



# BLOODBORNE PATHOGENS

This training module is designed to provide a basic understanding of bloodborne pathogens, common modes of their transmission, methods of prevention, and other pertinent information. A copy of the OSU Physical Plant's Bloodborne Pathogen Exposure Control Program is available upon request from OSU EHS. This program is designed to meet the requirements of the Occupational Safety and Health Administration's (OSHA's) Bloodborne Pathogen Standard, [29 CFR 1910.1030](#).

If you can **reasonably anticipate** facing contact with blood and/or other potentially infectious materials as part of your job duties, you should receive additional training from your instructor or supervisor including an opportunity for interactive questions and answers. You should also read the [summary](#) of OSHA's bloodborne pathogen standard before continuing with this module.

## Bloodborne Diseases

**Bloodborne pathogens** are microorganisms such as viruses or bacteria that are carried in blood and can cause disease in people. There are many different bloodborne pathogens including malaria, syphilis, and brucellosis, but *Hepatitis B (HBV)* and the *Human Immunodeficiency Virus (HIV)* are the two diseases specifically addressed by the OSHA Bloodborne Pathogen Standard.

While this module will focus primarily on HBV and HIV, **it is important to know which bloodborne pathogens (from humans or animals) you may be exposed to at work, especially in laboratories.** For example, personnel in the College of Veterinary Medicine might have the potential for exposure to rabies, and it would therefore be important to know specific information about rabies.

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## Hepatitis B (HBV)

In the United States, approximately 300,000 people are infected with HBV annually. Of these cases, a small percentage are fatal.

*"Hepatitis"* means *"inflammation of the liver,"* and, as its name implies, Hepatitis B is a virus that infects the liver. While there are several different types of Hepatitis, Hepatitis B is transmitted primarily through "blood to blood" contact. Hepatitis B initially causes inflammation of the liver, but it can lead to more serious conditions such as cirrhosis and liver cancer.

There is no "cure" or specific treatment for HBV, but many people who contract the disease will develop antibodies, which help them get over the infection and protect them from getting it again. It is important to note, however, that there are different kinds of hepatitis, so infection with HBV will not stop someone from getting another type.

The Hepatitis B virus is very durable, and it can survive in dried blood for up to seven days. For this reason, this virus is the primary concern for employees such as housekeepers, custodians, laundry personnel and other employees who may come in contact with blood or potentially infectious materials in a non first-aid or medical care situation.

### Symptoms:

The symptoms of HBV are very much like a mild "flu". Initially there is a sense of fatigue, possible stomach pain, loss of appetite, and even nausea. As the disease continues to develop, jaundice (a

distinct yellowing of the skin and eyes), and a darkened urine will often occur. However, people who are infected with HBV will often show no symptoms for some time. After exposure it can take **1-9 months** before symptoms become noticeable. Loss of appetite and stomach pain, for example, commonly appear within 1-3 months, but can occur as soon as 2 weeks or as long as 6-9 months after infection.

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## Human Immunodeficiency Virus (HIV)

**AIDS**, or acquired immune deficiency syndrome, is caused by a virus called the human immunodeficiency virus, or HIV. Once a person has been infected with HIV, it may be many years before AIDS actually develops. HIV attacks the body's immune system, weakening it so that it cannot fight other deadly diseases. AIDS is a fatal disease, and while treatment for it is improving, there is no known cure.

Estimates on the number of people infected with HIV vary, but some estimates suggest that an average of 35,000 people are infected every year in the US (in 2000, 45,000 new infections were reported). It is believed that as of 2000, 920,000 persons were living with HIV/AIDS in the United States. These numbers could be higher, as many people who are infected with HIV may be completely unaware of it.

The HIV virus is very fragile and will not survive very long outside of the human body. It is primarily of concern to employees providing first aid or medical care in situations involving fresh blood or other potentially infectious materials. It is estimated that the chances of contracting HIV in a workplace environment are only 0.4%. However, because it is such a devastating disease, all precautions must be taken to avoid exposure.

AIDS infection essentially occurs in three broad stages. The **first stage** happens when a person is actually infected with HIV. After the initial infection, a person may show few or no signs of illness for many years. Eventually, in the **second stage**, an individual may begin to suffer swollen lymph glands or other lesser diseases, which begin to take advantage of the body's weakened immune system. The second stage is believed to eventually lead to AIDS, the **third and final stage**, in all cases. In this stage, the body becomes completely unable to fight off life-threatening diseases and infections.

