Bloodborne Pathogens

Oklahoma State University
Objectives

- What is a Bloodborne Pathogen?
- Types, modes of transmission and causes.
- Who is at risk? Could you be exposed at work?
- Why do we have OSHA standards regarding Bloodborne pathogens and what are your employer's responsibilities?
- What is an exposure control plan, and how do I get one?
- How do I know when I could be exposed to a Bloodborne pathogen?
- How do I prevent or reduce exposure or the spread of Bloodborne Pathogens?
- Types of PPE, proper use, location, removal, handling, decontamination and disposal.
- Emergency actions and contact following the exposure or presence of BBP
Recently, OSHA announced that it has fined the U.S. Postal Service $342,059 in willful violations, after workers were exposed to bloodborne pathogens. These violations were a result of the lack of an implemented bloodborne pathogens exposure control plan. Exposure to bloodborne pathogens can result in serious or life-threatening illnesses. To reduce these hazards, an effective exposure control plan must be implemented.
What is a BBP, and why are they important?

- Microorganisms that are carried in blood that can cause disease in humans.
- These pathogens include, but are not limited to, HBV, HCV, and HIV.
- OSHA estimates 5.6 million workers in health care and other facilities are at risk of exposure to bloodborne pathogens, such as HIV and HBV.
- Bloodborne pathogens can be transmitted through blood or ‘other potentially infectious material’ (OPIM), such as?
Could you contract a bloodborne pathogen doing these things?

- Administering First-Aid?
- Cleaning the restroom?
- Using a tool covered with dried blood?
- A co-worker sneezing on you?
- Working in a sewer manhole?
- Cleaning up after an accident?
- Shaking a sick coworkers hand?
- Cutting yourself with glass that is contaminated with blood?
## Modes of Transmission

<table>
<thead>
<tr>
<th>Direct</th>
<th>Indirect</th>
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<tbody>
<tr>
<td>Direct contact transmission requires physical contact between an infected person and a susceptible person, and the physical transfer of microorganisms. Direct contact includes touching an infected individual, kissing, sexual contact, contact with oral secretions, or contact with body lesions.</td>
<td>Indirect contact transmission refers to situations where a susceptible person is infected from contact with a contaminated surface. Some organisms are capable of surviving on surfaces for an extended period of time. To reduce transmission by indirect contact, frequent touch surfaces should be properly disinfected.</td>
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</tbody>
</table>
Hepatitis B (HBV)

- 1-1.25 million Americans are *chronically* infected, however, there has been a HBV vaccination available since 1982!
- Hepatitis B can lead to chronic liver disease.
- HBV can survive for at least one week in dried blood.
- Symptoms, such as jaundice, fatigue, abdominal pain, nausea and vomiting can occur 1-9 months post-exposure.
- HBV is transmitted when blood or OPIM enters the body of a non-infected person.
- Employees are at risk of exposure when drug-injection materials are shared, direct contact is made with blood, or there is exposure to other sharp materials.
Hepatitis C (HCV)

- HCV is the most common chronic bloodborne infection in the United States— it affects about 3.5 million people in the United States.
- Hepatitis C can also lead to chronic liver disease and is a leading cause of liver cancer.
- Symptoms are similar to Hepatitis B, including jaundice, fatigue, abdominal pain, nausea and vomiting.
- HCV spreads through direct contact with infected blood.
Environmental Health and Safety

Human Immunodeficiency Virus (HIV)

- HIV is the virus that leads to _______?
- HIV depletes the immune system by destroying blood cells that help the body fight diseases.
- HIV does not survive well outside the body.
- HIV can be transmitted through unprotected sex with someone who has HIV, sharing needles, and even during childbirth.
- Less common transmission methods include: being stuck with an HIV-contaminated needle or sharp, and contact with broken skin, wounds, or contaminated body fluids.
- The CDC reports that HIV cannot be spread by air, water, insects, saliva, tears, sweat, casual contact; or closed mouth contact.
**Does 29 CFR 1910.1030 only apply to HBV, HCV, and HIV?**

