Biological Laboratory Hazards and Safety Rules

By

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Biological laboratory hazards

- Biological laboratory hazards are specific risks and threats associated with the handling, manipulation, study of living organisms, biological materials, and related substances within a laboratory setting.
- These hazards involve a wide range of potential dangers, including the transmission of infectious diseases, exposure to toxic or harmful biological agents, accidental spills or releases, and the potential for laboratory-acquired infections.

Biological laboratory hazards

- Effective hazard assessment, risk management, and strict adherence to safety protocols are essential for preventing accidents and ensuring the safety of laboratory personnel and the surrounding environment.

Biological laboratory hazards

- Biological laboratory hazards can cause 3 health effects

✓Infections

✓Allergy

✓Poisoning

BIOLOGICAL HAZARDS

Types of Biological Hazards

Bacteria is microscopic organisms that live in soil, water, or the bodies of plants and animals and are characterized by a lack of a distinct nucleus and the inability to photosynthesize.

Fungi is any major group of lower plants that lack chlorophyll and live on dead or other living organisms.

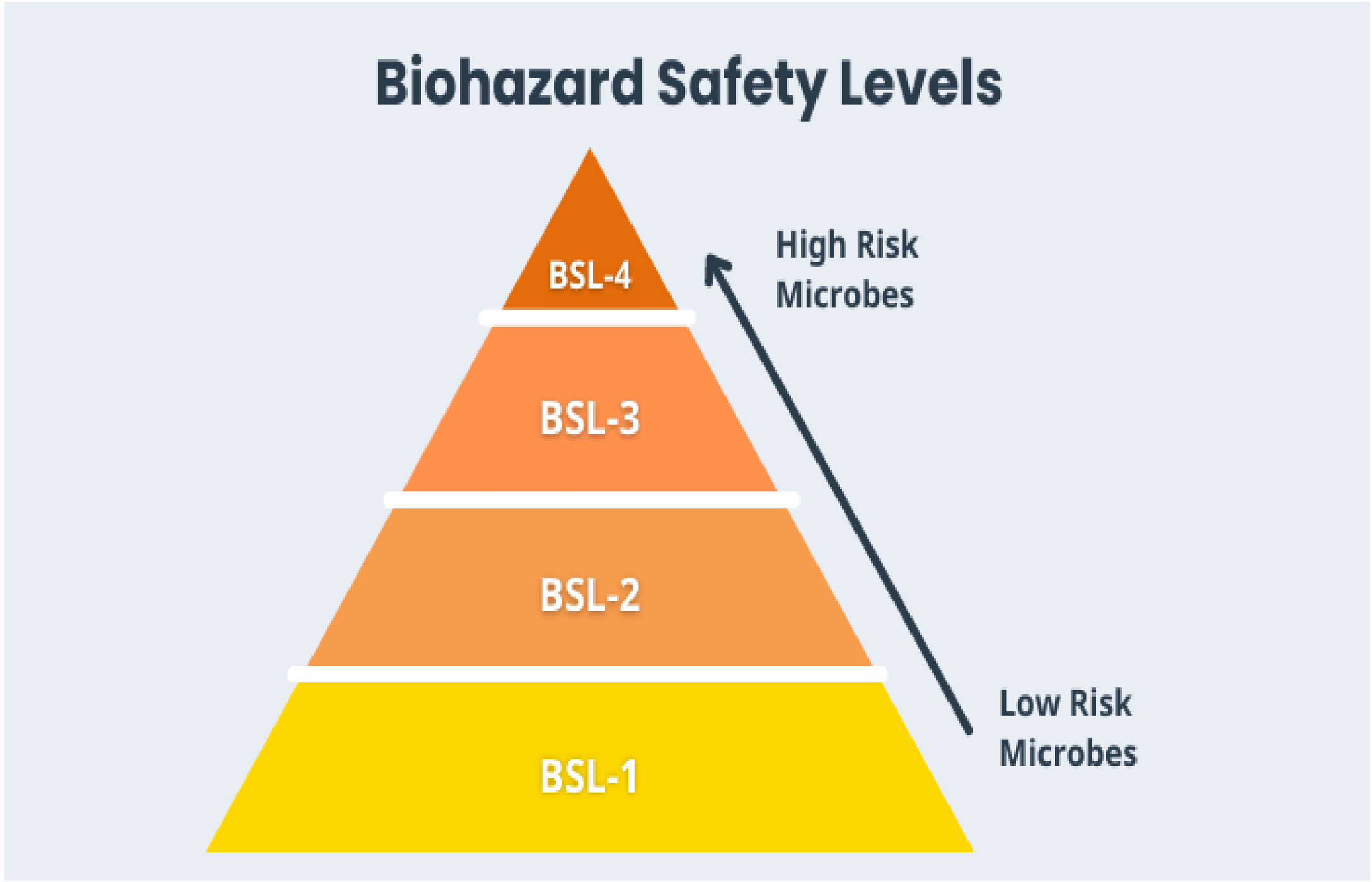
Viruses are a group of pathogens that consist mostly of nucleic acids and lack cellular structure. Viruses are dependent on their hosts for replication.

