

## **Chronic Hepatitis C Viral Infection: An Overview of the Silent Killer**

### **NYSNA Continuing Education**

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## How to Take This Course

Please take a look at the steps below; these will help you to progress through the course material, complete the course examination and receive your certificate of completion.

### 1. REVIEW THE OBJECTIVES

The objectives provide an overview of the entire course and identify what information will be focused on. Objectives are stated in terms of what you, the learner, will know or be able to do upon successful completion of the course. They let you know what you should expect to learn by taking a particular course and can help focus your study.

### 2. STUDY EACH SECTION IN ORDER

Keep your learning "programmed" by reviewing the materials in order. This will help you understand the sections that follow.

### 3. COMPLETE THE COURSE EXAM

After studying the course, click on the "Course Exam" option located on the course navigation toolbar. Answer each question by clicking on the button corresponding to the correct answer. All questions must be answered before the test can be graded; there is only one correct answer per question. You may refer back to the course material by minimizing the course exam window.

### 4. GRADE THE TEST

Next, click on "Submit Test." You will know immediately whether you passed or failed. If you do not successfully complete the exam on the first attempt, you may take the exam again. If you do not pass the exam on your second attempt, you will need to purchase the course again.

### 5. FILL OUT THE EVALUATION FORM

Upon passing the course exam you will be prompted to complete a course evaluation. You will have access to the certificate of completion **after you complete the evaluation**. At this point, you should print the certificate and keep it for your records.

## **Course Introduction**

Chronic Hepatitis C (HCV) now ranks on our priority list of significant public health problems. About 70% of persons infected with chronic HCV develop chronic liver disease, which is the 12<sup>th</sup> leading cause of death in adults in the US (CDC, 2003). The Centers for Disease Control (CDC) estimates that approximately 4 million Americans are currently infected with Hepatitis C Virus (HCV) (CDC, 2003). Healthcare workers need a double focus on this problem. First, they must understand the routes of infection, be able to identify risky behaviors, know the signs and symptoms of infection, acquire a knowledge base of disease pathology for their own understanding as well as patient education, and understand treatment options and possible side effects. Second, health care providers need to know how to protect themselves from accidental infection and the proper channels for counseling, testing, and treatment should an occupational exposure occur.

At present there is no cure or vaccine for HCV. Because many people who are infected with HCV remain asymptomatic, they may not take proper precautions not to infect someone else. According to CDC reports, there were approximately 21,000 new cases of HCV infection in 2001. Chronic HCV infection remains the leading cause of liver transplants in the United States (Cummings et al., 2001).

## **Course Objectives**

Upon completion of this course, the learner will be able to:

- Identify the routes of infection for Hepatitis C
- Discuss risky behaviors that may lead to Hepatitis C infection
- Distinguish between Hepatitis A, B, C, D, E
- Identify symptoms of Hepatitis C
- Discuss treatment options for Hepatitis C
- Describe the risk of occupational exposure and the prevention of Hepatitis C

## **About the Author**

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## Definitions

- **Acute Hepatitis C infection:** a newly acquired infection that may or may not be symptomatic. In asymptomatic people the most frequently seen characteristic is fluctuating ALT levels. The estimated time from infection to symptom development is about 6 to 7 weeks.
- **Serum alanine aminotransferase (ALT):** this test is sensitive for hepatocyte injury and is used to detect liver disease and hepatic cirrhosis.
- **Arthralgia:** joint pain
- **Chronic Hepatitis C:** chronic infection with Hepatitis C virus characterized by inflammation of the liver and elevated serum liver enzymes. The disease progresses slowly with few, if any, symptoms for two or more decades after infection. HCV is most often identified after the identification of HCV-antibodies following blood donation or an elevated ALT level during a routine examination.
- **Hepatic Cirrhosis:** a chronic disease of the liver characterized by architectural changes that result in a loss of functioning of the liver cells and an increased resistance to the flow of blood through the liver.
  
