

# **Safety rule and regulation in microbiological laboratory**

**Presented by**

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# INTRODUCTION

- Laboratory is a building or room equipped for conducting scientific research or for teaching practical science.
- Safety is the state of being certain that adverse effects will not be caused by some agent under defined conditions.
- Lab safety is to make certain that no any adverse effect will be cause by any of potential hazard or agent in the laboratory.

# Why it necessary and why does it matter

- In the microbiological laboratory there are many hazards, however, most problems and accidents can be prevented by following the rules, being prepared for lab, and by thinking about What to do and what not to do in Lab. Always behave thoughtfully and with consideration for others' safety.
- Make sure to read the laboratory exercise before class and plan your work.

# Microbiological Safety Procedures

- Microbiological Procedures for safety has been divided into three main sections:
  - **Good laboratory practice,**
  - **Aseptic techniques,**
  - **and Clean up.**

# Good Lab Practice

## Personal Habits:

- Do not eat, drink, smoke, or apply cosmetics in the laboratory. Never put anything in your mouth. Use pipette aids when appropriate. Never pipette by mouth.
- Wash your hands thoroughly with soap and water before leaving the laboratory and any time they become contaminated with culture material.
- Disinfect your lab bench before you start, if you spill culture, and before you leave the lab, disposing used items properly.

- **Labeling:** Label all cultures and solutions properly with your name or initials, date, course / lab section, and experiment information. The experiment information may include the composition of the solution, identity of the culture, or the experiment number.

- **Biosafety Guidelines:**

- Use the proper precautions when dealing with microorganisms and body fluids. Biosafety levels are determined by the National Institutes of Health and the Centers for Disease Control.
- **Biosafety Level 1**- is suitable for work involving well-characterized agents not known to consistently cause disease in healthy adult humans, and of minimal potential hazard to laboratory personnel and the environment.
- **Biosafety Level 2** - is similar to Biosafety Level 1 and is suitable for work involving agents of moderate potential hazard to personnel and the environment.

- **BSL-3** laboratories are used to study agents that can be transmitted through the air and may cause potentially lethal infection.
- **BSL-4** laboratories are used to study agents that pose a high risk of life-threatening disease, aerosol-transmitted lab infections, or related agents whose risk is not known. Lab personnel are required to shower when exiting the facility.
- Precautions for dealing with body fluids use biosafety level 2.



# CDC Biosafety Levels

High Risk  
Microbes

Dangerous and exotic, posing a high risk of aerosol-transmitted infections. Infections caused by these microbes are frequently fatal and without treatment or vaccines.

**Examples: Ebola, Smallpox.**

BSL-4

Microbes there can be either indigenous or exotic, and they can cause serious or potentially lethal disease through respiratory transmission.

BSL-3

Examples: HIV, H1N1 Flu, Yersinia pestis (The Plague), Tuberculosis, SARS, Rabies, West Nile Virus, Ricketts.

BSL-2

Moderate potential hazard to personnel and the environment. Includes bacteria and viruses that cause only mild disease to humans, or are difficult to contract via aerosol in a lab setting  
Examples: Most Chlamydiae, hepatitis A, B, and C, influenza A, Lyme disease, Salmonella, mumps, and measles..

