

University of Michigan Biological Safety in Teaching Laboratories

INTRODUCTION

The University of Michigan (U-M) is committed to providing a safe and healthy learning environment for all students in teaching laboratories. Teaching laboratory instructors must be aware of the associated risks in using biological materials in the laboratory. The American Society for Microbiology (ASM) and Centers for Disease Control (CDC) have created guidelines for best practices in teaching labs designed to encourage awareness of the risks, promote uniformity in teaching practices, and protect the health of students. The following guidelines adopted by U-M outline best practices to minimize the risks to students and the community.

RESPONSIBILITY

Environment, Health and Safety (EHS)- The biological safety group within EHS is responsible for assuring compliance with State and Federal standards and University policies related to laboratory practices involving biologicals. Although students who are not employed by the University are not covered by most state and federal occupational laws, U-M is committed to providing a safe environment in teaching laboratory settings. All teaching laboratories where biologicals are used must comply with these guidelines.

Laboratory Director/Principal Investigator (PI)/Course Instructor- The lab director/PI/Course Instructor will be responsible for training and supervision of graduate student instructors (GSI) or teaching assistants (TA) for their classes.

Graduate student instructor/Teaching Assistant- The teaching lab instructor will be responsible for implementation of the safety guidelines in each of the laboratory classes. Prior to experiments, or handling of biologicals, time in lecture or lab should be dedicated to covering lab safety.

Students- All students are responsible for their own safety. Each student conducting experiments must follow the safety guidelines and work in a safe manner. The student is responsible for wearing appropriate personal protective equipment needed for the class.

BIOLOGICAL SAFETY LEVELS

Biosafety Level 1 (BSL1) - Well characterized organisms that pose a low risk to the community and are unlikely to cause disease in immunocompetent healthy adults. Typically, organisms classified as risk group 1. Some examples include but are not limited to: *Bacillus subtilis* (asporogenic) and *Escherichia coli* K-12.

Biosafety Level 2 (BSL2) – Organisms that pose a moderate risk to the individual and community. When good lab practices are followed these organisms rarely cause serious disease, and effective treatment for infections is available. Typically, organisms classified as risk group 2. Some examples include but are not limited to:

Aspergillus fumigatus

Candida albicans

Corynebacterium diphtheriae

Enterococcus faecalis

Klebsiella pneumoniae

Proteus vulgaris

Salmonella typhimurium

Staphylococcus aureus

Streptococcus agalactiae

Streptococcus pneumoniae

Streptococcus pyogenes

Human derived materials and cell lines

BIOLOGICAL ORGANISMS

- Cultures used in teaching laboratories should come from authorized, commercial, or reputable sources.
- Fresh stock cultures of organisms should be obtained annually, to be certain of the source culture, minimize spontaneous mutations, and reduce contamination.
- Organisms should be stored in a secure location.
- Non-pathogenic organisms should be used in place of pathogenic organisms whenever possible.
- Pathogen safety data sheets are available for many organisms from the following link: <http://www.phac-aspc.gc.ca/lab-bio/res/psds-ftss/index-eng.php>
- A detailed U-M biosafety manual is available from the EHS website from the following link: <http://ehs.umich.edu/research-clinical-safety/biological/>
- A University Exposure Control Plan is available from the EHS <https://ehs.umich.edu/wp-content/uploads/2016/02/ECP.pdf>

PERSONAL PROTECTIVE EQUIPMENT (PPE)

The minimum PPE for all U-M labs are listed below. It is recommended that teaching labs follow U-M PPE standards.

- Safety glasses or goggles
- Lab coats
- Gloves, when handling biological materials or hazardous chemicals

LABORATORY SPACE REQUIREMENTS

- Nonporous floors, bench tops, chairs and stools
- Sink for hand washing
- Available eye wash
- Secured access
- Biohazard signage
 - Doors, and wherever organisms are used and stored
- Biological safety cabinet (for BL2)
 - Required for risk group 2 organisms when large volumes are used, or when a procedure will create aerosols.

STANDARD LABORATORY PRACTICES

- Do not wear shorts, or open toed shoes
- Tie back long hair
- Do not wear dangling jewelry
- Wash hands before exiting the laboratory, or after completing an experiment
- Disinfect bench before and after lab session
- Use appropriate disinfectants
- No food, or drinks
- Do not apply cosmetics, or handle contact lenses
- Label all containers clearly
- Keep laboratory doors closed during class
- Minimize the use of sharps
- Use proper containers for transporting organisms.
 - Example: Test tube racks for moving cultures in the lab
- Use leak proof containers for storage
- Use microincinerators or disposable loops rather than Bunsen burners when possible

- Proper disposal or autoclave of biologicals following U-M policies
- Do not handle broken glass; use a dustpan, broom or tongs
- Notify instructor of spills or injuries
- Document all injuries according to U-M policies
- Do not use cell phones, headphones or personal items while working with biologicals
- Lab notebooks, pens, etc., should remain in the laboratory
- Advise that immune-compromised students (including those who are pregnant) and students living with or caring for an immune-compromised individual that they may want to consult a physician to determine the appropriate level of participation in the laboratory.

HOUSEKEEPING

- Keep work areas clean and uncluttered
- Clean up at the end of an experiment or at the end of each lab class
- Dispose of waste according to U-M guidelines

TRAINING PRACTICES

The lab instructor must complete all relevant Environment Health and Safety required training in addition to any departmental training. Instructors should inform students of any safety precautions prior to each experiment or exercise.

DOCUMENT PRACTICES

- Documentation should be completed to show that students have been informed about safety precautions as well as the hazards of the organisms they will handle throughout the class
 - Examples; attendance sign in sheet, safety statement or agreement
- Maintain and make available (in syllabus or online) to all students a list of all organisms used in the course

EXPOSURES/INCIDENTS

- Skin, Mucous Membrane, or Injury Exposure
 - Thoroughly wash area with soap and water. Do not squeeze the wound to induce bleeding
 - Avoid use of abrasive chemical soaps or disinfectant washes as they can cause skin abrasions and a possible additional route of entry for the agent

- For mucous membranes (e.g., eyes, mouth), flush for a minimum of 15 minutes
- Students who are accidentally exposed to a potentially infectious agent must report the incident as soon as possible to the class instructor as well as EHS 734-647-1143
- Medical treatment or health monitoring is obtained through University Health Service (UHS) at 207 Fletcher St 734-764-8320
- Complete an Injury Report form