

Viral Hepatitis

Learning Objectives

Upon completion of this content the learner will be able to:

1. Discuss the epidemiology of HAV (hepatitis A virus), HBV (hepatitis B virus), HCV (hepatitis C virus), HDV (hepatitis Delta virus) and HEV (hepatitis E virus) hepatitis.
2. Describe and contrast routes of transmission, clinical manifestations and complications of viral hepatitis.
3. Describe the recommended lab tests/techniques for the diagnosis of viral hepatitis.
4. Discuss the management and counseling of patients with viral hepatitis.
5. Utilize available prevention strategies including exposure risk reduction, screening, active immunization and post-exposure prophylaxis as appropriate.
6. Discuss principles of primary care management and indications for referral of patients identified with chronic viral hepatitis.

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Hepatitis A (HAV)

Single-stranded RNA virus transmitted chiefly by the fecal-oral route. Generally causes a self-limited illness which confers solid immunity, but deaths do occur (case/fatality ratio 0.5%). Endemic worldwide, more prevalent in developing countries, children under age five act as an asymptomatic reservoir. In developed countries, immunity is acquired less often in childhood: sexual transmission (sexual practices involving oral-anal and oral-genital contact) along with sporadic and common source outbreaks among adolescent and adult susceptibles is more significant in western/industrialized nations. In the United States, Hepatitis A rates have declined by 92% since hepatitis A vaccine became available in 1995. No chronic state has been described. Persons with chronic liver disease are at greater risk for developing fulminant hepatitis A.

Hepatitis B (HBV)

Circular, double-stranded DNA virus transmitted by parenteral, sexual, and maternal-fetal routes. Horizontal transmission through premastication of food has been documented in some studies and is a less common source of transmission. Clinical illness may be more insidious and potentially more severe (case fatality rate .5% to 1%). Both clinical and subclinical infection may result in a chronic infectious state. The prevalence of chronic HBV infection ranges from 0.3-0.5% in the U.S. and Western Europe, to 8 to 10% in China and SE Asia, the Amazon, and parts of south/eastern Europe. Chronic infection perpetuates HBV transmission within a population and leads to cirrhosis and/or hepatocellular carcinoma in a small but significant proportion of cases.

Hepatitis C (HCV)

Single-stranded RNA virus, most common chronic blood-borne infection in US, with an estimated 3.2 million persons chronically infected nationwide. Hepatitis C was responsible for 80 to 90% of post-transfusion hepatitis prior to 1990. Currently, the risk per unit transfused is estimated to be less than 1 chance per 2 million transfused. Injection drug use (IDU) has always been the primary risk factor for acquiring HCV infection in the US. Sexual transmission appears to be much less efficient than with Hepatitis B. Chronic infection develops more frequently with HCV (70-85% of those infected), resulting in a significant morbidity due to cirrhosis and hepatic carcinoma.

Hepatitis D (HDV)

Defective RNA virus which requires concurrent HBV infection for replication and transmission. Hepatitis D is transmitted through percutaneous or mucosal contact with blood. HDV can be acquired as a co-infection with HBV or as a superinfection in persons with HBV infection. Co-infection (HBV-HDV) can be fulminant and fatal. People with chronic HBV infection who are "superinfected" with HDV are more likely to become chronically infected with HDV and have poorer outcomes. There is no vaccine for Hepatitis D, but it can be prevented in persons who are not already HBV-infected by Hepatitis B vaccination.

Hepatitis E (HEV)

Transmission (fecal-oral) and clinical course similar to that of Hepatitis A; unusually high mortality rate among pregnant women (20%) and their fetuses. Hepatitis E does not lead to chronic infection. Rare in the United States, Hepatitis E is common in many parts of the world. Virtually all U.S. cases have occurred among travelers returning from high HEV-endemic areas. Outbreaks usually associated with contaminated water supply in countries with poor sanitation. There is no FDA approved vaccine for Hepatitis E.

Hepatitis A (HAV)

I. Epidemiology

- A. Developing countries - asymptomatic children provide reservoir; as sanitary conditions improve, the susceptible population will increase with a shift to infection in young adults. Highest rates are in Africa, the Middle East, and Asia.
- B. Developed countries: Routine vaccination in the United States has impacted current epidemiology.
 - 1. In the pre-vaccine era, incidence varied cyclically in the US, with most disease from community-wide outbreaks. The last peak, in 1995, was primarily associated with an increase in reported cases among MSM and IDU. Hepatitis A rates have declined 92% since 1995 when vaccination to prevent Hepatitis A became available.
 - 2. The number of acute Hepatitis A cases reported in the United States declined by approximately 56%, from 4,488 in 2005 to 1,987 in 2009 (CDC-adjusted incidence is 21,000 for 2009 when considering asymptomatic cases and underreporting). The rate of acute Hepatitis A declined from 1.5 cases per 100,000 population to 0.6 cases per 100,000 population during 2005–2009.
 - 3. About one-third of U.S. population has evidence of prior infection (total anti-HAV positive) based on NHANES.
 - 4. Historically, incidence is higher in persons <40 yrs. of age; however, from 2002-2009 rates were similar and low among persons in all age groups (<1.0 cases per 100,000 population; range 0.31-0.96). The lowest rates were among children <9 years; highest rates in 2009 among persons 20-29 years of age. Historically, rates among males have been higher than among females. In 2009, incidence rates among males (0.7 cases per 100,000 population) were similar to those among females (0.6 cases per 100,000 population).
 - 5. Almost half of cases report no specific risk factor. Risk factors reported by adult cases include: international travel, household or sexual contact, non-household close contact (e.g., play and daycare) and IDU.

II. Pathogenesis

- A. HAV is a single-stranded RNA virus.
- B. The incubation period is relatively short: average four weeks (range 15 -50 days).
- C. Viral shedding in stool peaks toward the end of incubation and drops dramatically with onset of jaundice; usually no longer infectious two weeks after onset of illness, but viremia may last longer. Children and infants may shed HAV for longer time periods (up to several months) though chronic shedding does not occur.
- D. Modes of transmission:
 - 1. Fecal-oral:
 - a) Dominant mode of transmission is person-to-person by household contact or sexual contact with an infected person.
 - b) Virus is heavily concentrated in stool, and to a much lesser extent in serum.
 - 1) Pre-school and day-care facilities enrolling those under two years old: majority of those infected do not become symptomatic but shed high titers of virus. Diaper handling may result in infections in caregivers.
 - 2) Older siblings, parents, babysitters, daycare center staff are at risk. In one study of adults without an identified source of infection, 52% of their households had a child <15 yrs. of age and the presence of a young child was associated with HAV transmission within the household.
 - 3) Injecting and non-injecting drug users.
 - 4) Community-based epidemics may occur related to contaminated food (fast food, shellfish, green onions) or water.

