

Biosafety in Microbiology Laboratory

General Microbiology, second year, 2022
Faculty of Medicine, Hashemite University

Risks and Hazards

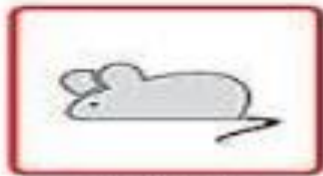
- Hazards in microbiology lab:
 - Infectious agents: bacteria, viruses, fungi, etc
 - Biological: human blood and fluids, human cell lines
 - Chemical hazards
 - Fire hazards
 - Sharps, needles, and glasswares
 - Heating hazards
 - Radiation hazards
 - Electrical hazards



Laboratory Safety

- Guidelines developed to protect workers in microbiological labs through:
 - Engineering and design controls
 - Management policies
 - Work practices
 - Safety guidelines and regulations
- Microbiology labs (research, teaching, or diagnostic labs) poses risk on:
 - Lab workers
 - Researchers and students
 - Close contact
 - Community

Lab Safety Symbols



Animal hazard



Sharp instrument hazard



Heat hazard



Glassware hazard



Chemical hazard



Electrical hazard



Eye & face hazard



Fire hazard



Biohazard



Laser radiation hazard



Radioactive hazard



Explosive hazard

dreamstime.com

Barriers

- Primary barriers: physical barriers or personal protective equipment between lab worker and pathogen (gloves, masks, eye goggles, lab coats, head cover, biological safety cabinets)
- Secondary barriers: structural aspects of the laboratory that make working environment safer against infection (Sinks for hand washing, special containment areas, special air ventilation patterns)





Standard Microbiological Practices

- NOT permitted in laboratories:
 - Eating
 - Drinking
 - Smoking
 - Handling contact lenses
 - Pipetting by mouth
 - Storing food and drink



**No eating, drinking
or smoking
in this area**

in this area

Standard Practices

- Wear a lab coat and shoes in the lab
- Roll up loose sleeves. Tie back long hair
- Frequent hand washing (before and after lab)
- Keep lab door closed when working
- Limits on access to the lab space when working
- Keep the lab bench free of unnecessary materials. Don't use the lab bench as a storage area for coats, books, etc
- Care to minimize splashes and actions that may create aerosols
- Decontamination of work surfaces after every use or after any spills
- Keep your work area uncluttered
- Never “horse around” or play practical jokes in the laboratory
- Treat all microbial cultures as if they are pathogens. Better safe than sorry
- When in doubt, ask the instructor!

Biosafety levels (BSL)

- Labs divided into 4 biosafety levels; protective practices increase with each
 1. Biosafety Level 1 labs - work with least dangerous agents, require fewest precautions
 2. Biosafety Level 2 labs
 3. Biosafety Level 3 labs
 4. Biosafety Level 4 labs - have strictest methods because dealing with agents that are most dangerous to human health

- **BSL-1:** microorganisms that don't consistently cause disease in healthy adults like non pathogenic *E. coli* species
- **BSL2:** microorganisms of moderate potential hazard, transmitted by contact, ingestion, puncture
 - Salmonella, herpesvirus, human blood
- **BSL3:** microorganisms that cause serious disease, transmitted by inhalation
 - M. tuberculosis, yellow fever virus, hantavirus, Y. pestis (plague)
 - Containment lab: double door entry; directional airflow; all work in biosafety cabinet
- **BSL4:** microorganisms that cause lethal disease, with no known treatment or vaccine
 - Ebola virus, Marburg virus
 - Maximum containment lab; positive pressure ventilated suits (moon suits)

- **NEVER**

- recap, bend, or break needles
- discard needles or sharps into biological waste bags
- discard needles into regular trash

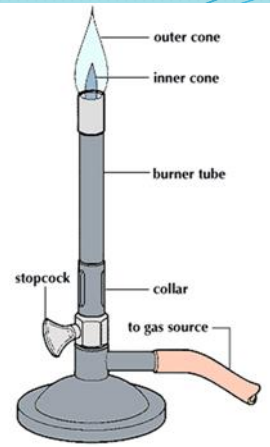


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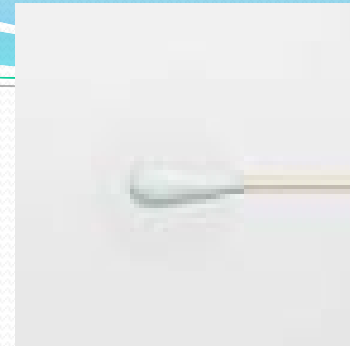
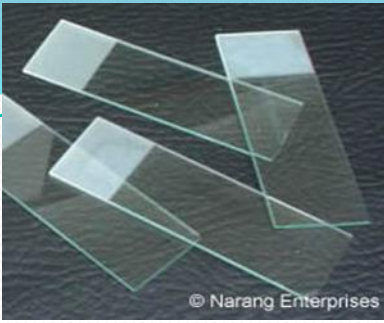
Instruments

- Autoclave
- Oven
- Incubator
- Fume hood
- Safety cabinet
- microscope



Lab equipment

- Bunsen Burner
- Inoculating loops
- Inoculating needles
- Petri-dishes



1



2

Autoclave

Autoclaves are also known as steam sterilizers, and are typically used for **healthcare or industrial applications**. An autoclave is a machine that uses steam under pressure to kill harmful bacteria, viruses, fungi, and spores on items that are placed inside a pressure vessel.

3

biological safety cabinet (BSC)

An enclosed and ventilated laboratory workspace to provide safety when working with materials that are contaminated by pathogens

4

Bunsen burner

A type of gas burner that produces a safe, smokeless, hot, non-luminous flame that can be used for various scientific experiments

5

water bath

is a laboratory equipment that is used to incubate samples at a constant temperature over a long period of time.

6

Centrifugation

A method of separating molecules having different densities by spinning them in solution around an axis (in a centrifuge rotor) at high speed.

7

Laboratory balances

Used to measure an object's mass to a very high degree of precision.



8

9

Laboratory incubators

Provide a controlled, contaminant-free environment for safe, reliable work with cell and tissue cultures by regulating conditions such as temperature, humidity, and CO₂

10

Inoculating Loops

inoculating loops and needles (sometimes called microstreakers or inoculating wands) are hand-held devices for inoculating plated or tubed growth media with microorganisms such as bacteria or yeasts prior to incubation, multiplication and growth

11

Culture plate

a low flat-bottomed laboratory container for growing a layer of organisms such as bacteria, molds, and cells on a thin layer of nutrient medium.

12

Pipetting

Is the process of using a pipette, whether it's a plastic pipette or a glass pipette, to measure or transfer a small volume of a liquid sample. The liquid sample measured by the pipette is in volumes of milliliters (mL) or microliters (μL).

13

Pasteur Pipettes

Pasteur Pipettes, also known as droppers or eye droppers, are laboratory liquid handling tools that are used to transfer small quantities of liquids.

14

Sharp box

Use a sharps bin to dispose of used needles or sharps