BSL-1

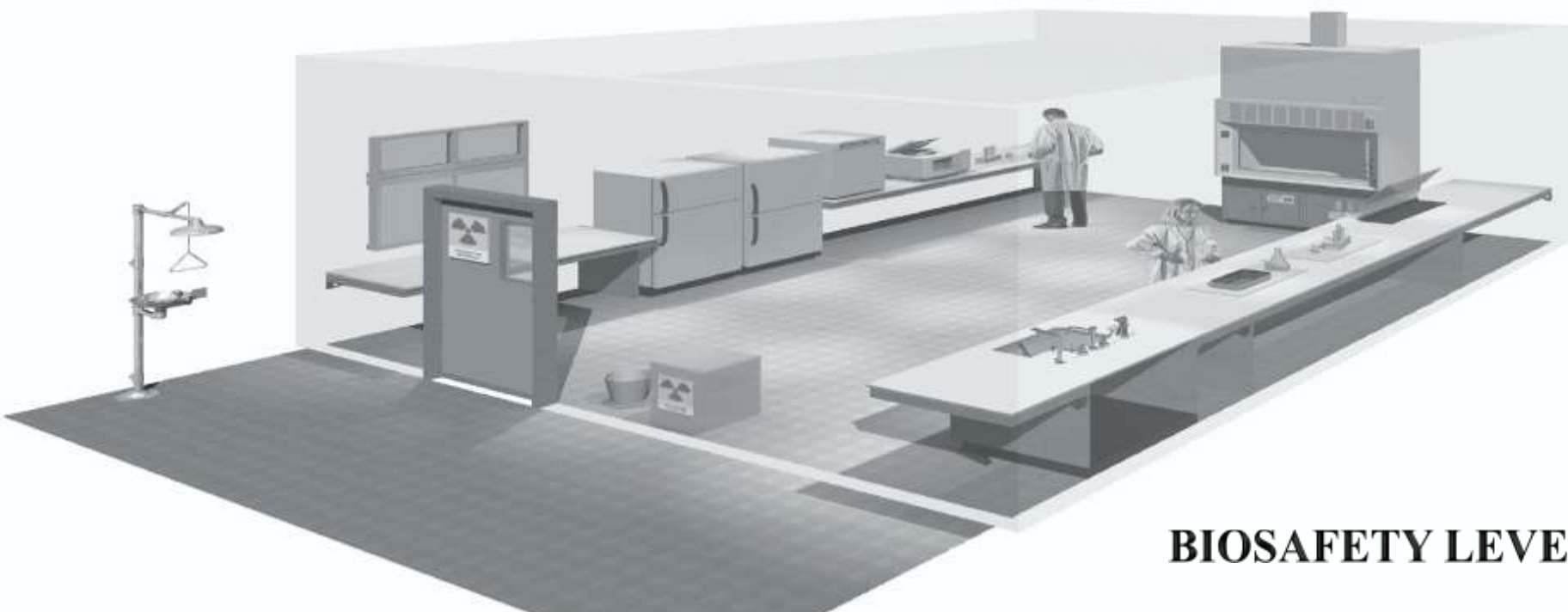
Not known to consistently cause disease in healthy adult humans, and of minimal potential hazard to laboratory personnel and the environment.

Examples: canine hepatitis, non-pathogenic Escherichia coli, and non-infectious bacteria.