<table>
<thead>
<tr>
<th>Pathogen Name</th>
<th>Disease Name</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Plasmodium</em> species</td>
<td><em>Spirillum minus</em></td>
</tr>
<tr>
<td><em>Treponema</em> species</td>
<td>Colorado Tick Fever Viruses</td>
</tr>
<tr>
<td><em>Babesia</em> species</td>
<td><em>Borrelia</em> species</td>
</tr>
<tr>
<td><em>Brucella</em> species</td>
<td>Creutzfeldt-Jakob agent</td>
</tr>
<tr>
<td><em>Leptospira</em> species</td>
<td>Human T-lymphotropic Virus Type I</td>
</tr>
<tr>
<td><em>Francisella</em> species</td>
<td>Hemorrhagic Fever Viruses</td>
</tr>
<tr>
<td><em>Streptobacillus moniliformis</em></td>
<td><em>Mycobacterium tuberculosis</em></td>
</tr>
<tr>
<td>Rabies Virus</td>
<td>Cutaneous Anthrax</td>
</tr>
<tr>
<td>Vaccinia</td>
<td>Epstein-Barr Virus</td>
</tr>
<tr>
<td>Human Papillomavirus</td>
<td>Simian Vacuolating Virus 40</td>
</tr>
</tbody>
</table>
Cutaneous Anthrax

Occupational exposure could occur when:

• Non-intact skin or mucous membranes are exposed to drainage from cutaneous anthrax lesion.

• There is entry through skin with sharp instruments that are contaminated with lesion drainage.
Occupational exposure could occur when:

- Non-intact skin or mucous membrane is exposed to saliva, nerve tissue, or cerebral spinal fluid from an infected person or animal.
- There is entry through skin with sharp instruments that are contaminated with infected nerve tissue.
Vaccinia

Occupational exposure could occur when:

• Mucous membranes or non-intact skin contact with drainage from a vaccinia infection.

• Susceptible skin comes into direct contact with object contaminated with lesion material.
Who is at risk? Could you be exposed at work?

- Workers in many occupations are at risk of exposure, including first responders, housekeeping personnel in some industries, lab personnel, Facilities Management, nurses and other healthcare personnel, although, all may be at risk for exposure to bloodborne pathogens.
- What other occupations could be at risk for Bloodborne pathogen exposure?
- Remember, exposures can occur when working in animal laboratories.
Why does 29 CFR 1910.1030 apply to finite and continuous human cell lines?

While an OSHA standard interpretation from 1994 does exempt established human cell lines that are characterized to be free of contamination from human hepatitis viruses, HIV, and other bloodborne pathogens, our OSU Bloodborne Pathogens Program does not. This is for a few reasons:

• The CDC’s Biosafety in Microbiological and Biomedical Laboratories recommends that all work with NHP and human cells follows the Bloodborne Pathogen Standard.
• There is extensive testing required to ensure that cell lines are free of all bloodborne pathogens – not just Viral Hepatitis and HIV (EBV, HTLV, HPV, CMV . . . ).
• Establishment of an ECP is much easier than maintaining documentation of testing for OSHA.
• Safety is our number one priority.
In March 1992, OSHA's Bloodborne Pathogen Standard, 29 CFR 1910.1030 took effect. This standard was designed to prevent more than 200 deaths and 9,000 Bloodborne infections every year. While the standard was primarily aimed at hospitals, funeral homes, nursing homes, clinics, law enforcement agencies, emergency responders, and HIV/HBV research laboratories, anyone who can "reasonably expect to come in contact with blood or potentially infectious materials" as part of their job is covered by the standard.
OSHA’s Bloodborne Pathogen Standard states that anyone whose job requires exposure to BBP is required to complete BBP training.

- Initial training is conducted face to face; not online
- Training is required annually

Anyone whose job requires exposure to BBP shall be offered vaccines and post exposure evaluation following any possible exposure incidents at no cost to the employee.

The Standard also requires employers to offer PPE and a written exposure plan.

