

# Hepatitis C

## An Update for Occupational Health Nurses

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by Patrice C. Al-Saden, RN, CCRC

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Just 5 years ago, the *AAOHN Journal* published the article, "Hepatitis C: An Emerging Dilemma" (Al-Saden, 1999). Hepatitis C is no longer an emerging dilemma, it is a public health problem. During the next decade, the number of individuals who suffer from complications of hepatitis C is expected to triple. Yearly, the United States spends more than \$600 million on the health care costs associated with liver disease related to the hepatitis C virus (HCV) (Lavanchy, 2000). In terms of human costs, 8,000 to 10,000 deaths are attributable to HCV yearly in the United States (Alter, 1997). Twenty-two percent of all hepatocellular carcinomas are caused by hepatitis C. It is the number one reason for liver transplant in the United States, with costs of more than \$300 million dollars a year. The problem is so large worldwide, more than 130 countries report hepatitis C infections (Booth, 2001).

Since the 1999 article (Al-Saden), much has been learned about hepatitis C and its treatments. This article describes these updates. The 1999 article focused on Occupational Safety and Health Administration (OSHA) standards, occupational health administrative controls, blood and body fluid exposures, treatment of exposures, counseling the exposed, prevention of future exposures in the workplace, and correction of potential exposure haz-

ards. In recent years, there have been specific reports about the risk of occupationally acquired HCV infection, particularly needlestick exposures. It is estimated there are as many as 800,000 sharps injuries to health care workers (HCWs) in the United States yearly. This prompted the Needlestick Safety and Prevention Act, signed into law November 6, 2000 (American Nurses Association, 2000). Although occupational exposure is addressed briefly in this article, the main focus is on the public health aspects of the disease.

### EPIDEMIOLOGY

Officially discovered and named in 1989, HCV is of the genera hepaciviruses, which is one of three genera in the *Flaviviridae* family. The 68 recognized members of the *Flaviviridae* family include the viruses that cause yellow fever, dengue fever, hemorrhagic fever, and bovine viral diarrhea (Stanford University, 2004). Hepatitis C is a very hepatotropic, or "liver oriented," disease. The liver is the reservoir for the virus. The virus causes an immune response in the liver that triggers a flood of white cells to the area causing inflammation. The prolonged inflammation, in turn, damages liver tissue. The injury causes fibrosis (scarring). If the scarring is not lessened or stopped by HCV treatment, it continues to progress and becomes cirrhosis, which can lead to decompensation, and eventually to liver failure.

In the United States alone, 1.8% of the population (approximately 4 million individuals) is believed to be HCV antibody positive. This figure is believed to be low because it does not account for individuals who are incarcerated and homeless (Center for Disease Control and Prevention [CDC], 2001). If the CDC figures are correct, approximate-

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ly 1,360,000 more individuals infected with hepatitis C are incarcerated or homeless. This means more than 5 million individuals in the United States are HCV antibody positive, with 80% to 90% testing positive for HCV RNA (replicating virus, the marker of active infection).

The CDC reports hepatitis C is the most common chronic bloodborne infection in the United States (CDC, 2001). Worldwide, hepatitis C infects more than 3% of the population. The country with the highest prevalence rate is Egypt. It is estimated that more than 18% of the Egyptian population is infected. This is primarily caused by parenteral therapy more than 20 years ago throughout the country for schistosomiasis, which is endemic in Egypt (Kim, 2002; Lavanchy, 2000).

### NATURAL HISTORY

The natural history of chronic HCV shows a slow progression of disease in the majority of cases. If 100 individuals are infected with HCV, 15% to 20% resolve the infection on their own. Approximately 75 develop chronic infection, and 15% to 20% of those individuals develop complications or cirrhosis leading to liver transplant. Seventy-five percent of individuals with chronic infection develop various levels of liver damage (mild to moderate) and live their "normal" life with "normal" life expectancy. There is no way to determine in whom the disease will progress and in whom it will not. The final 1% to 5% of individuals develop hepatocellular carcinoma (Lauer, 2001), and usually die within 6 months of diagnosis.

The morbidity and mortality from HCV increases after the second decade of infection. Peak mortality from HCV in the United States is expected around the year 2015 (Hepatitis Resource Network [HRN], 2001). Factors affecting disease progression and outcome include:

- Age at time of infection.
- Gender.
- Smoking status.
- Alcohol use.
- Illicit drug use.
- Co-infection(s).
- Virus levels or presence of quasispecies.
- Genotype(s).
- Chronic exposure to hepatotoxins (known and unknown).
- The host's immune system (Lauer, 2001; Pessione, 2001).

### DIAGNOSIS

Diagnosis of HCV exposure is confirmed with a positive HCV antibody test. Fifteen to twenty percent of individuals exposed to the disease clear the virus and are considered "cured." The other 80% to 85% become chronic carriers of the virus.

