

Appendix F—Mental Health Treatment Considerations for People Who Have Chronic Viral Hepatitis C

Mental illness and hepatitis frequently co-occur (Rosenberg et al., 2001; Rosenberg et al., 2003). People who have mental illness are at greater risk than the general public for exposure to infectious diseases, including chronic hepatitis (Rosenberg et al., 2001). For instance, in a study of veterans with hepatitis C, Fireman, Indest, Blackwell, Whitehead, and Hauser (2005) found that 93 percent of subjects had one or more psychiatric or substance use disorders at the time of or before the study.

Behavioral health conditions are not absolute contraindications for chronic hepatitis treatment. As healthcare providers increasingly consider treating hepatitis in patients with mental disorders, they might turn to behavioral health providers to assess their patients for readiness for antiviral treatment. In addition, behavioral health treatment providers might have clients who have chronic hepatitis and who require support through the lengthy and challenging hepatitis treatment process.

Behavioral Health Counseling

Goldsmith and Hauser (2003) advocate the participation of an informed behavioral health treatment provider in a client's antiviral treatment for chronic hepatitis. They assert that, to provide effective support in the treatment process, behavioral health treatment providers need to know:

- The natural history of hepatitis C virus infection (see Chapter 1 in this Treatment Improvement Protocol [TIP]).
- Standard treatment for chronic hepatitis (Chapter 5).
- Common adverse effects of treatment (Chapter 5).
- How to manage side effects of treatment (Appendix D).
- How to work with high-risk populations (Chapters 4, 5, and 6).
- How to manage (particularly with psychotropic medications) a client's mood and cognitive changes that might result from antiviral treatment (see below).

Behavioral health treatment providers can partner with healthcare providers to help patients with chronic hepatitis get evaluated for treatment (see Chapter 3) and adhere to treatment (Chapter 6). Psychiatrists are especially well suited to monitor patients being treated for hepatitis for psychiatric side effects of treatment (Straits-Tröster, Sloan, & Dominitz, 2003).

Issues Clients Who Have Chronic Hepatitis B or C Might Bring to Counseling

Treatment for chronic hepatitis is challenging for most people. Behavioral health treatment providers might have clients who need assistance with making psychological adjustments to having a chronic disease (e.g., coping with a chronic disease, learning about hepatitis, making healthful lifestyle changes) and making decisions related to having hepatitis (e.g., whether/how to disclose the condition to others, deciding on whether to undertake antiviral therapy, adhering to the treatment regimen). Helping clients make medical decisions about hepatitis treatment is the subject of Chapter 4. Chapter 6 of this TIP includes the following relevant topics:

- Using effective counseling strategies, including motivational approaches
- Ensuring safety of the counselor
- Providing reliable information about hepatitis
- Building the therapeutic relationship
- Helping clients understand their diagnoses
- Incorporating client needs in substance abuse treatment planning
- Developing a plan to prevent infecting others and to prevent further liver damage
- Using motivational approaches
- Confronting the social ramifications of disclosing hepatitis status
- Addressing relapse
- Building support systems
- Providing effective case management

Patients with baseline depression, anxiety, bipolar disorder, post-traumatic stress disorder (PTSD), or other behavioral health conditions might face additional challenges that

come with the neuropsychiatric side effects of hepatitis treatment, such as worsening of their symptoms, or relapse. Therefore, the issue of readiness for treatment is particularly relevant for mental health care professionals.

Readiness for Treatment

Many clients who have mental illnesses do not receive hepatitis pharmacotherapy because they are not prepared (in their view or in a care provider's view) to successfully complete the regimen. For example, some healthcare providers might defer treatment until an individual's mental illness, such as depression, can be stabilized. Individuals might choose to defer treatment until they are in stable housing or until they have built strong support networks.

Little information is available on how frequently clients receive a second referral for chronic hepatitis treatment if they are initially deferred but later become eligible for treatment. One study reported that none of the 306 patients who deferred had a second referral for treatment (Yawn, Wollan, Gazzuola, & Kim, 2002). A more recent study reported that of 111 patients deferred for psychiatric issues (including psychiatric instability and suicidal ideation), 53 percent received a followup referral, of which only 18 percent (20 individuals) were ultimately treated (Evon et al., 2007). These rates suggest that, if treatment for hepatitis is deferred at the initial assessment, few clients have opportunities to receive treatment after they become eligible.

