Microbiology Lab Safety Overview

Introduction

The key to safe microbiological work in the classroom is the knowledge and practice of *aseptic technique*. Microbiology experiments should not be undertaken without proper training and a thorough understanding of basic microbiological transfer techniques. If microbiological culture media is to be made and poured into Petri plates or agar slants, a hotplate with a stirring mechanism and magnetic stir bars are great time savers. In addition, an autoclave or pressure cooker is essential to ensure media sterility.

Microbiology Guidelines

The U.S. Department of Health and Human Services, the Center for Disease Control, and the National Institute of Health have outlined general safety standards for microbiological work in their publication "Biosafety in Microbiological and Biomedical Laboratories." Four biosafety levels for microbiology laboratory practices are outlined and referred to as Biosafety Level 1 (BSL1), BSL2, BSL3, and BSL4.

BSL1 (Biosafety Level 1) practices, safety equipment, and facility design are appropriate for all secondary educational training and teaching laboratories. BSL1 work involves using strains of viable microorganisms that are known not to cause disease in healthy adult humans and that are therefore of minimal potential hazard to laboratory personnel and the environment. BSL1 represents a basic level of containment that relies on standard microbiological practices with no special primary or secondary barriers recommended, other than a sink for hand washing. The laboratory is not necessarily separated from the general traffic patterns in the building. Work is generally conducted on open bench tops using standard microbiological practices. Special containment equipment or facility design is neither required nor generally used. Those working in the lab should have specific training in the procedures utilized in the laboratory.

The aforementioned publication outlines standard microbiological practices required for safety in BSL1 facilities. These guidelines would apply to all school teaching settings:

1. Access to the laboratory should be limited or restricted when experiments or work with cultures are in progress.
2. Persons must wash their hands after they handle viable materials, after removing gloves, and before leaving the laboratory.
3. Eating, drinking, handling of contact lenses, applying cosmetics, and storing food for human use are not permitted in laboratory work areas. Persons who wear contact lenses should also wear goggles or a face shield.
4. Mouth pipetting is prohibited; only mechanical pipetting devices are used.
5. Facilities for safe disposal of sharps should be instituted.
6. All procedures should be performed carefully to minimize splashes.
7. Work surfaces should be decontaminated at least once a day and after any spill of viable material.
8. All cultures, stocks, and other regulated wastes should be decontaminated by an approved decontamination method such as autoclaving or using bleach before disposal.
9. A biohazard sign may be posted at the entrance to the laboratory whenever microbiology labs are being conducted.
10. It is recommended that laboratory coats, gowns, or uniforms be worn to prevent contamination or soiling of street clothes.
11. Gloves should be worn if the skin on the hands is broken or if a rash is present. Alternatives to powdered latex gloves should be available.
12. Protective eyewear should be worn for conducting microbiological experiments.
13. Laboratories should have at a minimum:
    a. doors for access control
    b. sink for hand washing

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c. hard, easy-to-clean surfaces (carpeting not appropriate)

d. bench tops impervious to water and resistant to basic chemical deterioration.

e. well-constructed furniture capable of supporting loads and adequate cleaning space between all benches, cabinets and equipment.

In addition to the general guidelines outlined in "Biosafety in Microbiological and Biomedical Laboratories," certain other guidelines always apply to microbiology activities in the classroom.

1. Known pathogens should never be used.
2. Cultures should be obtained from reliable biological suppliers and in pure culture form.
3. All microorganisms should be handled as if they are pathogens. When environmental microbes are cultured, the Petri plates should be taped shut prior to incubation and never opened.
4. Cultures of unknown species should be taped shut and sterilized before disposal. (See SafetyFax No. 10492, Biological Waste Disposal).
5. Humans and/or human products should not be used as a source of culture material.
6. Blood agars and serum agars should not be used in the basic biology laboratory.
7. Most Petri dish cultures produced in classroom activities should be taped shut and not opened even after being sterilized for disposal.
8. All work areas should be disinfected before and after microbiological work.
9. Students should wash thoroughly with soap and water before and after microbioligical transfers and observations.
10. Sterilize all microbiological materials prior to disposal. (See BioFax No. 10375, Sterilization Guidelines).

Reference

Biosafety in Microbiological and Biomedical Laboratories; U.S. Department of Health and Human Services. Public Health Service. U.S. Government Printing Office: Washington, DC 1999, 4th Edition.