

XI. Training and Hazard Communication

Training Requirements

The laboratory manager or individual with primary supervisory responsibility must assure that all personnel who work with, or who may contact potentially biohazardous material are informed of the hazards and are trained in the proper procedures and equipment needed to avoid exposure, proper treatment and disposal of biohazardous wastes, and recognition of symptoms of infection or exposure.

All persons conducting research in a Rice University laboratory, where chemicals, biological materials, and/or physical hazards are present (radiological, laser or intense pulse light, industrial machinery, nanomaterials) must complete the “General Laboratory Safety” course as soon as possible after their employment or appointment begins. Additionally, upon entering the laboratory, and before initiating work they must complete site specific training for the laboratory. Attendance of the “General Laboratory Safety” course, and site specific training must be documents in the safety binder/manual. The “General Laboratory Safety” course must be completed on an annual basis. The site specific training must only be completed once and updated when new hazards arrive in the laboratory.

All persons conducting research in a laboratory that works with BSL-2 materials including; pathogenic microorganisms, viruses, human and non human primate cells, cell lines, human or primate tissues, human blood or bodily fluid, unfixed human, animal tissues, organs, potentially infectious material, or any active users listed on an approved IBC protocol for work that is not exempt by NIH guidelines as provided in Section III-F, must also annually attend the “Biosafety and Bloodborne Pathogens” course, and upon entering the laboratory, and before initiating work, must complete biological site specific training. A training checklist for biological site specific training can be found in Appendix I. Attendance of the “Biosafety and Bloodborne Pathogens” course, and biological site specific training must be documents in the safety binder/manual. The “Biosafety and Bloodborne Pathogens” course must be completed on an annual basis. The biological site specific training must only be completed once and updated when new hazards arrive in the laboratory.

All persons conducting experiments where radiological hazards exist necessitates attendance of the “Radiation Safety” course and radiological site specific training. Radiological hazards can include radioactive material (RAM) or source materials. If your research does not use any radiological hazards but is located in a RAM use area you should attend training. Attendance of the “Radiation Safety” course and radiological site specific training must be documents in the safety binder/manual. The “Radiation Safety” course must be completed on an annual basis. The radiological site specific training must only be completed once and updated when new hazards arrive in the laboratory.

All persons conducting experiments where class IIB or IV lasers are used must attend the “Laser Safety” course and laser site specific training. Attendance of the “Laser Safety” course and laser site specific training must be documents in the safety binder/manual. The “Laser Safety” course

must be completed on an annual basis. The laser site specific training must only be completed once and updated when new hazards arrive in the laboratory.

For more information regarding general laboratory safety, radiological safety and laser safety please check with your laboratory supervisor and read through the safety binder/manual or visit the EHS website at safety.rice.edu.

Course Descriptions

Below one can find a brief synopsis of the safety courses offered by Rice University Environmental Health and Safety department. For more information please visit the website at safety.rice.edu.

General Laboratory Safety

General Laboratory Safety training is designed to cover topics in general laboratory safety including personal protective equipment, the proper use of chemical fume hoods, hazardous chemical usage and segregation, hazard communication, proper waste segregation and disposal, proper gas cylinder use, spill response, and emergency response.

Biosafety and Bloodborne Pathogens

The Biosafety and Bloodborne Pathogens course is designed to cover a broad range of biological safety concerns and familiarize research staff with the safety resources Rice University has to offer. This course covers the NIH/CDC classification of biological organisms and safety requirements for working with biohazards and recombinant DNA in research laboratories in addition to emergency procedures, waste management and spill response. It is designed to be compliant with the OSHA requirement for bloodborne pathogens annual in person training.

Radiation Safety

Radiation Safety training is designed to cover topics in radiation safety including radiological theory, types of decay, detection, dosimetric calculations, potential effects on the human body, ALARA, administrative requirements, waste disposal, and emergency procedures.

Laser Safety

Laser Safety training is designed to cover topics in laser safety including basics of lasers and laser light, laser hazard classes, laser beam injuries, and hazard control measures.