In addition, although some clients might have healthcare providers who defer hepatitis treatment because of the client's behavioral health issues, some data suggest that some individuals do not follow through with steps necessary to get treatment (Butt, Wagener, Shakil, & Ahmad, 2005).

Behavioral health treatment providers can help clients who are currently ineligible for hepatitis treatment become eligible. For example, they can motivate clients to attend medical appointments. Helping a client become ready for treatment can take several months (Scheft & Fontenette, 2005). Behavioral health treatment providers can work with a client’s healthcare provider and advocate a referral for hepatitis treatment when clients are ready.

An expanded psychiatric evaluation can enhance the assessment of client readiness for hepatitis treatment (Scheft & Fontenette, 2005; Silberbogen, Mori, & Sogg, 2005). Silberbogen et al. (2005) developed a structured interview to help determine a client’s readiness for treatment. Facets of the structured interview include the following:

- Hepatitis C history
- Social support network
- Understanding of chronic hepatitis C and its treatment
- History of motivation and adherence to treatment
- Psychiatric history
- Mental status exam

Tools that might assist the psychiatric assessment include the following:

- Beck Anxiety Inventory
- Beck Depression Inventory
- Bipolar Spectrum Diagnostic Scale
- Brief Psychiatric Rating Scale
- Center for Epidemiologic Studies Depression Scale
- Geriatric Depression Scale
- Major Depression Inventory
- Mood Disorders Questionnaire

- Montgomery Asberg Depression Rating Scale
- Post-Traumatic Stress Disorder Checklist (civilian version)
- Quick Inventory of Depressive Symptoms
- State-Trait Anxiety Inventory
- Young Mania Rating Scale
- Zung Self-Rating Depression Scale

An important part of the expanded assessment is screening for substance use disorders. Tools to assess substance use disorders include the following:

- Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST)
- Alcohol Use Disorders Identification Test (AUDIT)
- Alcohol Use Disorders Identification Test—Consumption (AUDIT-C)
- CAGE Adapted to Include Drugs (CAGE-AID)
- Drug Abuse Screening Test
- Michigan Alcoholism Screening Test (MAST) (MAST-G for older adults)
- Patient Health Questionnaire (PHQ9)

Pharmacological approaches (see the section on Medications for People Who Have Behavioral Health Disorders, below) and nonpharmacological approaches (see Chapter 6) might be beneficial for helping the client become ready for treatment of hepatitis.

Effects of Antiviral Treatment for Chronic Hepatitis on Behavioral Health

People who never had problems with anxiety, depression, or irritability might experience these as a result of treatment for chronic hepatitis, and stable patients with previous mental health problems might have

exacerbations. Some early symptoms of treatment-related depression might also mimic opioid withdrawal. This can complicate clinical management for the large subset of patients with chronic hepatitis C who have a history of opioid injection drug use (Schaefer & Mauss, 2008).

In a review article by Robaey and Buntinx (2005), neurobehavioral changes leading to depression often begin by the eighth week of antiviral therapy, which coincides with the peak time for quitting medication treatment. Addressing mental health symptoms is important to antiviral treatment success because close adherence to and completion of multiple-week therapy are required for achieving treatment success (Sylvestre & Clements, 2007).

Clients with mental illness who decide to undergo treatment for chronic hepatitis will require regular psychiatric monitoring. In addition, treatment adherence might be enhanced with the following supports:

- Psychosocial interventions
- Medication, therapy, or both to manage anger, anxiety, irritability, depression, or other side effects of interferon treatment
- Support groups to combat social isolation and discrimination resulting from a hepatitis diagnosis
- Support to prevent relapse to substance use
- Motivational therapy to inspire changes in daily life that support antiviral treatment
- Education on how to prevent transmission of the hepatitis C virus

For patients with risk factors for depression (e.g., personal or family history of depression, suicide attempts, alcohol abuse, poor sleep quality) preemptive treatment with selective serotonin reuptake inhibitors (SSRIs) has been used as a prevention strategy (Schaefer & Mauss, 2008). Concurrent use of interpersonal psychotherapy, behavioral psychotherapies, and psychosocial support might also be beneficial to these clients (American Psychiatric Association, 2010; Wilson, Castillo, & Batey, 2010).