2. Sexual practices involving oral-anal and oral-genital contact can lead to transmission.
 - a) Sexual practices play a larger role in developed countries with adequate sanitation and water systems.
 - b) Seroprevalence varies among different populations: some studies show MSM have rates of approximately 30%, compared with 12% of heterosexual males, though not all studies have been consistent with these findings.
 - c) Anti-HAV-positive persons reported more frequent oral-anal contact, a greater number of sexual partners, and a longer time period of MSM activity than persons without evidence of prior HAV infection, in some surveys. Not all studies have identified these specific sexual practices.
 3. Percutaneous transmission is possible during the viremic phase of infection. It is rare among blood donors and likely more common among injecting drug users who share needles or other drug paraphernalia. It is unclear whether this is related to hygiene vs. true percutaneous transmission.
 4. Saliva: animal studies have detected infectious virus in saliva, although transmission has not been documented.
- E. Immunity: infection with HAV confers solid immunity and there is no chronic state.

III. Clinical Manifestations

- A. Symptom development: Likelihood of developing symptoms is related to age:
- <10% of children 0-4 yrs have symptoms.
 - 30-40% of children 5-9 yrs have symptoms.
 - 60-80% of youth 10-17 yrs have symptoms.
 - 80-90% of adults > 18 yrs have symptoms.

B. Manifestations:

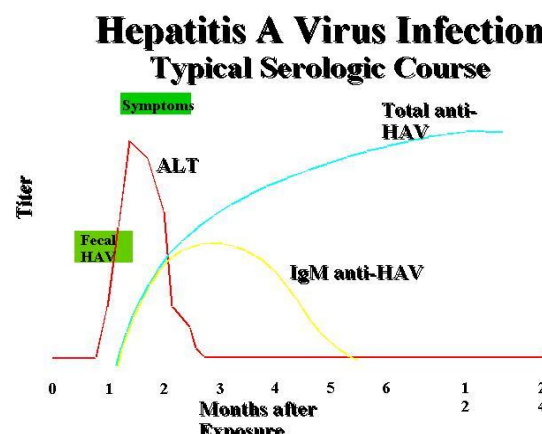
1. Onset is typically abrupt; symptoms are non-specific and may include fever, malaise, anorexia, nausea, abdominal pain (esp. RUQ), dark urine, jaundice.
2. Serum aminotransferase levels are elevated as with HBV, but resolve more quickly (most will be normal within six weeks; 10-20% may have abnormalities persisting for three months).

C. Course of disease:

1. Generally self-limited (usually <2 months)
2. Relapsing or prolonged HAV (up to six months) occurs in 10-15% of symptomatic infections
3. Case fatality rate increases with age; 1.8% for persons >50 years of age compared to 0.6% for persons <50 years of age. Persons with chronic liver disease are at increased risk for development of fulminant hepatitis A.

IV. Diagnosis

- A. Suspect hepatitis based on symptoms (see above: nausea, anorexia, fever, RUQ pain), with or without jaundice
- B. Diagnosis based on serologic findings as symptoms are not specific to HAV infection:
 1. IgM anti-HAV: present in acute infection, persists up to six months (ELISA)
 2. Total anti-HAV: persists indefinitely and confers lifelong immunity
 3. Elevated transaminases (AST, ALT) and GGT.



V. Treatment: None is available; supportive care.

VI. Prevention

A. Hand washing

B. Avoid direct or indirect fecal-oral contact during sex – fingers, penis, condoms, toys, etc.).

C. Counseling

1. Infected patients should be counseled regarding the need for careful personal hygiene (hand washing), sanitary disposal of feces, and the avoidance of oral-anal and oral-genital sex for at least one week after jaundice onset.

2. Partners should be counseled about vaccine and/or prophylaxis.

D. Prevention of Hepatitis A: Hepatitis A vaccine and immune globulin (IG) are two products used for prevention of Hepatitis A.

1. IG provides protection via passive transfer of anti-HAV IG administered within 2 weeks of exposure, >85%% effective in preventing HAV infection

2. Pre-exposure vaccination; Hepatitis A vaccine provides protection by eliciting neutralizing antibodies (anti-HAV); may take two to four weeks post-vaccination for development of anti-HAV.

a) Two inactivated vaccines: HAVRIX™ (GlaxoSmithKline Biologicals) and VAQTA™ (Merck & Co). Vaccine is administered to deltoid according to schedule:

Table 1. Recommended Immunization Schedule for HAVRIX™ (Glaxo SmithKline Biologicals)

<u>Vaccine Recipient's Age (yrs.)</u>	<u>Dose (EL. Units)</u>	<u>Volume (ml) per dose</u>	<u>No. of doses</u>	<u>Schedule (months)</u>
1-18	720	0.5	2	0 and 6-12
>18	1440	1.0	2	0 and 6-12

Table 2. Recommended Immunization Schedule for VAQTA™ (Merck)

<u>Vaccine Recipient's Age (yrs.)</u>	<u>Dose (Units)</u>	<u>Volume (ml) per dose</u>	<u>No. of doses</u>	<u>Schedule (months)</u>
1-18	25	0.5	2	0 and 6-18
>18	50	1.0	2	0 and 6-18

- b) If series is delayed, there is no need to repeat doses. For long-term protection, the full two-dose series should be completed. It is preferable to use the vaccines according to the licensed schedule, but data indicate that the two brands of Hepatitis A vaccine (HAVRIX and VAQTA) can be considered interchangeable.
- c) Safety in pregnancy has not been determined; however, because Hepatitis A vaccine is produced from inactivated HAV, the theoretical risk to the developing fetus is expected to be low.
- d) Both vaccines are immunogenic (99-100% of adults and children develop protective antibodies after second dose) and efficacious (protective efficacy 94-100% in two studies of children).
- e) Long-term protection is estimated to be >25 years in adults and >14-20 years in children based on kinetic modeling studies of antibody decline.
- f) Pre-vaccination serologic testing for susceptibility might be cost-effective in populations where prevalence is high; consider for persons born in areas of high endemicity and in adults >40 yrs (based on expected prevalence of 33%). Vaccination of a person who is already immune poses no harm to that person. The cost-savings of testing should be weighed against cost of vaccine and possibility that testing will delay or interfere with vaccination.
- g) CDC recommends vaccine for the following persons one year of age or older:
 - Travelers to areas with high or intermediate endemicity of Hepatitis A. (For persons with planned departure in <2 weeks' time period who are aged >40, immunocompromised, or with other chronic medical conditions, addition of IG to vaccine for optimal protection is advised.) See MMWR 2007/57(41)1080-1084).
 - Men who have sex with men.
 - Injecting and non-injecting drug users.
 - Persons with chronic liver disease (including persons with chronic HBV or HCV with evidence of chronic liver disease) .
 - Persons with clotting factor disorders (e.g., hemophilia).
 - Persons who have occupational risk for infection.
 - All children at age one. Catch up for children ages 2-18.

