

SAFETY

** This course meets the 1 hr. Management/Supervision/Safety requirement for Florida license renewal. **



BBP SERIES: Basic Review of the Pathogens

AUTHOR: Deborah L. Buckley, MBA, MT(ASCP)

COURSE CODE: SAF003

CONTACT HOURS: 2

COURSE LEVEL: Basic

FLORIDA CE BROKER: 20-711268

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COURSE OBJECTIVES

At the end of this course you will be able to:

- 1.) List potential Bloodborne Pathogens (BBP), recalling the most common ones.
- 2.) List the transmission routes for BBPs.
- 3.) Recall the background, symptoms, incubation period, risk of occupational injury, and post-exposure prophylaxis for HIV, HBV, and HCV.
- 4.) Discuss what to do after a BBP exposure.
- 5.) Recall how to minimize having an occupational exposure.

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Last Revised 04/14/19

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FREQUENTLY ASKED QUESTIONS

Last Revised 04/14/19

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Q. I ordered a Home Study Combo Course, may I complete the quiz online?

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Q. I need my certificate dated on a certain date; how can I be sure that this will happen?

A. 1.) Complete the quiz online. **OR** 2.) Be sure to fax or upload your answer sheet at least 72 hours before that date.

Q. What score is considered passing?

A. A score of 70% or higher is considered a passing grade. You may repeat the quiz if you fail it the first time.

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Q. What are your most popular courses?

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BBP SERIES: BASIC REVIEW OF THE PATHOGENS

Categories: Safety | **Contact Hours:** 2 | **Course Code:** SAF003

- 1.) You can find the Bloodborne Pathogens Standard at (29 CFR), Part 1910._____.
 - A. 102
 - B. 763
 - C. 1030

- 2.) Although the Standard specifically emphasizes Hepatitis B Virus (HBV) and Human Immunodeficiency Virus (HIV), there are other organisms that are capable of causing disease that the healthcare worker should be cautious about being exposed to.
 - A. True
 - B. False

- 3.) Transmission of a BBP can occur through multiple routes, including:
 - A. Hugs and handshakes
 - B. Touching objects, such as doorknobs, that the infected person touched
 - C. Blood, vaginal fluids, breast milk

- 4.) Human Immunodeficiency Virus (HIV) is a _____.
 - A. herpes virus
 - B. flavivirus
 - C. retrovirus

- 5.) HIV has a "Window Period" of _____ from time of exposure until the first positive test result appears.
 - A. 2-4 days
 - B. 1-4 weeks
 - C. 3 months

- 6.) PEP must be started within _____ after a recent or possible exposure to HIV.
 - A. 3 hours
 - B. 72 hours
 - C. 2 weeks

- 7.)** For 5-10% of those infected with HBV, it becomes a long-term, chronic infection.
- A. True
 - B. False
- 8.)** The average incubation period for HBV is _____.
- A. 12 days
 - B. 90 days
 - C. 6 months
- 9.)** Chronic HCV develops in _____ of infected patients.
- A. 20-25%
 - B. 45%
 - C. 75-80%
- 10.)** Currently, no effective prophylactic treatment for HCV has been identified.
- A. True
 - B. False
- 11.)** When a BBP exposure occurs, you must document the exposure, being sure to follow your facility's procedures.
- A. True
 - B. False
- 12.)** To prevent transmission of HIV to health care workers in the workplace, health care workers must assume that blood and other body fluids from all patients are potentially infectious.
- A. True
 - B. False

******END OF QUIZ******

ABOUT THE AUTHOR



Deborah L. Buckley, MBA, MT(ASCP) is the Program Administrator for Continuing Education Unlimited's Laboratory Division. In addition, she is also the Managing Director of www.Jobs4Lab.com and www.Jobs4Nursing.com, both Continuing Education Unlimited companies. Deborah received a Bachelor of Science degree in Medical Technology from Florida Institute of Technology in 1983 and a Master's Degree in Business Administration in 1995.

