Working Safely with Bloodborne Pathogens

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Course Overview

- What is the Standard?
- Epidemiology, transmission of HBV, HIV, and HCV
- Exposure control
- Personal protective equipment
- Disposal
- Exposure management
OSHA Standard, 1991

- 29 CFR Part 1910.1030
- Workplaces with occupational exposure to blood and OPIM
- Reasonably anticipated skin, eye, mucous membrane, or parenteral contact
- Universal Precautions—treat blood and body fluids as infectious
- Hazard communication—labeling, training, exposure control plan
Exposure Control Plan

- Comply with OSHA 29 CFR Part 1910.1030
- Exposure determination for employees
- Measures to eliminate or minimize your risk of exposure
- What to do if you are exposed to potentially infectious material
- http://www.ehs.cornell.edu/bio/expose_ctrl_blood.cfm
Chain of Infection

- Reservoir
- Means of escape
- Mode of Transmission
- Means of entry
- Susceptible host
- Infectious agent
- Work Practices/Equipment
- Surveillance
- Sanitation/Disinfection
- PPE
- Immunization/Preventive Therapy
Transmission

- Direct inoculation thru skin
- Open wounds, cuts, dermatitis
- Mucous membrane
- Aerosols
- Indirect transmission via inanimate objects or environmental surfaces
Transmission, or Not

- Not spread through the air like a cold
- Not spread by casual contact - sharing living space
- Not spread by non-sexual social situations - work, sharing air, food, and water
Infectious Materials

- Contact with blood and OPIM
  - Body cavity fluids
    - Cerebrospinal, synovial, pericardial, amniotic, pleural, other body fluids
  - Fluids visibly contaminated with blood. e.g., injuries to the mouth, dental procedures
  - Semen, vaginal secretions
  - Unfixed human tissue or organs, cell or tissue cultures
  - Experimentally infected animals
Not Covered by Standard?

- Tears, saliva, nasal secretions, urine, feces, sputum, and vomit
- Contaminated with blood
- HIV replication in saliva
Bloodborne Pathogens

- Disease-causing microorganisms that are present in human blood, body fluids, tissues
  - Hepatitis B Virus (HBV)
  - Human Immunodeficiency Virus (HIV)
  - Hepatitis C Virus (HCV)
  - Others include: Mycobacterium, Toxoplasma, Leishmania, Staphylococcus, West Nile virus
Bloodborne Pathogens

Hepatitis B virus (HBV)

- Inflammation of the liver
- Fatigue, nausea, loss of appetite, jaundice, dark urine, abdominal or joint pain, elevated liver function
- One ml may have $1 \times 10^8$ infectious doses
- Survive in dried blood for one to two weeks
- Acute to chronic infection - Hepatitis carriers
- 10% develop chronic infections
HBV Vaccine

- Offered free to all who have occupational exposure
- A safe and effective way of protecting yourself
- 85 to 97% effective - series of three shots over 6 months
- Vaccine is 70% to 88% effective if given within one week of exposure
- Long term protection >15 years
Bloodborne Pathogens

Hepatitis C virus (HCV)

- 80% of persons have no signs or symptoms
- Inflammation of the liver, cirrhosis, liver cancer
- Acute infection asymptomatic or mild clinical illness
- 75%-85% develop chronic infection
- Slowly progressive disease-10 to 40 years
- 8,000-10,000 deaths from chronic disease

Sources of Infection for Persons with Hepatitis C

- Injecting drug use 60%
- Sexual 15%
- Transfusion 10%
- Other * 5%
- Unknown 10%

*Nosocomial: Health-care work; Perinatal

Source: Centers for Disease Control and Prevention
Bloodborne Pathogens

Human Immunodeficiency virus (HIV)

- Causes flu-like symptoms, fever, fatigue, loss of appetite, weight loss, night sweats, skin rashes, swollen lymph glands
- May carry virus without developing symptoms
- Needle sticks have the highest potential risk, ~0.3%
- Very fragile
- HIV infection develops into AIDS and AIDS-related illnesses- immune suppression, neurological problems, cancer, opportunistic infections
You are working in the lab manipulating blood samples and you splash yourself in the mucous membranes. Nine months later you develop fatigue, jaundice, abdominal pain, and inflammation of the liver. You may have ______ infection.

hepatitis
Universal Precautions

Losing this much blood won't kill you.