- Persons who anticipate close personal contact (household or regular babysitting) with an international adoptee from a country of high or intermediate endemicity.
- h) Combined Hepatitis A and B vaccine (Twinrix[®] – Glaxo SmithKline) is FDA-approved for adults ages 18 and over. Probably useful for those at risk for both Hepatitis A and B. Given in a three-dose series and when administered on a 0,1 and 6-month schedule, studies show similar safety and immunogenicity to monovalent vaccines.
 - i) Post-vaccination serologic testing is not recommended. Most persons respond to the vaccine. In addition, not all current commercially available tests are able to detect the low anti- HAV concentrations after vaccine, even though these low levels provide protection for most vaccinated persons.
3. Post exposure Prophylaxis: Persons with recent exposure to HAV who have not previously been vaccinated with Hepatitis A vaccine should receive one dose of single antigen vaccine or IG as soon as possible. The efficacy of IG or vaccine given >2 weeks post exposure has not been established. Data on the relative efficacy of vaccine compared to IG is limited; there is no data on persons >40 years of age or those with underlying medical conditions. Consideration of patient age and risk for more severe Hepatitis A (e.g., if underlying chronic liver disease is present) should be weighed when deciding between Hepatitis A vaccine and IG.
 - a) Healthy persons ages 12 months-40 years:
Single-antigen Hepatitis A vaccine at age appropriate doses is preferred for healthy persons ages 12 months to 40 years because of the vaccine's advantage of long-term protection and ease of administration.
 - b) Persons aged >40 years:
IG is preferred because of lack of data on vaccine performance in these older persons and the possibility of more severe manifestations of Hepatitis A in older persons. Post-exposure prophylaxis IG dose is 0.02ml/kg IM (deltoid or gluteal muscle). If IG is not available, then single-antigen Hepatitis A vaccine can be used. If IG is used in a person for whom Hepatitis A vaccine is recommended, a dose of vaccine can be administered simultaneously with IG at a separate anatomic injection site.

- c) Children <12 months, immunocompromised person, persons with diagnosed chronic liver disease, and persons with contraindications to vaccine should be given IG for post-exposure prophylaxis.
- d) Post-exposure prophylaxis should be administered to:
 - all previously unvaccinated household and sexual contacts of serologically confirmed cases of HAV.
 - all previously unvaccinated persons who have shared illicit drugs with a person with serologically confirmed HAV.
 - unvaccinated daycare/childcare center staff and attendees, and persons in common source of outbreaks under certain circumstances (see MMWR 2007/56 (41)1080-1084).

VII. References: (See end of module)

Hepatitis B (HBV)

I. Epidemiology

A. United States:

1. The incidence of Hepatitis B has declined since the 1980s with an average annual incidence of 1.1/100,000 in 2009 compared to 11.5/100,000 in 1985 (90.5% decline). A total of 3,371 cases of acute Hepatitis B were reported in 2009 (CDC-adjusted incidence is 38,000 when accounting for asymptomatic infections and underreporting). There are an estimated 700,000 to 1.44 million chronically infected people in the U.S.
2. Sexual transmission (MSM, sexual contact with a case, or multiple sex partners) and injection drug use account for most new cases of Hepatitis B in the U.S. in those cases for which risk information is available.
3. CDC data from 2009 on acute Hepatitis B reveal:
 - Of 1,517 case reports with information about injection-drug use, 15.8% noted use of these drugs.
 - Of 943 case reports with information about sexual contact, 7.2% indicated sexual contact with a person with confirmed or suspected Hepatitis B infection.
 - Of 893 case reports with information about number of sex partners, 31.8% were among persons with ≥ 2 sex partners.
 - Of 224 case reports from males that included information about sexual preference/practices, 18.8% indicated sex with another man.
4. Seroprevalence varies with age, with highest rate of disease in 2009 among 30-39 year olds and lowest rate among persons <19 years of age. From 1990 through 2009, incidence rates for acute Hepatitis B decreased for all age groups; the greatest declines occurred in the 20–29 and 30-39-year age groups.
5. Males have consistently accounted for more cases than females. Male:female case ratio in 2009 was 1.6.
6. Incidence among health care workers (HCWs) has declined since 1985: 9% of reported cases in 1985 vs. 0.8% in 2009, likely due to widespread vaccination.

7. Rates for acute Hepatitis B have declined among all racial/ethnic groups except American Indians/Alaska Natives(AI/AN) from 1990-2009. During 1993–2003, AI/ANs experienced small spikes in rates that stabilized and closely matched rates of other racial/ethnic populations beginning in 2004. In 2009, the rate of acute Hepatitis B was lowest for Asian/Pacific Islanders and Hispanics, and highest for non-Hispanic blacks.

B. Worldwide:

1. Highly endemic areas include China and SE Asia, where chronic infection rates range from 8% to 10% with past evidence of infection in 80-90% of the population; perinatal transmission plays a much larger role. High rates are also found in the Amazon and parts of southern and eastern Europe. In the Middle East and India, chronic infection rates range from 2 % to 5% of the general population.
2. Worldwide an estimated 2 billion people have been infected with Hepatitis B with approximately 350 million people living with chronic HBV infection.

II. Pathogenesis

- A. HBV is a partially double-stranded DNA virus of the Hepadnavirus family.
- B. Incubation is six weeks to six months (average is 90 days) until clinical symptoms develop – longer than Hepatitis A.
- C. Virus gains access to the liver via the bloodstream; the liver is the primary site of replication.
- D. Modes of transmission: Highest concentration of HBV is found in blood, with lower concentrations in other body fluids, including wound exudate, semen, vaginal secretions and saliva. When compared to HIV and HCV, HBV is more infectious and relatively more stable in the environment. HBV is efficiently transmitted by percutaneous or mucous membrane exposure to blood or body fluids that contain blood.
 1. Primary risk factors for sexual transmission are unprotected sex with an infected partner, multiple sex partners, MSM, history of STDs.

2. Primary risk factors for percutaneous transmission are:
 - a) Injection drug use, needle-stick injuries in health-care settings.
 - b) Occupational injuries such as hollow-bore needle-stick exposures.
 - c) Contaminated tools used in tattooing or body piercing if the artist or piercer does not follow sterilization practices.
3. Perinatal transmission:
 - a) Most infections are acquired at time of birth. Less than 5% of infections occur in utero.
 - b) Maternal HBeAg is associated with higher infectivity.
4. Risk factors for mucosal contact with blood or body fluids:
 - a) Contact with blood or open sores of an infected person
 - b) Sharing items such as razors or toothbrushes with an infected person

E. Immunity: anti-HBs is protective against infection.

III. Clinical Manifestations

- A. Infants, children <5 years, and immunosuppressed adults are typically asymptomatic. Frequency of symptoms in all others ages >5years is about 30-50%.
- B. Symptom onset may be insidious and typically includes: malaise, anorexia, nausea, abdominal pain, low-grade fever, dark urine, light color stool with or without jaundice. Fatigue and anorexia typically precede jaundice by one to two weeks. Acute illness usually lasts two to four months. Among patients with acute Hepatitis B reported in 2009, 77% had jaundice, 47% were hospitalized for hepatitis, and 1% died.
- D. Chronic infection occurs in:
 - 90% of infants infected at birth
 - 30% of children infected at age <5 yrs
 - 2-6% of persons infected as adults.
- E. Among all patients with chronic HBV infection, 15%-25% will die prematurely of cirrhosis or hepatocellular carcinoma (HCC).
- F. Immunocompromised persons(e.g., hemodialysis patients and persons with HIV infection) are more likely to become chronically infected.