Prior to joining the management team at [4CEUINC](http://www.4CEUINC.com), Deborah was the Laboratory Manager at a privately-owned Medical Lab in South Florida. In addition to her management experience, she also brings experience as a generalist in the laboratory, specializing in Microbiology and Hematology, and has taught Microbiology at a community college during her 30+ years in the laboratory industry.

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INTRODUCTION

In order to better protect workers that have direct exposure to blood and other potentially infectious material (OPIM), OSHA published the Occupational Exposure to Bloodborne Pathogens Standard in 1991, which took effect in March of 1992. The purpose of this standard is to protect workers by limiting occupational exposure to blood and other potentially infectious materials. Statistically, it is designed to prevent the more than 200 deaths and over 9,000 documented bloodborne infections that were occurring each year before these stringent regulations were put into place.

The Bloodborne Pathogens Standard can be located in Title 29 of the Code of Federal Regulations ([29 CFR](#)), [Part 1910.1030](#). The Standard lays out in detail the steps that need to be implemented by every employer that has employees who have exposure, or have the potential for exposure, to bloodborne pathogens and other potentially infectious material. It should be noted here that "Good Samaritan" deeds, such as coming to the aid of a coworker with a nose bleed, does not fall under this regulation.

In 2000, the Needlestick Safety and Prevention Act (Public Law 106-430) mandated that OSHA clarify and revise the Bloodborne Pathogens Standard to address the implementation of safer needle devices. At that time, OSHA published a revised standard in the Federal Register in January 2001, which included the new requirements, such as, the use of safer needle devices and maintaining a log of contaminated needlestick injuries. This revised standard became effective in April 2001.

This part of the bloodborne pathogen series will review the most common pathogens of the Standard as it is currently written in the 29 CFR, Part 1910.1030.

WHAT ARE THE PATHOGENS

Both bloodborne pathogens (BBP) and other potentially infectious material (OPIM) are addressed under the Bloodborne Pathogens Standard in order to insure the safety of workers who have contact, or potential contact, with blood or body fluids that could potentially contain these pathogens.

Bloodborne Pathogens, as defined by OSHA, are pathogenic organisms that are present in human blood and are capable of causing disease in humans. Although the Standard specifically emphasizes Hepatitis B Virus (HBV) and Human Immunodeficiency Virus (HIV), there are other organisms that are capable of causing disease as well that the healthcare worker should be cautious about being exposed to.

Here is a partial list of potential **Bloodborne Pathogens (BBP)**:

- Hepatitis B Virus (HBV)
- Hepatitis C Virus (HCV)
- Other Hepatitis Viruses (potentially)
- Human T-cell Lymphotropic Virus (HTLV)
- West Nile Virus (WNV)
- Hemorrhagic Fever
- Some Herpes Viruses (CMV, HHV8, etc.)
- Creutzfeldt-Jacob Disease (CJD)
- HIV
- Syphilis
- Anaplasma & Other tickborne illnesses
- Leishmania
- Malaria
- Babesia
- Brucella

Here is a list of **Other Potentially Infectious Materials (OPIM)**, as defined by OSHA:

1. Any unfixed human organ or tissue, other than intact skin, from a living patient or cadaver.
2. HIV-containing cell or tissues from experimental animals infected with HIV or HBV.

3. Human body fluids including:

- Semen
- Vaginal Secretions
- Cerebrospinal Fluid
- Synovial Fluid
- Pleural Fluid
- Pericardial Fluid
- Amniotic Fluid
- Saliva in Dental Procedures
- Any Body Fluid Visibly Contaminated with Blood
- All Body Fluids Where it is Difficult or Impossible to Differentiate Between Body Fluids

MOST COMMON BLOODBORNE PATHOGENS

Although there are additional potential bloodborne pathogens as stated above, there are three that pose the most concern in healthcare due to occupational exposure: Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV), and Hepatitis C Virus (HCV).