Biosafety

- As defined by WHO, laboratory biosafety describes the practices that should be implemented to prevent unintentional exposure to pathogens and their toxins.

- Health care worker exposed to various blood borne pathogen

➢ HIV
➢ Hepatitis C
➢ Hepatitis B

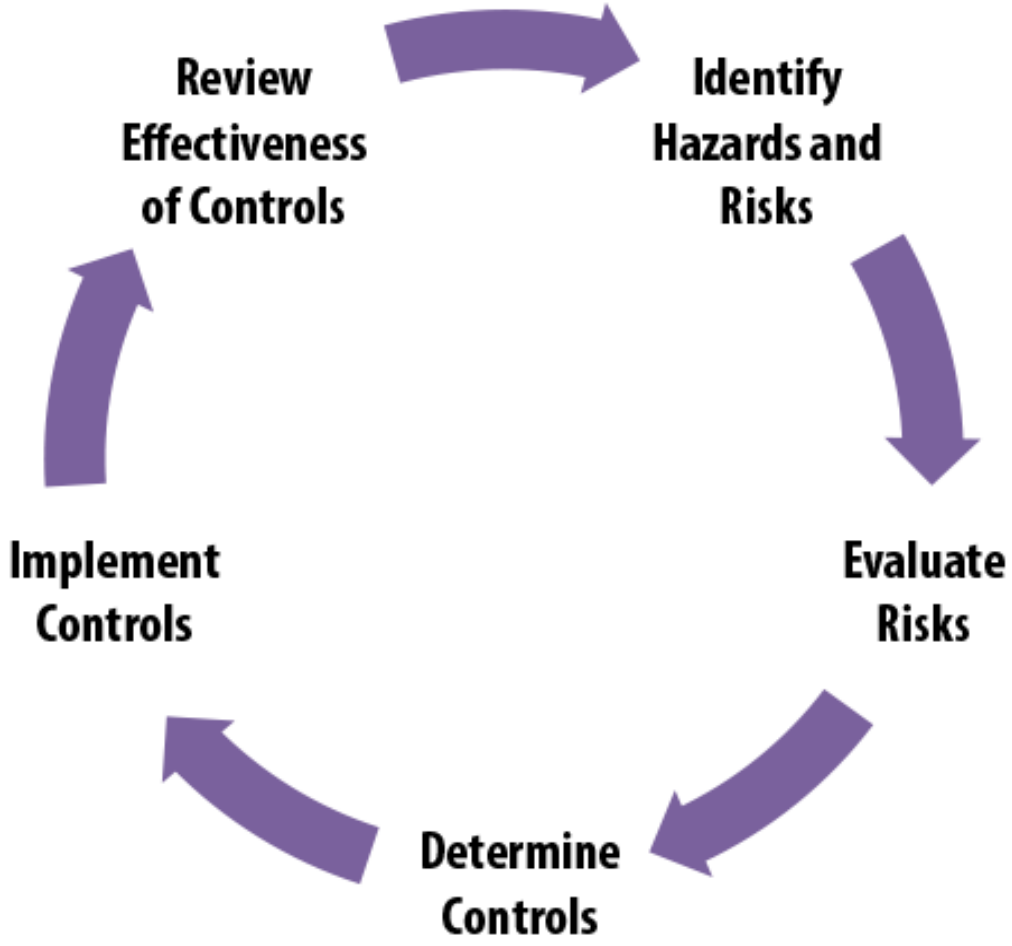

Biohazard Safety Levels
BSL-4
BSL-3
BSL-2
BSL-1
High Risk Microbes
Low Risk Microbes

Biohazard Safety Levels

- The Centers for Disease Control and Prevention (CDC) lists the 4 biosafety levels, with each of them having specific controls to contain microbes and biological agents:
- **Biohazard Level 1:** Often pertains to agents that include viruses and bacteria, this biosafety level requires minimal precaution, such as wearing face masks and maintaining no close contact. The biological hazard examples in the first level include E.coli and other non-infectious bacteria.
- **Biohazard Level 2:** Usually causing severe diseases to humans, the second level classifies agents that can be transmitted through direct contact with infected materials. HIV and hepatitis B are some biological hazard examples that pose moderate risks to humans.

