

## **Biosafety and Security**

**Saturday 31/12/2022**

**Laboratory biosafety:** control principles, technologies, and practices implemented to prevent accidental exposure to pathogens and toxins. Tuberculosis • Hepatitis B • HIV • Enteric infections

**Laboratory biosecurity:** protection, control and accountability for valuable biological materials within laboratories, in order to prevent their unauthorized access, loss, theft, misuse, or intentional release.

**Laboratory Bio risk Management:** Process to control safety and security risks associated with the handling or storage and disposal of biological agents and toxins in laboratories and facilities.

### **Bio risk**

The risk associated with biological materials in the laboratory has a safety and a security component.

### **Key Components of Bio risk Management:**

1-Bio risk Assessment:

2-Bio risk Mitigation

3-Performance

1-Bio risk Assessment: Process of identifying the hazards and evaluating the risks associated with biological agents and toxins, and deciding whether or not the risks are acceptable.

2-Bio Risk Mitigation: Actions and control measures that are put into place to reduce or eliminate the risks associated with biological agents and toxins.

3-Performance: The implementation of the entire bio risk management system, including evaluating and ensuring that the system is working effectively and continually improving the system.

Biosafety barriers in laboratories

**1. Personal protective equipment (PPE)** : is specialized clothing or equipment worn by an employee for protection against infectious materials.

- **Disposable gloves** serve as a barrier between your hands and any chemical, biological, or physical hazards that can enter your body through your skin.
- **Lab coats** protect the user's skin and personal clothing from accidental contact with biological or chemical hazards.
- **Face shields** should be worn whenever the entire face needs protection
- **Safety glasses/goggles** provide a barrier to your eyes and prevent exposure to chemical (eg chemical reagents) physical (eg dust, flying objects), and biological (eg bacterial culture splashes) hazards.
- **Masks** Disposable masks will limit the transmission of infectious agents.



## 2. Facility Design:

- **Suitable size & shape**
- **Entrances and exits**
- **Layout:** Each laboratory will need:
  - A teacher's work area / demonstration area.
  - A practical area for students.
  - A 'dry' work area for students
- **Benches:** A medium working bench height of 900 mm.
- **Bench surfaces:** Resistance to water penetration, chemical attack, heat (wood, Synthetic (laminates)) –
- **Floors:** must be resistant to fire, heat, chemicals and staining.
- **Walls:** should have a durable and stain resistant finish and be easily cleaned
- **Ventilation:** laboratories need good ventilation to ensure that any gases, fumes or water vapor produced during experiments
- **Fire prevention:** Smoke or heat sensors, sprinkler systems, fire extinguishers.
- **Water & drainage:** All laboratories must have access to both hot and cold water. As a minimum five sinks plus one deeper for washing up with hot water supply
- **Eyewash :**



## **Hazardous Agents in lab**

Which have the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors.

### **Types of hazardous agents:**

1-Chemical 2- Physical hazards 3- Electrical Hazards 4- **Biological Hazards**

#### Biological Hazard

- A biological agent is a bacterium, virus, protozoan, parasite, fungus, or toxin

Route of infection : through the mouth, eyes, nose, or urogenital openings, or through wounds or bites that breach the skin barrier.

Control Measures of biological hazard:

- 1) Eliminate the hazard. ...
- 2) Substitute the hazard with a lesser risk. ...
- 3) Isolate the hazard. ...
- 4) Use engineering controls. ...
- 5) Use administrative controls. ...
- 6) Use personal protective equipment.



Biosafety levels

### **1-Biosafety level 1(BSL-1) (minimum risk)**

the lowest level, applies to work with agents that usually pose a minimal potential threat to laboratory workers and the environment. BSL-1 labs are not usually isolated from the general building

**Laboratory Types:** Standard teaching and research laboratories.

**Laboratory Practices Requirements:** Standard Good Laboratory Practices (PPE), hand washing, and decontamination of work surfaces.

#### **Safety Equipment Required:**

Open bench , no need for Biological safety cabinets (BSCs).



