

BIOSAFETY IN MEDICAL LABORATORY

A SEMINAR PRESENTATION

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TO THE

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SUMMARY

Biosafety includes the protective measures against the risk of contamination with pathogen germs in the laboratory that handle pathogens, manipulate potentially contaminated products or perform microbiological tests for medical or scientific research problems. It is grouped into levels of containment based on the risks presented by the infections agents. The group consists of combination of laboratory practice and techniques, safety equipment, personnel training and laboratory facilities. Biosafety level 1 and 2 are fundamental to laboratories of all biosafety levels, where personnel work with low-risk microbes that pose no or moderate hazards to personnel and the environment like strain of Escherichia coli, Hepatitis B virus, and Salmonella typhi level 3 are the guidelines for containment laboratory work with exotic agents like Yellow fever, West Nile virus, Mycobacterium tuberculosis, and level 4 are modifications of and additions to the basic ones which consists of work with highly dangerous microbes like Ebola virus. The Centers for Disease Control and prevention sets Biosafety levels as a way of exhibiting specific control for the containment of microbes and biological agents, to protect the public from accidental or international exposure to infectious pathogens ,and to dictate the type of work practice that are allowed to take place in a laboratory setting.

BIOSAFETY IN MEDICAL LABORATORY

Biosafety is a set of biocontainment precautions required to isolate dangerous biological agents in an enclosed laboratory facility. They are individual safeguard designed to protect laboratory personnel, as well as the surrounding environment.

Biosafety is grouped into levels of containment ranging from the lowest biosafety level 1 to the highest at level 4 by the National Institutes of Health, and Centers for Disease Control and Prevention based on the risks presented by the infectious agent.

Biosafety level 1 and 2 are the basic/fundamental biosafety levels, level 3 represent the guidelines for containment laboratory and Level 4 is an addition to the basic ones.

THE FOLLOWING IS AN EXPLANATION OF EACH BIOSAFETY LEVELS, WHAT THEY MEAN AND HOW THEY DIFFER IN SAFETY MEASURES AND BEST PRACTICES:

➤ *BIOSAFETY LEVEL 1 AND 2*

Biosafety level 1 applies to laboratory settings in which personnel work with low- risk microbes that pose little to no threat of infection in healthy adults. And, Biosafety level 2 is appropriate for work involving agent that pose moderate hazards to personnel and the environment.

Biosafety level 1 and 2 requires only stranded microbial practices such as:

ACCESS:

- 1) The international biohazard warning symbol and signs must be displayed on the doors of the rooms where microbes of higher risk groups are handled.
- 2) Only authorized persons should be allowed to enter the laboratory working areas.
- 3) Laboratory doors must be kept closed.

PERSONAL PROTECTION:

- 1) Laboratory buttoned coats must be worn at all times in the laboratory.
- 2) Disposable examination gloves must be worn for all procedures that may involve direct or accidental contact with blood, body fluids, and other potentially infectious materials.
- 3) Personnel must wash hands after handling infectious materials, removing gloves and before leaving the laboratory working areas.
- 4) Safety glasses must be worn when necessary to prevent the eyes and face from splashes.
- 5) It is prohibited to wear protective laboratory clothing outside the laboratory.
- 6) Open-toed footwear must not be worn in the laboratory.
- 7) Eating, drinking, smoking, applying cosmetics and handling contact lenses is prohibited in the laboratory working areas.
- 8) Storing human foods or drinks anywhere in the laboratory working areas is prohibited.

LABORATORY PROCEDURES:

- 1) Never mouth pipette.
- 2) Labels on materials must not be licked.
- 3) All technical procedures should be performed in a way that minimizes the formation of aerosols and droplets.
- 4) A written procedure for the clean-up of all spills must be developed and followed.
- 5) Contaminated liquids must be decontaminated before discharge to sanitary sewer.
- 6) All spills, accidents and potential exposure to infectious materials must be reported to the laboratory supervisor.

LABORATORY WORKING AREA /DESIGN:

- 1) The laboratory should be kept neat, clean and free of materials that are not pertinent to the work.
- 2) Ample space must be provided in the laboratory.
- 3) Walls, ceilings and floors should be smooth, easy to clean, impermeable to liquids and resistant to chemicals and disinfectants normally used in the laboratory.
- 4) The laboratory should have a good source of light.
- 5) Hand -washing basins with running water if possible should be provided in each laboratory room, preferably, near the exit door.
- 6) Windows should be fitted with screens
- 7) Facilities to be storing outer garments and personal items and for eating, resting should be provided outside the laboratory working areas.

LABORATORY EQUIPMENT:

- 1) Should be designed to prevent or limit contact between the operator and the infectious materials.
- 2) Fabricated to be free of burns and sharp- edges.
- 3) Designed to provide ease maintenance, cleaning, decontamination and certification testing.
- 4) Glassware and other breakable materials should be avoided whenever possible.

TRAINING :

Personnel should be trained on:

- 1) Procedures to follow after a significant exposure.
- 2) Approved use of sharps when working with infectious agent.
- 3) Review of personal hygiene procedure.
- 4) Operation and use of laboratory equipment and decontamination methods.
- 5) Medical waste handling.
- 6) Decontamination and disposal of infectious materials.
- 7) Ingestion risks when handling specimens.
- 8) Proper hand washing procedure.
- 9) How to wear and remove gloves.

➤ ***BIOSAFETY LEVEL THREE***

It applies to work with exotic agents of increasingly greater potential for causing serious human illness or death.

The guidelines given in this chapter are presented in the form of additions to biosafety 1 and 2, which includes:

1. Laboratory protective clothing must be worn.
2. Respiratory protective equipment may be necessary for some laboratory procedures.
3. Access hand free sink and eye wash should be available near the exit.
4. Windows must be closed, sealed and break- resistant
5. Controlled ventilation that maintains a directional airflow into the laboratory room.
6. The safety cabinet should be sited away from walking areas.
7. Autoclaves for decontamination of contaminated materials should be available in the laboratory.

➤ ***BIOSAFETY LABORATORY 4:***

They are rare. It consists of work with highly dangerous and exotic microbes. Infections caused by these types of microbes are frequently fatal and come without treatment.

Its containment requirements include:

1. Personnel must wear appropriate personal protective equipment.
2. Personnel are required to change clothing before entering, shower upon exiting.
3. Decontamination of all materials before exiting.

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