liver disease: 70% of chronically HCV-infected persons • Deaths from chronic liver disease: <3% • HCV is the leading indication for liver transplant in the United States.
Transmission	<ul style="list-style-type: none"> • Highest infection rates (60-90%) occur in persons with large or repeated, direct percutaneous exposure to blood or blood products, including: • Less than 10% of cases are sexually transmitted. • Perinatal transmission accounts for 5% of cases.
Communicability	All persons with HCV antibody or HCV-RNA in their blood are considered infectious.
Risk Groups	<ul style="list-style-type: none"> • High Risk: <ul style="list-style-type: none"> - injection drug users - recipients of clotting factors made before 1987 • Intermediate Risk: <ul style="list-style-type: none"> - hemodialysis patients - recipients of blood and/or solid organs donated before 1992 - persons with undiagnosed liver problems - infants born to HCV-infected mothers • Low Risk: <ul style="list-style-type: none"> - health care/public safety workers - persons who have sex with multiple partners - persons who have sex with an HCV-infected steady partner
Prevention	<ul style="list-style-type: none"> • Persons who use or inject illegal drugs should be advised to: <ul style="list-style-type: none"> - stop using and injecting drugs; - enter and complete substance abuse treatment, including relapse prevention programs; - if continuing to inject drugs to: <ul style="list-style-type: none"> • never reuse or share syringes, needles, water, or drug preparation equipment; if injection equipment has been used by other persons, clean with bleach and water; • use only syringes obtained from a reliable source (e.g., pharmacy); • use a new sterile syringe to prepare and inject drugs; • use sterile water to prepare drugs, otherwise use clean water from a reliable source (e.g., tap water); • use a new or disinfected container ("cooker") and a new filter ("cotton") to prepare drugs; • clean the injection site with a new alcohol swab prior to injection; and • safely dispose of syringes after one use. - to receive vaccination against HBV and HAV. • Persons diagnosed with a sexually transmitted disease or who are sexually active should be advised to: <ul style="list-style-type: none"> - have sex with only one partner or not at all; - use latex condoms correctly during every sexual encounter; and - get vaccinated against HBV (and, if risk factors are present, HAV).

Hepatitis C Virus (HCV) Fact Sheet (cont.)

Testing	<ul style="list-style-type: none"> • Testing is recommended for all high- and intermediate-risk persons. • Testing is recommended for low-risk persons only after known exposure. • Testing is recommended after 12-18 months of age for infants born to HCV-infected mothers. • See testing algorithm below.
Medical Management	<ul style="list-style-type: none"> • Evaluate patient for liver disease. • Interferon, pegylated interferon, and ribavirin are drugs licensed for treatment of persons with chronic HCV infection. Given alone, interferon yields a sustained response in 15%-25% of patients; combination therapy results in a sustained response in 40% of patients. • Evaluate patient for HAV and HBV immunization status; vaccinate if indicated. • Advise against alcohol consumption and, if necessary, provide counseling for alcohol abuse.
Post-exposure Management	<ul style="list-style-type: none"> • Follow-up of occupational HCV exposures: <ul style="list-style-type: none"> - perform anti-HCV testing of source patient. - for the person exposed to an HCV-positive source: <ul style="list-style-type: none"> • perform baseline testing for anti-HCV, ALT activity, with follow-up testing at 4-6 months (for earlier diagnosis, testing for HCV RNA may be performed at 4-6 weeks). • confirm all positive anti-HCV results obtained by enzyme immunoassay using supplemental anti-HCV testing (e.g., RIBA). • Immune globulin and antiviral agents are not recommended after exposure to HCV-positive blood. No guidelines exist for administration of antiviral therapy during HCV infection; however, limited data indicate that antiviral therapy may be beneficial if started early in HCV infection. When HCV infection is identified early, refer patient to a specialist for medical management. • Institutions should establish policies and procedures for HCV testing after percutaneous or mucosal exposures to blood and ensure that staff are familiar with them. • Clinicians who care for persons with occupational exposure to HCV should be familiar with the risk for HCV infection and recommendations for post-exposure counseling, testing, and follow-up.
Trends and Statistics	<ul style="list-style-type: none"> • The number of new infections per year in the U.S. declined from an average of 240,000 in the 1980s to about 40,000 in 1998. • Most infections are due to illegal injection drug use. • Transfusion-associated cases occurred prior to routine HCV screening of blood donors and now occurs at a rate of less than one case per million units of transfused blood. • 3.9 million (1.8%) persons in the U.S. are HCV-infected including 2.7 million chronic infections.