Receiving this much could.
Administrative Controls

- Elimination or substitutions
- Supervision by knowledgeable individual
- Lab and agent-specific training
- Standard operating procedures
  - Use as training
  - Succinct
  - Review periodically
Engineering Controls

Biological Safety Cabinets

- Primary containment devices
- Procedures that produce aerosols or splashing
- HEPA filtration
- Worker, samples, and environment protected
BSC Operation

- Don’t cover front grilles
- Operate in middle of cabinet
- Use perpendicular motions
Engineering Controls

Safer Needles

- Engineered sharps injury protections and needleless systems
- Isolate or remove BBP hazard
- Substitute whenever feasible
- Employees involved in selection
Engineering Controls

Sharps Containers

- Rigid, puncture resistant
- Leak proof
- Biohazard label or symbol

Red Bag Containers

- Red biohazard bags
- Non-sharps waste
- Covered when not in use
Engineering Controls

Autoclaves

- Reduce the microbial load
- Not a final treatment

Centrifuge

- Sealed centrifuge rotors, tubes
- Load and unload tubes, rotors in BSC
- Accidents, broken tubes
  - Turn off centrifuge/close lid
  - Leave lab, prevent access
  - Call EH&S
Work Practice Controls

Personal Hygiene

- DO NOT eat, drink, smoke, apply cosmetics or handle contact lenses in work areas
- Avoid contact with mucous membranes
- Use mechanical devices when pipetting
- Minimize splashing, spraying, spattering or generation of droplets
- Use designated refrigerators to store food or beverages
Work Practice Controls

Handwashing

- Every time you remove gloves and immediately after possible exposure
- Ordinary soap OK
- Wash for 15-20 secs
- Alcohol-based sanitizers
Work Practice Controls

Sharps

- Don’t recap, bend, break, or remove needles from syringes
- One-handed technique or mechanical device
- Use forceps or tongs for broken glass
- Keep in full view at all times
- Puncture-resistant containers for disposal
Personal Protective Equipment

- Gloves
- Laboratory coats/gowns
- Safety glasses, goggles, face shield, face mask
Personal Protective Equipment (PPE)

Provision and Use

- PPE based on anticipated exposure and appropriate for the task
- Use each time you perform task
- Trained in proper use of equipment
- If damaged or contaminated, remove as soon as possible
- Remove all PPE before leaving workplace
Remove gloves before touching common surfaces!!
In the lab John does not eat or drink, works in a biosafety cabinet, recaps his needles, and wears gloves and a lab coat.

Which practice is not appropriate?

Recapping needles
Housekeeping

- Routinely clean and decontaminate surfaces and equipment (e.g., 1:10 household bleach)
- Overt contamination
- End of work day
- Always use tongs, forceps or a brush and dust pan to pick up contaminated sharps
- Proper segregation
Regulated Medical Waste

- “Soft” waste - gloves, paper, intact plastics
- Sharps waste - syringes, needles, broken glass
- Liquid waste - cell culture fluids, supernatant
Disposal

Regulated medical wastes are collected, repackaged at the Vet College for offsite transport and disposal.

Red bags and containers must **not** enter the regular waste stream.
Improper Waste Disposal
Signage

- Universal Biohazard Symbol
- Primary and secondary containers
- Equipment, refrigerators, freezers
Sharps disposal and red bag waste containers, biological safety cabinets, and safer needles are all examples of __________ controls

Engineering
Spill Cleanup

- MUST WEAR GLOVES!
- Face, eye protection, and protective gowns if splash hazard
- Disinfect area (e.g., 1:10 household bleach)
- Segregate waste
- Too much to handle? Call 911
Spill Cleanup

OOPS!!

Cover spill with towel and saturate with disinfectant.

Remove sharps

Carefully discard and reapply disinfectant.
What Do You Do If You Are Exposed?

- Wash thoroughly with soap and water
- Flush mucous membranes with running water
- Alcohol-based sanitizers
- Notify supervisor
- Seek post-exposure evaluation, preventive treatment
- Complete CU Injury/Illness report form
- http://prp.ehs.cornell.edu/Acc-Inj/
Post exposure Evaluation

- Medical evaluation
- Confidentiality of tests and records
- Determine risk associated with exposure
  - Type of fluid, exposure
- Evaluate exposure source
  - Prior testing, unknown sources
- Evaluate the exposed person
  - Immune status, immunizations
- Vaccine, immunoglobulins, antivirals
In incidents where there are large volumes of fluids or where splashing may occur, you may need additional protection (beyond gloves) such as ______, _______, and/or _______.

Eyewear, mask, gown
_____ is the most effective work practice to minimize transmission of infectious materials and contamination of the work area.

Handwashing
Summary

- Infectious organisms present in blood
- Treat all blood and bodily fluids as potentially infectious - Universal Precautions
- Use appropriate engineering controls, work practices, and personal protective equipment when handling potentially infectious materials
- It is possible to protect yourself....
Contacts for Assistance

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