- **Biohazard Level 3:** Mainly through respiratory transmission, pathogens that are highly likely to become airborne can cause serious or lethal diseases to humans. Mycobacterium tuberculosis, the bacteria that causes tuberculosis, is an example of a level-3 biohazard.
- **Biohazard Level 4:** Extremely dangerous pathogens that expose humans to life-threatening diseases, the fourth and last level requires workers to utilize maximum protection and containment. Ebola virus is an example of a level-4 biohazard

Risk Assessment process



Hierarchy of Controls

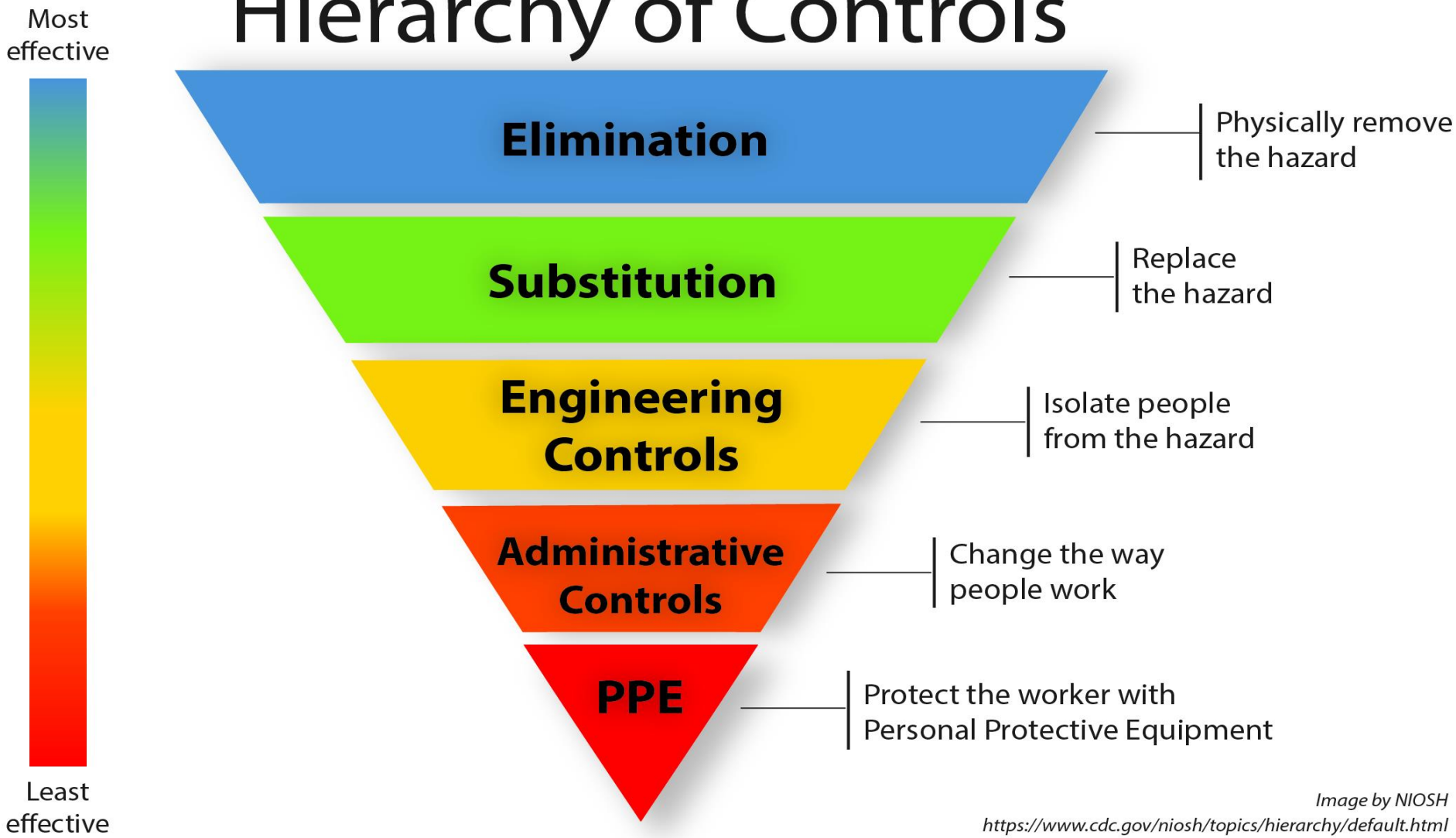


Image by NIOSH
https://www.cdc.gov/niosh/topics/hierarchy/default.html

Safety program

- Every clinical laboratory must have and implement a comprehensive formal safety program.