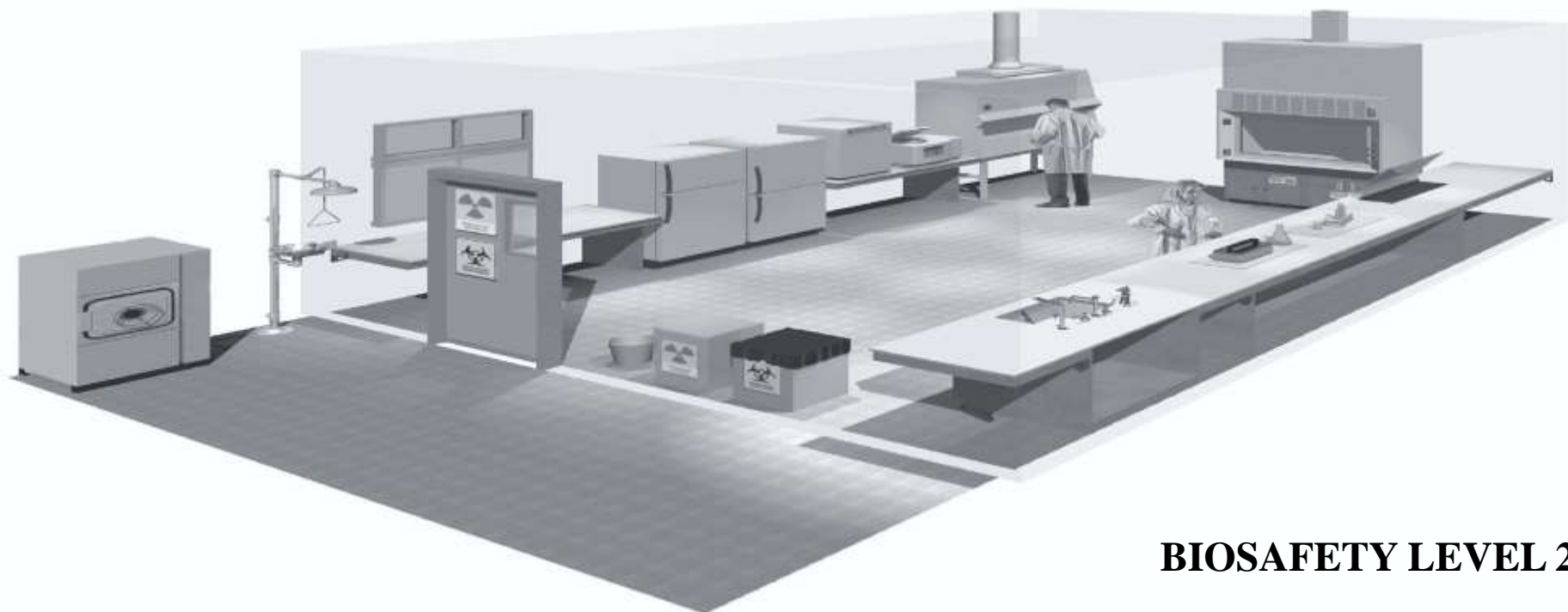
Low Risk  
Microbes



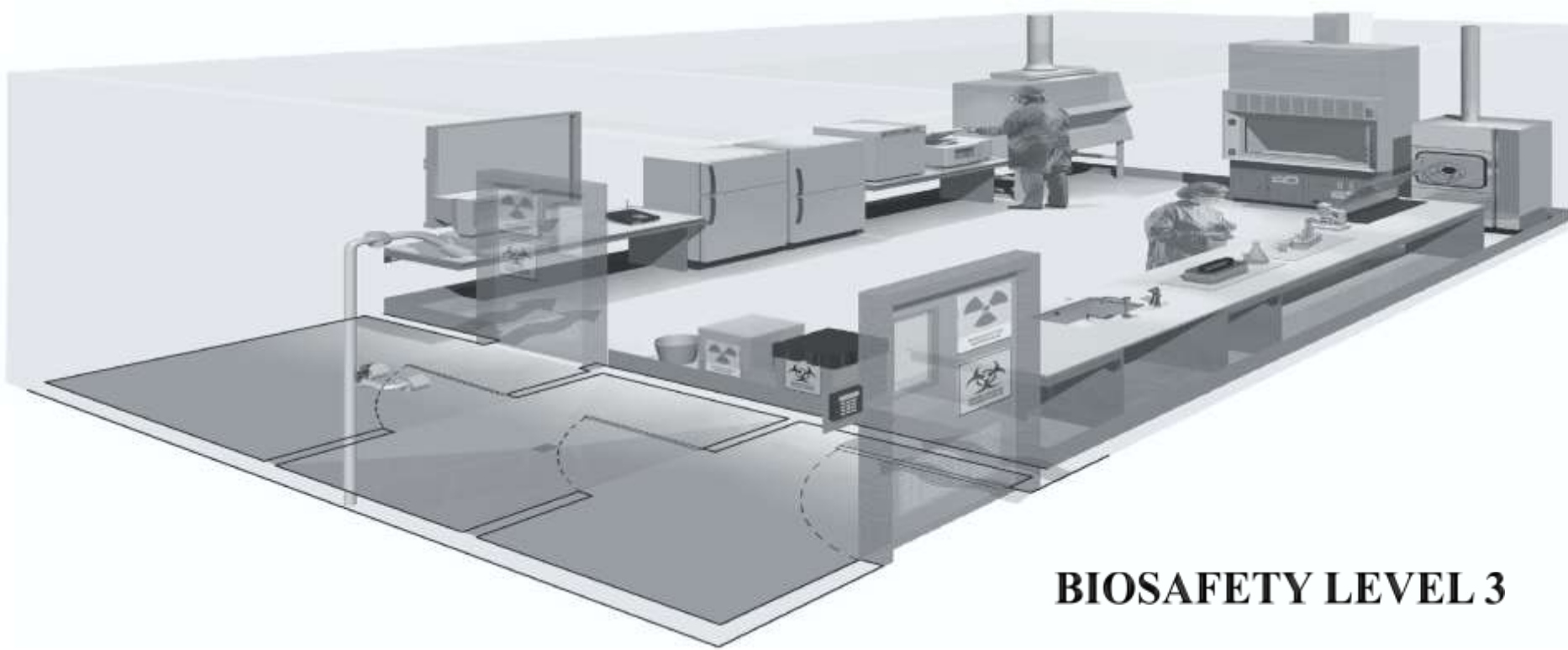
<b>BSL</b>	<b>Laboratory type</b>	<b>Laboratory practices</b>	<b>Safety equipment</b>
1	Basic teaching, research	Good microbiological techniques	None Open bench work
2	Primary health services; diagnostic services, research	Good microbiological techniques, protective clothing, biohazard sign	Open bench PLUS biological safety cabinet for potential aerosols
3	Special diagnostic services, research	As BSL 2 PLUS special clothing, controlled access, directional airflow	Biological safety cabinet and/or other primary devices for all activities
4	Dangerous pathogen units	As BSL 3 PLUS airlock entry, shower exit, special waste	Class III biological safety cabinet, positive pressure suits, double ended autoclave (through the wall), filtered air



