



Life Threatening  
Vocational Hazards  
Diseases and Toxins



# INTRODUCTION

- What is the blood-borne pathogens standard?

**29CFR 1910.1030**

- Who needs blood-borne pathogens (BBP) training?

- What content needs to be included?



# OSHA's Standard

- The Big 3 are:

1. Hepatitis B (HBV)


2. Hepatitis C (HCV)

3. Human Immunodeficiency Virus (HIV)

**Workers exposed to blood-borne pathogens are at risk for serious or life-threatening illnesses.**



# OSHA'S EXPECTATIONS

- **Employers Duties**
    - identify job risks and classify
    - provide appropriate training
    - provide a plan
    - provide appropriate
  - **Employees Duties**
    - follow employer's plan
    - know job classification
    - complete training
    - use equipment provided by employer
- 

# BLOOD-BORNE PATHOGENS DEFINED



- Disease-causing microorganisms that may be present in human blood or OPIM (other potentially infectious material)

–Viruses



# MODES OF TRANSMISSION

- **Puncture wounds or cuts**
- **Contact (touch, splash, or spray) with blood or OPIM on:**
  - **mucous membrane**
  - **non-intact skin**
    - **cuts, abrasions, burns**
    - **acne, rashes**
    - **Paper cuts, hangnails**
  - **contaminated sharps**



# RISK OF EXPOSURE



- **Objective of BBP standard is to minimize or eliminate the hazard posed by work that may expose one to blood or OPIM**



# OCCUPATIONAL EXPOSURE INCIDENTS



- Occupational contact with blood or OPIM is considered an exposure incident
- If an exposure occurs:
  - wash with soap & water
  - report incident
  - document incident
  - seek “immediate” medical evaluation





# **MEDICAL EVALUATION POST EXPOSURE**

- **Entitled to confidential medical evaluation**
- **Personal decision about blood testing**
- **Blood may be tested only with consent**
- **Blood may be stored for 90 days, while considering testing**
- **Interpretation of any test results occurs with health care provider**

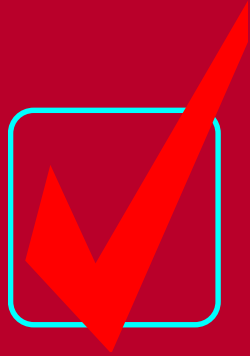


# SPECIFIC BLOODBORNE PATHOGENS



- Definition
- Signs and symptoms
- Course of infection
- Prevention and control





## HIV DEFINED

- **HIV is Human Immunodeficiency Virus**
- **HIV can cause acquired immune deficiency syndrome (AIDS)**
- **Risk of HIV infection from a puncture injury exposure to HIV infected blood is very low -- 0.3%**



# SIGNS & SYMPTOMS OF HIV

- **Signs and symptoms include:**
  - **Weight loss**
  - **Night sweats or fever**
  - **Gland swelling or pain**
  - **Muscle and/or joint pain**
- **Cannot rely on signs and symptoms to confirm if one is infected**



# **COURSE OF INFECTION WITH HIV**

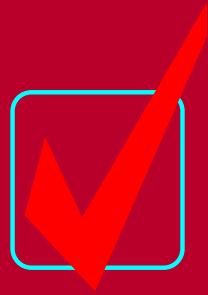
- **Incubation period from HIV infection to AIDS can be 8 to 10 years**
- **Varies greatly among individuals**



# HIV PREVENTION

- **There is no vaccine to prevent HIV infection**
- **Follow Universal Precautions**





## HCV DEFINED

- **HCV is Hepatitis C Virus**
- **It affects the liver**
- **It is most common chronic bloodborne infection in US**
- **Needle stick injury is only occupational risk factor associated with HCV**
- **Risk of HCV infection after exposure to HCV infected blood is 1.8%**
- **70 to 75% of those with acute HCV infection have no symptoms**



# SIGNS & SYMPTOMS OF HCV

- **Jaundice - yellow color to skin and whites of eyes**
- **Fatigue**
- **Headache**
- **Abdominal Pain**
- **Loss of appetite**
- **Nausea and vomiting**





# COURSE OF HCV INFECTION

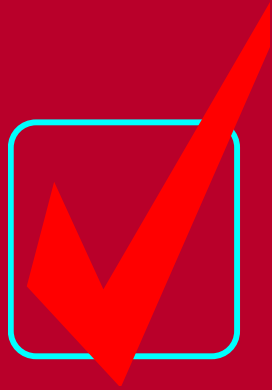
- **Incubation period averages 7 weeks**
- **Chronic liver disease may occur in 70% of those infected with HCV**



# HCV PREVENTION

- **No vaccine exists to prevent HCV infection**
- **Follow Universal Precautions**





## HBV DEFINED

- **HBV is Hepatitis B Virus**
- **It affects the liver**
- **Prevalence of HBV infection among healthcare workers is 10 times greater than HCV infection**



# **SIGNS & SYMPTOMS OF HBV**

- **Jaundice - yellow color to the skin and whites of eyes**
- **Fatigue**
- **Headache**
- **Abdominal Pain**
- **Loss of appetite**
- **Nausea and vomiting**



# COURSE OF HBV INFECTION

- **Incubation period averages 12 weeks**
- **Most cases of HBV resolve without complications**
- **Chronic liver disease may occur in 6 to 7% of those infected with HBV**



# HBV PREVENTION

- A vaccine does exist to prevent HBV infection
- Employers are required to offer HBV vaccination to employees covered under BBP standard
- Follow Universal Precautions



# HBV IMMUNIZATION

- **Employees with routine occupational exposure to blood/OPIM have right to HepB vaccination at no personal expense**
- **Employee refusal established by signing HepB vaccination declination form**
- **Vaccine is Energix-B**
- **Must be made available within 10 working days of initial assignment to job**