### **2-Biosafety level 2 (BSL-2) (moderate risk)**

cover work with agents associated with human disease, pathogenic or infectious organisms posing a moderate hazard. e.g. performing routine diagnostic procedures for HIV .



## Bio-Medical Waste Segregation Chart

Category	Type of Waste
<p><b>YELLOW</b></p> 	<ul style="list-style-type: none"> <li>• Post Operative Body Parts</li> <li>• Placenta</li> <li>• Plaster of Paris (POP)</li> <li>• Pathological Waste</li> <li>• Cotton Waste</li> <li>• Dressing Materials</li> <li>• Beddings</li> <li>• Body Fluid Contaminated Paper and Cloth</li> <li>• Face Mask, Cap</li> <li>• Cytotoxic, Expired &amp; Discarded Medicines</li> <li>• Microbiology, Biotechnology Lab Waste</li> </ul>
<p><b>RED</b></p> 	<ul style="list-style-type: none"> <li>• Syringe with out needles</li> <li>• I.V.Set</li> <li>• Catheters</li> <li>• Gloves</li> <li>• Urine Bag</li> <li>• Dialysis Kit</li> <li>• IV Bottles</li> </ul>
<p><b>WHITE (Translucent)</b></p> 	<ul style="list-style-type: none"> <li>• Needles</li> <li>• Syringes with fixed needles</li> <li>• Blades</li> <li>• Scalpels</li> </ul> <p><small>* Use 1% Hypo Chloride Solution for disinfecting Glass &amp; Metal Sharps</small></p>
<p><b>BLUE</b></p> 	<ul style="list-style-type: none"> <li>• Glass                             <ul style="list-style-type: none"> <li>- Broken Glass</li> <li>- Ampoules</li> <li>- Lab Slides</li> </ul> </li> <li>• Metals                             <ul style="list-style-type: none"> <li>- Nails</li> <li>- Metallic Body Implants</li> <li>- Scissors</li> </ul> </li> </ul> <p><small>* Use 1% Hypo Chloride Solution for disinfecting Glass &amp; Metal Sharps</small></p>

### 3-Biosafety level 3 (BSL-3) **(highly risk)**

work with agents may cause serious or lethal disease via aerosol transmission. e.g. yellow fever virus

**Laboratory Types:** Research and diagnostic lab.

**Laboratory Practices Requirements:** PPE, restricted access to laboratory areas, special clothing, directional air flow.

#### **Safety Equipment Required:**

Same of level2.

#### **4-Biosafety level 4 (BSL-4) life-threatening disease**

Working with extremely dangerous and life-threatening disease. e.g. Ebola virus. require complete clothing change before entry, a shower on exit and decontamination of all materials prior to leaving the facility.

**Laboratory Types:** Dangerous pathogen unit

**Laboratory Practices Requirements:** PPE, restricted access to laboratory areas, special clothing, air lock entry, shower exit, special waste disposable.

**Safety Equipment Required:**

1-Autoclave

2- class III hood

3-filtered air





## **Good microbiological techniques    GMT**

- 1-Do not eat or drink in the lab and don't use fridge for food
- 2-Report any accident (spill, breakage, etc.) or injury (cut, burn, etc.) to the teacher immediately, Do not panic.
- 3-Never attempt unauthorized experiments
- 4-Keep work places clean and free of unwanted chemicals, biological specimens.
- 5- wear Gloves , lab coat, mask and glasses.
- 6- Tie hair and use closed shoes
- 7-Do not touch , taste, or smell any chemicals.
- 8-Do not use unlabeled bottle.
- 9-Work only with materials once you know their flammability, reactivity, toxicity, safe handling and emergency procedures.
- 10-Never pipette by mouth; use mechanical transfer devices.
- 11-Do not mix chemicals in the sink.
- 12-If a chemical was splashed in your eye(s) or on your skin, immediately flush with running water for at least 20 minutes. Immediately (and loudly) yell out the teacher's name to get the teacher's attention.
- 13-Walk DON'T run in the lab.
- 14-Keep exits and passageways clear at all times.
- 15-Turn of gas, water before leaving.
- 16-Wash your hands thoroughly before leaving the laboratory.

Mark the work area with the warning sign and contact information