Preventing needlestick injuries and splashes from blood or body fluids is the best way to protect yourself from these infections.

In healthcare, the most common occupational exposure route to bloodborne pathogens is from a needlestick injury. Less commonly, workers may also be exposed through splashes of infected blood and body fluids that contaminate an open cut or wound, or mucous membranes, such as the eyes and mouth.

TABLE 1: Average Risk of BBP Exposure After A Needlestick Injury	
PATHOGEN (Source Blood)	RISK (Exposed Worker)
Hepatitis B Virus (HBV) HBeAG+ (virus replicating) HBeAG - (virus not replicating)	22 to 30% (non-immune or vaccine non-responder) 1 to 6% (immune, vaccine responder)
Hepatitis C Virus (HCV)	1.8%
Human Immunodeficiency Virus (HIV)	0.3%

TRANSMISSION OF BLOODBORNE PATHOGENS

Transmission occurs through contact with certain body fluids from a person with a BBP:

- Blood
- Semen or pre-seminal fluids
- Vaginal fluids
- Rectal fluid or discharge
- Any body fluid with visible blood
- Breast milk

SOURCE: CDC.gov

For transmission to occur, infected fluid must come in contact with a mucous membrane, cut or damaged tissue, or be injected directly into the bloodstream or body via a needle, syringe, or sharp object. Mucous membranes of concern to healthcare workers are located in the eye, nasal passages, and mouth.

Box 1: FAST FACTS ON OCCUPATIONAL EXPOSURE TO BLOODBORNE PATHOGENS

- Occupational transmission of HIV to healthcare workers is extremely rare.
- CDC recommends proper use of safety devices and barriers to prevent exposure to HIV in the health care setting.
- For workers who are exposed, CDC has developed recommendations to minimize the risk of developing HIV.

SOURCE: CDC.gov

For more information on HIV and transmission to healthcare workers visit:

<https://www.cdc.gov/hiv/pdf/workplace/cdc-hiv-healthcareworkers.pdf>

HUMAN IMMUNODEFICIENCY VIRUS (HIV)

Overview

Human immunodeficiency virus (HIV) belongs to a class of viruses known as a retrovirus. Once infected, the virus replicates in the body, damaging and disabling the body's CD4+ cells of the immune system until they're no longer capable of fighting the infection. Once a person becomes immunocompromised from this damage, the disease progresses to the final stage known as AIDS. The HIV infected person is also more vulnerable to other diseases and opportunistic infections during the last stage of their infection.

An HIV infection has three stages:

1. Acute Infection – Develops within 2-4 weeks of infection
2. Chronic Infection – May be asymptomatic, even though virus continues to multiply at low levels
3. AIDS – Occurs when the CD4+ count drops below 200 cells/mm³

