

LABORATORY SAFETY WORKBOOK



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I. INTRODUCTION

Virginia Tech is committed to providing a safe and secure learning environment for students, particularly, in the laboratories. Laboratory safety is the responsibility of both instructors and students. Being proactive in your desire to maintain a safe laboratory environment for all begins with **prevention**. Preventative measures include, understanding safety standards and hazards, appropriate laboratory conduct along with many other concepts. The purpose of this manual is to provide guidelines and references to help students distinguish between good and bad laboratory practices.

Microbiology is a challenging, but fun and rewarding course. Many of you plan to pursue a career in some aspect of food science, therefore this course will assist in your future endeavors. Within the past several years the necessity to ensure consumers a safe food supply has increased. As a result, the number of students studying food science has increased. Food contamination by microorganisms can occur at any stage of food production, therefore it is important for you, as a future food scientist, to be able to suggest or conduct accurate microbiology tests to ensure food safety. This course will afford you this opportunity while teaching important procedures to prevent hazardous conditions in a laboratory setting.

Knowledge of safety rules and equipment is the first component of laboratory safety. Adhering to these rules is the second. There are several causes of laboratory accidents each year. The three most common are, 1) inappropriate use of chemicals and equipment, 2) inexperienced students, instructors and/or personnel and 3) inappropriate behavior or conduct.

Persons that work or study in a microbiology lab will be required to handle potentially infectious agents, therefore, the concepts presented are

imperative to your success. All microorganisms are potential pathogens, but proper handling (i.e. adhering to aseptic techniques, good laboratory practices) will reduce the likelihood of it becoming a health hazard. It is important to note that none of Virginia Tech's microbiology lab courses perform experiments with virulent pathogens.

II. DEFINITIONS

Terms to help students understand microbiological concepts and laboratory safety.

- **Aseptic Technique**- procedure performed under sterile conditions to eliminate contamination in hopes to obtain a pure culture of one type of microorganism.
- **Biohazard**- biological organisms that are of potential harm or risk to humans
- **Disinfectant**- the use of chemicals to destroy or inhibit the growth of microorganisms that may cause disease or illness.
- **Good Laboratory Practice (GLP)**- a method employed in a laboratory setting to prevent contamination, accidents and injuries.
- **Media**- a source of nutrient for the growth and reproduction of microbes.
- **Microorganism**- a tiny unicellular organism that includes, bacteria, viruses, fungi and protists.
- **Pathogen**- a disease or illness producing biological agent
- **Personal Protective Equipment (PPE)**- a barrier used to shield person(s) from potentially hazardous or hazardous biological, chemical or physical agents.
- **Spoilage organisms**-microbes that cause physical changes, discoloration, and odors. Example microbes are bacteria and molds.
- **Sterilization**- the use of heat for the complete destruction or elimination of all microorganisms.
- **Ubiquity**- microorganisms are everywhere
- **Virulent**- extremely infectious pathogen that causes disease

III. MICROBIOLOGY LABORATORY PRACTICES

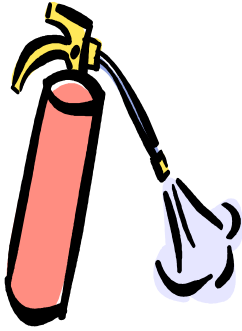
It is important to follow the safety practices listed below to ensure safe handling of potentially pathogenic agents.

1. Listen to the instructor at all times.
2. Do not eat food, drink, chew gum or apply cosmetics.
3. All chemicals have the capability to cause injury or illness.
4. Read the lab manual or any other relevant material before class begins.
5. No sandals, open-toed shoes, loose or baggy clothes and dangling jewelry. Long hair must be tied up. Anyone wearing inappropriate shoes will not be permitted to enter the laboratory.
6. Observe good housekeeping practices by maintaining an organized workstation and keeping the aisles clear of backpacks, etc.
7. Work area/bench top must be immediately disinfected with ethanol or a bleach solution before and after lab.
8. Always wear laboratory goggles as instructed.
9. Use disinfectant soap to wash your hands when you enter laboratory and then before you leave.
10. Work area/bench top must be immediately disinfected with ethanol or a bleach solution before and after lab.
11. Remove lab coats prior to exiting lab and entering non-laboratory areas.
12. Exercise care and discretion when using media, microorganisms, reagents and other chemicals
13. Label all materials to include petri dishes, test tubes, reagents, media, chemicals, etc with your name, date, type of media, organism and any other relevant information.
14. Never pipet chemicals, reagents or broth cultures with your mouth.