- **Cryoglobulemia:** a systemic disorder with symptoms that include purpura, arthralgia, and weakness. Symptoms seem to be caused by the presence of an abnormal protein in the blood that precipitates and may lead to occlusion of the vessels.
- **Etiology:** cause of the disease.
- **Extrahepatic Symptoms:** symptoms appearing somewhere other than the liver.
- **Genotype:** the combination of genes of an organism.
- **Glomerulonephritis:** an inflammation of the kidney primarily involving the glomeruli, resulting in hematuria, proteinuria, edema, and hypertension.
- **Hepatic Failure:** the inability of the liver to function as the result of a disease process.
- **Jaundice:** a yellow color on the skin, in the urine, and in the white of the eyes usually caused by a blockage of the bile duct, malfunctioning of the liver cells, or an excess destruction of red blood cells.
- **Occupational Exposure:** accidental exposure to an infectious agent while performing routine job duties. The consistent use of universal precautions greatly decreases the chance of exposure and/or infection.
- **Porphyria Cutanea Tarda:** a skin condition that results from an abnormality in porphyrin metabolism and extrinsic factors. Friable skin, a change in natural pigmentation, the appearance of vesicles, and bullae characterize this disease.
- **Urticaria:** a vesicular reaction associated with clear translucent wheals and itching
- **Vasculitis:** inflammation of the vessels of the blood and lymphatic system
- **Viral Load:** an estimate of the number of copies of virus in the circulating blood

## **Historical Background**

The disease we know as Hepatitis C was commonly referred to before genomic identification as non-A/non-B hepatitis. As you could easily assume from the name, once scientists had identified Hepatitis A and B viruses, they realized that there was at least one more agent responsible for the hepatitis syndromes they were seeing. Using highly technical microbiology techniques they were able to develop a test to detect antibodies to the virus, as well as characterize the virus itself.

HCV is a small virus from the flaviviridae family, and is related to the viruses responsible for causing Dengue Fever and Yellow Fever in humans, and Hog Fever in animals. The virus is highly variable and at least 6 genotypes have already been identified. Because of this high level of variability, scientists have had difficulty in developing a vaccine to prevent Hepatitis C infection. Also, there is the possibility of infection with multiple strains among persons with high-risk behaviors which can influence test and treatment results (Cecil, 1996).

Research continues to reveal new information about the diseases we now know as Hepatitis A, B, and C. Hepatitis D and E have also been identified, and further research may lead to the discovery of yet additional viruses.

## **Types of Hepatitis**

To clarify the differences in etiology, pathology, and diagnosis of the known types of hepatitis, a short summary of each follows:

### **Hepatitis A**

Hepatitis A virus (HAV) is almost always spread by the oral-fecal route. Contaminated water and food facilitate transmission. The virus is associated with child care centers, gay men, and food workers. Research has indicated a strong link between infection with HAV and lower socio-economic status. Good personal hygiene is the best prevention. Immunization is available for HAV and should be considered for travelers' and persons infected with HCV.

Viral incubation for HAV ranges from 2 to 6 weeks. Symptoms can be non-specific and mimic a mild flu-like syndrome. Rarely there can be more serious sequelae, which can include jaundice, systemic immune responses, and hepatic failure.

### **Hepatitis B**

Hepatitis B virus (HBV) is transmitted through parental routes and is abundantly found in body fluids and secretions. Routes of infection include unprotected sexual contact; punctures with contaminated needles, and maternal/fetal transmission. It is a major pandemic, with 300 million chronic carriers reported worldwide (Imperial, 1999). A series of three immunizations are available for HBV.

Viral incubation for HBV ranges from 4 weeks to 6 months. Extrahepatic symptoms include urticaria and rashes, and less frequently glomerulonephritis and vasculitis.

### **Hepatitis C**

Hepatitis C virus is transmitted primarily through inoculation with a large amount of serum from an infected individual, thus the most common routes of infection are through blood transfusion or needle sharing. Other persons at risk include organ recipients and renal dialysis patients.

Viral incubation for HCV ranges from 5 to 7 weeks. Many people remain asymptomatic and diagnosis is often serendipitous.

### **Hepatitis D**

Hepatitis Delta virus (HDV) is usually seen as a complication of HBV infection. This is because infection requires antecedent or simultaneous infection with HBV. About 5% of people infected with HBV will be co-infected with HDV. Hepatitis D is most commonly spread through exposure to infected blood via transfusion or sharing syringes. There have been reports in some geographic areas of sexual transmission. In most cases HDV resolves as HBV resolves and is cleared from the serum.

### **Hepatitis E**

Hepatitis E virus (HEV) is usually transmitted via the fecal-oral route. It is hardly ever seen among people living in Europe, the United States, or Canada, the exception being persons with a travel history to the more endemic areas.



The viral incubation for HEV ranges from 2 to 9 weeks. The most vulnerable populations include adolescents and young adults and less frequently, children. Skin rash and arthralgia are common, and there is a high rate of jaundice.