# HBV VACCINATION SCHEDULE

- **Vaccine given in 3 doses over 6 months**
  - 1st on initial assignment
  - 2nd one month later
  - 3rd five months after 2nd dose
- **CDC recommends HepB antibody testing 1 to 2 months following 3rd dose**
- **Employer cannot require employee to use health insurance to cover test cost**
- **Pre-screening is not required**
- **HBV is declining because of vaccine use!**





# PREVENTION

- **Engineering Controls**
- **Work Practice Controls**
- **Personal Protective Equipment**
- ***Universal Precautions***



# ENGINEERING CONTROLS

- **Design safety into work tools and work space organization**
- **Engineering controls can:**
  - **Decrease risk of exposure to hazards**
  - **Eliminate hazards**
  - **Isolate hazards**



# EXAMPLES OF ENGINEERING CONTROLS

- Hand and eye washing facilities
- Sharps container use
- Biohazard labeling
- Self-sheathing needles
- Needleless IV systems



# CLEANING

- **Clean work surfaces according to employer's exposure control plan**
- **Use PPE and EPA-approved solution**
- **10% bleach and water must be replaced weekly**
- **Place contaminated laundry in color-coded laundry bag, use PPE, and handle as little as possible**
- **DO NOT take contaminated materials home to launder!**



# Wastewater Treatment

- In addition to the diseases cited in the blood borne pathogens, diseases associated with worker exposure in WWTP's include:
  - Hepatitis A
  - Enteric Viruses
  - Parasites
  - Mycobacteria

Brown, N. J. (1997). Health hazards manual: Wastewater treatment plant and sewer workers. Ithaca, NY: Cornell University, Chemical Hazard Information Program.  
<http://digitalcommons.ilr.cornell.edu/manuals/2>



# Wastewater Treatment

- Toxins can be introduced from industrial plants, dumping by homeowners or transportation accidents.
- PCBs, pesticides, asbestos and mercury are just some of the toxins that may find their way into the wastewater stream.
- Concentrated toxins may be received from freshwater treatment plants if filters are back-flushed into the sanitary system.



# Exposure Scenarios

- The largest exposure risk is through inhalation.
- Processing wastewater may generate mists or aerosols that can contain pathogens or toxins.
- These may be inhaled. Bacteria and some enteric viruses are infectious via inhalation.



# Exposure Scenarios

- Other exposure pathways involve ingestion, injection and absorption through the skin.
- Ingestion of toxins and pathogens can happen as a result of poor hygiene practices or the contamination of food and drink from splatters or aerosols.





# Exposure Scenarios

- Broken skin is a pathway for many disease agents.
- However, some infectious agents can penetrate intact skin (e.g. hookworm)
- Needles and other infectious articles will be found in the grit removal system.



# Exposure Scenarios

- HIV, HBV and HCV are relatively fragile compared to, for example, enteric viruses and parasites.
- Most disease agents found in wastewater have evolved to be transmitted via the fecal route.
- Most of these are susceptible to treatment processes, but some are resistant.



# Exposure Scenarios

- Toxins on the other hand may not be reduced by wastewater treatment processes.
- Some volatile compounds will be stripped by exposure to air. Trickle filters and surface aeration seem to more effective at this.
- Others may be persistent, and concentrate in sludges or form scales inside pipes and tanks.



# Exposure Scenarios

- Giardia and the eggs of *A. lumbracoides* (roundworm) are examples of highly resistant bugs.
- Sunlight (UV), dry air and air movement all serve to reduce the number of infectious organisms in the air and on surfaces.
- Some bacteria release endotoxins when killed that can themselves cause illness.



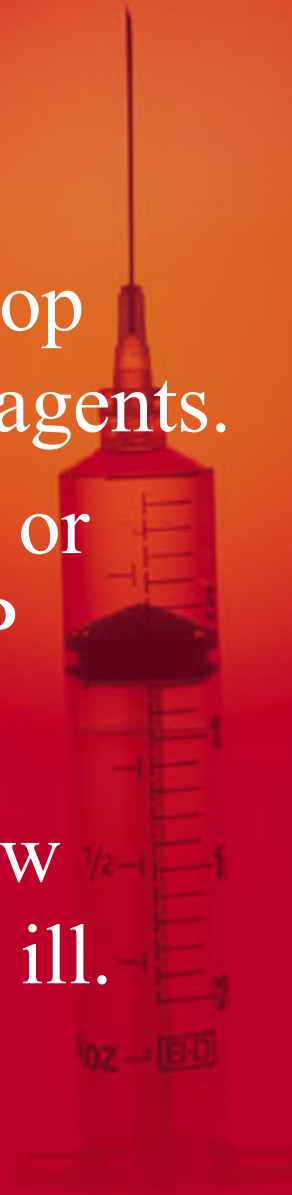
# Exposure Risk

- WWTP personnel have acquired diseases and disease symptoms due to exposure at work.
- Studies have shown that antibodies are often present in the blood, showing exposure to disease causing organisms.
- The infections may be acute or sub-clinical.



# Exposure Risk

- It appears that WWTP workers develop immunities to many of these disease agents.
- No significant increases in morbidity or mortality in the population of WWTP workers have been demonstrated.
- However, individual case studies show where workers were infected and fell ill.



# Exposure Risk

- The risks of acquiring an illness are low, but not zero.
- Higher risk areas appear to be near aeration tanks, dewatering systems and sludge handling.
- Newer workers and workers new to a process area have higher rates of symptoms.
- This may be due to more experienced workers developed immunities.



Thank You!