Diagnosing hepatitis C is usually accidental. Diagnosis of an acute infection is rare because more than 70% of individuals with an acute infection are asymptomatic. "Classic" acute hepatitis C signs and symptoms occur less than 30% of the time and are similar to the other acute hepatitis viruses' signs and symptoms. Symptoms

include any one or any combination of the following (Al-Saden, 1997, 1999):

- Malaise.
- Anorexia.
- Weight loss.
- Elevated enzymes.
- Jaundice.
- Urticaria.
- Pruritic hives.
- Tea colored urine.
- Clay colored stools.
- Vague tenderness in the right upper quadrant.
- Skin and scleral icterus.
- Nausea.
- Vomiting.
- Enlarged palpable liver.

Many individuals are informed of the diagnosis at the time of blood donor screening. Others with symptoms attribute the way they feel to influenza, stomach upset, lack of rest, chronic fatigue syndrome, fibromyalgia, or some other malady. The vast majority of individuals are diagnosed after they are chronically infected. Some are told they have elevated liver enzymes when tested for an insurance physical.

It is estimated approximately 38,000 acute HCV infections occur in the United States per year (Lauer, 2001). The presence of HCV antibodies does not mean one has had the infection, cleared it, and now carries protective antibodies. The antibodies mean an individual has been exposed. If RNA is present, the individual is chronically infected (more than 6 months).

Testing for hepatitis C has come a long way since the discovery of the virus in 1989 (Booth, 2001). The ELISA (enzyme-linked immunosorbent assay) first generation antibody test lacked the needed sensitivity and specificity. Second generation ELISA 2 (1992) was more sensitive than the first generation testing, and the false positive rate dropped from 70% to between 40% and 50%. This shortened the "window period" (i.e., time of exposure to antibody seroconversion) by 6 weeks, allowing diagnosis of more infections more expediently after exposure. This decreased the number of positive blood donors. In effect, it dropped the transmission of HCV via blood and blood products to less than .001% per unit transfused (CDC, 1998). The ELISA 3 has a 97% sensitivity and has enabled diagnosis as early as 2 to 3 weeks after exposure. Even though the initial HCV test has high specificity, in areas of low prevalence (e.g., blood donors), a confirmatory test is conducted because of large numbers of false positive results (Gretch, 1997).

A recombinant immunoblot assay (RIBA) is the test run for confirmation of a positive ELISA. The RIBA tests are considered positive when there is a positive reaction in two or more of the antigen bands. If results are indeterminate (only one antigen band positive), tests for HCV RNA by polymerase chain reaction (PCR) are performed to confirm viremia and are used as a marker of HCV viral replication. During HCV treatment, quantitative HCV RNA assays are used to monitor the effectiveness of treatment. Laboratory variability in testing can affect results

with the majority of laboratory error being false negatives on HCV RNA positive samples (Gretch, 1997). Because of the many tests and varied results, the World Health Organization (WHO) has taken on the task of establishing international standardization of HCV RNA quantification with the units IU/mL (international units per milliliter). Some laboratories still report results in copies/mL, which is quickly becoming outdated and unacceptable. An approximate conversion of copies to international units is 2.5 copies/mL to 1 IU/mL (Pawlotsky, 2000).

## ROUTES OF TRANSMISSION

In the United States, the young adult population (i.e., ages 30 to 49) accounts for 65% of all HCV infections. In the 1980s, there were approximately 130 cases of HCV per 100,000 individuals per year. The incidence has decreased dramatically to approximately 26 cases per 100,000 individuals per year. This is because of better screening and testing of blood donors and donated blood, and needle exchange programs. Hepatitis C virus is acquired quickly after intravenous (IV) drug use is started. Within 5 years of initiating and continuing IV drug use, as many as 90% of users are HCV positive. This makes HCV the most prevalent infection among IV drug users. In the developed western countries, risk from health care related procedures is low, except among individuals undergoing chronic kidney dialysis. In spite of infection control practices, several reported patient to patient cases have occurred. Multi-dose vials contaminated by improper use and inadequate cleansing of reusable medical equipment (e.g., endoscopes, bronchoscopes) provide rare instances when transmission of the virus has occurred (Alter, 2000; Roberts, 2001).

In spite of all the possible chances for exposure to individuals who have been infected, physicians, dentists, and nurses do not have a higher prevalence rate of infection (1% to 2%) than the general population. The conversion rate for post-needlestick exposure is 1.8% (0% to 7% range) (Alter, 2000).

### Sources of Transmission

Sources of transmission are many and varied. High risk behaviors (e.g., injection drug use, multiple sexual partners) along with high viral load of the source at the time of exposure determine chances of transmission and subsequent seroconversion. The following are known or highly suspected risk factors for transmission.