## Routes of Hepatitis C Viral Infection

There are numerous ways that people can become infected with HCV:

- Sharing needles to inject intravenous (IV) drugs. HCV is sometimes referred to as the “silent killer” because people who are infected can remain asymptomatic for many years. Even if someone only shares needles one time they could be infected with HCV. The use of IV drugs accounts for about 60% of HCV cases (CDC, 2003). There is some evidence that sharing straws to snort drugs can also result in accidental exposure to small amounts of blood and lead to infection.
- Having a blood transfusion or organ transplant before 1990. Reliable commercial tests for HCV were not available before that year. As early as the mid to late 70’s it became obvious that about 90% of post transfusion hepatitis was caused by a then unknown non-A /non-B virus. In May 1990 a program was initiated to screen all donated blood for HCV. A second more sensitive test was developed and used in 1992, reducing the risk for HCV infection to 0.001% per unit transfused (CDC, 1998). About 10% of HCV cases today are the result of transfusions prior to adequate blood testing.
- People who have any clotting factor problems and were given blood products before 1985 (Factor VIII) and 1987 (Factor IX) (CDC, 1998).
- Newborns of HCV-infected mothers. The average rate of infection is about 6% in non-HIV+ mothers/infants compared to about 17% in infants born to HIV+ mothers (CDC 2003). There is no known association between breast feeding or method of delivery and HCV infection.
- People who have had any procedures performed with an unsterilized needle including:
  - tattoos
  - ear and body piercing
  - acupuncture
  - electrolysis
- Sharing household articles that can harbor small amounts of blood may pose a slight risk of infection. These items may include:
  - razors
  - finger nail clippers
  - scissors
  - toothbrushes
- Long term renal dialysis patients
- People exposed to infected blood through occupational accidents such as needlesticks.
- Having unprotected sex with someone who has HCV accounts for about 15% of infections. The risk of infection increases with multiple partners. People with a break in the skin or mucosal barriers of the mouth, anus, or vagina also are at increased risk. The risk of infection in monogamous couples when one partner is infected with HCV is very low (about 1.5%). Transmission of HCV is more efficient from men to women, and there is no increase in risk between men who have sex with men than between heterosexuals (CDC, 2003)

About 10% of cases are unable to identify a risk factor for infection.

## **Signs and Symptoms of Hepatitis C Viral Infection**

People who are infected with HCV may remain asymptomatic for many years. Some people experience an intermittent flu like syndrome for several months that can include fatigue, body aches, fever, chills, and nausea. Because the symptoms can be so vague, many people never go to their health care provider, and eventually they feel better without any treatment. Occasionally a person may become jaundiced and their skin and the whites of their eyes become yellow. One important sign of HCV infection is an elevated serum alanine aminotransferase (ALT). It is important to remember that while elevated ALTs can be an indicator of HCV infection, recent studies have shown that some liver disease can be present even in persons with normal ALTs when they have chronic HCV infection.

HCV infection will not show up with routine blood work. Diagnosis is only possible if the health care provider orders a test that is specific for HCV. The tests recommended for routine testing of asymptomatic persons are the enzyme-linked immunosorbent assay (ELISA) or HCV viral load (HCV RNA). Confirmatory testing using the Recombinant Immunoblot Assay (RIBA) will eliminate false positive antibody results. In the case of indeterminate results, a thorough medical examination as well as additional testing of HCV Polymerase chain Reaction (PCR) and ALTs may be done, or the ELISA can be repeated in 2 or more months (CDC, 1998).

## **Effects of Chronic Hepatitis C Viral Infection**

Not every person infected with HCV progresses in the same manner. About 15 to 20% of persons who are infected spontaneously combat the infection with no treatment. These people may never even know they have been infected. Studies focusing on these individuals have not been successful in identifying any variables consistently linked to these phenomena (Quinn et al, 1999). Of the remaining 80 to 85%, about 70% go on to develop chronic liver disease; 15 to 20% develop cirrhosis; and the remaining 5 to 10% die from liver cancer (hepatoma) or liver failure (Lee et al, 2000).

No definitive factors have been isolated that accurately predict the progression to chronic liver disease, but several possible factors have been identified in population based studies. These include: male gender, infection after age 40, co-morbidity with other viruses (ie. HIV), mode of acquisition (Imperial, 1999), and co-infection with chronic HBV (CDC, 2003). Ingestion of even moderate amounts of alcohol (greater than 10g/d) have been shown to accelerate disease progression leading to architectural changes in the liver and fibrosis. There is a much greater risk of hepatocellular carcinoma among persons with cirrhosis (CDC, 1998).

HCV infection leads to a generalized inflammation of the liver, which results in a liver that is swollen and tender. Chronic infection can lead to injury and/or scarring. Proper liver functioning is necessary to metabolize medications, filter waste products from the blood, and produce factors that help the blood to clot. An improperly working liver can affect many systems needed for homeostasis in the body.

