Biohazard Management

PHHS Pathology

Objectives

- Compare physical and health hazards
- Identify the how bloodborne pathogens are transmitted
- Explain the importance of personal hygiene, handwashing, and PPE in avoiding exposure to biohazard
- Discuss the different components of PPE
- Recall the purpose of engineering controls
- Identify the safety measures available in the laboratory
- Describe the proper response to an injury on duty
- Summarize the safe use of centrifuges

Laboratory Environment

- The laboratory work environment poses special infectious disease risks.
- Pathology Leadership has identified these risks and has adopted procedures to protect its employees.
- It is the employee's responsibility to ensure that the proper Personal Protective Equipment (PPE) is used and safe practices are followed.

Laboratory safety is the key to reducing injury and illness.

Know Your Surroundings

Many laboratories contain hazardous substances.

- A hazardous substance is defined as a material/substance that poses a physical or health hazard. This includes both chemicals and biological agents.

- A biological agent has the ability to adversely affect human health in a variety of ways, ranging from relatively mild, allergic reactions to serious medical conditions, even death.

Laboratory Hazards

- Each lab is faced with different hazards. There could be exposure to biological, chemical, or radioactive material, which may pose a variety of physical and/or health hazards.

- There are differences between a physical hazard and a health hazard. Let's take a look.

Physical Hazard

A physical hazard has the following characteristics:

- Explosive
- Flammable
- Oxidizer
- Pyrophoric
- Organic peroxide
- Compressed gas
- Combustible liquid
- Unstable (Reactive)
- Water-reactive

Health Hazard

A health hazard has the following characteristics:

Chemical:

- Carcinogen
- Toxic or highly toxic
- Reproductive Toxins
- Irritants
- Corrosives
- Sensitizers
- Nephrotoxins
- Neurotoxins

Biological:

- Bacteria
- Viruses
- Fungi
- Toxins
- Hepatotoxins

Biohazards

- Physical and chemical health hazards are covered in another module; so, let's focus on biological health hazards (or biohazards).

- Biohazards pose a threat because these substances are capable of producing infection or disease in living organisms, particularly humans.

Bloodborne Pathogens

Some of the biohazards in the clinical laboratory are classified as Bloodborne Pathogens

- Transmitted by blood/body fluid exposure

Blood/Body Fluid Exposure

Blood/Body fluid exposures can be caused by:

- Percutaneous injuries (punctures by needles, scalpels, or other sharp objects)
- Splashes to the mucous membranes of the mouth, nose, or eyes
- Contact with open wounds (fresh open abrasions, incisions, lacerations)
- Human bites

Any blood/body fluid exposure warrants immediate attention.

Avoiding Exposure

Avoiding Exposure

- In order to avoid exposure to biohazards, there are four key practices:
  1. Follow standard precaution measures
  2. Pay attention to your personal hygiene
  3. Wash your hands often and properly
  4. Adhere to Personal Protection Equipment guidelines

Standard Precautions

Standard Precautions is the system that considers all blood, body fluids, and fresh tissue as potentially infectious.

- These precautions were introduced to decrease the occupational risks of bloodborne diseases such as
  - Human Immunodeficiency Virus (HIV)
  - Hepatitis B (HBV)

Personal Hygiene

- Do not eat, drink, smoke, chew gum, apply cosmetics, or remove/insert contact lenses while in the laboratory
- Do not store food or beverages in the lab or in chemical refrigerator
- Restrain hair when working with hazardous materials
- Remove protective clothing (PPE) before leaving the lab
- Adhere to laboratory clothing guidelines

Handwashing

- Wash hands :
  - After removal of gloves or other protection equipment
  - When visibly contaminated with blood, body fluids, or bodily tissue
  - Before leaving the work area.
  - Before donning personal protective equipment (PPE)

Handwashing is the single-most effective means of preventing the spread of infectious disease.

Personal Protective Equipment (PPE)

- PPE includes:
  - Gloves
  - Lab coats
  - Safety glasses
  - Face shields
  - Other items worn on the body as barrier protection

Barrier protections create a 'barrier' to protect skin, respiratory, and mucous membranes from contamination.

Let's look at some of the different types of PPE!

PPE: Gloves

- Laboratory professionals are required to wear gloves anytime contamination of the hands can occur.

- Gloves must be:
  - Comfortably fitted without restricting motion
  - Replaced immediately when torn or contaminated
  - For single-use only (may not be washed and reused)

PPE: Lab Coats

- Wearing a fluid-resistant lab coat is required whenever working near:
  - Blood
  - Body fluids
  - Fresh tissue

- Lab coats are disposable, but may be reused for several days if not soiled.

Dispose of lab coat immediately if soiled with biohazardous material.

PPE: Safety Glasses & Face Shields

- Face protection is used during procedures that are likely to generate droplets of blood or other body fluids.
- Used to prevent exposure to the mouth, nose, and eyes

Engineering Controls

- The good news is - PPE is **NOT** the only protective barrier!
- Engineering controls are also used as barrier protection and include:
  - Sharps containers
  - Safety needles
  - Biological safety cabinets (BSC)
  - Mechanical pipettes
  - Many other items.

