

# *Overview of biological safety & security equipment*

*Practical Medical Biology*

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# Introduction :Definitions and concepts

➤ **Hazard**:- A source, situation, or act with a potential for causing harm. At workplace categorized:

1- Physical:-

a-Moving road tankers. b- Noise.

2- Chemical:-

a- Smoke. b- Toxic material.

3-Biological:-

a-Toxicological lab.

➤ **Biohazard**:- The potential source of harm caused by biological agents or toxins .

# Introduction :Definitions and concepts

- **Threat:** The likelihood for an adverse event to occur, as an expression of intention to inflict evil, injury, disruption or damage.
- **Misuse:** The misuse of Valuable Biological Materials (VBM, see definition below) describes their inappropriate or illegitimate use, despite existing and subscribed agreements, treaties and conventions.
- **Valuable Biological Materials:** Biological materials that require protection, control and accountability. May include: pathogens and toxins, non-pathogenic organisms..

# WHAT IS BIOSAFETY?

- **Biosafety(Laboratory Biosafety)** : “The application of a combination of laboratory practices and procedures, laboratory equipment and safety equipment for working with potentially infectious micro-organisms”
- **Or, Laboratory Biosafety** :-The set of containment principles, technologies and practices that are implemented to prevent exposure to biological agents . and toxins, or their accidental release.
- **Biosafety** :-is the application of safety precautions that reduce a laboratorian’s risk of exposure to a potentially infectious microbe and limit contamination of the work environment and, ultimately, the community.
- **Biosafety** :-Safety for human health and the environment, including the protection of biodiversity, during the use of genetically modified organisms (or micro-organisms), and during the contained use of pathogenic organisms for humans. A combination of procedures, containment measures and construction technologies with the purpose of minimizing the risk of contaminating laboratories and prevent escape of GMO and/or pathogens into the surrounding environment.
- **Biosafety** :- refers to the development and implementation of administrative work practices, facility design and safety equipment to prevent the transmission of biologic agents to workers, other persons or the environment.

# WHAT IS BIOSAFETY?

- Measures employed when handling biohazardous materials to avoid infecting oneself, others or the environment.
  - ✓ Achieved through;
    - ✓ Administrative Controls
    - ✓ Engineering Controls
    - ✓ Personal Protective Equipment
    - ✓ Practices and Procedures.

# Why is Biosafety Important?

- Laboratorians recognize hazards of processing infectious agents
- Guidelines developed to protect workers in microbiological and medical labs through engineering controls, management policies, work practices

# WHAT IS BIOSECURITY?

- **Biosecurity(Laboratory Biosecurity)** :- The set of measures taken to limit the threat posed by sudden widespread disease or biological contamination, as from biological warfare, or pandemic outbreaks.
- **Or, Biosecurity** refers to measures that are taken to stop the spread or introduction of harmful organisms to human, animal and plant life. The measures taken are a combination of processes and systems that have been put in place by bioscience laboratories, customs agents and agricultural managers to prevent the use of dangerous pathogens and toxins.
- **Or, Biosecurity (Laboratory Biosecurity)**: protection, control, and accountability for valuable biological materials within laboratories, in order to prevent their unauthorized access, loss, theft, misuse, diversion, or intentional release whether or not the biorisk(s) is acceptable.
- **Laboratory biosecurity** : refers to institutional and personal security measures designed to prevent the loss, theft, misuse, diversion or intentional release of pathogens and toxins.
- **Biosecurity** measures to protect the release of high consequence microbial agents, biological pathogens, toxins, critical information, pests or diseases as a result of theft or misuse.

# WHY ARE WE CONCERNED? (BIOSAFETY)

- Potential for acquiring a laboratory-associated infection (LAI)
- Contamination of the environment
- Contamination of research
- Public perception



# UNIVERSAL PRECAUTIONS

- Minimum standard of practice for preventing the transmission includes:
  - ✓ Education
  - ✓ Hand washing
  - ✓ Wearing protective barriers
  - ✓ Use safe work practices
  
- ❖ If samples cannot be guaranteed non-infective ..... treat as infectious!

# PERSONAL PROTECTIVE EQUIPMENT (PPE)

- PPE can become an important line of defense (last line of defense)
- Responsibility of both the user and the supervisor to ensure that PPE is worn
- Ensure PPE is removed before leaving the lab
- Benefits; possible prevention of exposure, potential minimization of risk that exposure can occur, compliments existing controls to enhance personal protection. PPE protects only the individual wearing it



# PERSONAL PROTECTIVE EQUIPMENT (PPE)

- **Footwear**

Closed toed shoes should always be worn. Booties are worn in some higher containment labs and animal facilities, Closed toed shoes protect against spills and injuries from dropped sharps.

- **Lab Coats/Gowns**

- Long-sleeved, knee length with snaps
- Elastic cuffs help prevent spills and contamination
- Back-closing gowns
- Periodic cleaning required



# PERSONAL PROTECTIVE EQUIPMENT (PPE)



- **Gloves**

- Latex, nitrile & vinyl for work with biological agents.
- Exam gloves should not be reused, change frequently. Utility gloves can be disinfected and reused if they show no sign of degradation.
- Consider tensile characteristics, length of cuff.
- Double gloving.
- BSO can provide assistance finding an alternative for people with allergies.

# PERSONAL PROTECTIVE EQUIPMENT (PPE)

- **PE Eye & Face Protection**

- Goggles, safety glasses to protect the eyes
- Full face shield to protect facial skin.



- **Respirators**

- Only personnel who have been fit-tested and trained should wear respirators.



# PERSONAL PROTECTIVE EQUIPMENT (PPE)

- Lab Safety Safe Laboratory Practices :
- Lab coats
- Safety glasses
- Proper foot
- wear Hair back
- No food or drink in the laboratory



# WHAT IS A BIOHAZARD?

- A potential hazard to humans, animals or the environment caused by a biological organism, or by material produced by such an organism , Or, **An agent of biological origin that can cause disease in humans**
- **Examples:**
  - Viruses, bacteria, fungi, and parasites and their product.
  - Blood and body fluids, as well as tissues from humans and animals.
  - Transformed cell lines and certain types of nucleic acids .



# Why use biosafety practices?

- **To protect:**

1. Workers/Students
2. Products/Experimental results
3. Environment/Laboratory classroom



# Role of laboratory services



# Components of Safety in all laboratory

1-Safe handling, storage and disposal of

-Specimens

-Chemicals

-Instruments

-Radioactive components

2-Fire safety

3-Electrical safety

# Universal safety precautions

- 1. Consider all the specimens potentially infectious for HIV and other blood borne infections .
- 2. All specimens should be placed in a leak-proof impervious container for transport.
- 3. Use gloves while handling all samples, especially when there is contact with body fluids, non-intact skin or mucous membrane.
- 4. If there is likelihood of spattering, use face mask with glasses and gowns. Wrap around gowns should be preferred. These should not be used outside the lab.
- 5. Cover cuts or abrasions present over skin with waterproof bandage. Universal safety precautions
- 6. Decontaminate the laboratory work surfaces immediately in case of spillage of blood or any other body fluids.

# Universal safety precautions

- 7. Follow 'no needle recapping' strategy.
- 8. All sharps should be collected and disposed away properly.
- 9. Never pipette by mouth. Use mechanical pipetting devices.
- 10. There should always be a system working efficiently for management of hospital generated waste.
- 11. It is advisable for the laboratory personnel to be vaccinated against Hepatitis-B.
- 12. Not permitted in Laboratories :Eating, Drinking, Storing food, Smoking, Handling contact lenses.