Occasionally, HCV infection can affect body organs other than the liver. These extrahepatic conditions may result from the body's immune system fighting itself (Fuhrman, 2000). They include glomerulonephritis, essential mixed cryoglobulemia, and porphyria cutanea tarda.

## Treatment Options

Before initiating treatment with medication, the healthcare provider will perform a comprehensive exam on someone diagnosed with HCV. This will include a complete physical and blood work to determine if there are any coexisting medical complications which will interfere with treatment. HCV specific labs include a HCV Polymerase chain reaction (PCR) to detect the presence or absence of virus, HCV titer (HCV RNA) to determine the number of copies of virus present, and genotype to identify the strain of virus that the individual is infected with. Routine labs include complete blood count (CBC), ALT, thyroid-stimulating hormone (TSH), alpha feto-protein (AFP), anti-nuclear antibodies (ANA), and urine for pregnancy. Finally, a liver biopsy should be done for staging and grading of any liver disease. It is important to determine the spread of the infection (stage) as well as any architectural changes (grade) in the liver (Ishak et al, 1995). People with hemophilia or other bleeding disorders may not be candidates for a liver biopsy.

The purpose of HCV treatment is two-fold, to eradicate the virus from the body and to stop the progression of liver disease. Currently there are only a few medications that are FDA approved for treatment of HCV.

**$\alpha$ -Interferon ( $\alpha$ -INF)** is the medication best known for HCV treatment. It is a substance native to our bodies and is produced in response to infection. Having treatment with INF increases the amount available in our bodies to fight infections.

$\alpha$ -INF is administered subcutaneously (sq) three times a week. The length of treatment is usually one year. There are many side effects from this drug including flu like symptoms, depression, head and muscle aches, nausea and vomiting, and insomnia. Studies have shown that it is highly effective in only a small number of people (fewer than 20%). While this treatment is not ideal, in some cases it can slow the progression of liver disease and prevent further damage.

In the spring of 2001 a new product received FDA approval for the treatment of HCV. Pegulated INF alpha-2a (PEG INF) is dosed sq once a week due to a longer half-life, sustained absorption, and a slower clearance rate. Early studies reported fewer side effects and greater viral suppression with this new medication than with  $\alpha$ -INF (Zeuzem et al, 2000).

Ribavirin is a medication taken orally that does not have an effect on HCV when used alone but when used with PEG INF it has a synergistic effect. In studies that have already been done, up to 30 to 40% of people with certain genotypes who were treated with a combination therapy of PEG INF and Ribavirin have had a significant decrease in the amount of HCV in their bodies (HCV viral load).

Although combination therapy with these medications appears to be very promising, treatment is very costly and can result in serious side effects. Most importantly, PEG INF and Ribavirin should never be prescribed to someone who is pregnant because of the highly toxic effect on the fetus. All women, including female partners of men being treated, should agree to use two methods of birth control (one must be a barrier), before beginning therapy. In addition to the side effects mentioned above, other possible side effects include:

- neutropenia (low white blood count), at times severe
- anemia (low red blood count), at times severe
- fatigue
- confusion
- hair loss

More serious side effects can include:

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- seizures
- heart failure
- renal disease
- suicidal thoughts
- thyroid disease
- hearing loss
- medical conditions that effect the eye
- blood infection

As with any medications, people experiencing any of these symptoms should contact their healthcare provider immediately.

In some cases medication therapy may not be an option for someone who has chronic HCV infection. This is usually because the person's liver disease is so far advanced the liver specialists do not feel medication will be effective. However, if candidates have a long history of psychiatric illness, especially major depression and/or suicide attempts, they also will not be considered for treatment. If medication therapy is not an option for any reason, liver transportation may be considered. This is a decision that is made only after all other options have been fully explored. There is a limited number of organs available for transplant.

## Occupational Exposure to Hepatitis C Virus

Because healthcare providers and other hospital staff are more routinely exposed to potentially infective substances than the average worker, it is important that they do not take chances to save time or steps, but always use Universal Precautions. The rate of infection with HCV after a needle stick is about 1.8% (CDC, 2003). Presently, the CDC does not recommend that health care workers who are accidentally exposed receive any type of post exposure prophylaxis. All possible accidental exposures should be reported immediately to assure prompt medical attention. The table below describes current recommended treatment post exposure.

