

Laboratory Safety

Portions adapted from Black, Gach, and Kotzian (1996) and edited by Jon Lillemoen, Manager, Research Health & Safety (2016)

As an instructor, you have the responsibility to ensure a safe learning environment for you and your students. Laboratories present many more potential hazards than the conventional classroom, and it makes sense from everyone's standpoint to prepare for situations you will hopefully never have to handle. The classroom situation is often unpredictable and you are expected to provide written safety precautions to your students for the specific hazards present.

Within the University of Michigan, the Department of Environmental Health and Safety (EHS) (734-647-1143) offers safety resources for University employees, including GSIs. Laboratory safety guidelines are available that detail University policy on laboratory rules and maintenance, hazardous waste management, electrical safety, chemical spill procedures, and emergency and first-aid procedures (ehs.umich.edu/).

EHS also provides training in laboratory safety and right-to-know issues. EHS's online training courses General Laboratory Safety Training (BLS025w) and Bloodborn Pathogens Training (BLS101w) are a great start: <https://ehs.umich.edu/research-clinical-safety/biological/>. BLS025w is required for all employees working in laboratories and BLS101w is required for employees working with human blood or tissues. Enrolled students that take part in academic laboratories, courses, or projects that work with hazardous materials or equipment are required to take Student Laboratory Safety Training (BLS042w). They must also be provided with lab-specific safety and health training focused on the hazards and materials present. Providing the lab-specific training is the responsibility of the lab director, instructor, professor or supervisor of the students.

The U-M Chemical Hygiene Plan (CHP) is intended to provide information on best practices in laboratory health and safety. A detailed review of the CHP is presented in the Laboratory Safety Training course, and the entire CHP can be found on the EHS website (<http://ehs.umich.edu/research-clinical-safety/chemical/>).

Where instructors are performing demonstrations or students are conducting experiments using hazardous materials, the instructor is required to perform a documented hazard risk assessment. Refer to Section 3.6 of the CHP for additional information regarding safety requirements for instructional laboratories where experiments are conducted or demonstrations are performed using hazardous materials.

Here are some basic guidelines for most laboratory classes: Protective clothing (lab coats, safety goggles, gloves, shielding) needs to be available for everyone handling hazardous materials or equipment. Separate waste receptacles for glass, biohazards, organic and inorganic chemicals, and radioactive materials should be in place. It is University of Michigan policy that eating, drinking, and smoking are not allowed in the laboratory. GSIs as well as students must follow this policy.

For additional safety concerns pertinent to your course, consult the course supervisor.

Running a Safe Class

Before each class, remind students of the importance of laboratory safety and be thoughtful about setting up the safety expectations. While laboratory safety is everyone's responsibility, you now have a role as the instructor to make sure that a safe environment is created and maintained. Explain the general type of safety preparation required for each laboratory session and make sure the students know the safety rules for each class, e.g. when to use goggles or details of specific toxic materials. Be sure to point out and reinforce the rules that are found in the safety section of your instructional laboratory manual around the day's procedures. Explain in detail the general ground rules for the proper handling and storage of supplies and equipment. Emphasize that because subsequent classes must use the laboratory, work areas must be cleared and all equipment cleaned and stored before the end of each session. Remind students what they need to do in the event of an emergency. These procedures can be found in the safety manual for your instructional laboratory. Use the following checklist to help you run a safe class:

GSI Tip: Be firm, fair, and friendly about enforcing laboratory safety. You will develop a safe, learning centered environment if you are clear and consistent with your safety practices. Be friendly up front about why safety is important, be firm about enforcing the safety rules from day one, and be consistent about fairly applying these rules to all students to gain student confidence and buy-in for your beliefs about safety.

Laboratory Safety and Course Preparation Checklist

Determine hazards present in your lab (e.g., electrical, mechanical and other equipment, hazardous chemicals, biohazardous materials, radioactive materials). Know how to safely handle and dispose of these materials.