- EHS has an example exposure plan
Exposure Control Plan: Elements of the plan

- Your exposure control plan should be updated annually to implement any changes and should be available within your department
  – EHS can provide current template
- Address the implementation of *Universal Precautions* and the identification and use of engineering controls
- Provisions for PPE and training
- Hep B vaccinations available for all employees with occupational exposure
- Post exposure evaluation and follow-up for any occupational exposure
- Use of signs and labels to communicate hazards
- Record keeping
Bloodborne Pathogen Binder

Suggested binder set up:
- OSHA Bloodborne Pathogen standard 1910.1030
- ECP with all appendixes
- List of all employees under plan
- Copies of completed/signed Hep B vaccination forms
- Training documentation
- Self inspection documentation
- Completed parameter sheet

EHS can assist with program set up and may do periodic checks.
Exposure Prevention

- Elimination and Substitution: Eliminate the hazard completely or substitute with something less hazardous.
- Engineering Controls: Isolate workers from the hazard.
- Administrative Controls: Controls employees’ exposure by scheduling tasks to minimize exposure levels. Provides guidance to employees through SOPs and training.
- PPE: Clothing and other work accessories designed to create a barrier against workplace hazards.
Engineering Controls

• Reduce exposure by either removing or isolating the hazard, or isolating the worker from exposure
• Are limited in effectiveness due to proper selection, examination, and maintenance
Administrative/Workplace Controls

• Restrict eating, drinking, smoking, applying cosmetics, and handling contact lenses
• Prevent the storage of food or drink in refrigerators or other locations where blood or OPIMs are kept
• Provide and require the use of handwashing facilities
• Require the use gloves when cleaning up OPIM spills
• Prohibit recapping, bending, removing, shearing, or breaking contaminated needles
• Routinely check equipment and decontaminate it prior to servicing and shipping
Universal Precautions

Precautionary measures based on the principle that all blood, body fluids, secretions, excretions except sweat, non-intact skin, and mucous membranes may contain transmissible infectious agents.

These include:
• Hand hygiene
• Use of gloves, gowns, masks, eye protection, or face shield, depending on the anticipated exposure; and
• Safe injection practices
Personal Protective Equipment
Hand, eye, face, extremities, protective clothing, respiratory devices and protective shields and barriers.

- PPE must be used if engineering controls and work practice control do not eliminate exposure
- PPE is only appropriate if it prevents blood or OPIM from passing through or reaching clothes or body
- PPE can consist of gloves, gowns, laboratory coats, face shields, masks, and eye and respiratory protection
- PPE selection is based on anticipated contact with blood or OPIM
Proper Use and Handling of PPE

For PPE to be effective, observe the following precautions:

• Wear appropriate gloves when there is a reasonable hazard of contact with infectious materials
• Replace gloves if torn, punctured, contaminated or if they no longer function as a barrier
• Never reuse disposable gloves
• Only reuse utility gloves if they are uncompromised
• Wear face and eye protection if risk of splashes, sprays, splatters or droplets of blood or OPIM are present
• Wear protective body coverings when necessary
• Remove PPE when contaminated and before leaving the work area
PPE, Contaminates and Sharps Disposal

- Gloves and other PPE should be disposed of in an appropriate area
- Sharps should be disposed of in sharps containers
- Sharps containers must be puncture-resistant, leak-proof and labeled or color-coded red
Disposal of Biological Waste

- Blood and OPIM should be disposed of in a closable, leak-proof and labeled/color-coded container
- In the event of a spill, each building should have a janitor trained in body fluids cleanup-- this is the person in charge of the cleanup
  - Disinfectants used in laboratories must be effective against *Mycobacterium tuberculosis* and listed by the EPA
- EHS does not accept any biological waste that has not been autoclaved
Warning labels will be affixed to items such as:
- Containers of regulated waste
- Containers of contaminated reusable sharps
- Refrigerators and freezers containing blood or OPIMs
- Containers used to store, transport, or ship blood or OPIMs
- Contaminated equipment being shipped or serviced
- Bags or containers of contaminated laundry
Signs, Labels and Color-Coding Cont.

Labels will:
• Include appropriate legend in fluorescent orange or orange-red
• Be affixed as close as feasible to the container

Items that do not need labels:
• Labeled containers of blood released for clinical use
• Regulated waste that is decontaminated
What happens after an accidental exposure?