Let's look at each engineering control in depth!

Sharps Container

- All used sharps must be placed into a rigid, puncture and leak-resistant container that is also impervious to moisture. The sharps container must be labeled either with “Biohazard” or “Infectious Waste”.
- Do not over fill the sharps container.
  - Seal when ¾ full.
- Examples of sharps are:
  - Needles/syringes
  - Scalpels
  - Blades

Safety Needles

- In 2010, the *Needlestick Safety and Prevention Act* improved protection against injuries that expose laboratory workers to potentially deadly blood borne pathogens.

- Safety needles have a safety mechanism built into the device which protects workers from accidental needlestick injuries.

Biological Safety Cabinets (BSC)

- The biological safety cabinet (BSC) is used as a containment for infectious agents. The BSC has a HEPA filter in the exhaust system to protect the environment and yourself.

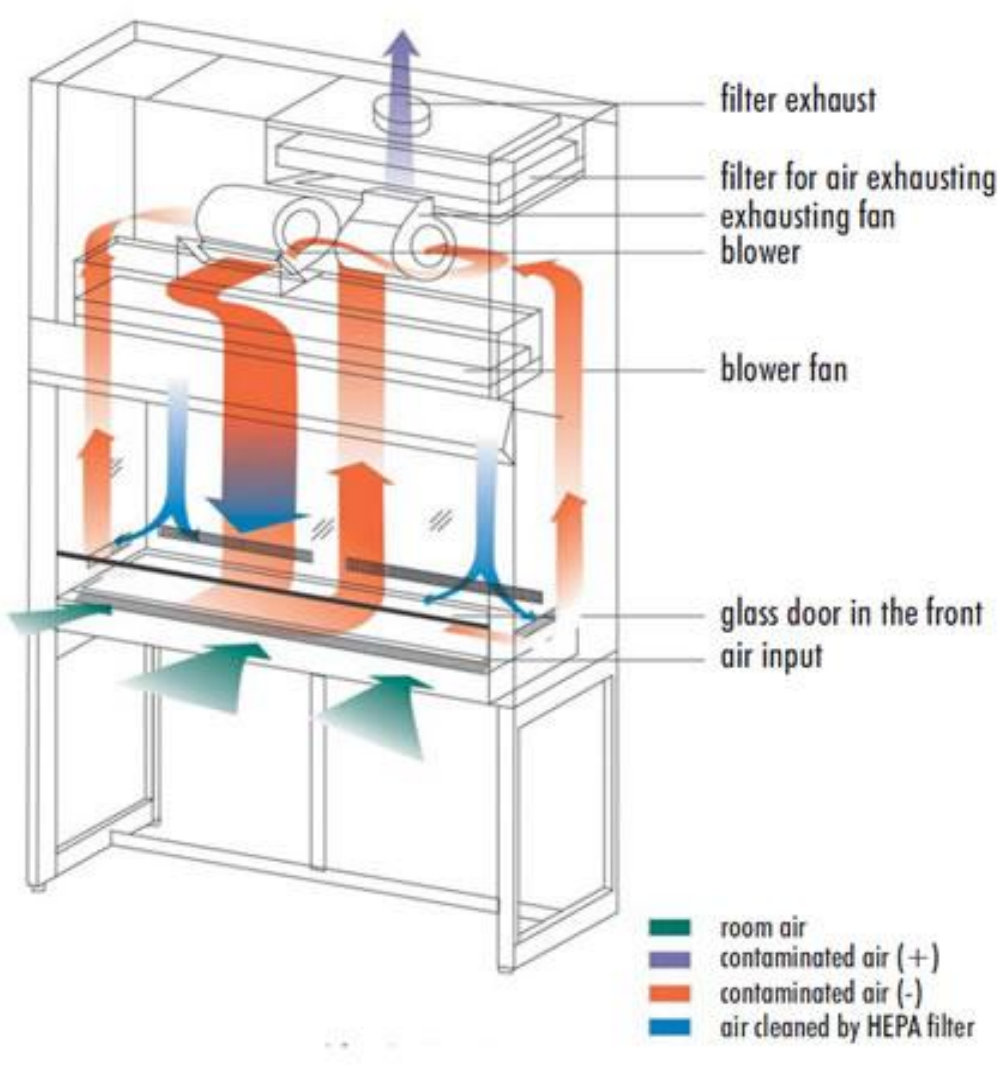
- Considered the single most useful safety device in the microbiology laboratory

- The (HEPA) filter is a high efficiency particulate air filter. It is able to remove particles at a size of 0.3 μm with an efficiency of 99.97%. It is also able to remove both smaller and larger particles.