Preexisting psychiatric medication regimens might need modification during hepatitis treatment. For example, a patient with bipolar disorder who takes valproic acid might need to change to a mood stabilizing medication that is less toxic to the liver while on antiviral therapy. A patient who was previously stable on an SSRI might need an increased dosage or a medication change. Psychiatric medications and care might need to continue for at least 6 to 12 weeks after antiviral treatment is completed because mood disorders, neurocognitive changes, and other psychological problems might persist (Schaefer & Mauss, 2008).

With pretreatment screening to determine need for medication, continuous monitoring, and individualized treatment, patients with preexisting or emerging mental health problems might be able to mitigate the adverse IFN- α psychiatric side effects, complete treatment, and achieve sustained viral response. These positive outcomes have been reported with collaborative care provided by multidisciplinary management teams that include healthcare providers, psychologists, psychiatrists, addiction specialists, and other behavioral health workers (Belfiori et al., 2009; Guadagnino et al., 2007; Schaefer et al., 2003; Sylvestre & Clements, 2007).

Medications for People Who Have Behavioral Health Disorders

Affective Disorders

Depression is common among patients who require antiviral treatment of chronic hepatitis C (Schaefer & Mauss, 2008). Others can develop major depression during the course of antiviral treatment. The medications most commonly prescribed for depression include SSRIs (e.g., fluoxetine, citalopram, sertraline, paroxetine, escitalopram), serotonin and norepinephrine reuptake inhibitors (e.g., duloxetine, venlafaxine), and the chemically unique bupropion. Older antidepressant medications (e.g., monoamine oxidase inhibitors, tricyclics) are less often prescribed because they have more side effects and drug interactions (National Institute of Mental Health [NIMH], 2008). Depression screening scales that rely on patient self-reporting can be used, but the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV-TR) criteria (APA, 2000) and clinical evaluation are essential to guide treatment decisions.

Bipolar disorder is another affective disorder in which patients cycle through alternating episodes of depression and mania. Patients are treated with mood stabilizers (e.g., carbamazepine, lamotrigine, lithium, oxcarbazepine, valproic acid). Antidepressants are sometimes added to mood stabilizers to treat symptoms of depression in bipolar disorder, but these medications need to be used with great care because of the risk of exacerbating manic symptoms and/or inducing suicidality (NIMH, 2008). Atypical antipsychotics (e.g., aripiprazole, clozapine, olanzapine, risperidone, ziprasidone) are sometimes added to treat depression or bipolar disorder.

Anxiety Disorders

Anxiety disorders include obsessive-compulsive disorder, PTSD, generalized anxiety disorder, panic disorder, social phobia, and others (APA, 2000). When patients undergoing treatment for chronic hepatitis exhibit symptoms related to anxiety disorders, it is important to determine whether symptoms are related to the psychological demands of coping with a chronic disease, whether they are due to the rigors of treatment, or whether they are an exacerbation of a preexisting condition so that appropriate pharmacological and nonpharmacological treatments can be arranged. Cognitive behavioral therapy is frequently used for the treatment of anxiety disorders and can improve symptoms significantly within a short timeframe. Other nonpharmacological treatments include group therapy, systematic desensitization, acupuncture, and biofeedback.

Suicidality

Suicide is the worst outcome of major depressive disorder, and treatment of modifiable risk factors (anxiety, insomnia, agitation, psychotic symptoms, and substance abuse) are recommended in addition to treating the depressive episode (APA, 2010).

Some of the medications that are used to treat depression and bipolar disorder might increase the risk of suicidal thoughts and behaviors (U.S. Food and Drug Administration, 2009). All clients should be screened for risk of suicide. People at risk for suicide should be closely monitored for new or worsening symptoms of depression, suicidal thoughts or behaviors, or unusual changes in mood or behavior (NIMH, 2008). More information can be found in TIP 50: *Addressing Suicidal Thoughts and Behaviors in Substance Abuse Treatment*

(Center for Substance Abuse Treatment, 2009b). Other materials are available at the National Suicide Prevention Lifeline (<http://www.suicidepreventionlifeline.org>).

Treating Patients With Hepatitis C and Serious Mental Illness

Adults with a serious mental illness (SMI) are people ages 18 and older who, at any time during a given year, have a diagnosable mental, behavioral, or emotional disorder that meets the criteria of DSM-IV-TR (APA, 2000) and that results in functional impairment which substantially interferes with or limits one or more major life activities (Substance Abuse and Mental Health Services Administration [SAMHSA], 1999).