### Symptoms:

Symptoms of HIV infection can vary, but often include weakness, fever, sore throat, nausea, headaches, diarrhea, a white coating on the tongue, weight loss, and swollen lymph glands.

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If you believe you have been exposed to HBV or HIV, especially if you have experienced any of the signs or symptoms of these diseases, you should consult your physician or doctor as soon as possible.

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## Modes of Transmission

Bloodborne pathogens such as HBV and HIV can be transmitted through contact with infected human **blood** and **other potentially infectious body fluids** such as:

- Semen
- Vaginal secretions
- Cerebrospinal fluid

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- Synovial fluid
- Pleural fluid
- Peritoneal fluid
- Amniotic fluid
- Saliva (in dental procedures), and
- Any body fluid that is visibly contaminated with blood.

It is important to know the ways exposure and transmission are most likely to occur in your particular situation, be it providing first aid to a student in the classroom, handling blood samples in the laboratory, or cleaning up blood from a hallway.

## HBV and HIV are most commonly transmitted through:

- Sexual Contact
- Sharing of hypodermic needles
- From mothers to their babies at/before birth
- Accidental puncture from contaminated needles, broken glass, or other sharps
- Contact between broken or damaged skin and infected body fluids
- Contact between mucous membranes and infected body fluids



**Accidental puncture from contaminated needles and other sharps can result in transmission of bloodborne pathogens.**

In most work or laboratory situations, transmission is most likely to occur because of accidental puncture from contaminated needles, broken glass, or other sharps; contact between broken or damaged skin and infected body fluids; or contact between mucous membranes and infected body fluids. For example, if someone infected with HBV cut his or her finger on a piece of glass, and then you cut yourself on the now infected piece of glass, it is possible that you could contract the disease. Anytime there is **blood-to-blood contact** with infected blood or body fluids, there is a slight potential for transmission.

Unbroken skin forms an impervious barrier against bloodborne pathogens. However, **infected blood can enter your system through:**

- Open sores
- Cuts
- Abrasions
- Acne
- Any sort of damaged or broken skin such as sunburn or blisters

Bloodborne pathogens may also be transmitted through the **mucous membranes** of the

- Eyes
- Nose
- Mouth

For example, a splash of contaminated blood to your eye, nose, or mouth could result in transmission.

## **PPE, Work Practices & Engineering Controls**

It is extremely important to use personal protective equipment and work practice controls to protect yourself from bloodborne pathogens.

"**Universal Precautions**" is the name used to describe a prevention strategy in which all blood and potentially infectious materials are treated as if they are, in fact, infectious, regardless of the perceived status of the source individual. In other words, whether or not you think the blood/body fluid is infected with bloodborne pathogens, *you treat it as if it is*. This approach is used in all situations where exposure to blood or potentially infectious materials is possible. This also means that certain engineering and work practice controls shall **always** be utilized in situations where exposure may occur.

## **Personal Protective Equipment**

Probably the first thing to do in any situation where you may be exposed to bloodborne pathogens is to ensure you are wearing the appropriate personal protective equipment (PPE). For example, you may have noticed that emergency medical personnel, doctors, nurses, dentists, dental assistants, and other health care professionals always wear latex or protective gloves. This is a simple precaution they take in order to prevent blood or potentially infectious body fluids from coming in contact with their skin.

**To protect yourself, it is essential to have a barrier between you and the potentially infectious material.**

### Rules to follow:

- Always wear personal protective equipment in exposure situations.
- Remove PPE that is torn or punctured, or has lost its ability to function as a barrier to bloodborne pathogens.
- Replace PPE that is torn or punctured.
- Remove PPE before leaving the work area.

If you work in an area with routine exposure to blood or potentially infectious materials, the necessary PPE should be readily accessible. Contaminated gloves, clothing, PPE, or other materials should be placed in appropriately labeled bags or containers until it is disposed of, decontaminated, or laundered. It is important to find out where these bags or containers are located in your area before beginning your work.

### Gloves

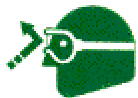


Gloves should be made of latex, nitril, rubber, or other water impervious materials. If glove material is thin or flimsy, double gloving can provide an additional layer of protection. Also, if you know you have cuts or sores on your hands, you should cover these with a bandage or similar protection as an additional precaution before donning your gloves. You should always inspect your gloves for tears or punctures before putting them on. **If a glove is damaged, don't use it!** When taking contaminated gloves off, do so carefully. Make sure you don't touch the outside of the gloves with any bare skin, and be sure to dispose of them in a proper container so that no one else will come in contact with them, either.