- Learn departmental policy on goggles and lab coats.
- Scout out the location and availability of all safety equipment in the lab.
- If any safety equipment is missing or in disrepair, make sure there is a replacement.
- Run the eyewash at least once a week to ensure the water runs clear.
- You may wish to ask for rubber gloves, a CPR mask, and a first-aid kit for your lab.
- Determine department policy for handling injuries.
- After reading through the university's Emergency Response Flip Chart, think about your response to a crisis. Pay particular attention to the instructions for Physical Emergencies such as Evacuation, Severe Weather, Flooding, Power Outage, Bomb Threat, Civil Disturbance, Workplace Violence/Terrorism, and Active Shooter.
- Learn how to operate the fire extinguisher in your lab (arrange through your Safety Coordinator)
- Attend any department-sponsored safety seminars.
- Be familiar with the University's safety requirements and the role that safety offices such as EHS might play. Review some of the pertinent safety Guidelines for various hazards at <http://ehs.umich.edu/plans-guidelines/>

Strategies for How to Run a Safe Class: Do's and Don'ts

- *Do enforce students' use of protective clothing (lab coats, safety goggles, gloves, shielding) when handling dangerous materials or equipment.* Don't allow students into the lab with open toes shoes or flip flops, clothing that does not cover them safely, or allow them to perform any laboratory procedures without safety goggles on their faces. At a minimum, safety glasses with side shields must be worn at all times in any laboratory that contains hazardous materials or processes.
- *Do follow the proper waste disposal procedures for your department.* Generally this includes separate waste receptacles for glass, biohazards, organic and inorganic chemicals, and radioactive materials. Chemical waste containers must be properly labeled with the specific contents at the time they are put into use. For additional safety concerns pertinent to your course, consult the course laboratory supervisor. Don't be casual or uninformed about how students are to dispose of laboratory materials – if you are in doubt about what to do, ask someone. Never dispose of chemical waste by pouring it down the drain. This violates federal, state, and local government regulations.
- *Do ban eating, drinking, and smoking in the laboratory.* It is University of Michigan policy that eating, drinking, and smoking are not allowed in the laboratory. GSIs as well as students should follow this policy. Don't tell the students one thing and then act differently yourself. This will be perceived as unprofessional. If the students see the GSI drinking coffee in the lab, they will think they can do it too. Model safe and professional behavior.
- *Do check to see that electrical cords are in good condition.* Equipment with worn or broken cords should be taken out of service for repair or replacement. All electrical equipment should be grounded with either a three-pronged plug or double insulation. Any electrical equipment used near water must be plugged into a socket with a ground-fault interrupt trip circuit. Check that your students do not bypass this precaution. Don't ever use electrical equipment near flammable solvents and do not handle any electrical connection with wet hands or when near or standing in water.
- *Do extinguish electrical fires using only a multipurpose ABC, BC, or carbon dioxide extinguisher.* Don't try to put out a fire with water or a water-based extinguisher. Burning materials may react with water or spread if oil is involved. However, do not attempt to use any fire extinguisher unless you have been trained on how to use them.
- *Do keep your mouth and nose away from chemicals.* Always use a pipette bulb when pipetting. All stock chemicals and in-use chemicals must be labeled in both instructional and research laboratories, so odor should never have to be used to identify chemicals. All materials that produce toxic fumes, such as waste cyanides and sulfides, should be stored in a fume hood to reduce the chance of accidental inhalation. Don't expose your nose or your mouth to chemical contact or vapors by smelling or pipetting. Assume that the chemical vapors have some level of toxicity and are likely to cause harm.
- *Do remove all contaminated clothing and wash the affected area at the nearest shower or eyewash station in the event of a chemical spill.* When there is chemical spill in the room, notify the class and ventilate the room. Supplies for cleaning chemical spills should be available to you. Don't ignore spills—report all chemical spills large or small to your supervisor and clean them up using the proper technique. Other people who use the room after you won't be aware of the spill, so it is your responsibility to clean the area thoroughly. Contact Environment, Health & Safety (EHS), Incident Response Team (IRT) at (734) 763-4568 for large spills beyond your ability to handle safely.
- *First aid should be used only to provide assistance until professional medical attention can be given.* Procedures for basic first aid are found in the U-M Emergency Flipchart: <http://www.dpss.umich.edu/emergency-management/procedures-poster.html>

If an accident or injury occurs during your class, report it to the laboratory supervisor and, if necessary, notify medical authorities. If needed, you or the supervisor should accompany the student to the University Health Service during working hours and the U-M Health System Emergency Department after 5pm. Don't ignore accidents—report all accidents large or small to your supervisor and document the occurrence and the outcome.

- *Do call 911 for severe trauma or shock.* Don't delay. Every second counts.
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References

Black, B., Gach, M., & Kotzian, N. (1996). *Guidebook for teaching labs for University of Michigan Graduate Student Instructors*. Ann Arbor, MI: Center for Research on Learning and Teaching, University of Michigan.