**BIOSAFETY LEVEL 1**



**BIOSAFETY LEVEL 2**



**BIOSAFETY LEVEL 3**



**BIOSAFETY LEVEL 4**

# Aseptic Techniques

- Because microorganisms are so small, large populations are generally needed in order to monitor microbial activity. Aseptic techniques help ensure that only one type of microorganism is present in a container (pure culture). These methods also ensure that the microorganisms do not escape from the container, contaminating the laboratory, and possibly causing disease

# Clean Up

- For your safety and the safety of others, glassware and trash must be disposed of properly.
- 1) Items contaminated with microorganisms or body fluids must be autoclaved before disposal or washing. A special cart is designated in the laboratory for items that require autoclaving.



- Needles and syringes must be thrown into the red sharps container. Syringes without needles must be disposed of in the sharps container.
- Plastic Petri plates and other disposable plastic items used to culture or contain microorganisms must be placed in the red biohazard bags for autoclaving prior to disposal.



- Chemicals must be disposed of properly. Some chemicals must be placed in special containers for disposal to prevent environmental contamination.



- Never pick up broken glass with your hands; use a broom. Disposable glass items that are not contaminated with culture must be placed in the broken glass container - even when they are not broken.



- Paper towels should be thrown in the ordinary trash, unless they are contaminated with culture.





# General protective procedures:

- Read the laboratory exercise before class and plan your work. This creates awareness of the special safety concerns for the laboratory class and permits efficient use of class time.
- Come properly dressed to lab.
- Disinfect your lab bench before you start, if you spill culture, and before you leave the lab.
- Use pipette aids when appropriate. Never pipette by mouth.



# Protective Procedures for chemical hazards:

- Your laboratory instructor will inform you when you are using chemicals that require special handling. Special precautions include:



Prevent contact with the skin by wearing gloves and a lab coat.

Minimize hazards due to the formation of dangerous aerosols and splashing by wearing protective eye gear



Limit exposure to chemical fumes by working in a chemical fume hood

Properly dispose of chemicals that pose environmental hazards



# Protective procedures for physical hazards

Working with hot items, either from the autoclave or heated in the Bunsen burner requires protection of your hands. Wear mitts or handle the hot item with tongs



Using a sonicator, or sonic dismembrator, requires wearing protective ear coverings.

When working with a UV light source, wear coated UV-protective safety glasses. Protective eye coverings are required any time that aerosols might be generated or splashing might occur.



# Emergency Procedures

One the first day, familiarize yourself with the location of the eye wash station, the safety shower, the campus phone, and the fire extinguisher



If a culture or chemicals are splashed in or near you or your partner's eyes, immediately go the eye wash station.



In special emergency situations, TURN OFF GAS JETS FIRST, then evacuate the building as directed by your lab instructor.