**Always check your gloves for damage before using them**



### Goggles



Anytime there is a risk of splashing or vaporization of contaminated fluids, goggles and/or other eye protection should be used to protect your eyes. Again, bloodborne pathogens can be transmitted through the thin membranes of the eyes so it is important to protect them. Splashing could occur while cleaning up a spill, during laboratory procedures, or while providing first aid or medical assistance.

### Face Shields



Face shields may be worn in addition to goggles to provide additional face protection. A face shield will protect against splashes to the nose and mouth.

## Aprons



Aprons may be worn to protect your clothing and to keep blood or other contaminated fluids from soaking through to your skin.

Normal clothing that becomes contaminated with blood should be removed as soon as possible because fluids can seep through the cloth to come into contact with skin. Contaminated laundry should be handled as little as possible, and it should be placed in an appropriately labeled bag or container until it is decontaminated, disposed of, or laundered.

**Remember to use universal precautions and treat all blood or potentially infectious body fluids as if they are contaminated. Avoid contact whenever possible, and whenever it's not, wear personal protective equipment.** If you find yourself in a situation where you have to come in contact with blood or other body fluids and you don't have any standard personal protective equipment handy, you can improvise. Use a towel, plastic bag, or some other barrier to help avoid direct contact.

## Hygiene Practices



**Handwashing** is one of the most important (and easiest) practices used to prevent transmission of bloodborne pathogens. Hands or other exposed skin should be thoroughly washed as soon as possible following an exposure incident. Use soft, antibacterial soap, if possible. Avoid harsh, abrasive soaps, as these may open fragile scabs or other sores.

Hands should also be washed immediately (or as soon as feasible) after removal of gloves or other personal protective equipment.

Because handwashing is so important, you should familiarize yourself with the location of the handwashing facilities nearest to you. Laboratory sinks, public restrooms, janitor closets, and so forth may be used for handwashing if they are normally supplied with soap. If you are working in an area without access to such facilities, you may use an antiseptic cleanser in conjunction with clean cloth/paper towels or antiseptic towelettes. If these alternative methods are used, hands should be washed with soap and running water as soon as possible.

If you are working in an area where there is reasonable likelihood of exposure, **you should never:**

- **Eat**
- **Drink**
- **Smoke**
- **Apply cosmetics or lip balm**
- **Handle contact lenses**

No food or drink should be kept in refrigerators, freezers, shelves, cabinets, or on counter tops where blood or potentially infectious materials are present.



You should also try to minimize the amount of splashing, spraying, splattering, and generation of droplets when performing any procedures involving blood or potentially infectious materials, and you should **NEVER pipette or suction these materials by mouth.**

## Decontamination and Sterilization

All surfaces, tools, equipment and other objects that come in contact with blood or potentially infectious materials must be decontaminated and sterilized as soon as possible. **Equipment and tools must be cleaned and decontaminated before servicing or being put back to use.**

Decontamination should be accomplished by using

- A solution of 5.25% sodium hypochlorite (household bleach / Clorox) diluted between 1:10 and 1:100 with water. The standard recommendation is to use at least a quarter cup of bleach per one gallon of water.
- [Lysol or some other EPA-registered tuberculocidal disinfectant](#). Check the label of all disinfectants to make sure they meet this requirement.

If you are cleaning up a spill of blood, you can carefully cover the spill with paper towels or rags, then gently pour the 10% solution of bleach over the towels or rags, and leave it for *at least 10 minutes*. This will help ensure that any bloodborne pathogens are killed before you actually begin cleaning or wiping the material up. By covering the spill with paper towels or rags, you decrease the chances of causing a splash when you pour the bleach on it.

If you are decontaminating equipment or other objects (be it scalpels, microscope slides, broken glass, saw blades, tweezers, mechanical equipment upon which someone has been cut, first aid boxes, or whatever) you should leave the disinfectant in place for *at least 10 minutes* before continuing the cleaning process.

Of course, any materials you use to clean up a spill of blood or potentially infectious materials must be decontaminated immediately, as well. This would include mops, sponges, re-usable gloves, buckets, pails, etc.

## Sharps

Far too frequently, housekeepers, custodians and others are punctured or cut by improperly disposed needles and broken glass. This, of course, exposes them to whatever infectious material may have been on the glass or needle. For this reason, it is especially important to handle and dispose of all sharps carefully in order to protect yourself as well as others.