*Needlesticks, Sharing Needles, and Other Wounds.* Sources include infected scalpels, needles, or sharps previously used on HCV infected individuals. Infected tattoo needles can transmit HCV. Traditional practices in some cultures (many in developing countries), such as ear or body piercing, blood letting, and tattooing with common needles are known sources for transmission of HCV. Reuse of improperly sterilized medical supplies, many of which are needles or syringes, is also a known transmission source. This is a particular issue in developing countries. In addition, reuse of a syringe or needle from an infected drug user provides a transmission source.

*Hepatitis C Infected Blood.* Transmission is possible if infected blood comes in contact with conjunctiva, an open area on the skin, or mucous membranes.

*Intranasal Drug Use.* Desiccated mucous membrane which is friable from intranasal drug use is a plausible way to pass infected blood along on any device used to apply the drugs (Alter, 2000).

*Oral Contact.* Transmission of HCV can occur through several types of oral contact including:

- Performance of oral sex on an infected person without using a condom or barrier if the individual performing the oral sex has open wounds or abrasions in the mouth.
- Performance of oral sex by an infected person on a person with open wounds or abrasions on the genital area.
- Oral contact with an infected person with open wounds or abrasions in the mouth.
- Use of improperly cleaned dental instruments.
- Recent dental work where bleeding in the mouth commonly occurs followed by kissing someone with open wounds on the lips or in the mouth.
- Use of an infected individual's toothbrush or eating utensils by a person with open mouth wounds (Romero, 1990; Terrault, 2002).

*Pregnancy.* Pregnancy is not contraindicated for women infected with HCV, but perinatal transmission can occur (less than 4.5%). Breastfeeding is not contraindicated because an active HCV infection is not found to be transmitted by this route, in spite of the fact that HCV is found in breast milk. However, experts believe that infants born to HCV positive mothers should be HCV antibody tested between 12 to 18 months. If there is urgency in knowing infant HCV status, a HCV RNA can be performed at 1 to 2 months. Mothers co-infected with HCV/HIV, and who have HCV RNA, increase the mother to infant infection rates to as high as 25% (Alter, 2000; National Institutes of Health [NIH], 2002).

*Manicures and Pedicures.* Improperly cleaned manicure or pedicure equipment can transmit HCV. It is advisable to have cuticles pushed back, rather than clipped and to have the manicurist use the infected individual's own manicure and pedicure equipment. Another recently identified risk factor is barber shop shaving with a common straight razor (Lavanchy, 2000).

*Sexual Intercourse.* Increased chances for sexual transmission occur with vaginal or anal sex with an infected person without use of a condom or other barrier along with a spermicidal agent and co-infection with HCV/HIV, multiple partners, and perhaps other sexually transmitted diseases (Alter, 2000; Terrault, 2002).

*Health Care Worker to Patient.* Physicians, nurses, dentists, and other HCWs who are infected can transmit the virus during invasive procedures such as surgery (Fry, 1997).

*Medical Instruments.* Colonoscopies, bronchoscopies, esophagogastroduodenoscopies have been found to transmit HCV virus if the scopes are not properly sanitized (Roberts, 2001).

*Blood Transfusions.* Transfusion related HCV is extremely rare today (.004% to .0004% per unit transfused) because of the development of the HCV second and third generation antibody tests (Gretch, 1997; Schreiber, 1996).

**Family Transmission.** Families sharing razors, toothbrushes, washcloths, and nail clippers are potential sources of transmission. Non-sexual household contacts have HCV prevalence rates of approximately .5% to 13% (Booth, 2001).

**Organ Transplantation.** Receiving organs or tissues from a hepatitis C infected donor can be a source of transmission. There is a window period that may allow for transmission, even if the source tests negative.

### **Risk of Exposure**

Generally, the risk of exposure can be identified based on how blood and body fluids are categorized. High risk body fluids include:

- Blood.
- Blood products.
- Semen.
- Vaginal secretions.
- Synovial fluid.
- Cerebral spinal fluid.
- Pleural fluid.
- Peritoneal fluid.
- Pericardial fluid.
- Amniotic fluid.
- Fluids from unknown or unidentified sources.

Low risk body fluids include:

- Feces.
- Nasal secretions.
- Sputum.
- Sweat.
- Tears.
- Urine.
- Vomit.
- Saliva, with the exception of saliva in the dental setting where blood may be present.

Exposing the virus to chloroform, formalin, heat of 100° C for 5 minutes, heat of 60° C for 10 hours, or beta-propiolactone ultraviolet light inactivates the virus (Fang, 1997).