Whether SMIs such as psychotic disorders and major mood disorders should be contraindications to undergoing antiviral therapy for hepatitis C is controversial. The American Psychiatric Association (APA, 2010) states that SMIs are not necessarily contraindications to antiviral treatment. Psychotic symptoms (hallucinations and delusions) make effective coping with a chronic infectious disease difficult, increase patient risk of suicide, and might make adherence with complex antiviral regimens impossible. Patients with psychotic symptoms frequently need antipsychotic medications (e.g., aripiprazole, chlorpromazine, clozaril, fluphenazine, haloperidol, olanzapine, paliperidone, perphenazine, quetiapine, risperidone, ziprasidone) alone or in combination with other medications (NIMH, 2008). These complex psychiatric medication treatment regimens can be difficult to manage during antiviral treatment. Patients with depression frequently experience increased depressive symptoms during antiviral treatment (Ghany et al., 2009). This increase in symptoms has not been reported for patients

with schizophrenia (Huckans, Mitchell, & Pavawalla 2010); however, this has not been well studied.

Antiviral therapy can be successful for chronic hepatitis C patients with SMIs but often requires expert psychiatric management and close monitoring by clinical staff. Intensive case management by a behavioral health case manager might be needed to support treatment adherence, make and monitor treatment appointments, and assist with housing, food, and employment needs. More frequent physician appointments might be needed for laboratory monitoring of liver function and to detect any dangerous medication interactions. The decision to treat needs to consider the social support network and the availability of social services, as well as the patient's abilities.

Drug Interactions

A combined medication regimen consisting of pegylated interferon and ribavirin is the standard of care for chronic hepatitis C (Ghany et al., 2009). Both antiviral drugs have side effects and potential toxicities, but they have few specific interactions with medications used to treat behavioral health disorders (see Exhibit F-1). Interferon has no clinically significant interactions with methadone used to treat opioid addiction; however, its potential interaction with buprenorphine has not been adequately studied to identify such interactions. Ribavirin's potential interactions with methadone or buprenorphine have also not been studied in depth and are unknown (McCance-Katz, Sullivan, & Nallani, 2009). Ribavirin does not interact adversely with any medications listed in Exhibit F-1. The patient should be monitored closely for any adverse effects or drug interactions when receiving medications that are metabolized by the liver.

Exhibit F-1 Potential Interactions Among Medications Used to Treat Chronic Hepatitis and Behavioral Health Conditions

Prescription Medication	Indication	Potential Interaction With Hepatitis Medications
Alprazolam	Anxiety	<p>The use of telaprevir with alprazolam increases exposure to alprazolam. Clinical monitoring for dose adjustment is recommended.</p> <p>The use of boceprevir could result in increased sedation or respiratory depression when used with alprazolam. A lower dose of alprazolam should be considered.</p>
Buprenorphine	Opioid dependence	The use of boceprevir could result in an increase or decrease in buprenorphine levels. However, the combination of buprenorphine and boceprevir has not been studied. Clinical monitoring for dose adjustment is recommended.
Bupropion	Depression; nicotine dependence	The use of bupropion is associated with an increased risk of seizures. Use of interferon and bupropion together might increase seizure risk as well.
Clozapine	Schizophrenia; psychosis	Clozapine might cause marrow disorders, neuroleptic malignant syndrome, and increased seizure risk. When taken with interferon, the risks of these might increase.
Desipramine	Depression	The use of telaprevir or boceprevir could result in an increase in desipramine concentration, which might lead to adverse events (e.g., nausea, dizziness). The combination of telaprevir or boceprevir and desipramine should be used with caution and a lower dose of desipramine should be considered.
Disulfiram	Alcohol use disorders	Disulfiram might cause or worsen hepatitis. When taken with interferon alpha 2a, there is increased risk of peripheral neuropathy.
Escitalopram	Depression	The use of telaprevir can result in decreased escitalopram concentration. Clinical monitoring for dose adjustment is recommended.
Methadone	Opioid dependence	<p>The use of telaprevir is associated with decreased methadone concentration. Clinical monitoring for dose adjustment is recommended.</p> <p>The use of boceprevir could result in an increase or decrease in methadone levels. However, the combination of methadone and boceprevir has not been studied. Clinical monitoring for dose adjustment is recommended.</p>

Exhibit F-1 Potential Interactions Among Medications Used to Treat Chronic Hepatitis and Behavioral Health Conditions (continued)