Hepatitis C Virus (HCV) Testing for Asymptomatic Persons



ALT = alanine aminotransferase
 Anti-HCV = antibody to HCV
 EIA = enzyme immunoassay
 RIBA = recombinant immunoblot assay
 RT-PCR = reverse transcriptase polymerase chain reaction

Patient Evaluation for Viral Hepatitis

Patient History	Timing of Test	Recommended Test(s)	Reason for Test
DIAGNOSING HEPATITIS			
Symptomatic consistent with viral hepatitis	At visit	<div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">IgM anti-HAV</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">HBsAg & anti-HBc IgM</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Anti-HCV EIA</div> <div style="border: 1px solid black; padding: 2px;">ALT, AST, total bilirubin</div>	<div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">acute HAV infection</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">acute or chronic HBV</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">acute or chronic HCV</div> <div style="border: 1px solid black; padding: 2px;">liver function</div>
SCREENING PREGNANT WOMEN			
Pregnant	early in pregnancy. If test is negative and patient is high risk, re-test again prior to delivery	HBsAg & anti-HBc IgM	acute or chronic HBV infection
DETERMINING IMMUNE STATUS			
Infant born to a woman with chronic HBV infection	9-15 months of age, or 1-2 months after 3rd dose of vaccine if last dose given after 8 months of age	<div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">HBsAg</div> <div style="border: 1px solid black; padding: 2px;">anti-HBs</div>	<div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">HBV infection</div> <div style="border: 1px solid black; padding: 2px;">immune to HBV</div>
Refugee or immigrant	First screening visit	<div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">HBsAg</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">anti-HBs</div> <div style="border: 1px solid black; padding: 2px;">anti-HBc</div>	<div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">HBV infection</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">immune to HBV</div> <div style="border: 1px solid black; padding: 2px;">prior natural HBV infection</div>
Health care worker	1-2 months after last dose of vaccine	anti-HBs	immune to HBV
Possible exposure to HAV	At visit	anti-HAV	immune to HAV

Viral Hepatitis Markers and Their Significance

Marker	Definition	Common Terminology	Meaning of a Positive Test
Hepatitis A Virus (HAV)			
anti-HAV IgM	antibody to hepatitis A virus, IgM fraction	HAV IgM	acute illness (within 6 months) or recent HAV vaccination (rarely)
anti-HAV	antibody to hepatitis A virus (combined total of IgM and IgG)	total HAV	recent or previous illness or immunity due to vaccination (does not distinguish between IgG and IgM)
Hepatitis B Virus (HBV)			
HBsAg	hepatitis B surface antigen	surface antigen	HBV infection (additional tests needed to determine chronic or acute status)
anti-HBs	antibody to hepatitis B surface antigen	surface antibody	immunity to HBV (due to natural infection or HBV vaccination)
HBeAg	hepatitis B "e" antigen	e antigen	active viral replication; increased risk of transmitting HBV
anti-HBe	hepatitis B "e" antibody	e antibody	low viral replication in HBsAg-positive persons
anti-HBc	antibody to hepatitis B core antigen	core antibody	natural infection (acute, resolved, or chronic); not present after vaccination
HBcAg	hepatitis B core antigen	—————	(test not commercially available)
anti-HBc IgM	antibody to hepatitis B core, IgM fraction	core IgM	current or recent HBV infection (within 6 months); presence of anti-HBc IgM without HBsAg denotes "window" phase late in some acute HBV infections where HBsAg has dropped below detectable levels; can persist in some chronic HBV infections
anti-HBc IgG	antibody to hepatitis B core, IgG fraction	core IgG	past or chronic HBV infection
HBV PCR	polymerase chain reaction for hepatitis B virus DNA	HBV PCR	measures viral load; used to monitor response to HBV anti-viral therapy
Hepatitis C Virus (HCV)			
anti-HCV EIA	enzyme immunoassay for antibody to hepatitis C virus	anti-HCV EIA	acute, resolved, or chronic HCV infection
anti-HCV RIBA	recombinant immunoblot assay for antibody to hepatitis C virus	RIBA	supplemental antibody test used to verify a positive anti-HCV EIA result
HCV RT-PCR qualitative	qualitative reverse transcriptase polymerase chain reaction test for hepatitis C virus	HCV PCR qualitative	supplemental HCV RNA test used to verify an anti-HCV EIA result; a single negative PCR test result is not conclusive, as viral RNA detection may be intermittent
HCV RT-PCR quantitative	quantitative reverse transcriptase polymerase chain reaction test for hepatitis C virus RNA	HCV PCR quantitative	supplemental HCV RNA test to measure viral load; used to monitor response to anti-viral therapy (test not standardized or FDA-approved)