The occupational health nurse can implement programs aimed at reducing the risk of HCV transmission from source patients, from patient to patient, and from HCW to patient. This is as simple as ensuring universal precautions are adhered to, that personal protective equipment (PPE) is used, and that there is proper handling and disposal of sharps. Proper sterilization of reusable medical, dental, and surgical equipment cannot be over emphasized. Workers in the equipment cleansing and sterilization (central supply) areas of the hospital should be initially certified and followed up with yearly re-certification or in-service to ensure guidelines are observed and implemented. All HCWs should be educated about bloodborne pathogens yearly. In addition, the use of disposable versus reusable medical, dental, and surgical devices should be encouraged.

### **GENOTYPES**

Genotype testing determines the sequence analysis of the virus. There are 6 main genotypes that vary approximately 33% from one other. Within the genotypes there

are subtypes (assigned a letter of the alphabet in order of discovery) which can vary as much as 23%. Genotypes 7 to 11 are not separate genotypes, as previously believed, but subtypes within genotypes 3 and 6 based on their phylogenetic analysis (Simmonds, 2000). Genotypes have various geographical distribution. Genotypes 1, 2, and 3 are found worldwide, but 70% of all HCV in North America is Genotype 1 (primarily 1a and 1b). The genotype is useful in predicting how effective treatment may be. One may be infected with multiple genotypes and subtypes. Unfortunately, Genotype 1, particularly 1b is the most resistant to treatment for reasons not yet fully understood. If the patient has not been treated with interferon and ribavirin previously and is genotype 2 or 3, they can have a sustained response rate of 80% to 85% when treated with pegylated interferon plus ribavirin.

### **LIVER ENZYMES AND BIOPSY**

Not all individuals with HCV have elevated transaminases (enzyme alanine transaminase [ALT]/serum alanine aminotransferase [SGPT] and aspartate aminotransferase [AST]/serum aspartate aminotransferase [SGOT]). Low enzymes do not necessarily mean less damage on biopsy. Liver enzymes do not correlate with inflammatory and fibrosis scores on biopsy. Biopsy is highly recommended to stage the disease before treatment (N.H. Afdhal, MD, personal communication, September, 2001). For individuals refusing treatment, a liver biopsy every 3 years is recommended to monitor progression of the disease (H.S. Conjeevaram, MD, personal communication, June, 1998). Biopsy identification of disease progression to another stage may motivate the individual to start treatment.

### **THERAPY**

The current standard-of-care therapy has several antiviral treatments available. Roferon® (interferon alfa-2a by Hoffman-LaRoche), Intron-A® (interferon alfa-2b by Schering-Plough) and Infergen® (interferon alfacon-1 by InterMune) are monotherapies which can be administered 3 to 7 times per week in various doses. These therapies are 10% to 25% effective based on viral genotypes. These therapies, when combined with ribavirin, have pushed response rates for all genotypes combined as high as 46%.

The new pegylated interferons, Pegasys® (pegylated interferon alfa 2a, by Roche) and Peg-Inton® (pegylated interferon alfa 2b, by Schering Plough) are once weekly dosing interferons. They were developed by adding an ethylene glycol molecule onto the branched 40kD molecule of Pegasys® or the linear 12kD molecule of Peg-Inton®. When used as monotherapy, they are as effective as thrice weekly dosing of regular interferons [Intron-A (alfa-2a), or Roferon (alfa-2b)] plus ribavirin, orally, twice daily.

Common side effects of alfa interferons, regardless of whether or not pegylated are:

- Influenza-like symptoms.
- Fatigue.
- Depression.
- Nausea.

## Elements of an Effective Exposure Control Plan

1. Identifies employees at risk through job descriptions (employees identified should receive yearly training/in-services on the personal protective equipment (PPE) they use, what to do if an exposure occurs and should receive any vaccines which protect them from some of the blood and body fluid pathogens to which they may be exposed (i.e., hepatitis B)
2. Effectively implements various methods of exposure control:
  - a. Universal precautions—any blood/body fluid should be assumed infectious and proper safety measures (e.g., gowns, mask, gloves, goggles) should be taken to protect oneself from exposure. These measures are to be supplied by the employer free of charge so employees may perform their job with minimal risk.
  - b. Engineering and work place practice controls (to isolate or remove the blood or body fluid hazard from the workplace). Seventy-five percent of syringe and needle incidents can be prevented if the safe design with a shield retractable or recessed needle was implemented (OSHA, 1999). Practical techniques to reduce the likelihood of exposure are as simple as handwashing and not recapping needles. Nurses and other health care workers should keep cuts (e.g., paper cuts) covered with a protective dressing as well as wear a glove on the hand if there is a chance for exposure to a blood or body fluid during patient care.
  - c. Proper use of PPE (i.e., barriers to protect skin, mucous membranes, personal clothing from blood or body fluid exposure). It is important to have the proper equipment for the job and to use it properly (learned and reinforced through yearly in-services).
3. Hepatitis B vaccine availability to those who need it.
4. Record-keeping of the exposures:
  - Action taken to prevent further incidents and treatment of the exposed.
  - Records of necessary changes made to correct the hazardous situation should also be kept.
  - Records of “near misses” should be kept to establish a potential hazard which can be corrected before an incident occurs (CCOHS, 1998, 1999; OSHA, 1999).
  - Procedures for evaluating circumstances surrounding an exposure incident.