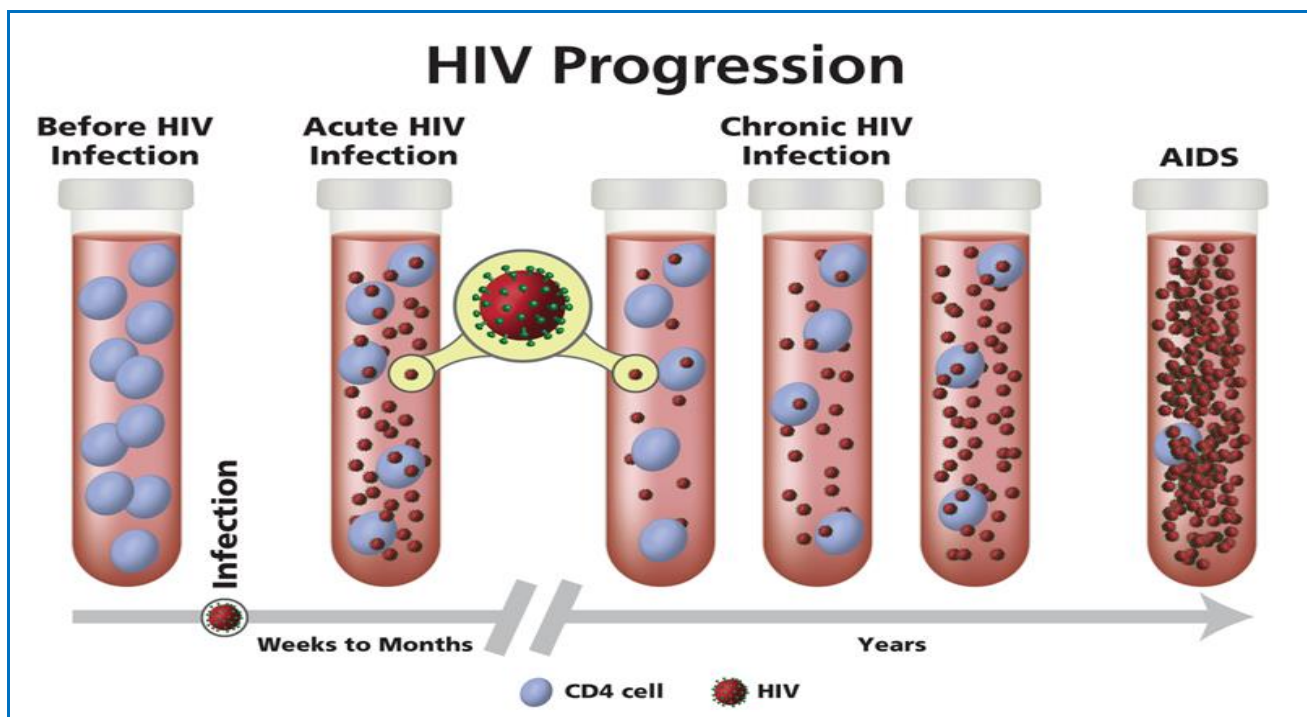


FIGURE 1: Relationship Between CD4 Cells & the HIV Virus in the Progression of HIV Infection

Symptoms

Symptoms of HIV vary depending on the stage of the disease.

Acute Infection

In the first stages of HIV infection, approximately 40-90% of those infected will have flu-like symptoms within a 2-4 weeks after infection. Those non-specific symptoms may include:

- Fever
- Chills
- Headache & Muscle Aches
- Tiredness
- Rash
- Sore Throat
- Mouth Ulcers
- Enlarged Lymph Nodes

Chronic Infection

During this phase, HIV is still replicating in the body at low levels. People in the chronic phase may have mild HIV-related symptoms, or may have no symptoms at all.

AIDS

During the late stages of HIV infection, the virus severely weakens the immune system, and people infected with the virus may have the following symptoms:

- Rapid weight loss
- Pneumonia
- Extreme, unexplained fatigue
- Mouth, anal, or genital ulcers
- Diarrhea that lasts >1 week
- Mouth, anal, or genital ulcers
- Recurring fever or profuse night sweats
- Prolonged swelling of the lymph glands
- Memory loss, depression, & other neurologic disorders
- Red, brown, pink, or purple blotches on the skin, inside the mouth, or eyelids.

Incubation Period After Exposure

HIV has a "Window Period" of 1-4 weeks from time of exposure until the first positive test result appears. The person can pass on HIV Virus during that time.

Risk of Occupational Injury and Transmission

The estimated risk of HIV infection from a sharps injury in the United States is about 0.3 percent or 1 in 300. The CDC has reported 58 documented cases and 150 possible cases of HIV transmission to U.S. healthcare workers between 1981 and December 2013, although researchers estimate that number may actually be higher because reporting is voluntary. Only one of those 58 cases documented, occurred after 1999.