Interpretation of Hepatitis Laboratory Test Results*

Test	Result	Interpretation	Follow-up
HBsAg anti-HBc anti-HBs	Negative Negative Negative	Susceptible to HBV	Vaccinate for HBV
HBsAg anti-HBc anti-HBs	Negative Negative Positive	Immune to HBV due to vaccination	None required
HBsAg anti-HBc anti-HBs	Negative Positive Positive	Immune to HBV due to infection	None required
HBsAg anti-HBc IgM anti-HBc anti-HBs	Positive Positive Positive Negative	Acute HBV infection	Report and counsel [§]
HBsAg anti-HBc IgM anti-HBc anti-HBs	Positive Positive Negative Negative	Chronic HBV infection	Report and counsel [§]
HBsAg anti-HBc anti-HBs	Negative Positive Negative	Four possible interpretations [‡]	Report and counsel [§]
anti-HAV	Negative	Susceptible to HAV	Vaccinate for HAV
anti-HAV IgM anti-HAV	Positive Negative	Immune to HAV	None required
anti-HAV IgM-anti-HAV	Positive Positive	Acute HAV infection	Report and counsel [§]
anti-HCV	Positive [†]	Acute, chronic or past HCV infection	Report, perform additional testing, and counsel [§]

* Adapted from materials developed by the Hennepin County Community Health Department and the Minnesota Department of Health

† Additional testing may be needed for diagnosis.

‡ Possible interpretations: 1) recovering from acute HBV infection, 2) distantly immune, test not sensitive enough to detect very low level of anti-HBs in serum, 3) susceptible with a false-positive anti-HBc, or 4) chronically infected with an undetectable level of HBsAg in serum.

§ See corresponding viral hepatitis fact sheet.

Reporting Hepatitis Cases to the Minnesota Department of Health (MDH)

In accordance with Minnesota Rules Governing Communicable Diseases, physicians, designates at health care facilities and medical laboratories are required to report cases of hepatitis A (acute), hepatitis B (acute, chronic and HBsAg-positive women of childbearing age), hepatitis C (acute and chronic), hepatitis D, and hepatitis E to MDH:

Phone: (612) 676-5414 or (877) 676-5414 (toll free)
Fax: (612) 676-5689
Mail: Minnesota Department of Health, Infectious Disease Reporting
P.O. Box 9441
Minneapolis, MN 55440-9441

Health care providers or facilities who are interested in reporting data to MDH via encrypted electronic data files may contact Felicia Fong at (612) 676-5397 for further information.

Jan K. Malcolm, Commissioner of Health

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CHANGING YOUR ADDRESS?

Please correct the address
below and send it to:
DCN MAILING LIST
Minnesota Department of Health
717 Delaware Street SE
PO Box 9441
Minneapolis, MN 55440-9441

The *Disease Control Newsletter* is available on the MDH Acute Disease Investigation and Control (ADIC) Section web site (<http://www.health.state.mn.us/divs/dpc/ades/pub.htm>).

The *Disease Control Newsletter* toll-free telephone number is 1-800-366-2597.