*Canadian Centre for Occupational Health and Safety (CCOHS), (1998, 1999); Occupational Safety and Health Administration (OSHA), (1999).*

- Vomiting.
  - Constipation.
  - Diarrhea.
  - Memory problems.
  - Loss of appetite.
  - Thinning hair.
  - Bone marrow suppression.
  - Autoimmune conditions.
  - Seizures.
  - Worsening of hepatitis.
  - Infections.
  - Inflammation of the lungs.
  - Decrease or changes in vision.
  - Decreased sex drive.
- Common side effects of ribavirin include:
- Hemolytic anemia.
  - Increased iron stores in the liver.
  - Gout.
  - Itching.
  - Skin sensitivity to the sun.
  - Nasal stuffiness.
  - Sinus problems.
  - Ear infections.
  - Sore throat.
  - Depression.
  - Nervousness.
  - Insomnia.
  - Fetal abnormalities.

- Decreased sperm count.
- Increased potential to develop cancer.

When pegylated interferons are combined with ribavirin, depending on genotypes and previous treatment status, sustained response rates are 54% to 85% (Fried, 2002; Manns, 2001). Adding amantadine (i.e., a weak antiviral developed to treat influenza virus type A), to the pegylated interferon plus ribavirin regimen may drive sustained response rates up as high as another 8% without more noticeable side effects. This triple therapy is currently under study in the United States in a large multi-center trial. It has shown promise in an Italian genotype-1 trial by Brillanti (2000).

### OCCUPATIONAL EXPOSURE

For HCWs with exposure, the initial work up in employee or occupational health services should include baseline HCV antibodies and ALT. Other lab tests vary from institution to institution, but usually include HIV-1 and HIV-2, hepatitis B antibody (if partially or fully vaccinated), hepatitis B surface antigen (if partially, or not vaccinated), and rapid plasma reagin (RPR, for syphilis). If the source is positive, follow-up should be from a minimum of 4 months to a year. Testing for HCV antibodies should be performed a minimum of once every 8 weeks for 24 weeks. If the source is negative, the HCW should be tested a minimum of 8 weeks later to account for a newly acquired infection

which may not have been detectable in the source at the time of exposure. A RIBA confirmatory assay should be performed for anyone exposed to HCV positive blood or body fluids who was negative on baseline and becomes antibody positive. If an acute case of HCV is suspected from the exposure, the HCW should be referred to a hepatologist. One German study reported 42 successfully treated acute HCV infections (Jaeckel, 2001). This is significant because it is more difficult to eradicate chronic HCV infections. In the acute stage, treatment time is shortened, regardless of genotype, and the use of ribavirin may not be necessary as evidenced by this study, thus eliminating many of the unpleasant ribavirin side effects. This is a landmark study and one that may change the long term outcome of hepatitis C infection when diagnosed and treated acutely.

The source should also have baseline blood work which includes HCV antibody, HIV-1 and HIV-2 antibody, hepatitis B virus (HBV) surface antigen/core antigen, and RPR.

### **OCCUPATIONAL HEALTH NURSE ROLES**

The occupational health nurse must practice due diligence. The occupational health nurse, as a representative of the employer, ensures that the employer takes all reasonable precautions to prevent injuries or accidents in the workplace. Management strategies should include implementation of safer medical devices on a hospital wide basis. This duty also applies to situations not covered in OSHA guidelines. The occupational health nurse must not only identify potential workplace hazards, but must also be diligent and perform corrective action to prevent injuries and accidents from these identified hazards (CCOHS, 1998, 1999).

OSHA developed the Blood Borne Pathogens Standard (BBPS) to protect employees from blood and body fluid exposures. The Standard, effective December 6, 1991, unfortunately does not mention HCV *per se*, but makes reference to it: "These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV)" (Barlow, 1992). It is recommended that the BBPS be updated to include and emphasize HCV, the most common infectious disease in this country, which is easier to contract from a blood exposure to a sharp than HIV. The BBPS also fails to mention that HCWs should be tested for HCV antibody or viral RNA post blood or body fluid exposure. Any employer with at least one employee with the potential to have occupational exposure to blood and body fluids is required to develop an exposure control plan using the OSHA BBPS as a guide.

OSHA revisited the BBPS in conformance with the requirements of the Needlestick Safety and Prevention Act. The summary of the revision of the BBPS, which became effective on April 18, 2001, is as follows:

This act directs OSHA to revise the BBPS to include new examples in the definition of engineering controls along with 2 new definitions; to require that exposure control plans reflect how employers implement new developments in control technology; to

require employers to solicit input from employees responsible for direct patient care in the identification, evaluation, and selection of engineering and workplace controls; and to require certain employers to establish and maintain a log of percutaneous injury from contaminated sharps (OSHA, 2001).