Of the 58 documented cases of occupational transmission:

- 49 were associated with percutaneous injury (puncture/cut injury)
- 5 had mucocutaneous exposure
- 2 had both percutaneous and mucous exposure
- 2 had an unknown route of exposure

Among healthcare personnel, the majority of cases of occupational transmission involved nurses and laboratory personnel. For those records available, transmission breakdown occurred as follows:

- 24 Nurses
- 16 Clinical Laboratory Technicians
- 6 Non-Surgical Physicians
- 11 Other healthcare personnel

Post-Exposure Prophylaxis (PEP)

A health care worker who has a possible exposure should seek immediate care, either through a physician or visit to an emergency room. PEP must be started within 72 hours after a recent or possible exposure to HIV.

Physicians caring for healthcare workers who've had a possible exposure can call the PEPLine (1-888-448-4911), which offers 24-hour advice on managing occupational exposures to HIV and other BBP.

HEPATITIS B VIRUS (HBV)

Overview

The Hepatitis B virus (HBV) causes a liver infection called hepatitis. The infection progresses differently in each patient, with some being asymptomatic after exposure, while others develop symptoms after an incubation period.

For some patients, Hepatitis B is an acute, or short-term, illness that can resolve on its own with some never realizing they were infected. For 5-10% of those infected, it becomes a long-term, chronic infection. Chronic Hepatitis B can lead to serious health issues, like cirrhosis or liver cancer, which can eventually cause serious liver damage and even death. Cirrhosis from HBV carries a 20% lifetime risk of death and a 6% risk of dying from liver cancer. Risk for chronic infection is often related to age at infection, with approximately 90% of infected infants becoming chronically infected, compared with just 2-6% of adults.

HBV is transmitted when infected blood or body fluid enters the body of someone who is not infected, therefore, the best way to prevent a Hepatitis B infection is by getting vaccinated.

Symptoms

Symptoms vary among those infected, with newly acquired HBV infections only causing symptoms 30-50% of the time in those ≥ 5 years of age. When symptoms do occur, they can include:

- Fever
- Fatigue
- Loss of Appetite
- Nausea & Vomiting
- Abdominal Pain
- Joint Pain
- Jaundice
- Dark Colored Urine
- Clay Colored Bowel Movements

SOURCE: CDC.gov

As stated previously, some that are infected with HBV may never exhibit symptoms of the infection and may not even realized they were exposed until they are tested.

When symptoms do occur, they typically last for several weeks, but can persist for up to 6 months.

Incubation Period After Exposure

If HBV symptoms occur, they typically begin between 60 and 150 days after exposure, with an average of 90 days.

Risk of Occupational Injury and Transmission

National hepatitis surveillance data shows that approximately 400 health care workers became infected with HBV in 2001. This figure represented a 95% decline from the 17,000 new infections estimated in 1983. The decline was largely due to the widespread immunization of health care workers with the Hepatitis B vaccine and the use of universal precautions and other measures required by OSHA.

The chance of becoming infected with hepatitis B from a sharps injury is estimated to be between 6 and 30%. In order to protect yourself, it's important to practice safety when using sharps, wear protective PPE, and immediately address any exposures that occur.

Post-Exposure Prophylaxis

After exposure to Hepatitis B virus (HBV), appropriate and timely prophylaxis can prevent HBV infection, subsequent development of chronic HBV infection, or liver disease.

The mainstay of HBV postexposure prophylaxis (PEP) is the Hepatitis B vaccine, but in certain circumstances, Hepatitis B immune globulin is recommended in addition to the vaccine for added protection. For workers who have gone through

the HBV vaccine series, have written documentation, and test positive for an HBV titer, should still receive a vaccine booster.

Physicians caring for healthcare workers who’ve had a possible exposure can call the PEpline (1-888-448-4911), which offers 24-hour advice on managing occupational exposures to HBV and other BBP.