Prescription Medication	Indication	Potential Interaction With Hepatitis Medications
Midazolam	Anxiety	Telaprevir is contraindicated with oral midazolam. The interaction could result in increased sedation or respiratory depression. The use of boceprevir could result in increased sedation or respiratory depression when used with intravenous midazolam. A lower dose of intravenous midazolam should be considered.
Naltrexone	Opioid and alcohol use disorders	When taken with interferon alpha 2a, naltrexone might exacerbate liver damage.
Trazodone	Depression	The use of telaprevir or boceprevir can result in an increase in trazodone concentration, which might lead to adverse events (e.g., nausea, dizziness). The combination of telaprevir or boceprevir and trazodone should be used with caution and a lower dose of trazodone should be considered.
Triazolam	Insomnia	Telaprevir and boceprevir are contraindicated with triazolam. The interaction could result in increased sedation or respiratory depression.
Zolpidem	Insomnia	The use of telaprevir can result in decreased zolpidem concentration. Clinical monitoring and dose adjustment of zolpidem is recommended to achieve the desired response.

Sources: *Physicians' Desk Reference 2010* (64th ed.), 2009; U.S. Food and Drug Administration, 2011c and 2011d.

Appendix G—Motivational Interviewing and Counseling Resources

- *Case Management Adherence Guidelines, Version 2.0* (Case Management Society of America, 2006), <http://www.cmsa.org/portals/0/pdf/CMAG2.pdf>
- *Enhancing Motivation for Change in Substance Abuse Treatment* (Center for Substance Abuse Treatment [CSAT], 1999), <http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=hssamhsatip&part=A61302>
- *Enhancing Motivation for Change Inservice Training* (CSAT, 2006), <http://www.kap.samhsa.gov/products/manuals/tip35c/index.htm>
- *Group Treatment for Substance Abuse: A Stages-of-Change Therapy Manual*. M. Velasquez, G. Maurer, C. Crouch, & C. DiClemente. New York: Guilford Press, 2001
- *Motivational Groups for Community Substance Abuse Programs*. K. Ingersoll, C. Wagner, & S. Gharib. Kansas City: Addiction Technology Transfer Center Network, 2000
- *Motivational Interviewing: Preparing People for Change*, 2nd ed. W. Miller & S. Rollnick. New York: Guilford Press, 2002
- The Motivational Interviewing Web Page, <http://www.motivationalinterview.org>

Appendix H—Sources for Financial Assistance

- A source for identifying government sources of healthcare and support benefit programs by State. (<http://www.benefits.gov/>)
- Low-income clients might be eligible for **Medicaid**, but benefits vary significantly across States. (<http://cms.hhs.gov>)
- **Federally funded health centers** provide medical services to people who are uninsured and underinsured. (1-800-ASK-HRSA [1-800-275-4772]).
- The **Veterans Healthcare System** offers hepatitis C virus screening, treatment, and support services to eligible U.S. veterans. (<http://www.hepatitis.va.gov>)
- The **Ryan White CARE Act** provides medications to eligible low-income U.S. residents who have HIV, including those co-infected with hepatitis. (<http://hab.hrsa.gov>)
- **NeedyMeds.org** is a consumer site providing sources on pharmaceutical, State, Medicare, and Medicaid financial support for the treatment of serious diseases, including hepatitis. (<http://www.needymeds.org/>)
- **Partnership for Prescription Assistance** is a pharmaceutical-company-sponsored resource that offers low- or no-cost medication to people who lack prescription drug coverage. (<http://www.pparx.org>)
- **National Foundation for Transplants** helps individuals find financial support for transplantation operations. (<http://www.transplants.org>)
- **National Transplant Assistance Fund** raises funds for uninsured medical expenses related to transplantation. (<http://www.transplantfund.org>)
- **Hepatitis clinical trials** are available to a limited number of people. (<http://clinicaltrials.gov/ct2/results?term=hepatitis>)

Appendix I—Hepatitis C Training Programs for Substance Abuse Treatment Program Staff

Focus on Hepatitis C was developed by the Hepatitis C Association, sponsored by the Substance Abuse and Mental Health Services Administration. The 3-hour training includes a PowerPoint presentation, a question-and-answer session, and a discussion of local resources. Content includes functions of the liver, risk factors, modes of transmission, diagnostic process and treatment of HCV, natural history and progression of HCV and HCV/HIV co-infection, healthful lifestyle choices that preserve liver health, counseling guidelines, and issues and challenges in providing care for clients with hepatitis C in treatment centers. Training provides information on locating community resources; Web sites, toll-free support lines, and venues for medical care; and information on obtaining treatment assistance for people who are not insured or are underinsured. Continuing education credits can be earned (<http://www.hepcfocus.com>).