An effective exposure control plan should include the elements as described in the Sidebar on page 214.

The government website [www.osha.gov/OshDoc/Directive\\_pdf/CPL\\_2-2\\_69\\_APPD.pdf](http://www.osha.gov/OshDoc/Directive_pdf/CPL_2-2_69_APPD.pdf) has an outline for writing and developing an exposure control plan. However, policies alone will not prevent injuries and accidents. The occupational health nurse must ensure the policies are incorporated into the employees' activities of daily working. Documentation of this should be maintained. An exposure control plan should be in place, reviewed yearly, and updated as necessary. The occupational health nurse can prevent exposure to HCV through workplace control by ensuring that OSHA's BBPS is implemented.

An effective occupational health nurse develops and reviews policies and procedures for safe and healthy work conditions for employees. Occupational health nurses develop and evaluate all safety and health programs, including implementation of an exposure control plan for bloodborne pathogens. The occupational health nurse establishes and implements procedures for workplace safety inspections. This includes inspecting areas with numerous blood and body fluid exposures for breaches in PPE use, engineering controls, equipment failure, or employee failure to follow universal precautions. The occupational health nurse also establishes procedures for investigating and recording all workplace accidents, illnesses, and fatalities, ensuring implementation of the OSHA Standard including resource allocation and recommendations in response to exposure incidents. The occupational health nurse reviews screening and surveillance data. All devices used to prevent occupational exposure should have functionality, accessibility, visibility, and accommodation (OSHA, 1999).

Occupational health nurses need to stress that reporting and documenting exposures is imperative as is initial testing of the source and the exposed HCW. Thoroughly interviewing the HCW to understand the mechanism of exposure can prevent future occurrences. Follow-up screening for the exposed HCW should be implemented to completion. Any vaccines (e.g., HBV, hepatitis A virus, tetanus-diphtheria [TD], tuberculosis test) that need updating easily can be given during this several month follow-up period.

The occupational health nurse has the important task of educating HCWs about the mechanisms of transmission, how to prevent those transmissions, and how to protect themselves at all times from potential exposures. Likewise, if HCWs are already infected and practicing, the occupational health nurse must protect the HCW's privacy while ensuring that the infected HCW is protecting patients entrusted to their care. This may mean assigning the HCW outside of high risk areas of practice (e.g., emergency department, operating room, intensive care unit) where sharps exposure is greatly increased. However,

## Useful Websites

American Association for the Study of Liver Diseases:  
[www.aasld.org](http://www.aasld.org)

American Liver Foundation:  
[www.liverfoundation.org](http://www.liverfoundation.org)

Canada's National Occupational Health and Safety Resource:  
[www.ccohs.ca](http://www.ccohs.ca)

Center for Disease Control and Prevention:  
[www.cdc.gov](http://www.cdc.gov)

Hepatitis C Support Group:  
[www.hcvadvocate.org](http://www.hcvadvocate.org)

Hepatitis Foundation International:  
[www.HepFI.org](http://www.HepFI.org)

Hepatitis quarterly journal with an online community message board:  
[www.hepatitismag.com](http://www.hepatitismag.com)

Hepatitis resource network:  
[www.h-r-n.org](http://www.h-r-n.org)

National Hepatitis C Coalition:  
[www.nationalhepatitis-c.org](http://www.nationalhepatitis-c.org)

National hepatitis C prevention strategy:  
[www.cdc.gov/ncidod/diseases/hepatitis/c/plan/strategy.pdf](http://www.cdc.gov/ncidod/diseases/hepatitis/c/plan/strategy.pdf)

U.S. Department of Labor, Occupational Safety and Health Administration:  
[www.osha.gov](http://www.osha.gov)

### **Centers for Disease Control and Prevention (CDC) and U.S. Department of Health and Human Services (HHS) Guidelines and Recommendations:**

Disease prevention guidelines:  
[www.phppo.cdc.gov/cdcRecommends/showarticle.asp?a\\_artid=P0000871&TopNum=50&CallPg=Adv](http://www.phppo.cdc.gov/cdcRecommends/showarticle.asp?a_artid=P0000871&TopNum=50&CallPg=Adv)

Immunization of Health Care Workers Recommendations:  
[www.cdc.gov/epo/mmwr/preview/mmwrhtml/00050577.htm](http://www.cdc.gov/epo/mmwr/preview/mmwrhtml/00050577.htm)

Infection control guidelines:  
[www.cdc.gov/ncidod/hip/GUIDE/InfectControl98.pdf](http://www.cdc.gov/ncidod/hip/GUIDE/InfectControl98.pdf)