For class schedule and attendance certificates please visit the EHS website at safety.rice.edu.

Biological Hazard Communication

All persons working around biohazardous materials or in laboratories that conduct research with biohazardous materials have a right to know that they may be exposed to biohazards. To this end

all laboratories working with biohazardous materials will be delineated with a biohazard symbol and the term biohazard. Additionally any equipment used to store, manipulate, or that could have become contaminated with biohazardous materials must have a biohazard symbol on it. The laboratory sign must contain the name of the organism or type of biohazardous materials present. Clear entry and exit requirements must be posted outside the laboratory.

As a part of the biological site specific training all persons working in laboratories conducting research with biohazardous materials must be advised of the types of hazards present and the symptoms associated with that disease were they to become exposed/infected.

The universal biohazard symbol can be found below it is usually found on a red or orange background.



For information regarding chemical hazard communication please refer the Rice University Chemical Hygiene Plan. For hazard communication regarding radiological materials or Lasers please refer to the Rice University Radiation Safety Manual, and Laser safety Manual respectively. All these material can be found on the EHS website at safety.rice.edu.

Laboratory Specific Biological Safety Training

PI: _____ Department: _____

All persons working in biological laboratories must have site specific biological safety training before beginning work. Training must be conducted by a principal investigator (PI) or their designee.

List the biohazardous substances that may be found in the laboratory, including rDNA and its products that may pose a hazard to the health of laboratory staff, community, or if released into the environment:

List the symptoms associated with exposure to the materials listed above:

The following topics should be covered during the training. Check all that are covered.

- Aseptic technique
- Personal protective equipment (*i.e.* PPE as detailed in Biosafety Manual and BMBL)
- Activities of concern (*e.g.* sonication, centrifugation, sharps use etc.)
- Containment requirement (*e.g.* Biosafety Level 1 or 2)
- Disinfection and sterilization procedures (as detailed in Biosafety Manual and Spill Response Plan)
- Biological and biohazardous waste management
- Locations of required signs, notices, and EHS Biological Safety Manual
- Where biological material is used and stored within the lab(s) and restrictions on that use
- Review of written protocols involving biological and biohazardous materials
- Review emergency procedures (from Laboratory Safety Manual)
- Location of safety equipment (*e.g.* spill kits, spill cleanup materials, eye wash, safety shower *etc.*)
- Review incident reporting procedures

Instructor: _____ Researcher: _____

X _____ X _____

Date Completed: _____

Spill Response Plan

What are the hazardous biological materials present in the laboratory?

The following disinfectants and contact times are appropriate for the biohazards presented by the biological materials found in the lab. (e.g. 10% household bleach and 6% hydrogen peroxide are an acceptable disinfectant if the solution less than 48 hours old. You may substitute another product if it is compliant with OSHA bloodborne pathogens standard, and is certified to have germicidal activity on *Mycobacterium tuberculosis*, *Staphylococcus aureus*, and HBV. All commercial disinfectant must be mixed and used per manufacturers recommendations)

Biohazard spill response procedure and spill kit checklist

This document is designed to inform laboratory workers of the supplies that should be available and the proper procedure for attending to spills involving biohazards.

Biohazard spill kit checklist:

1. Plastic bucket¹
2. Dust pan¹
3. Broom¹
4. Mop/rags¹
5. Disinfectant
6. Spray bottle
7. Paper Towels
8. Gloves²
9. Lab coat³
10. Safety Glasses⁴
11. Surgical Mask⁵
12. Bag⁶
13. Tongs (optional)

Biological Waste Management

Biological and biohazardous materials are routinely used in research laboratories throughout the Rice University campus. When laboratories have completed their investigation those materials must be disposed of according to federal, state, and local guidelines. The Texas Commission on Environmental Quality (TCEQ) has guidelines that pertain to the generation, storage and disposal of biological and biohazardous materials. This document and procedures described within are intended to assist laboratories in the management and disposal of the biological and biohazardous materials

Definitions

Biological hazard (biohazard) - An agent of biological origin that has the capacity to produce harmful effects on humans and the environment.