**Needles must be disposed of in sharps containers.**

**Improperly disposed needles can injure housekeepers, custodians, and other people.**



## **Needles**

- Needles should never be recapped.
- Needles should be moved only by using a mechanical device or tool such as forceps, pliers, or broom and dustpan.
- Never break or shear needles.

- **Needles shall be disposed of in labeled sharps containers only.**
  - Sharps containers shall be closable, puncture-resistant, leak-proof on sides and bottom, and must be labeled or color-coded.
  - When sharps containers are being moved from the area of use, the containers should be closed immediately before removal or replacement to prevent spillage or protrusion of contents during handling or transport.

## Broken Glassware

- Broken glassware that has been visibly contaminated with blood must be sterilized with an approved disinfectant solution before it is disturbed or cleaned up.
  - Glassware that has been decontaminated may be disposed of in an appropriate sharps container: i.e., closable, puncture-resistant, leak-proof on sides and bottom, with appropriate labels. (Labels may be obtained from OSU EHS.)
- Broken glassware will not be picked up directly with the hands. Sweep or brush the material into a dustpan.
  - Uncontaminated broken glassware may be disposed of in a closable, puncture resistant container such as a cardboard box or coffee can.

**By using Universal Precautions and following these simple engineering and work practice controls, you can protect yourself and prevent transmission of bloodborne pathogens.**

## Signs, Labels & Color Coding

Warning labels need to be affixed to containers of [regulated waste](#), refrigerators and freezers containing blood or other potentially infectious material; and other containers used to store, transport, or ship blood or other potentially infectious materials. These labels are fluorescent orange, red, or orange-red, and they are available from EHS. Bags used to dispose of regulated waste must be red or orange red, and they, too, must have the biohazard symbol readily visible upon them. Regulated waste should be double-bagged to guard against the possibility of leakage if the first bag is punctured.



**Labels should display this universal biohazard symbol.**

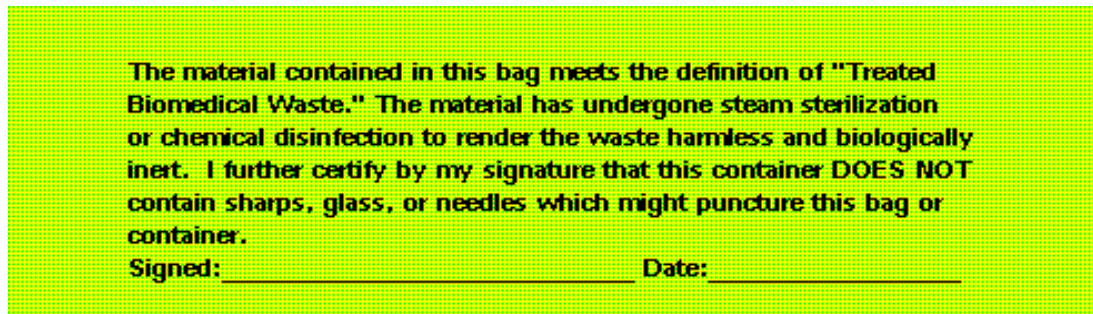
**Regulated waste** refers to

- Any liquid or semi-liquid blood or other potentially infectious materials
- Contaminated items that would release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed
- Items that are caked with dried blood or other potentially infectious materials and are capable of releasing these materials during handling
- Contaminated sharps
- Pathological and microbiological wastes containing blood or other potentially infectious materials

**All regulated waste must be disposed in properly labeled containers or red biohazard bags.** These must be disposed at an approved facility. Most departments or facilities that generate regulated waste will have some sort of contract with an outside disposal company that will come pick up their waste and take it to an approved incineration/disposal facility.

**Non-regulated waste** (i.e., does not fit the definition of regulated waste provided above) that is not generated by a medical facility such as the Student Health Center, Wellness Center, or human health-related research laboratory may be disposed in regular plastic trash bags *if it has been decontaminated or autoclaved prior to disposal*.

However, **all bags containing such materials must be labeled, signed, and dated, verifying that the materials inside have been decontaminated according to acceptable procedures and pose no health threat.** Pre-printed labels designed for this purpose are available from EHS, and they must be placed on the bag so that they are readily visible.