NIH Hepatitis C Management Consensus Statement:  
[http://consensus.nih.gov/cons/116/116cdc\\_intro.htm](http://consensus.nih.gov/cons/116/116cdc_intro.htm)

### **Engineering controls:**

[www.fda.gov/cdrh/safety.html](http://www.fda.gov/cdrh/safety.html)  
[www.healthsystem.virginia.edu/internet/epinet/](http://www.healthsystem.virginia.edu/internet/epinet/)  
[www.cdc.gov/niosh/sharps1.html](http://www.cdc.gov/niosh/sharps1.html)

### **For designing an OSHA training program:**

[www.ccohs.ca/oshanswers/prevention/ppe/universa.html](http://www.ccohs.ca/oshanswers/prevention/ppe/universa.html)  
[www.ccohs.ca/oshanswers/prevention/effectiv.html](http://www.ccohs.ca/oshanswers/prevention/effectiv.html)  
[www.ccohs.ca/oshanswers/hsprograms/osh\\_policy.html](http://www.ccohs.ca/oshanswers/hsprograms/osh_policy.html)

because of the many factors to be assessed, this determination is usually done on a case by case basis.

The occupational health nurse must emphasize to the HCW the responsibility to their patients for “doing no harm.” The occupational health nurse may have an expanded role by serving as the liaison responsible for talking to a patient who was exposed to an infected HCW’s blood or body fluid. Any patient exposed should be notified promptly, be notified of the HCW’s baseline testing results, receive counseling, and be offered post-exposure prophylaxis (i.e., HBV vaccine, TD vaccine) (SHEA, 1997). The occupational health nurse must make sure an incident report is completed and the hospital’s risk management team contacted. This action of “due diligence” can protect an occupational health nurse in a court of law. Documentation cannot be overemphasized.

## RESEARCH AND THE FUTURE OF THERAPY

There is a tremendous need for continuing research into new therapies for chronic HCV. Currently, therapies approved by the U.S. Food and Drug Administration are costly and vary widely in efficacy from 15% to 85% based on genotype and previous treatment status (e.g., naïve versus relapser or non-responder). More than \$600 million is spent annually on medical and work loss costs of HCV related acute and chronic disease (CDC, 1998). Current therapies, whether successful or not, improve histology and decrease the chance for progression to liver cancer in more than 90% of those treated. Unfortunately, the majority find the treatment difficult to tolerate because of unpleasant side effects. The only in vivo model available for research is the chimpanzee. This makes for a costly and slow moving research process (Gagneten, 2000).

Upcoming potential therapies currently in research include (DiBisceglie, 2002):

- Antisense therapies.
- Protease inhibitors.
- Helicase inhibitors.
- Polymerase inhibitors.
- Vaccines.
- Ribozymes.
- Therapies to boost host CD4 T-cell response.
- Viral interference through dominant negative mutants or defective interfering viruses.

It is believed that if any of these treatments are used alone, viral resistance will quickly develop. Combination therapies for individuals who can tolerate them are expected to be the standard of care for years to come. The best combination for each patient is, perhaps, the most difficult question with which researchers are faced.

## CONCLUSION

Occupational health nurses who are well informed are better able to protect HCWs and patients for whom they are responsible. See the Sidebar for helpful resources. The occupational health nurse is in a pivotal position to influence hospital wide policy, procedures, and potentially affect countless lives.

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## IN SUMMARY

### Hepatitis C

An Update for Occupational Health Nurses

Al-Saden, P.C.

*AAOHN Journal*, 2004; 52(5), 210-217.

- 1 Hepatitis C is no longer an emerging dilemma. It is a significant public health problem with life altering complications.
- 2 Occupational health nurses have the responsibility to their employees to be up to date on the latest treatment modalities so they can accurately advise their clients should an exposure occur.
- 3 Occupational health nursing practice needs to focus on employee education related to Occupational Safety and Health Administration's Blood Borne Pathogens Standard and the latest in safety devices through regular yearly in-services.

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## Hepatitis C: An Update for Occupational Health Nurses

This issue of the AAOHN JOURNAL contains a Continuing Education Module on "Hepatitis C: An Update for Occupational Health Nurses." 1.1 contact hours of continuing education credit will be awarded by AAOHN upon successful completion of the posttest and evaluation.

A certificate will be awarded and the scored test will be returned when the following requirements are met by the participant: (1) The completed answer sheet is received at AAOHN on or before April 30, 2005; (2) A score of 70% (7 correct answers) is achieved by the participant; (3) The answer sheet is accompanied by a \$10.00 processing fee. Expect up to 6 weeks for delivery of the certificate.

Upon completion of this lesson, the occupational health nurse will be able to:

1. Discuss the epidemiology, natural history, and diagnosis of hepatitis C virus (HCV) illnesses.
2. Describe the transmission routes and treatment of HCV.
3. Describe the roles of the occupational health nurse in preventing and treating occupational exposures to HCV.