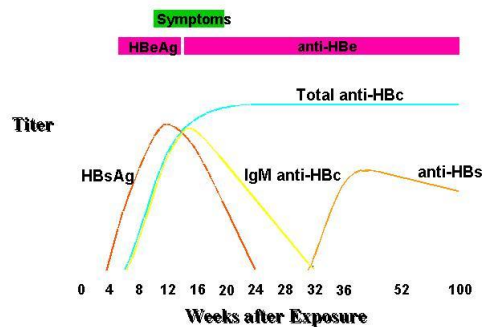
- G. Persons with chronic infection can be asymptomatic and have no evidence of liver disease or they can be symptomatic with a spectrum of disease ranging from chronic hepatitis to cirrhosis to liver cancer.

IV. Diagnosis

- A. Clinical presentation: see previous section.
- B. Diagnosis based on serologic findings, as symptoms are not specific to HBV infection.
- C. Laboratory findings:
1. Elevated liver enzymes with or without elevated bilirubin.
 2. Hepatitis B surface antigen (HBsAg). On average, HBsAg can be detected one month after exposure to the virus, but detection can range from about one week to nine weeks. In persons who recover, the duration of HBsAg positivity is variable. Transient HBsAg positivity has been documented for up to 18 days after Hepatitis B vaccination and is not evidence of infection.
 3. Antibody to Hepatitis B surface antigen (Anti-HBs) becomes detectable during convalescence after the disappearance of HBsAg (among those who clear infection).
 4. HBV DNA can be detected by highly sensitive nucleic acid tests in a person 10-20 days before detection of HBsAg.
 5. Antibody to Hepatitis B core antibody (anti-HBc)
 - IgM anti-HBc is a marker of acute infection. IgM anti-HBc will persist up to 6 months if the infection resolves. However, persons with exacerbations of chronic Hepatitis B can also test positive for IgM anti-HBc. Use of IgM anti-HBc should be limited to persons with clinical evidence of acute hepatitis or contact with a person with HBV infection.
 - Total anti-HBc persists indefinitely and is a marker of prior or current infection. In some people, total anti-HBc may be the only detectable marker of Hepatitis B virus. Isolated anti-HBc positivity can have four interpretations shown in Table 3 below.

6. Hepatitis Be antigen (HBeAg) presence indicates higher infectivity. HBeAg positivity is associated with very high HBV DNA levels. In most patients with chronic infection, HBeAg is cleared over time and antibody to Hepatitis Be Antigen (anti-HBe) appears. Patients who are HBeAg negative and anti-HBe usually have low to modest levels of HBV DNA.
 7. Lag occurs between disappearance of HBsAg and the appearance of anti-HBs: anti-HBc (IgM and total anti-HBc) and anti-HBe are the only markers during this "window" period during transition from acute illness to convalescence.
 8. Chronically infected people have persistently detectable HBsAg and total anti-HBc and HBV DNA.
- D. Three phases of chronic HBV infection are now understood: immune tolerant phase (HBeAg positive with high levels HBV DNA but absence of liver disease); immune active or chronic hepatitis phase (HB eAg positive, HBeAg negative or anti-HBe positive, with high levels of HBV DNA and active liver inflammation), and the inactive phases (anti-HBe positive, normal liver aminotransferase levels and low or absent HBV DNA). These phases are fluid and patients can evolve through them or revert back from inactive to active at any time.

**Acute Hepatitis B Virus Infection with Recovery
Typical Serologic Course**



Progression to Chronic Hepatitis B Virus Infection Typical Serologic Course

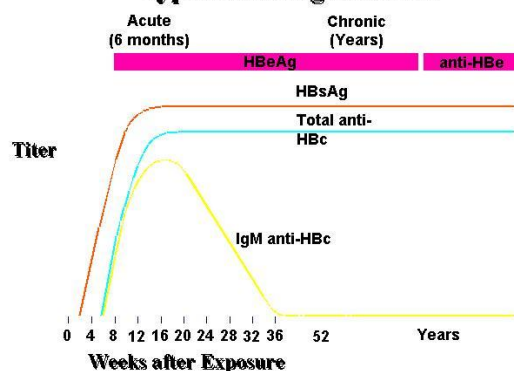


Table 3. Interpretation of Hepatitis B Serology

Condition	HBsAg	anti-HBs	anti-HBc	IgM anti-HBc
Susceptible	neg	neg	neg	
Immune due to infection	neg	pos	pos	
Immune due to vaccine	neg	pos ≥ 10 mIU	neg	
Acutely infected	pos	neg	pos	pos
Chronically infected	pos	neg	pos	neg
Equivocal interpretation*	neg	neg	pos	

*Equivocal interpretation has four possible explanations: (1) May be recovering from acute infection, most common in high-prevalence populations. (2) May be susceptible with false-positive anti-HBc. (3) May have undetectable level of HBsAg present in serum in person with chronic HBV infection. Persons positive only with anti-HBc are unlikely to be infectious except in unusual circumstances (e.g., blood transfusion or organ transplant). (4) Resolving acute infection.

V. Treatment

- A. Acute Hepatitis B: supportive care and close monitoring. However, the American Association for the Study of Liver Disease (AASLD) recommends treatment for patients with fulminant Hepatitis B.
- B. Chronic Hepatitis B (persistence of HBsAg >6 months):
 1. Management of Hepatitis B should be undertaken by a physician experienced in managing chronic liver disease. Patients are selected for treatment based on HBV DNA levels, HBeAg status, ALT levels and extent of liver disease.

2. Several antiviral drugs are FDA cleared to treat Hepatitis B including: adefovir, interferon alfa-2b, pegylated interferon alfa-2a, lamivudine, entecavir, telbivudine, and tenofivir. Some patients benefit from early intervention with antiviral treatment or screening for hepatocellular cancer at an early stage. There are other nucleoside analogs in development.

VI. Counseling

- A. To protect the liver from further harm, HBsAg-positive persons should be advised to:
 1. Abstain from or limit alcohol intake to reduce additional liver injury.
 2. Discuss all new medications, including over the counter and herbal medicine, with their health care provider.
 3. Obtain Hepatitis A vaccine if liver disease is present.
- B. To prevent transmission to others, HBsAg-positive persons should be counseled about the risk of transmission to household, sexual, and needle-sharing contacts and the need for these contacts to receive the Hepatitis B vaccine. Specific counseling messages include:
 - Use of condoms to protect non-immunized sexual partners until the partner can be vaccinated and immunity documented;
 - Prevent spread of infections by covering cuts and skin lesions;
 - Refrain from donating blood, plasma, body organs, other tissue or semen;
 - Avoid sharing household articles that can be contaminated with blood (e.g. toothbrushes, razors or personal injection equipment).
 - Refrain from sharing presmasticated food to susceptible persons.

