Biosafety Training

Prerna Sharma,
Department of Physics
Indian Institute of Science

What is biosafety?

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.

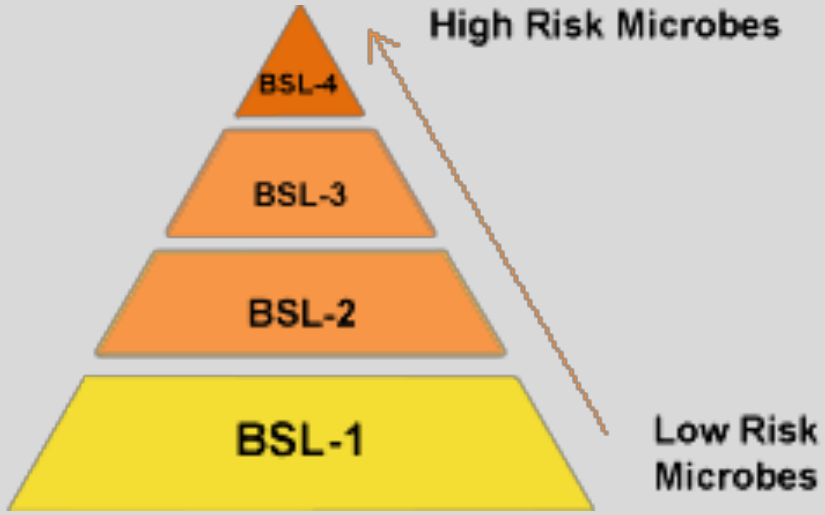


Image courtesy: https://www.cdc.gov/training/QuickLearns/biosafety/

Standard Microbiological Practices

Common to all laboratories. These practices include

1. Hygiene:
- No eating, drinking, or applying cosmetics in the lab.
- Washing hands after working with infectious materials and before leaving the lab.
- Routinely decontaminating work surfaces (Decontaminate lab bench before and after work).
- Do not reuse contaminated equipment.
- If no sharps container: collect sharps immediately to prevent needle-stick injury

2. Attire:
    - Lab coat/gown, safety glasses/face shields, disposable gloves, face mask when handling powders,

3. Work Plan
    - Know in advance what you are working with.
    - Read available resources (MSDS)

Biosafety Levels

- Each level has specific controls for containment of microbes and biological agents. These controls govern laboratory practices, safety equipment and facility construction.

- The primary risks that determine levels of containment are infectivity, severity of disease, transmissibility, and the nature of the work conducted. Origin of the microbe, or the agent in question, and the route of exposure are also important.

Biosafety Level 1 (BSL-1)

- Minimal PPE, such as a lab coat, gloves, and eye protection worn as needed.
- Standard microbiological practices are followed.
- Agents not known to cause disease (non-Pathogenic): Lab strains of E.coli K-12, Transgenic Plants, Plasmids, Fungi, Mold, Yeast.
- Standard laboratory table or benches are used.
- Bio cabinet not required (unless creating aerosols).

Biosafety Level 2 (BSL-2)

- Agents associated with human disease cause by direct contact or aerosol exposure: Herpes Simplex Virus, Staphylococcus aureus
- Treatment for disease available.
- Agent poses moderate hazard to personnel and environment.
- Work is conducted on a standard laboratory bench in a contained area with limited access.
- PPE, including a lab coat, gloves, and eye protection are a must to reduce accidental infection.
- All procedures that can cause infection from aerosols or splashes are performed within a biological safety cabinet (BSC).
- An autoclave or an alternative method of decontamination is available for proper disposals.
- Red bag & sharps containers required.
- Biohazard Sign posted at entrance to lab.