Interpreting HBV Test Results to Determine HBV Status

The following table will help determine the HBV status for the source of exposure and the healthcare worker with the occupational exposure:

TABLE 2: Antibody and Antigen Biomarkers for Hepatitis B Infection		
Serological Marker	Test Result	HBV Status
HBsAG Anti-HBc Anti-HBs	Negative Negative Negative	Susceptible to HBV
HBsAG Anti-HBc Anti-HBs	Negative Positive Positive	Immune due to prior infection
HBsAG Anti-HBc Anti-HBs	Negative Negative Positive	Immune due to vaccination
HBsAG Anti-HBc IgM anti-HBc Anti-HBs	Positive Positive Positive Negative	Acute Infection
HBsAG Anti-HBc IgM anti-HBc Anti-HBs	Positive Positive Negative Negative	Chronic Infection
HBsAG Anti-HBc Anti-HBs	Negative Positive Negative	Interpretation Unclear: 1.) Resolved Infection (most common) 2.) False positive anti-HBc (susceptible to HBV) 3.) Low-Level Chronic Infection 4.) Resolving Acute Infection

HEPATITIS C VIRUS (HCV)

Overview

The Hepatitis C virus (HCV) causes a serious liver infection called hepatitis. The infection progresses differently in each patient, with some being asymptomatic after exposure, while others develop symptoms after an incubation period.

Hepatitis C virus causes serious damage to the liver and can eventually become a fatal disease. While infection can occur without symptoms or only mild ones, chronic hepatitis develops in 75-80% of infected patients, and 70% of those individuals get active liver disease. Of the patients that develop active liver disease, 10-20% develop cirrhosis and 1-5% develop liver cancer.

Symptoms

Acute Symptoms

Symptoms vary among those infected, with newly acquired HCV infections only causing symptoms 20-30% of the time. When acute symptoms do occur, they can include:

- Fever
- Fatigue *
- Loss of Appetite *
- Nausea & Vomiting
- Abdominal Pain *
- Joint Pain
- Jaundice *
- Dark Colored Urine
- Clay Colored Bowel Movements

SOURCE: CDC.gov

* Indicates most common symptoms.

Chronic Symptoms

The majority who develop a chronic HCV infection are asymptomatic or have non-specific symptoms such as chronic fatigue and depression. Chronic liver disease

that develops in those HCV-infected patients is usually insidious, progressing slowly without any signs or symptoms for several decades. HCV infection is often not recognized until asymptomatic individuals are identified as HCV-positive when being screened for a blood donation or when elevated alanine aminotransferase (a liver enzyme known as ALT) levels are detected during routine examinations.

Many of those with a chronic HCV infection eventually develop chronic liver disease, which can range from mild to severe, including cirrhosis and liver cancer.

Incubation Period After Exposure

In those who do develop symptoms, the average period from exposure to symptom onset is 2–12 weeks with a range of 2–26 weeks on average.

Risk of Occupational Injury and Transmission

Although the prevalence of HCV infection among healthcare workers is similar to that in the general population (1% to 2%), healthcare workers have an increased occupational risk for HCV infection.

According to the CDC, the average risk of infection after a needlestick or cut exposure to infected blood is approximately 1.8%. Although recent studies show an association between sharps injuries and HCV infection, the number of healthcare workers who have acquired HCV occupationally is unknown. Of the total acute HCV infections that have occurred annually (ranging from 100,000 in 1991 to 36,000 in 1996), 2% to 4% have been healthcare workers exposed to blood in the workplace.

HCV is transmitted when infected blood or body fluid enters the body of someone who is not infected. In order to protect yourself, it's important to practice safety when using sharps, wear protective PPE, and immediately address any exposures that occur.

Post-Exposure Prophylaxis

Currently, no effective prophylactic treatment for HCV has been identified, however, immediate cleansing of the affected area should be performed.

Physicians caring for healthcare workers who've had a possible exposure can call the PEpline (1-888-448-4911), which offers 24-hour advice on managing occupational exposures to HCV and other BBP.