VII. Prevention

Hepatitis B vaccine and Hepatitis B immune globulin (HBIG) can be used as prophylaxis against HBV infection.

- A. Hepatitis B vaccine:
 1. There are two single-antigen Hepatitis B vaccines for use in adolescents and adults that contain recombinant HBsAg: Recombivax-HB[®] (Merck & Co) and Engerix B[®] (Glaxo SmithKline Biologicals). There is one combination vaccine (Hepatitis A and Hepatitis B) for use in adults, Twinrix (Glaxo SmithKline Biologicals). Two additional combination vaccines that contain recombinant

HBsAg as one component are available for use in infants and young children. Details on these two combination vaccines that target infants/young children are not covered in this document.

Table 4: Hepatitis B Vaccine Dosing for Adolescents and Adults

<u>Group</u>	Recombivax HB [®] Dose [†] ug (ml)	Engerix-B [®] Dose [†] ug (ml)	Twinrix* Dose [†] ug (ml)
Adolescents 11-19 years [§]	5 (0.5)	10 (0.5)	NA
Adolescents 11-15 years [¶]	10 (1.0)	NA	NA
Adults age ≥20 years	10 (1.0)	20 (1.0)	20 (1.0)
Hemodialysis patients and other immunocompromised persons age <20 years [§]	5 (0.5)	10 (0.5)	NA
Hemodialysis patients and other immunocompromised persons age ≥20 years	40** (1.0)	40 ^{††} (2.0)	NA

*Combined Hepatitis A and Hepatitis B vaccine. This vaccine is recommended for persons age ≥18 years who are at increased risk for both Hepatitis B and Hepatitis A.

[†]Recombinant Hepatitis B surface antigen protein dose, in micrograms.

[§]Pediatric formulation administered on a 3-dose schedule.

[¶]Adult formulation administered on a 2-dose schedule.

**Dialysis formulation administered on a 3-dose schedule at 0,1 and 6 months.

^{††}Two 1.0 mL doses of the adult formulation administered at one site on a 4-dose schedule at 0,1,2 and 6 months.

2. Hepatitis B vaccine schedule:

For all vaccine schedules, if series is interrupted the missed dose should be given as soon as possible. No need to restart series.

- Approved adolescent and adult schedule for monovalent vaccines (i.e., Engerix-B and Recombivax HB) include: 0, 1 and 6 months; 0, 1 and 4 months; and 0, 2 and 4 months.
- Engerix-B is also approved in a 4-dose schedule for all ages (0, 1, 2 and 12 months).
- Recombivax HB adult formulation (10 ug) is licensed for adolescents aged 11-15 years in a two-dose schedule (0, 4-6 months). When scheduled to receive second dose, adolescents age >15 years should be switched to a

3-dose series and receive doses 2 and 3 of pediatric formulation (5 ug) administered on an appropriate schedule.

- Twinrix is approved for a 0, 1, and 6-month schedule for persons age ≥ 18 years at risk for both Hepatitis A and Hepatitis B.
3. Vaccine should be administered IM (in the deltoid), NOT intradermal and not in the buttock.
 4. Safe in pregnancy/lactation.
 5. Safe to administer Hepatitis B immune globulin (HBIG) at same time, but different anatomic site.
 6. Vaccine contraindicated in persons with a history of anaphylaxis after prior dose and in persons with known anaphylactic reaction to any vaccine component.
 7. The hepatitis vaccine is highly immunogenic: protective antibody present in 30-55% of adolescents and healthy adults age < 40 years after one dose, 75% after two doses and $> 90\%$ after three doses. The duration of protection is not known; however, vaccine-induced immune memory has been demonstrated to persist at least 15-20 years.
 8. CDC does not recommend routine periodic serologic testing or booster doses among vaccine recipients with normal immunity. It is recommended for specific populations (see 11 below).
 9. Serologic testing to determine susceptibility prior to vaccination might be considered in some scenarios to reduce the cost of vaccination . Pre-vaccination serologic testing may be cost-effective for adults with high prevalence of HBV infection (adult MSM, injecting drug users, persons born in geographic regions with HBsAg prevalence of $\geq 2\%$ (e.g., much of Eastern Europe, Asia, Africa, the Middle East, and the Pacific Islands)). Pre-vaccination testing for susceptibility is recommended for unvaccinated household, sexual and needle-sharing contacts of HBsAg positive persons. Anti-HBc is the test of choice for prevaccination testing; persons who are anti-HBc-positive should be tested for HBsAg. Persons found to be HBsAg-positive should be referred for medical management and their household, sexual, and needle-sharing partners should be vaccinated.

Prevaccination serologic testing should not delay vaccination and in most cases the first dose of vaccine should be administered at the same visit after

the blood is drawn. Further vaccination can then be done depending on testing results.

10. American College of Immunization Practices (ACIP) current recommendations for Hepatitis B vaccination include:

- All infants at birth.
- All children aged <19 who were not previously vaccinated.
- Susceptible sex partners of HBsAg-positive persons.
- Sexually active persons who are not in a long-term, mutually monogamous relationship (e.g., >1 sex partner during the previous 6 months).
- Persons seeking evaluation or treatment for an STD.
- MSM.
- Injection drug users.
- Susceptible household contacts of HBsAg-positive persons.
- Health care and public safety workers at risk for exposure to blood or blood-contaminated body fluids.
- Persons with end-stage renal disease, including predialysis, hemodialysis, peritoneal dialysis, and home dialysis patients.
- Residents and staff of facilities for developmentally disabled persons.
- Travelers to regions with intermediate or high rates of endemic HBV infection.
- Persons with chronic liver disease.
- Persons with HIV infection.
- Unvaccinated adults with diabetes mellitus who are aged 19 through 59 years (discretion of clinicians for unvaccinated adults with diabetes mellitus who are aged ≥60 years).
- All other persons seeking protection from HBV infection — acknowledgment of a specific risk factor is not a requirement for vaccination.

11. Post vaccination serologic testing in adolescents and adults recommended for:

- HIV infected persons , chronic hemodialysis patients, and other immunocompromised persons.
- Health care workers or public safety workers who are exposed to blood or body fluids in the workplace.
- Sex partners and needle sharing partners of HBsAg-positive persons.

When indicated, post vaccination serologic testing should take place 1-2 months after administration of the last dose of the vaccine series. Testing should use a method that allows for determination of a protective level of anti-HBs (i.e. ≥ 10 mIU/mL). Persons found to have anti-HBs levels of < 10 mIU/mL after the primary vaccine series should be revaccinated with a full 3-dose series with anti-HBs testing 1-2 months after third dose. Nonresponders to vaccine should be counseled that HBsAg testing is recommended. Persons found to be HBsAg-positive should be provided with appropriate medical management, counseling, and vaccination of household or sexual contacts. Nonresponders who are HBsAg-negative should be considered susceptible to HBV infection and should be counseled about precautions to prevent HBV infection and the need to obtain appropriate postexposure prophylaxis (with HBIG)for any known or likely parenteral exposure to blood.

