

# BIO-SAFETY



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# Introduction

Handling bio-related products require special precautions. Department has a Microbiology lab where such bio-related activities are carried out. Although bio-related activity includes microbial, animal or plant cells, this lab limits handling of selected microorganisms only. Even the used drugs are non toxic in nature.

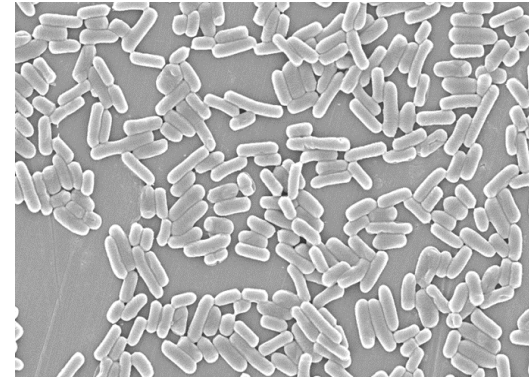
To handle such bio-related products, standard bio-safety procedures are followed. Standard safety techniques prevent students and researchers from the adversities of contaminations.



# MICROBIOLOGY LABORATORY IN DEPARTMENT OF CHEMICAL ENGINEERING

Experiments conducted in Microbiology Laboratory in areas of :

- **Studies of various parameter on growth of microbes**
- **Bacterial, yeasts and moulds counts of Foods**
- **Enumeration of Escherichia coli and the Coliform Bacteria**
- **Analysis of potable and waste water.**
- **Antimicrobial activity against selected microorganism**
- **Drug Delivery**



**Strain stored/handled in Microbiology Lab**

- **1. *E. Coli***
- **2. *Bacillus subtilis***
- **3. *Lactobacillus casei***
- **4. *Saccharomyces cerevisiae***



# Classification of pathogenic microorganisms

## Risk group I

- A pathogen that is unlikely to cause any disease in humans or animals.
- All bacterial, fungal and parasitic agents not included in higher groups.

## Risk group II

- A pathogen that can cause disease in humans or animals but is unlikely to be a serious hazard.
- Effective treatment and preventive measures are available and the risk of spread of infection is limited.
  - Bacterial- *Vibrio cholerae*
  - Fungal- *Aspergillus fumigatus*, *Actinomyces*
  - Parasitic- *P.falciparum*, *Plasmodium thcilera*
  - Viral and Rickettsial - *Vole rickettsia*, *Mumps virus*

# Classification of pathogenic microorganisms

## Risk group III

- A pathogen that can cause serious human or animal disease , but does not ordinarily spread from one infected person to another. Effective treatment and preventive measures are available.
  - Bacterial - *Clostridium botulium*, *Francisella tularensis*
  - Fungal - *Coccidioides immitis*, *Histoplasma capsulatum*
  - Parasitic- *Schistosoma mansoni*
  - Viral and Rickettsial - *Foot-and- Mouth disease virus*

## • Risk group IV

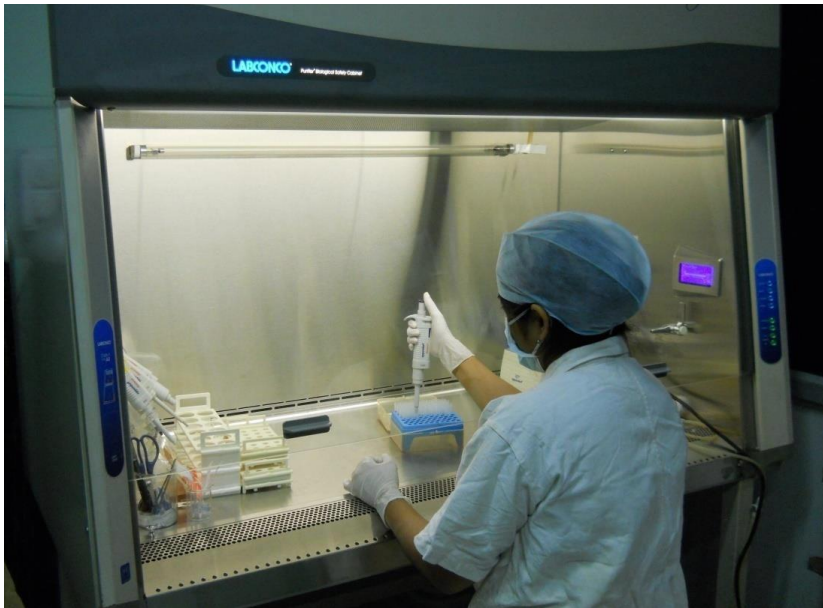
- A pathogen that usually causes serious human or animal disease and that can be readily transmitted from one individual to another, directly or indirectly. Effective treatment and preventive measures are not usually available.
  - *Korean hemorrhagic fever*
  - *Omsk hemorrhagic fever and*
  - *Central European Encephalitis viruses*

# Physical Containment

- Physical containment helps to confine the pathogenic organisms being handled and prevent exposure to personnel. It is achieved by
  1. Primary Containment: offers protection to personnel and immediate laboratory environment
    - Laboratory practices
    - Containment equipment
  2. Secondary Containment : Protection to the environment outside the laboratory.
    - Special laboratory design : Proper design of the facility helps in protecting personnel inside the facility and also prevents the release of pathogenic organisms outside the facility.