A fire extinguisher is ready in each laboratory



For large spills on your body or if caustic chemicals are spilled on you, proceed immediately to the safety shower



If a culture is spilled, cover the spilled material with paper towels and apply a generous amount of laboratory disinfectant. Let it sit twenty minutes and then clean up the towels and disinfect the bench

# Basic rule and regulation of safety in microbiological laboratory

1. No food or drinks are permitted in the laboratory at any time.

2. Keep hands and other objects away from your face, nose, eyes, ears, and mouth.

3. Only closed-toe shoes are to be worn in the laboratory.

4. Work areas/surfaces must be disinfected before and after use.



5. Laboratory coats must be worn and buttoned while in the laboratory. Laboratory coats should not be worn outside the laboratory.



6. Protective eyewear must be worn when performing any exercise or procedure in the laboratory.

7. Long hair should be secured behind your head



8. Hands must be washed before leaving the laboratory.

10. Never pipette anything by mouth (including water). Always use pipetting devices.



11. All unnecessary books, purses, briefcases, etc., must be kept off the countertops.



12. Label all materials with your name, date, and any other applicable information

13. When handling chemicals, note the hazard code on the bottle and take the appropriate precautions indicated.



14. Do not pour bio hazardous fluids down the sink.



15. Return all chemicals, reagents, cultures, and glassware to their appropriate places.



16. Glassware should be washed with soap and water, then rinsed with distilled water.



17. Flame transfer loops, wires, or needles before and immediately after use to transfer biomaterial.



18. Turn off incinerators before leaving the laboratory.

19. Immediately, report any broken glass, especially those containing infectious materials.



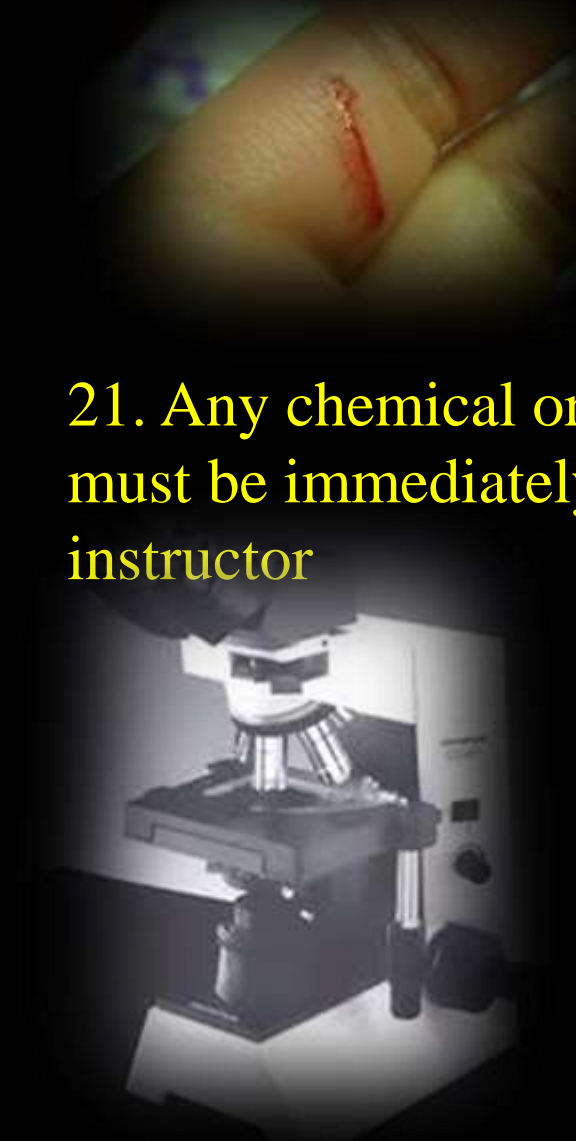
20. If you are injured in the laboratory, immediately contact your instructor

21. Any chemical or biological fluid spills must be immediately reported to your course instructor



22. Always wipe and clean the lenses of your microscope before putting it away.

23. Do not remove any materials from the laboratory without the written permission of the course instructor.



# SAFETY CODES

- Health and Safety at Work Act – 1974
- Internationally– World Health Organization – 1983
- Centre for Disease Control – 1988
- Health Services Advisory Committee – 1991
- Occupational Safety and Health Administration– 1991
- Advisory Committee on Dangerous Pathogens– 1995a
- Advisory Committee on Dangerous Pathogens– 1995b

**THANK YOU**