- B. Hepatitis B Immune Globulin (HBIG): HBIG provides passive transfer of antibodies and is prepared from plasma known to contain a high concentration of anti- HBs.

HBIG provides temporary protection from HBV infection and is typically used as post-exposure prophylaxis (PEP). It can be used with the Hepatitis B vaccine in previously unvaccinated persons or alone in persons who have not responded to vaccine .Recommended adolescent/adult dose is 0.06 mL/kg.

C. Postexposure Prophylaxis

1. Both passive-active PEP (using HBIG and Hepatitis B vaccine administered at separate sites) and active PEP (Hepatitis B vaccine alone) have been shown to be highly effective in preventing infection after exposure to HBV. HBIG alone has been shown to be effective in preventing HBV transmission, but with the availability of Hepatitis B vaccine, HBIG typically is used as an adjunct to vaccination.
2. Non occupational exposures, including sexual, percutaneous and needle-sharing exposures to known blood or body fluids from an HBsAg-positive or unknown HBsAg-status-person should be managed as indicated in Table 5 below.

Table 5: Recommended Hepatitis B Post-Exposure Prophylaxis* of Adolescents/ Adults with Non Occupational exposures to Blood or Body Fluids that contain Blood

Exposure	Treatment for Unvaccinated person [§]	Treatment for previously vaccinated person [¶]
HBsAg-positive source Percutaneous (e.g., bite or needlestick) or mucosal exposure to HBsAg-positive blood or body fluids that contain blood Sexual or needle-sharing contact of an HBsAg-positive person Sexual assault/abuse by perpetrator who is HBsAg-positive	Administer Hepatitis B vaccine series and HBIG Administer Hepatitis B vaccine series and HBIG Administer Hepatitis B vaccine series and HBIG	Administer Hepatitis B vaccine booster dose Administer Hepatitis B vaccine booster dose Administer Hepatitis B vaccine booster dose
Source with unknown HBsAg status Victim of sexual assault/abuse by a perpetrator who is unknown HBsAg status Percutaneous (e.g., bite or needlestick) or mucosal exposure to potentially infectious blood or body fluids from a source with unknown HBsAg status Sex or needle-sharing contact with a person of unknown HBsAg status	Administer Hepatitis B vaccine series Administer Hepatitis B vaccine series Administer Hepatitis B vaccine series	No treatment No treatment No treatment

*Immunoprophylaxis should be started as soon as possible, preferably ≤24 hours. Studies are limited on the maximum interval after exposure during which PEP is effective, but the interval is unlikely to exceed 7 days for percutaneous exposures and 14 days for sexual exposures. The complete vaccine series should be administered.

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

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

3. Occupational exposure: Management based upon knowledge of the source's status or risk factors, exposed vaccination history, and response (if known). May include doing nothing, HB vaccine or HBIG (or both), depending on the situation. See Table 6 below.

Table 6: Recommended Hepatitis B Post-Exposure Prophylaxis for Occupational Exposure to Blood or Body Fluids that contain Blood

Vaccination and antibody status of exposed person	Source is HBsAg +	Source is HBsAg -	Source not tested or status unknown
Unvaccinated	HBIG* x 1 and initiate HB vaccine series	Initiate HB vaccine series	Initiate HB vaccine series
Vaccinated, known responder [†]	No treatment	No treatment	No treatment
Vaccinated, non-responder, not revaccinated [‡]	HBIG x 1 + HB revaccination series	HB revaccination series	If known high-risk source, treat as if source were HBsAg+
Vaccinated, non-responder, revaccinated	HBIG x 2 [§]	No treatment	If known high-risk source, treat as if source were HBsAg+
Vaccinated, antibody response unknown	Test exposed person for anti-HBs: 1) if adequate, no treatment 2) if inadequate, HBIG x 1 + HB vaccine booster dose ^{**}	No treatment	Test exposed person for anti-HBs: 1) if adequate, no treatment 2) if inadequate, give HB vaccine booster dose ^{**} and check anti-HBs in 1-2months

*HBIG dose 0.06 ml/kg intramuscularly

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

[‡] Revaccination = additional three-dose series of hepatitis B vaccine administered after the primary series

[§] First dose as soon as possible after exposure and the second one month later

^{**} Vaccine booster = single dose of HB vaccine appropriate for person's age

VII. References: (See end of module)

Hepatitis C (HCV)

I. Epidemiology

A. United States

1. HCV infection is the most common chronic bloodborne infection in the U.S. An estimated 2.7- 3.9 million persons have been infected. Infection is most prevalent among persons born between 1945-1965. After adjusting for asymptomatic cases and underreporting, the estimated incidence of HCV infection was 16,000 cases in 2009.
2. In 2009, a total of 205,997 reports of chronic Hepatitis C (past or present) infection were submitted to CDC by 36 states. Persons 40-54 years of age account for a majority of cases.
3. HCV infection is the leading cause for liver transplantation among adults. Viral-hepatitis-associated death rates were highest among persons infected with HCV (4.6 deaths per 100,000 population), (n=15,106). In 2007, the highest mortality rate (15.7 deaths per 100,000 population) was observed for persons aged 55–64 years. From 2004 through 2007, the highest mortality rates for Hepatitis C were observed among blacks and males.
4. Before 1990, post transfusion non-A, non-B hepatitis (PTNANBH) occurred in 10% of transfusion recipients, with 90% of PTNANBH attributed to HCV infection. Since the introduction of a sensitive screening test for Hepatitis C in 1992, the risk for infection is estimated to be less than one per 2 million units transfused.
5. HCV infection is most prevalent among persons born between 1945 and 1964.
6. Despite a decline in the number of reported cases among injecting drug users, injecting drug use continues to be the most frequent risk factor for HCV infection.
7. Prevalence of HCV infection is also high among HIV infected persons.

8. Reported cases are higher among males than females. Overall, two-thirds (66.3%) of reported cases were among males. Among all cases for whom race/ethnicity was known, non-Hispanic whites accounted for the highest proportion (24.7%) of chronic HCV case reports.

B. Worldwide:

1. Global prevalence estimated at 2.2- 3%, with 130-170 million chronic infections.
2. Highest prevalence of HCV infection found in the African and Eastern Mediterranean regions.

C. Modes of transmission:

1. Percutaneous (i.e., passage through the skin) exposures to infectious blood
 - a) Injection drug use (IDU) – well-documented in multiple studies and the most common means of HCV transmission in the United States
 - b) Blood and blood products and organs: well-characterized, e.g., transfusions before 1992, clotting factor recipients before 1987. Risk from a blood transfusion is now less than 1 per 2 million transfused units.
 - c) Contaminated medical equipment, and invasive health care procedures, such as injections (usually recognized in the context of outbreaks). Infrequent mode of transmission. Reports of transmission have occurred in numerous settings including: chronic hemodialysis, surgery, endoscopy, inpatient wards, pain management, and oncology clinics.
 - d) Occupational (needlestick injury); average incidence 1.8% post-needlestick from HCV-positive person.
 - e) Sharing personal items contaminated with infectious blood such as razors, toothbrushes (an inefficient means of transmission).
 - f) Intranasal cocaine use (snorted or smoked)) may be a possible risk factor as limited data suggest a possible association. However, it is difficult to differentiate cocaine use from associated injection-drug use and sex with HCV-infected partner in these limited studies.
 - g) Tattooing and body piercing do not appear to be percutaneous risk factors for HCV infection if tattooing or piercing was done in a licensed

professional parlor. However limited studies have shown higher rates of HCV among persons who obtained their tattoos in prison settings or by friends.