Custodians and housekeepers will not remove bags containing any form of blood (human or animal), vials containing blood, bloody towels, rags, biohazardous waste, etc. from laboratories unless the bag has one of these labels on it. They have been given very strict instructions not to handle any non-regulated waste unless it has been properly marked and labeled (including signature).

Custodians will not handle regulated waste.

For more information on this as it pertains to laboratories, check out the section on [Treated Biomedical Waste](#) in OSU's Lab Safety Manual.

## Emergency Procedures

In an emergency situation involving blood or potentially infectious materials, you should always **use Universal Precautions** and try to minimize your exposure by wearing gloves, splash goggles, pocket mouth-to-mouth resuscitation masks, and other barrier devices.

If you are exposed, however, you should:

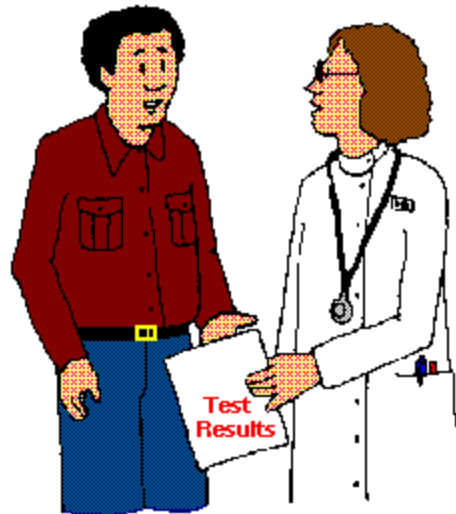
1. Wash the exposed area thoroughly with soap and running water. Use non-abrasive, antibacterial soap if possible.

**If blood is splashed in the eye or mucous membrane, flush the affected area with running water for at least 15 minutes.**

2. Report the exposure to your supervisor as soon as possible.
3. Fill out an exposure report form, if you desire. This form will be kept in your personnel file for 40 years so that you can document workplace exposure to hazardous substances. This report is available from your supervisor or from OSU EHS.
4. You may also go to the Student Health Center to request blood testing or the Hepatitis B vaccination if you have not already received it.

The Student Health Center has a specific set of procedures they will follow for all post-exposure cases. These are:

- Document the route(s) of exposure and the circumstances under which the exposure incident occurred.
- Identify and document the source individual unless such documentation is impossible or prohibited by law.
- Test the source individual's blood for HBV and HIV as soon as possible after consent is obtained. If the source individual is known to be seropositive for HBV or HIV, testing for that virus need not be done.
- Collect your blood as soon as feasible, and test it after your consent is obtained.



- (If you consent to baseline blood collection, but do not give consent at that time for HIV serological testing, your blood sample will be kept for at least 90 days. If, within 90 days of the incident, you decide to consent to have the baseline sample tested, such testing shall be done as soon as possible, and at no cost to you.)
- Administer post exposure prophylaxes, when medically indicated, as recommended by the US Public Health Service.
- Provide counseling.
- Evaluate reported illnesses.

Apart from the circumstances surrounding the exposure itself, all other findings or diagnosis by the SHC or health care professional(s) will remain entirely confidential.

## Hepatitis B Vaccinations

Employees who have routine exposure to bloodborne pathogens (such as doctors, nurses, first aid responders, etc) shall be offered the Hepatitis B vaccine series at no cost to themselves **unless**:

- They have previously received the vaccine series
- Antibody testing has revealed they are immune
- The vaccine is contraindicated for medical reasons

In these cases they need not be offered the series.

Although your employer must offer the vaccine to you, you do not have to accept that offer. You may opt to **decline** the vaccination series, in which case you will be asked to sign a declination form. **Even if you decline the initial offer, you may choose to receive the series at anytime during your employment thereafter**, for example, if you are exposed on the job at a later date.

As stated in the [Emergency Procedures](#) section, if you are exposed to blood or potentially infectious materials on the job, you may request a Hepatitis B vaccination at that time. If the vaccine is administered immediately after exposure it is extremely effective at preventing the disease.

The Hepatitis B vaccination is given in a series of three shots. The second shot is given one month after the first, and the third shot follows five months after the second. This series gradually builds up the body's immunity to the Hepatitis B virus.

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The vaccine itself is made from yeast cultures; there is no danger of contracting the disease from getting the shots, and, once vaccinated, a person does not need to receive the series again. There are booster shots available, however, and in some instances these may be recommended (for example, if there is an outbreak of Hepatitis B at a particular location).

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**This is the end of the Bloodborne Pathogens Training Module. To receive credit for this training, take the Quiz.**