Biosafety Levels 3 &4 (BSL-3, BSL-4)

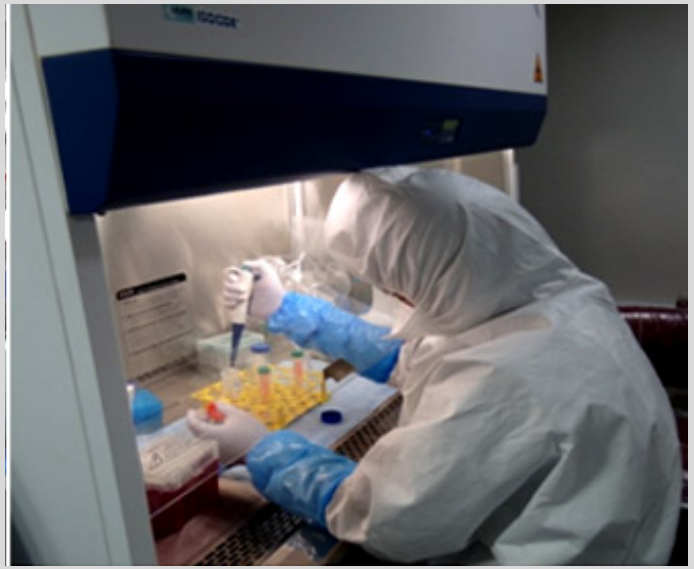
BSL-3

- Indigenous or exotic agents : HIV, Mycobacterium tuberculosis, Coxiella burnetii
- Aerosol transmission
- Serious health effects
- Treatment may or may not exist

BSL-4

- Dangerous/exotic agents: Ebola Hemmorrhagic Fever Virus, Marburg Virus, Lassa Fever Virus
- Life threatening disease
- Aerosol transmission
- No known treatment

- A hands-free sink and eyewash are available near the exit.
- Exhaust air cannot be recirculated, and the laboratory must have sustained directional airflow by drawing air into the laboratory from clean areas towards potentially contaminated areas.



There is only one BSL-3 lab at IISc hosted in Centre for Infectious disease research.

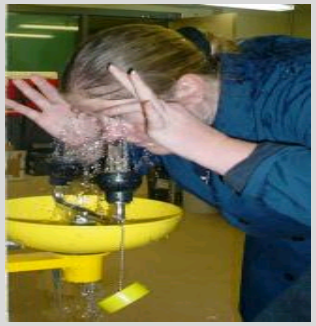
There is no BSL-4 lab at IISc.

Material Transport, Waste handling and disposal

- Package samples appropriately for transport: Storage temperature, leak proof.
- Decontaminate spills - 10% bleach after wiping the surface clean.
- Disinfect working areas for future use - 1% household bleach daily.
- Soak contaminated non-disposable equipment/material in 1% household bleach for 5 minutes.
    - wash in soapy water before re-use, sterilize if necessary.
- Place waste in leak-proof biohazard bags - ensure safe final management of waste by coordinating with Division of Biological Sciences which has a bio-waste pick-up.
- Protect cleaning/decontamination personnel with protective coat, thick rubber gloves.

First Aid Measures

Have first aid kit readily accessible



Splash to Eye or Needlestick Injury
Rinse thoroughly for 15 minutes at the eyewash or sink

Handling Hazards common to Biological Labs

- Ethidium Bromide: DNA staining dye which is known carcinogen. Use safer alternatives like Gel red. Always use thick nitrile gloves. Have a separate working zone/area with designated glass/plasticware for gel related work.
- Acrylamide: Neuro-toxin, Carcinogen. Nitrile gloves a must.
- Dry Ice: Ultra cold temperature. Use cryo-gloves. Disposal: Leave it in an open well ventilated area.
- UV light exposure: Gel visualization with UV protective glasses.
- Autoclave: Check the pressure and temperature before opening the door. Maintain and service the equipment regularly. Use thermal gloves while taking out material from the autoclave.

Biosafety Committee Approval

- All projects/labs working with recombinant DNA require approval from Institute Biosafety committee.
- More info @ http://mcbl.iisc.ac.in/download.html