2. Perinatal: average rate of infection ~5%, with higher risk of transmission if woman co-infected with HIV. Mothers with high HCV viral load may be more likely to transmit Hepatitis C to their infants. Studies on the mode of delivery (cesarean vs. vaginal) are inconclusive regarding transmission risk. Pregnant women infected with HCV are not advised to have cesarean sections, other than for the usual obstetric indications). Breast-feeding is not thought to be a risk for transmission. However, women should consider abstaining from breastfeeding if their nipples are cracked or bleeding.
3. Sexual: appears to be inefficient mode of transmission. Recent data indicate sexual transmission may occur more commonly among HIV-infected persons. CDC surveillance data reveal 10% of persons with acute HCV report sexual contact with a known HCV-positive person as their only risk factor.
 - a) Studies that compare HBV with HCV sexual transmission rates show a cumulative incidence of HCV seroconversion of 2.5% compared with 26% for HBV, suggesting that HCV is about 10 times less efficiently transmitted to sexual partners than HBV.
 - b) Studies on HCV sexual transmission have yielded mixed results; general studies have found increased rates of HCV infection in partners of persons with HCV infection compared with those whose partners are not HCV-infected. Risk in some studies appears to increase along with increasing number of sex partners for both heterosexual and MSM and especially if partners are coinfecting with HIV.
 - c) Recent studies in multiple European cities and in New York City reveal apparent HCV sexual transmission among HIV-infected MSM. Risk factors associated with transmission include serosorting (i.e., HIV-infected men having sex with one another), group sex, cocaine, and other drug use.
 - d) HCV RNA has been detected in semen of HCV-infected men and in cervicovaginal secretions of HCV-infected women using highly sensitive PCR testing.

II. Pathogenesis

- A. HCV is an enveloped positive-stranded RNA virus related to the flaviviruses / togavirus family (arboviruses, dengue).
- B. At least six distinct HCV genotypes have been identified, with more than 50 subtypes. Genotype 1 is the most common in the U.S.
- C. Incubation is highly variable, depending on route and titer of exposure; for persons who develop symptoms, average time from exposure to symptom onset is 4–12 weeks (range: 2–24 weeks).
- D. Superinfection with a different genotype or strain of same genotype is possible, particularly if risk factor (i.e., injection-drug-use) continues.

III. Clinical Manifestations

Understanding of the natural history of HCV infection is evolving and many cofactors can influence the course and progression.

- A. Most persons newly infected are asymptomatic or have mild clinical illness. Manifestations of acute disease may include: abdominal pain, jaundice; malaise occurs in 20-30% and is mild. For those who develop symptoms, average time period from exposure to symptoms is one-three months. Spontaneous resolution of acute infection appears to occur more frequently in women than in men and in whites compared to African Americans.
- B. Chronic disease may be asymptomatic for years; may have nonspecific symptoms such as fatigue. Chronic infection develops in 75% to 85% of persons infected as older adults (>45 years) compared to 50% to 60% of those infected as adolescents and younger adults.
- C. Approximately 30% of persons with chronic HCV infection have no evidence of liver disease, while 70% will develop chronic liver disease. Progression to liver disease (cirrhosis and liver cancer) is not linear and 80% of persons with HCV will be asymptomatic in the first 2-3 decades post exposure.
- D. Time frame for disease progression is highly variable. Factors associated with more rapid progression or poorer outcome are: alcohol use, onset age >45, HIV or HBV co-infection. Males appear to be at higher risk for hepatic fibrosis.

- E. A small percentage of persons with chronic Hepatitis C appear to be at risk for developing medical conditions beyond liver disease. These may develop due to autoimmune response to HCV infection. Conditions include: diabetes mellitus, glomerulonephritis, essential mixed cryoglobulinemia, porphyria cutanea tarda and possibly, non-nHodgkin's lymphoma.

IV. Diagnosis

- A. Clinical presentation: non-specific symptoms (nausea, vomiting, malaise), with or without jaundice.
- B. Diagnosis based on serologic findings, as symptoms are not specific to HCV infection.
- C. Laboratory findings: current assays
 - 1. FDA approved serologic assays that detect antibodies to HCV (anti-HCV) include two enzyme immunoassays (Abbott HCV EIA 2.0 and ORTHO HCV Version 3.0 ELISA) and one enhanced chemiluminescence immunoassay (VITROS Anti-HCV). These tests can detect antibodies within 4-10 weeks after infection. Anti- HCV is detected in 97% by 6 months after exposure. Specificity is greater than 99% with current EIAs however, can have low positive predictive value in low prevalence populations. Specificity extremely high if using signal-to-cutoff ratios (e.g. > 3.8 for the EIA tests) to predict true positives. HIV-infected persons and other immunocompromised individuals may not develop hepatitis C antibodies. HCV RNA testing should be considered for immunocompromised persons when suspicion of exposure to HCV is high.
 - 2. Recombinant immunoblot assay (RIBA): detects antibodies to HCV. Prior to the development of current EIA tests, this test was used primarily as a supplemental, more specific assay to earlier EIAs. With current widespread availability of nucleic acid testing, the need for RIBA testing has declined.
 - 3. Qualitative detection of HCV RNA with nucleic acid tests (NATs) can detect virus as early as 1-2 weeks post-exposure. There are numerous FDA approved qualitative HCV RNA tests including: Amplicor[®] HCV v2.0, Cobas Amplicor[®] HCV v 2.0, Ampliscreen, Versant HCV RNA, and Procleix HIV-1/HCV. In the past, qualitative assays have been more sensitive than quantitative assays, but with recent improved sensitivity of polymerase chain

reaction PCR and TMA assays, there is less need for qualitative assays in clinical settings.

4. There are numerous FDA approved Quantitative HCV RNA assays including: Amplicor HCV Monitor, Cobas Amplicor HCV Monitor V2.0, Versant HCV RNA 3.0, Cobas Taqman HCV and others that may be FDA approved in the future. These tests can be for confirmation of an anti-HCV result as well as for monitoring HCV RNA levels during treatment.
5. A single negative HCV RNA test result cannot exclude a diagnosis of chronic HCV, as persons may have intermittent viremia. Two positive HCV RNA tests six months apart are needed to diagnose a case of chronic HCV infection. Conversely, two negative HCV RNA tests six months apart are needed to rule out chronic HCV infection.