• Post exposure evaluation and follow-up procedures:
  • Evaluation will involve documenting exposure root cause and circumstances
  • Identifying and documenting the source individual
  • Collecting exposed employee’s blood
  • Testing individual’s blood
  • Sharing results with exposed employee
  • Post exposure measures and counseling
  • Evaluating reported illness
What is the risk of infection following an occupational exposure?

- **HBV**
  - Personnel who have received hepatitis B vaccine and developed immunity to the virus are at virtually no risk for infection. For a susceptible person, the risk from a needlestick or cut exposure to HBV-infected blood ranges from 6 – 30%.

- **HCV**
  - The average risk for infection after a needlestick or cut exposure to HCV-infected blood is approximately 1.8%.

- **HIV**
  - The average risk of HIV infection after a needlestick or cut exposure to HIV-infected blood is 0.3%.
Precautions for Providing First-Aid to a Co-Worker

Protect yourself before offering assistance by:

• Wearing clean, leak-proof gloves
• Being aware of personal cuts or broken skin
• Attempt to have the co-worker self administer first-aid
• Protect your nose and mouth in the event of splatters or sprays
• Immediately wash skin if contaminated with blood, or flush eyes with water if contaminated
• Report the incident to your supervisor
The shipping of infectious substances is highly regulated by the US Department of Transportation (49 CFR 173.134). The US DOT classifies infectious substances into two categories:

- Category A Infectious Substances – an infectious substance in a form capable of causing permanent disability or life-threatening or fatal disease in otherwise healthy humans or animals when exposure to it occurs.
- Category B Infectious Substances – an infectious substance that is not in a form generally capable of causing permanent disability or life-threatening or fatal disease in otherwise healthy humans or animals when exposure to it occurs.

Infectious substances must be packaged in accordance to 49 CFR 173.196 or 49 CFR 173.199.
The determination of the appropriate category for an infectious substance **must** be done by an individual trained in infectious substance shipping (49 CFR 171.1 (b))

### Examples of Category A Infectious Substances

<table>
<thead>
<tr>
<th>Example</th>
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</thead>
<tbody>
<tr>
<td><em>Bacillus anthracis</em></td>
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<tr>
<td><em>Brucella abortus</em></td>
</tr>
<tr>
<td><em>Coxiella burnetti</em></td>
</tr>
<tr>
<td>Human Immunodeficiency Virus</td>
</tr>
<tr>
<td>Highly Pathogenic Avian Influenza Virus</td>
</tr>
<tr>
<td>West Nile Virus</td>
</tr>
<tr>
<td>Ebola Virus</td>
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</tbody>
</table>

### Examples of Category B Infectious Substances

<table>
<thead>
<tr>
<th>Example</th>
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</thead>
<tbody>
<tr>
<td><em>Borrelia burgdorferi</em></td>
</tr>
<tr>
<td><em>Campylobacter jejuni</em></td>
</tr>
<tr>
<td><em>Chlamydia trachomatis</em></td>
</tr>
<tr>
<td>Human B-Lymphotropic Virus</td>
</tr>
<tr>
<td>Hepatitis E Virus</td>
</tr>
<tr>
<td>Hepatitis C Virus</td>
</tr>
<tr>
<td>Herpes Simplex Virus 2</td>
</tr>
</tbody>
</table>

**Environmental Health and Safety**

**BBP and the US Department of Transportation**
• The following are exempted from the US DOT requirements:
  • Non-infectious biological materials from humans, animals, or plants. Examples include non-infectious cells, tissue cultures, blood or plasma from individuals not suspected of having an infectious disease, DNA, RNA, or other non-infectious genetic elements.
  • Material containing microorganisms that are non-pathogenic to humans or animals.
  • Material containing pathogens that have been neutralized or inactivated such that they no longer pose a health risk.
  • Material with a low probability of containing an infectious substance, or where the concentration of the infectious substance is at a level naturally occurring in the environment so it cannot cause disease when exposure to it occurs.
  • Blood collected for the purpose of blood transfusion.
  • Human or animals samples being transported for routine testing not related to the diagnosis of an infectious disease.
BBP and the US Department of Transportation