AAOHN is accredited as a provider of continuing education in nursing by the American Nurses Credentialing Center's Commission on Accreditation. AAOHN is additionally approved as a provider by the California Board of Registered Nursing (#CEP9283) and the Louisiana State Board of Nursing (#LSBN3).

Contact hour credits received for successful completion of the posttest and evaluation may be used for relicensure, certification, or re-certification.

*Directions:* Circle the letter of the best answer on the answer sheet provided. (Note: You may submit a photocopy for processing.)

- 1. A human cost of hepatitis C virus (HCV) is that \_\_\_\_\_ deaths are attributed annually to liver disease associated with HCV.**
- A. 2,000 to 4,000.
  - B. 5,000 to 7,000.

- C. 8,000 to 10,000.
- D. 11,000 to 13,000.

- 2. Diagnosis of an acute infection of HCV is rare because more than \_\_\_\_\_% of persons with an acute infection are asymptomatic.**
- A. 40.
  - B. 50.
  - C. 60.
  - D. 70.

- 3. Which of the following is true in relation to testing for HCV?**
- A. The ELISA 3 (enzyme-linked immunosorbent assay) has an 85% sensitivity.
  - B. The RIBA (recombinant immunoblot assay) is the test for confirmation of a positive ELISA.
  - C. Diagnosis 2 to 3 days after exposure is possible with the ELISA 3.
  - D. The World Health Organization has standardized HCV RNA (replicating virus) quantification units as copies/mL.

- 4. Within 5 years of initiating and continuing intravenous drug use, what percentage of users becomes HCV positive?**
- A. 60%.
  - B. 70%.
  - C. 80%.
  - D. 90%.

- 5. When counseling a female employee about HCV transmission, the occupational health nurse includes which of the following?**
- A. Transmission can occur during oral sex with an infected person.
  - B. Pregnancy is contraindicated for women infected with HCV.
  - C. Vaginal or anal sex with an infected person increases chances for transmission.
  - D. Breastfeeding is contraindicated for women infected with HCV.

- 6. Low risk fluids for transmission of HCV include:**
- A. Sputum.
  - B. Cerebrospinal fluid.
  - C. Synovial fluid.
  - D. Amniotic fluid.

- 7. The occupational health nurse counsels an employee starting on ribavirin that common side effects include:**
- A. Inflammation of the lungs.
  - B. Bone marrow suppression.
  - C. Nausea.
  - D. Hemolytic anemia.

- 8. Treatment combining pegylated interferons and ribavirin, depending on genotypes and previous treatment, can produce sustained response rates as high as \_\_\_\_\_%.**
- A. 65.
  - B. 75.
  - C. 85.
  - D. 95.

- 9. The occupational health nurse develops an exposure control plan for HCV. An engineering control for HCV is (a):**
- A. Handwashing.
  - B. Recessed needle.
  - C. Not recapping needles.
  - D. Wearing gloves.

- 10. According to the Centers for Disease Control and Prevention (1998), more than \_\_\_\_\_ million is spent yearly on medical and work loss costs of HCV related acute and chronic diseases.**
- A. \$200.
  - B. \$400.
  - C. \$600.
  - D. \$800.

# ANSWER SHEET

## Continuing Education Module

### Hepatitis C: An Update for Occupational Health Nurses May 2004

(Goal: To gain ideas and strategies to enhance personal and professional growth in occupational health nursing.)

**Mark one answer only!**  
(You may submit a photocopy of the answer sheet for processing.)

- |            |             |
|------------|-------------|
| 1. A B C D | 6. A B C D  |
| 2. A B C D | 7. A B C D  |
| 3. A B C D | 8. A B C D  |
| 4. A B C D | 9. A B C D  |
| 5. A B C D | 10. A B C D |

### **EVALUATION (must be completed to obtain credit)**

Please use the scale below to evaluate this continuing education module.

	4 - To a great extent	3 - To some extent	2 - To little extent	1 - To no extent
1. As a result of completing this module, I am able to:				
A. Discuss the epidemiology, natural history, and diagnosis of hepatitis C virus (HCV) illnesses.	4	3	2	1
B. Describe the transmission routes and treatment of HCV.	4	3	2	1
C. Describe the roles of the occupational health nurse in preventing and treating occupational exposures to HCV.	4	3	2	1
2. The objectives were relevant to the overall goal of this independent study module.	4	3	2	1
3. The teaching/learning resources were effective for the content.	4	3	2	1
4. How much time (in minutes) was required to read this module and take the test?	50	60	70	80

*Please print or type: (this information will be used to prepare your certificate of completion for the module).  
DEADLINE: APRIL 30, 2005. Allow up to 4 weeks for processing.*

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