Table 7: Interpretation of HCV Assays

Anti-HCV	HCV RNA	Interpretation
Positive	Positive	Acute or chronic HCV depending on clinical context*
Positive	Negative	Resolution of HCV; Acute HCV during period of low-level viremia†
Negative	Positive	Early acute HCV infection; chronic HCV in setting of immunosuppressed state; false positive HCV RNA test‡
Negative	Negative	Absence of HCV infection

Table adapted from American Association for the Study of Liver Diseases Practice Guidelines

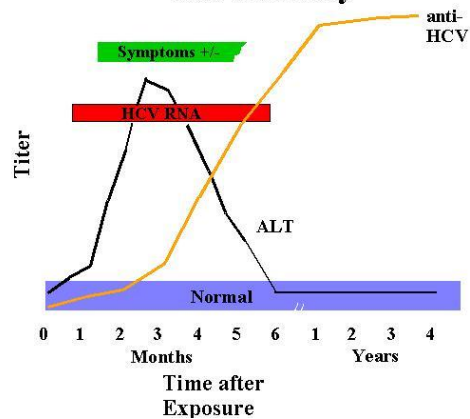
*Clinical scenario of recent ALT elevation and positive Anti-HCV and HCV RNA consistent with either acute infection if recent known exposure, exacerbation of chronic HCV, or with acute hepatitis of another etiology in a patient with chronic HCV.

†Commonly represents recovery from HCV infection or may occur in acute HCV during a period of transient clearance of HCV RNA. Could also be a false positive or false negative result.

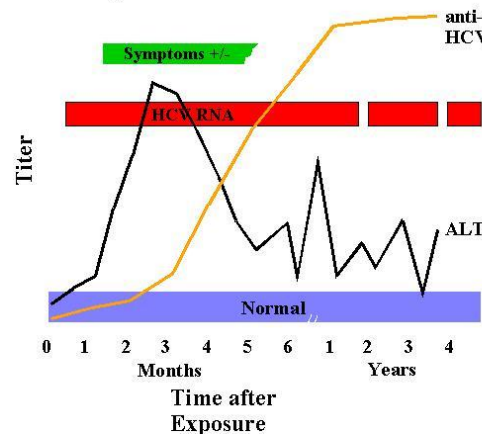
‡Can represent early stage acute HCV infection prior to development of antibody or could be chronic HCV infection in an immunosuppressed patient. Also could be a false positive HCV RNA result. Retesting for anti-HCV and HCV RNA in 4-6 months should be done.

6. HCV genotyping assays are useful for determining optimal clinical management and duration of therapy. Several commercial assays are available including: Trugene 5'NC HCV Genotyping kit, INNO-LiPa HCV II and Versant HCV Genotyping Assay 2.0.

Serologic Pattern of Acute HCV Infection with Recovery



Serologic Pattern of Acute HCV Infection with Progression to Chronic Infection



V. Treatment

Management of HCV infection should be undertaken in conjunction with an expert.

- A. Acute Infection: In general, the response rate is higher in persons with acute infection compared to those with chronic infection. However, the optimal treatment regimen and duration of treatment for acute infection has not been definitively established. When to initiate therapy similarly remains uncertain. Evidence demonstrates treatment of acute HCV infection reduces risk of progression to chronic infection.
 - 1. Interim guidelines from the American Association for the Study of Liver Diseases (AASLD) recommend considering treatment for patients with acute HCV infection with peginterferon. The addition of ribavirin has not been studied and as such there is no specific recommendation for or against its use in acute infection.
- D. Chronic HCV infection: AASLD guidelines recommend that treatment decisions should be individualized. Decision to treat is based on severity of liver disease, potential for serious side effects, likelihood of treatment response, presence of co-morbid conditions, and the patient's readiness for treatment. Treatment is recommended in patients who have liver histology demonstrating bridging fibrosis or compensated cirrhosis, as long as the patient does not have contraindications to therapy.
 - 1. Combination therapy with pegylated interferon (long-acting interferon with once-weekly dosing) plus ribavirin is the current optimal treatment for chronic HCV infection.
 - 2. Patients with Genotypes 1 and 4 should receive a longer duration and weight-based ribavirin dosing to maximize treatment response.
 - 3. Treatment success rates are now being improved with the addition of polymerase and protease inhibitors to standard pegylated interferon/ribavirin combination therapy

VI. Prevention

- A. There is no Hepatitis C vaccine, and IG in post-exposure prophylaxis is not effective.
- B. Patient counseling and prevention issues:
 - 1. Persons who inject drugs should be counseled to stop using and get into treatment. If they do not stop using, they should be counseled on how to inject safely (i.e., use of sterile, single-use equipment, including needles, syringes, cookers, cottons, water, etc., each and every time they inject). They also should be advised to get vaccinated for Hepatitis A and B if nonimmune and get tested for HIV infection.
 - 2. Persons with multiple sex partners, particularly those with concurrent HIV infection, should be counseled to reduce the transmission of HCV, HBV, HIV and other pathogens by the use of male latex condoms. The efficacy of latex condoms in preventing HCV is unknown, but the correct and consistent use of latex condoms may reduce transmission.
- C. Standard precautions in healthcare and laboratory settings.
- D. No recommendations on sexual practice changes in the setting of steady monogamous relationships. Education regarding low risk of sexual transmission: persons in a monogamous relationship where one partner is HCV-positive, should be educated that risk is low, but not absent (may consider barrier methods to reduce risk). They should be counseled to discuss the risk with their partner.
- E. HCV-positive women do not need to avoid pregnancy or breastfeeding. CDC recommends that HCV-positive women abstain from breastfeeding if nipples are cracked or bleeding.
- F. Caesarian section is not routinely recommended for HCV-positive pregnant women.
- G. Knowledge of serostatus by routine testing of high-risk persons is recommended by CDC and other experts. (Note: U.S. Preventive Services Task Force found insufficient evidence to recommend routine screening even among those at high risk.) Groups at increased risk or at risk for severe outcomes include:

- Persons who have ever injected illegal drugs, including those who may have used only once many years ago
- Recipients of clotting factor concentrates made before 1987
- Recipients of blood transfusions or solid organ transplants before July 1992
- Patients who have ever received long-term hemodialysis treatment
- Persons with known exposures to HCV, such as:
 - ◆ health care workers after needlestick involving HCV-positive blood
 - ◆ recipients of blood or organs from a donor who later tested HCV-positive
- All persons with HIV infection
- Patients with signs or symptoms of liver disease (e.g., abnormal liver enzyme tests)
- Children born to HCV-positive mothers (to avoid detecting maternal antibody, these children should not be tested before age 18 months)

VII. Counseling

- A. To protect their livers from further harm, HCV-positive persons should be advised to:
 1. Avoid drinking alcohol.
 2. Avoid starting any new medications (including over-the-counter or herbals) without checking with their clinical provider.
- B. To reduce the risk for transmission to others, HCV-positive persons should be advised to:
 1. Avoid donating blood, body organs, other tissue, or semen.
 2. Cover cuts and sores.
 3. Avoid sharing any personal items that may have blood on them (e.g., toothbrushes, razors).

VII. References: (See end of module)

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