(1) Proper labeling of chemicals,

(2) Types and locations of fire extinguishers,

(3) Hoods that are in good working order,

(4) Proper grounding of electrical equipment,

(5) Ergonomic issues (which include equipment, such as pipetting devices, laboratory furniture)

(6) Providing means for the proper handling and disposal of biohazardous materials, including all patient specimen .

Safety program

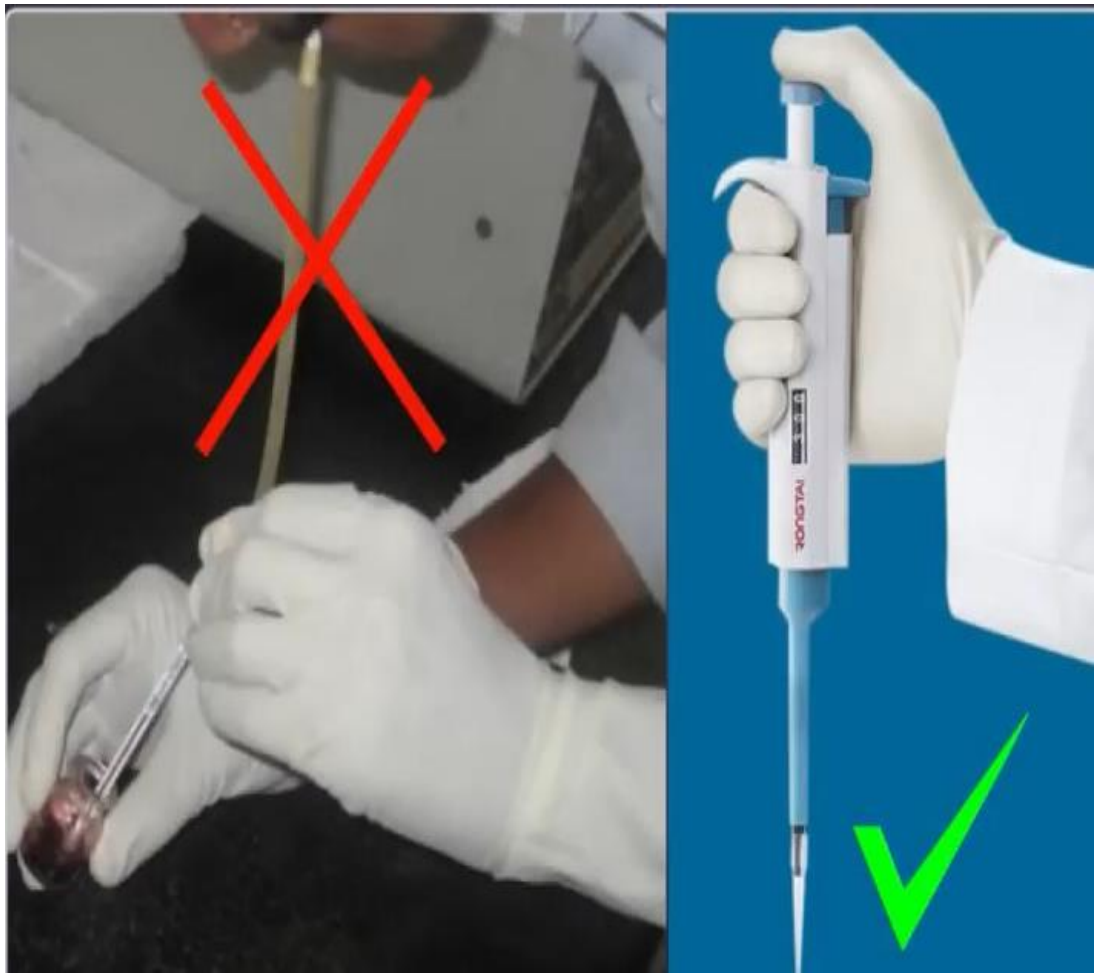
- Persons must wash their hands after working with potentially hazardous materials and before leaving the laboratory

Safety program

- Eating, drinking , smoking, must not be permitted in the laboratory areas

Safety program

- Mouth pipetting is prohibited , mechanical pipetting devices must be used



Safety program

- Perform all procedures to minimize the creation of splashes and or aerosols

Safety program

- **Policies for the safe handing of sharps such as needles, pipettes and broken glassware must be developed and implemented**

Safety program

- Decontaminate work surface after completion of work and after any spill or splash of potentially infectious material with appropriate disinfectant

Biological hazards preventive measures

- A laboratory specific biosafety manual must be prepared and adopted as policy .
- Training should be imparted regularly regarding prevention of exposure and post exposure procedures
- Staff training should always include information on safe methods for highly hazardous procedures that are comely encountered by all laboratory personal .


Thank
you