Interpreting HCV Test Results to Determine HCV Status

The following table will help determine the HCV status for the source of exposure and the healthcare worker with the occupational exposure:

TABLE 3: Interpretation of Results for Hepatitis C Virus (HCV) Infection		
Test Outcome	Interpretation	Actions
HCV antibody non-reactive	No HCV antibody detected	<ul style="list-style-type: none"> - Sample can be reported as nonreactive for HCV antibody. No further action required. - If recent exposure in person tested is suspected, test for HCV RNA. *
HCV antibody reactive	Presumptive HCV infection	A repeatedly reactive result is consistent with current HCV infection, or past HCV infection that has resolved, or biologic false positivity for HCV antibody. Test for HCV RNA to identify current infection.
HCV antibody reactive HCV RNA detected	Current HCV infection	Provide appropriate counseling and direct patient to appropriate healthcare provider.
HCV antibody reactive HCV RNA not detected	No current HCV infection	<ul style="list-style-type: none"> - No further action required in most cases. - If distinction between true positivity and biologic false positivity for HCV antibody is desired, and if sample is repeatedly reactive in the initial test, test with another HCV antibody assay. - In certain situations, follow up with HCV RNA testing and appropriate counseling.

* If HCV RNA testing is not feasible and person tested is not immunocompromised, do follow-up testing for HCV antibody to demonstrate seroconversion. If the person tested is immunocompromised, consider testing for HCV RNA.

WHAT TO DO AFTER AN EXPOSURE

If blood or body fluid exposure occurs, it must be addressed immediately, following these generic steps: **BE SURE TO FOLLOW THE WRITTEN GUIDELINES AT YOUR FACILITY.**

- Immediate cleansing of the site exposed to the blood or body fluids as follows:
 - Intact skin exposure - wash with soap and water
 - Exposure to small wounds or punctures - wash with soap and water and/or use an alcohol-based antiseptic, such as a hand-sanitizer
 - Exposure to mucous membranes – rinse mouth with copious amounts of water. Eyes should be irrigated with water or saline.
- Document the exposure, being sure to follow your facility's procedures.
- If known, determine the HIV, HBV, and/or HCV status of the exposure source
- Determine the HIV, HBV, and/or HCV status of the healthcare worker that was exposed. Follow-up testing at appropriate intervals should also be conducted.
- Counseling of the healthcare worker to determine risk assessment.

All facilities should have a post-exposure plan available for managing bloodborne exposures, **please consult YOUR facility's PEP guidelines if an exposure occurs.** When indicated, PEP should be started as soon as possible (within 72 hours) and continued until the source is confirmed negative for the particular BBP or until you have completed the recommended course of prophylaxis prescribed!

MINIMIZING OCCUPATIONAL EXPOSURE

To prevent transmission of HIV to health care workers in the workplace, health care workers must assume that blood and other body fluids from all patients are potentially infectious. They should therefore follow these infection control precautions at all times:

- Routinely use Personal Protective Equipment (such as gloves, goggles, face shields, gowns, etc.) when anticipating contact with blood or body fluids.
- Immediately wash your hands and other skin surfaces after contact with blood or body fluids.
- Carefully handle and dispose of sharp instruments during and after use.

Safety devices have been developed to help prevent needlestick injuries and when used properly, these devices help reduce the risk of exposure to BBP. Many percutaneous injuries, such as needlesticks and cuts, are related to the disposal of sharp medical devices. All used syringes or other sharp instruments should be routinely placed in “sharps” containers for proper disposal to prevent accidental injury and risk of HIV transmission.

Plans for postexposure management of health care personnel exposed to BBP should be in place.

CONCLUSION

OSHA’S bloodborne pathogens standard protects employees who work in occupations where they are at risk of exposure to blood or other potentially infectious materials. The Standard requires employers to develop written documents to explain how they will implement each part of The Standard, provide training to employees, and protect the health and safety of their workers.

REFERENCES

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