- The **Centers for Disease Control and Prevention** (CDC) maintains numerous trainings and resources (<http://www.cdc.gov/ncidod/diseases/hepatitis/resource/training/counseling.htm>).
- **HCV Advocate** offers training resources and information from the client's perspective (http://www.hcvadvocate.org/hepatitis/training_resources.asp).
- **CDC's Division of Viral Hepatitis** provides funding to HCV coordinators across the country to offer viral hepatitis counseling, testing, vaccinations, and other services (<http://www.cdc.gov/hepatitis/index.htm>).
- Pharmaceutical manufacturers of hepatitis medications are often willing to conduct free onsite training sessions for counseling staff. Contact manufacturers directly.

Appendix B—Glossary

acetaminophen—The generic name for a common nonprescription medication used to treat mild pain or fever.

acute hepatitis—An inflammatory process in the liver that resolves in 6 months.

adefovir dipivoxil—A U.S. Food and Drug Administration-approved antiviral medication for treating chronic hepatitis B, taken orally.

alanine aminotransferase (ALT)—An enzyme found in the liver; an increased level of ALT in the blood indicates liver inflammation.

albumin—A protein made in the liver that helps move small molecules through the bloodstream. It plays an important role in keeping the fluid from the blood from leaking into the tissues. If albumin drops to very low levels, fluid might leak into tissues from the blood vessels, resulting in edema (swelling).

alkaline phosphatase (ALP)—An enzyme found in the liver and other parts of the body; elevated levels might indicate liver injury.

antibody—A type of protein produced by the body's immune system. Antibodies protect the body from disease by binding to antigens (see below) and destroying them.

antigens—Foreign substances (e.g., bacteria, viruses) in the body that are capable of causing disease. The presence of antigens in the body triggers an immune response, usually the production of antibodies (see above).

antiviral (literally against-virus)—Any medicine capable of destroying or weakening a virus or suppressing its ability to replicate.

aspartate aminotransferase (AST)—An enzyme found in the liver; an increased level of AST in the blood indicates liver inflammation.

asymptomatic—Presenting no symptoms of disease.

boceprevir—A U.S. Food and Drug Administration-approved medication for treating chronic hepatitis C, taken orally.

chronic hepatitis—An inflammatory process in the liver that lasts longer than 6 months.

cirrhosis—Irreversible scarring of the liver caused by ongoing damage, which might affect liver function. Cirrhosis in some cases can lead to liver failure, liver cancer, and death.

co-infection—The condition of an organism or cells being infected simultaneously by two different pathological microorganisms, such as infection with both hepatitis C virus and HIV.

contagious—Capable of being transmitted from one person to another by contact or close proximity.

coronary heart disease—A narrowing of the small blood vessels that supply blood and oxygen to the heart. Also called coronary artery disease.

decompensated cirrhosis—A progression of cirrhosis that can be life threatening. Symptoms include internal bleeding, large amount of fluid in the abdomen, encephalopathy (confusion), and jaundice.

end-stage liver disease—Severe damage to the liver. End-stage complications include liver failure and liver cancer. These conditions occur primarily in people who develop permanent scarring of the liver (cirrhosis).

entecavir—An oral prescription medicine used for chronic infection with hepatitis B virus in adults.

enzyme—A protein (or, rarely, ribonucleic acid) that catalyzes a chemical reaction; it is produced by living cells and catalyzes specific biochemical reactions at body temperatures.

exposure—Coming in direct contact with an agent that might cause a disease or infectious process (e.g., exposure to hepatitis B virus might result in hepatitis B infection).

fecal–oral route—A mode of transmission of an infectious agent from person to person by putting something in the mouth that has been contaminated with infected stool (feces).

fibrosis—Scar tissue developed as a result of chronic infection and inflammation. The presence of fibrosis usually means infection has been active for several years.

genotype—The genetic makeup of the virus that describes the “family” to which the specific virus belongs.