### CDC Recommendations for Testing After Occupation Exposure for HCV

#### SOURCE KNOWN HCV+

Baseline testing as soon as possible post-exposure for anti-HCV

Repeat anti-HCV test at 4-6 months and monitor ALT

HCV PCR may also be performed at 4 to 6 weeks \*

\*Hepatitis C Virus antibodies

#### SOURCE STATUS UNKNOWN

Test worker and source for anti-HCV as soon as possible

Repeat anti-HCV testing for the worker at 4 to 6 months and monitor ALT

HCV PCR may be performed at 4 to 6 weeks

Healthcare workers who have chronic HCV are at low risk of infecting patients but they should still remember to use Universal Precautions. Currently CDC does not recommend any restrictions for healthcare workers infected with Chronic HCV (CDC 2003). Proper hand washing and the use of appropriate protective barriers are important for their own safety and the safety of their patients. Special attention should be paid to assure the proper disposal of needles and other sharp instruments.

## Conclusion

While we know much more about Hepatitis C now than we did in the mid- 70s, there are still many things we need to understand. Hepatitis C is a blood borne disease, and can be spread by exposure to infected blood through sharing needles or accidental needlesticks (including tattoos and piercing), transfusions, organ transplants, unprotected sex with multiple partners, and the maternal/fetal route. Even sharing razors, scissors, or nail clippers with infected persons can be risky. Hugging, kissing, coughing, and sharing eating utensils and bathrooms with someone who has HCV will not be a source of infection.

Signs and symptoms of HCV usually involve a mild flu-like syndrome but can become very serious and even cause death. Many people who have chronic HCV do not even know they are infected. HCV can only be detected by specific blood tests that identify antibodies to HCV. An abnormal ALT can be a clue to suspect HCV infection.

Current treatments involve sq injections of  $\alpha$ -INF alone or PEG INF with oral medications as a combination therapy. Early studies of patients treated with Pegulated INF with ribavirin have shown promising results. In some cases, people with advanced liver disease may not be candidates for treatment with medications because of co-existing medical or psychiatric conditions or the stage of their liver disease, and a liver transplant may be recommended.

Healthcare providers and other hospital staff can help their patients by staying up to date on information related to HCV. Knowing the routes of infection, being able to identify high risk behaviors, assessing for signs and symptoms, understanding the pathology, and being familiar with treatment options and possible side effects will assure quality care and positive patient outcomes. A thorough knowledge of HCV will also remind workers to use Universal Precautions to avoid accidental injury.



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## Chronic Hepatitis C Viral Infection: An Overview of the Silent Killer Course Exam

After studying the downloaded course and completing the course exam, you need to enter your answers online. **Answers cannot be graded from this downloadable version of the course.** To enter your answers online, go to e-leaRN's Web site, [www.elearnonline.net](http://www.elearnonline.net) and click on the Login/My Account button. As a returning student, login using the username and password you created, click on the "Go to Course" link, and proceed to the course exam.

- Hepatitis C is a bloodborne pathogen.
  - True.
  - False.
- All of the following are ways that persons become infected with HCV **EXCEPT**:
  - Unprotected sex.
  - Contaminated water.
  - Sharing of intravenous injection equipment.
  - Procedures where an unsterilized needle may be used such as tattoos, piercing, electrolysis or acupuncture.
- The sharing of household articles where a small amount of blood may linger such as finger nail clippers, razors, scissors or toothbrushes are not a route of infection for HCV.
  - True.
  - False.
- The early symptoms of Hepatitis C are vague, intermittent flu-like symptoms that can include fatigue, body aches, fever, chills, and nausea.
  - True.
  - False.
- Diagnosis of Hepatitis C can be made only with specific HCV testing such as all of the following **EXCEPT**:
  - Enzyme-linked immunosorbent assay (ELISA).
  - HCV Polymerase chain reaction (PCR).
  - HCV RNA to detect viral load.
  - Alpha interferon.
- The progression of Hepatitis C is variable, with infected individuals having a range of responses from no illness to chronic liver disease, cirrhosis or liver cancer.
  - True.
  - False.

7. The purpose of HCV treatment is:
- A. To eradicate the virus from the body.
  - B. To stop the progression of liver disease.
  - C. Neither A or B.
  - D. Both A and B.
8. Treatment for HCV includes all the following medications **EXCEPT**:
- A. Alpha Interferon.
  - B. Pegulated Interferon alpha-2a.
  - C. Cutanea Tarda.
  - D. Ribavirin.
9. Side effects to the medications used to treat HCV can be very serious including neutropenia, heart failure, seizures, renal disease as well as being highly toxic to the fetuses of pregnant women.
- A. True.
  - B. False.
10. Universal precautions are the best way for healthcare workers to protect themselves from the risk of infection with HCV.
- A. True.
  - B. False.