Scenarios

- Dr. Jane Smith needs to ship a blood sample that she believes could contain Hepatitis B Virus.
  - Hepatitis B Virus is a Category A Infectious Substance. It must be shipped following provisions in 49 CFR 173.196. All of those involved in shipping the sample must be trained in infectious substance shipping.
- Dr. John Brown needs to send a medical instrument to be calibrated. He disinfected the instrument before shipping.
  - Dr. John Brown is exempt from the US DOT 6.2 shipping requirements. He disinfected the instrument prior to shipping and removed biological hazards. However, medical equipment must be labeled in accordance with 29 CFR 1910.1030.
- Ms. Karen Clark needs to send a bacterial culture for identification. She has reason to believe it could be *Campylobacter*.
  - *Campylobacter* spp. is a Category B Infectious Substance. It must be shipped following provisions in 49 CFR 173.199. All of those involved in shipping the sample must be trained in infectious substance shipping.
BBP and the US Department of Transportation

- Do you perform any of the following tasks:
  - Determine the hazard class of an infectious substance to be shipped?
  - Select packaging for an infectious substance to be shipped?
  - Package an infectious substance?
  - Secure a closure on an infectious substance package?
  - Mark a package to indicate it contains an infectious substance?
  - Label a package to indicate it contains an infectious substance?
  - Prepare or review a shipping paper?
  - Provide emergency response information for a package containing infectious substance?
  - Certify that an infectious substance is in proper condition for transportation?
  - Load an infectious substance package into a transport vehicle?

If yes, you **must** complete training in infectious material shipping.
Remember, for industries that do not work with blood in an occupational manner; any exposure to these potentially hazardous substances by anyone other than the cleaning staff is almost always the result of an accident. We make continual efforts to create safe work conditions and avoid these accidents.
What should you take away?

Bloodborne pathogen rules are in place for your health and safety.

Failure to follow these rules is an unnecessary risk that shouldn’t be taken.

“Better safe than sorry”
Environmental Health and Safety

Programs and services:
• Fire Protection Engineering
• Life Safety and Emergency Preparedness
• Laboratory Safety
• Occupational Safety
• Occupational Health and Medical Surveillance
• Materials Management
• Industrial Hygiene
• Chemical Hygiene
• Safety Training

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Questions?

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Environmental Health and Safety
744-7241
Jeopardy
• The act of treating any potentially infectious material as if it is contaminated.

• Universal Precautions
1 - $200

- A transmission route that requires physical contact between an infected person and a susceptible person.

- Direct Contact Transmission
1 - $300

- The most effective type of exposure prevention.

- Engineering Controls
This organization designed the Bloodborne pathogen standard 29CFR 1910.1030.

OSHA
This Bloodborne disease can survive for at least one week in dried blood.

Hepatitis B
How often must employees receive BBP training?

- Annually
Which employees are required to participate in BBP training?

Any employee whose job requires exposure to BBP.
This Bloodborne pathogen cannot be spread by: air or water, insects, saliva, tears or sweat, or casual contact.

- Human Immunodeficiency Virus (HIV)
2 - $400

- Work accessories designed to create a barrier against workplace hazards.

- Personal Protective Equipment
Employers are required to provide employees with this vaccination if they have the chance of occupational exposure.

- Hepatitis B Vaccine
3 - $100

- This Bloodborne pathogen has infected 1-1.25 million Americans.

- Hepatitis B
3 - $200

- This rigid container is designed to prevent unwanted BBP exposures by containing dirty needles and other sharp waste.

- Sharps Container
These microorganisms are carried in blood and can cause disease in humans.

- Bloodborne Pathogens
- This standard prevents more than 200 employee deaths and 9,000 Bloodborne infections per year.

- OSHA’s Bloodborne pathogen standard- 29CFR 1910.1030
Employees should never do what while wearing contaminated gloves or working with OPIM?

- Smoke, eat, drink, apply cosmetics, or handle contact lenses.
Final Jeopardy

- True or false: The EHS department is the GREATEST department on campus?
  - TRUE