# PRIMARY CONTAINMENT

- Adhere to standard microbiological practices and techniques and awareness of potential hazards.
- Biological safety cabinets and enclosed containers (e.g. safety centrifuge cup).



# BIOSAFETY LEVELS

BIOSAFETY LEVEL I: Suitable for teaching laboratories and for facilities in which work is done with defined and characterised strains of agents not known to cause any disease.

- Good microbiological techniques(GMT) to be followed.

BIOSAFETY LEVEL II:Applicable to facilities in which work is done with indigenous moderate-risk agents present in the community and associated with human disease of varying Severity. It is appropriate when work is done with any humanderived blood, body fluids, tissues, or primary human cell lines, in which presence of an infectious agent may be unknown.

- Following GMT
- Use of personal protective equipment
- Use of BSC
- Use of autoclaves



# BIOSAFETY LEVELS

BIOSAFETY LEVEL III: Applicable to facilities in which work is done with indigenous or exotic agents where the potential for infection by aerosols is real and the disease may have serious or lethal consequences. It requires in addition to that of BSL II requirements

- Special clothing
- Directional airflow
- Controlled access
- Double door entry/Anteroom
- Supervision

BIOSAFETY LEVEL IC: Applicable to work with dangerous and exotic agents which pose a high individual risk of life-threatening disease. It requires in addition to BSL III requirements

- Positive pressure personnel suits
- Strictly limited access
- Double ended autoclave
- Class III BSC
- Airlock with shower
- Supervision

# Good Microbiological Techniques

- Specimen containers must be correctly labelled for easy identification.
- Use secondary containers while transporting specimens to contain spill.
- Specimen containers received from external agencies must be opened in the biosafety cabinet.
- Use mechanical pipettes
- Open flame must not be used in BSC as it can distort the air flow pattern and damage the filters.
- Always use disposable gloves. Do not touch mouth, eyes and face with contaminated hands.
- Food and drink must not be stored or consumed in the laboratory.



# Good Microbiological Techniques

- Glassware must be replaced with plasticware
- Sharps(e.g., needle sticks, glass) must be avoided wherever possible as it can transmit blood borne pathogens in case of injury.
- Use engineered sharp-safety devices when syringes and needles are necessary.
- Needles must not be recapped, to prevent needle stick injury.
- Puncture-proof containers fitted with covers must be used for disposing sharps
- Tubes and specimen containers must always be securely capped (screw-capped if possible) for centrifugation.
- Refer to manufacturer's instructions before operating equipments.
- Work area must be decontaminated with a suitable disinfectant at the end of the work.
- Hands must be thoroughly washed before leaving the lab.

# General rules for Personal protection

- Cultures, reagents, or other materials are issued to the students only by laboratory in-charge..
- Personal protective equipment must be selected on the basis of the risks involved in the task performed.
- Personal protective equipment act as a barrier to minimize the risk of exposure to aerosols, splashes and other injuries
- Lab coat, safety glasses and toe covered footwear is a minimum requirement while working in the lab.
- Face shield must be used if there is any risk of splashing of infectious materials

# General rules for Personal protection

- Gloves must be worn for all procedures that may involve direct contact with blood, infectious materials, or infected animals.
- Gloves must be removed aseptically and autoclaved with other laboratory wastes before disposal.
- If re-usable gloves are used, on removal they must be cleaned and disinfected before re-use.
- Lab coats and other personal protective equipment used must not be used outside the laboratory

# Emergency measures In case of exposure to bio samples

- Remove the contaminated clothing.
- Wash the skin thoroughly with soap and water.
- In case of eye contact flush the eyes with water.
- Report the exposure to the Lab in charge.
- Get medical attention immediately.
- Decontaminate by
  - Sterilisation to makes an item free from all living microorganisms and viruses by applying heat.
  - Disinfection when some organisms such as bacterial endospores may survive. A disinfectant is a chemical or mixture of chemicals used to kill microorganisms, but not spores. They are usually applied to inanimate surfaces or objects. Examples or disinfectants: Sodium hypochlorite and formaldehyde, phenolic compounds, alcohols, iodine etc.,

# DISPOSAL OF WASTE FROM MICROBIOLOGY LABORATORY

1. Non-contaminated general waste : collected in Dustbin, and disposed off with other waste from Department

2 .Contaminated waste: Contaminated materials are never placed in a waste basket but stored separately to be Recycled or Incinerated.

- Used Petri dishes/pipettes are placed in a plastic bag for autoclaving
- .“Sharps”-needles, glass pieces, etc collected separately
- Unused test-tube cultures are placed in a wire basket for autoclaving
- Contaminated material which cannot be recycled are stored safely for incineration.