hepatitis—Inflammation of the liver. The most common cause is infection with a hepatitis virus, but hepatitis can also be caused by other viruses, bacteria, parasites, and toxic reactions to drugs, alcohol, and chemicals.

hepatitis A—An inflammatory process of the liver caused by the hepatitis A virus.

hepatitis B—An inflammatory process of the liver caused by the hepatitis B virus.

hepatitis B core antibody—A protein that appears at the onset of symptoms in acute hepatitis B and persists for life. Its presence indicates previous or ongoing infection with the hepatitis B virus.

hepatitis B surface antibody—A protein that the immune system produces to attack hepatitis B virus. Its presence generally indicates recovery and immunity from the hepatitis B virus.

hepatitis B surface antigen—A serologic marker on the surface of the hepatitis B virus. It can be detected in high levels in serum during acute or chronic hepatitis.

hepatitis B virus DNA (deoxyribonucleic acid)—A molecule that controls the manufacture of the hepatitis B virus. Its presence indicates active viral replication; high levels correlate with high rates of replication. Levels predict response to antiviral therapy.

hepatitis C—An inflammatory process of the liver caused by the hepatitis C virus.

hepatitis C virus RNA (ribonucleic acid)—A fragment of the replicating hepatitis C virus. It can be detected using sophisticated tests to determine the level of the virus in serum.

hepatocellular carcinoma—The most common primary liver cancer.

high-risk behavior—Behavior that puts a person at risk of contracting hepatitis (e.g., sharing needles or drug paraphernalia; having multiple sex partners).

high-risk group—A group with an elevated risk of disease.

immune system—The complex system in the body responsible for fighting disease. It identifies foreign substances in the body (e.g., bacteria, viruses, fungi, parasites) and develops a defense against them known as the immune response. It produces protein molecules called antibodies to eliminate foreign organisms that invade the body.

immunity—Protection against a disease. There are two types of immunity: passive and active. Immunity is indicated by the presence of antibodies in the blood and can usually be determined with a laboratory test.

immunization—The process by which a person or animal becomes protected against a disease.

immunoglobulin—Proteins found in the blood that function as antibodies that fight infection.

infection—An invasion of an organism by a pathogen such as bacteria or viruses. Some infections lead to disease.

infectious—Capable of spreading disease. Also called communicable.

interferon—A group of proteins produced naturally by the cells of human bodies; interferon increases the resistance of surrounding cells to attacks by viruses.

jaundice—Yellow color in the skin, the mucous membranes, and the eyes.

lamivudine—A U.S. Food and Drug Administration-approved antiviral medication for treating chronic hepatitis B, taken orally.

liver enzyme—A protein that catalyzes chemical reactions needed for body functions. Levels of certain enzymes, such as alanine aminotransferase and aspartate aminotransferase, are higher when the liver is injured, as they leak into the bloodstream when the cell is inflamed, injured, or destroyed.

liver panel—Common blood tests that are used to evaluate liver function. Also called liver function tests.

medication-assisted treatment (MAT)—Treatment for substance use disorders that uses medications such as methadone, buprenorphine, or naltrexone.

neutropenia—Low count of a type of white blood cell. Neutropenia has several causes including side effects of medications, viral infections, and autoimmune diseases.

pulmonary disease—A disease of the lungs.

ribavirin—A U.S. Food and Drug Administration-approved antiviral medication that improves the effectiveness of interferon in treating chronic hepatitis C, taken orally.

ribonucleic acid (RNA)—Chemical found in the nucleus and cytoplasm of cells; plays an important role in protein synthesis and other chemical activities of the cell.

sustained virologic response (SVR)—Achieving and sustaining a virus negative state for 6 months or longer after completing treatment for a virus, such as hepatitis C.

telaprevir—A U.S. Food and Drug Administration-approved medication for treating chronic hepatitis C, taken orally.

telbivudine—A U.S. Food and Drug Administration-approved medication for treating hepatitis B, taken orally.

tenofovir—A U.S. Food and Drug Administration-approved medication for treating hepatitis B, taken orally.

transmission—An incident in which an infectious agent is passed from one person to another.

viral load—Measurement of the amount of virus in the bloodstream.

virologic relapse—A return of the hepatitis C virus after antiviral treatment.

virus—An organism that multiplies within cells and causes diseases such as chickenpox, measles, mumps, rubella, pertussis, and hepatitis. It is not affected by antibiotics, the medications used to kill bacteria.