15. If the bunsen burner is lit never reach across it. Do not leave the burner unattended.
16. Never use your hands to pick up broken glass; use a broom and dustpan. Dispose of broken glass in the broken glass container.
17. Never walk around with transfer loops, needles and wires that have not been flame sterilized.
18. Petri dishes are to remain closed until necessary.
19. Close solution, reagent bottles and bacterial cultures when not in use.

IV. SAFETY and PERSONAL PROTECTIVE EQUIPMENT

Familiarize yourself with the location and operation of the following equipment.

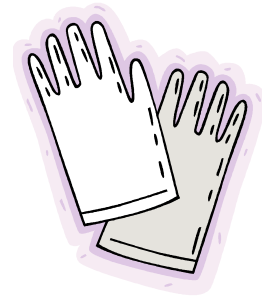


Safety Equipment

- Eyewash station
- Fire extinguisher
- Fire blanket
- Emergency Shower
- Drench hose
- First Aid Kit
- Broken Glass Container
- Sharps Box
- Biohazard Waste Receptacle
- Exits
- Spill Kit

Personal Protective Equipment (PPE)

- Gloves
- Safety Goggles
- Face Mask or Shield
- Lab Coat



V. EMERGENCY PROCEDURES

In case of an emergency notify your instructor IMMEDIATELY!

A. Chemical Spill

1. Notify your instructor and classmates immediately.
2. Determine if anyone has been affected by the chemical. (i.e. allergic reaction)
3. Make instructor aware of any injured classmate(s). If a chemical splashes on the skin or clothing lead the student to the emergency shower. If the chemical splashes in the eyes lead them to the eye wash station or drench hose. Remember to flush the affected area for 15 minutes.
4. The instructor will then follow-up with additional instructions.

B. Biohazard Spill

1. Notify your instructor and classmates immediately.
2. Cover the spill with a paper towel or cloth.
3. Pour fresh 10% bleach solution or an appropriate disinfectant agent on the spill starting from the inside out.
4. Let the spill sit for about 30 minutes.
5. If there is broken glass use a dustpan and broom to pick-up it up. Dispose of the glass in the broken glass container. In the event that the material is a sharp dispose of it in the biohazard sharps container.
6. Clean the area with disinfectant and dispose of contaminated material in a hazardous waste bin.

C. Evacuation

1. Evacuation procedures are specific to each building and laboratory. Your instructor will discuss with you the procedures.

VI. SIGNAGE AND LABELS

Observe the safety signage located at the entrance and inside the laboratory. It is important for you to acknowledge and abide by the information indicated on the sign. Many chemicals and reagents used in the laboratory are labeled according to its hazard level.

Biohazard Sign



Flammable



Corrosive



Toxic Chemicals

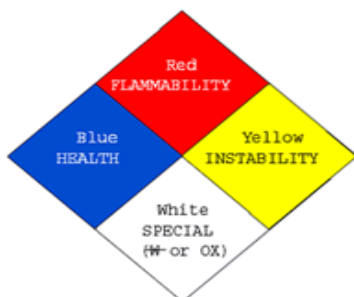
No Food or Drink



Hand wash Station



Chemical Hazards



VII. MICROSCOPE USAGE AND SAFETY

You are expected to handle each microscope with the utmost care. Certain laboratory exercises will require you to prepare bacterial slides, therefore, it is important to know how to properly clean slides. Procedures like this help to prevent contamination and ensure laboratory safety.



Materials required for microscope usage and safety include, microscope slides, cover slips, immersion oil, lens paper, lens cleaner, cleaning solution (70% ethanol or 10% bleach solution)

Microscope Rules

1. Always use both hands to carry a microscope. One hand goes on the handle and the other on the base. Do not carry your microscope with one hand!
2. Lens paper is the only material that should be used to clean the lens. Anything else will scratch it.
3. After using immersion oil lens paper and cleaner should be used to wipe the objective lens.
4. Remove slides from the stage before returning the microscope to the cabinet.
5. Never drag the microscope across the bench top. Instead, step away from the lens to allow your instructor or classmate to see what is in the field of view.

Slide Disposal

To prevent the contamination of microscopes and surrounding areas clean and/or dispose of used slides in one of the following manners,

1. Directly after use clean slides with 70% ethanol and wipe with lens paper,
or
2. Directly after use place slides in a fresh 10% bleach solution.