Biological Safety Cabinets (BSC)

- There are 3 classes of BSC that are used. The higher the risk group and biosafety level, the higher the class of cabinet that is used.
- Each lab has a BSC appropriate for their biosafety needs
- When using this containment device, remember to <u>also use the proper personal protective equipment</u>.

Diagram of Class II BSCs

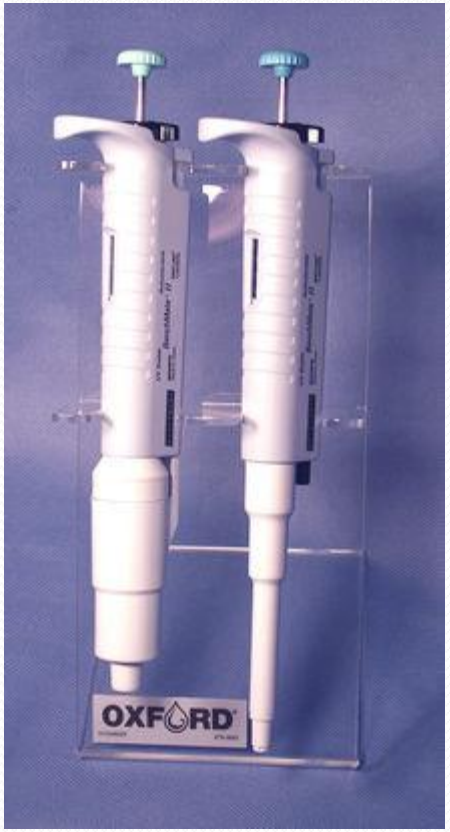


BSC Guidelines

- Not to be used with toxic materials or carcinogens
- Make sure that your head remains above sash opening
- Don't block front grill
- Keep area organized
  - Work in a unidirectional flow (don't hold dirty objects over clean supplies)
- Minimize the air disruption in the room
  - Move slowly to avoid air disruption
  - No fans allowed in room
- BSCs are remotely exhausted – meaning that an alarm will sound if exhaust is not working properly
  - If alarm is sounding, do not use even if the BSC is running!

Mechanical Pipettes

- Mechanical pipettes shall be used for manipulating all liquids including:
  - blood
  - body fluids
  - chemicals
  - reagents in the laboratory



Safety Measures

Safety Measures

- When physical hazards and health hazards exist, it is very important to know where the safety measures are located.
  - Eye wash/safety shower
  - First aid kit
  - Incident report protocol
  - Emergency spill kit
  - MSDS

- Unexpected accidents do occur and knowing where to go at the time of an emergency can reduce injury/illness.

Injury on Duty Response

- If a blood/body fluid exposure occurs, follow these steps:
  - Flush the site with large amounts of water to remove the body fluids
  - Report the incident to the supervisor on the same shift the accident occurred.
  - The supervisor will complete a Pathology Safety Incident Form and an Injury on Duty (IOD) Report. The IOD is sent to Worker's Compensation within twenty-four hours of the injury.
  - The exposed/injured employee shall report to Occupational Health with their IOD as soon as possible for treatment and followup.

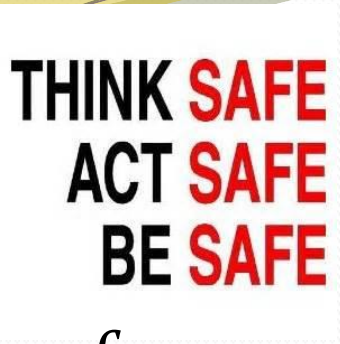
Aerosol Prevention

- Fill evacuation tubes, vials, and bottles by using their internal vacuum only.
- Never force fluid into an evacuation tube by exerting pressure on the syringe plunger.
- Perform all aerosol-producing activities (de-capping tubes, transferring high-risk samples from one container to another, etc.) according to the protocols described in your lab area.
- Use all engineering controls indicated for your area.

Safe Use of Centrifuges

- Before use, check to see if:
  - Balanced – equal volumes in opposing positions.
    - May need a "placeholder tube"
  - Tightly cap all tubes & check for damage before spinning
- Use sealable buckets (safety cups) or sealed rotors
- Close & lock lid before starting centrifuge. Leave lid closed and locked until centrifuge stops.
- After run, check to see if:
  - Centrifuge completely stopped
  - Spills or leaks (clean immediately with appropriate disinfectant)
  - Allow aerosols to settle (30 minutes) or open in a Biosafety Cabinet

Safe Practices



These safe practices should be followed to ensure safe working conditions:

- Use proper PPE
- Do not use chipped or cracked glassware
- When working with hazardous materials, have a second person nearby
- Know emergency procedures
- Keep the laboratory neat and clean
- Use hazardous chemicals under a fume hood and biohazardous materials under a biosafety cabinet (BSC)
- All procedures should be performed to minimize aerosol

A Final Word about PPE

Knowing how to properly use PPE can be the key to adequate protection. Not only do you want to make sure it is the proper size for you, but also make sure you are wearing it properly. If it is too big or too small, it is not right for you! Let your supervisor know if you need a different size.