Biological waste- Unwanted solid or liquid material which may be composed of or contaminated with biological or biohazardous materials.

Recombinant DNA (rDNA) :

- (i) molecules that a) are constructed by joining nucleic acid molecules and b) that can replicate in a living cell, i.e., recombinant nucleic acids;
- (ii) nucleic acid molecules that are chemically or by other means synthesized or amplified, including those that are chemically or otherwise modified but can base pair with naturally occurring nucleic acid molecules, i.e., synthetic nucleic acids, or
- (iii) molecules that result from the replication of those described in (i) or (ii) above.

This may include but not limited to:

- Discarded cultures and stocks of microbiological, infectious agents and associated biologicals
- Discarded cultures of specimens from medical, pathological, pharmaceutical, research, clinical, commercial, and industrial laboratories.
- Discarded live and attenuated vaccines, but excluding the empty containers thereof.
- Discarded, used disposable culture dishes.
- Discarded, used disposable devices used to transfer, inoculate, and mix culture.
- Plants and soil contaminated with organisms modified with rDNA
- Materials used for and in contact with rDNA materials.

All biological and biohazardous waste must be treated before disposal either on or off site.

On-Site Treatment

Steam Sterilization (autoclaving)

1. Place the waste in a plastic or metal autoclave bin.
2. Place a strip of autoclave tape on the bag, or on the biohazard symbol if applicable, of the waste before beginning the sterilization cycle.
3. Use the following program parameters.
 - a. minimum temperature of 121°C
 - b. pressure above 15 psi
 - c. dwell time of at least 30 minutes
 - i. porous materials and larger loads may need a pre-vacuum cycle and/or increase the dwell time, temperature, and pressure.
 - d. fill in your information on the autoclave log book.

Chemical Disinfection

Use a chemical agent which is registered with the EPA as a disinfectant and in accordance with the manufacturer's instructions or

Immerse/combine the waste for not less than 20 minutes in:

1. Freshly prepared solution of 10% v/v household bleach and water. Bulk solutions can be diluted with bleach to achieve the 10% concentration.
2. Solution of 70% by volume isopropyl or ethyl alcohol (solid waste which has been immersed/combined with a liquid disinfectant must be thoroughly drained before disposal).

Disposal of Treated Biological Waste

Biological waste must be treated in accordance with one of the acceptable methods listed above.

1. If treated waste is in a liquid form, dispose through the sanitary sewer after chemical disinfection with copious amounts of water.
 - a. If there is a chemical component to the waste it must be treated as chemical waste.
2. If treated waste is solid after treatment
 - a. Place a sticker noting that the material has been decontaminated on the autoclaved bag.
 - b. Place the waste in an opaque or black trash bag.
 - c. Tie the top and discard in the trash.
3. Make sure to deface any biohazard symbols before disposal.

Off-Site Treatment

Wastes to be transported off-site for treatment must be packaged securely in regulated medical waste box (RMW) containers available at the George R Brown (GRB) or Bioscience Research Collaborative (BRC) loading docks.

Disposal of Untreated Biological Waste

1. Waste container must be filled and weight no more than 40 pounds
2. The red interior liner must be hand-tied closed and the top of the box must be securely folded shut. If the waste material is frozen or had the potential to leak, you must use two red bed liners before folding shut.
3. Write the name of your principal investigator and phone extension on the exterior of the box.
4. Fill out the Hazardous Waste Pickup form or leave the box in the
 - a. BRC - Cold Storage Room off of the Loading Dock
 - b. Main Campus - GRB Loading Dock

Before beginning work with any biological materials e.g. toxins, prions, either resistant to chemical or heat sterilization/degradation please consult Rice EHS.

Biosafety Evaluation

Building		Room(s)	
PI		Designee	

General Microbiological Requirements

All personnel wash their hands after working with potentially hazardous materials and before leaving the laboratory.			
Eating, drinking, smoking, handling contact lenses, applying cosmetics, and storing food for human consumption are not allowed in the laboratory.			
Mouth pipetting is prohibited; mechanical pipetting devices are available.			
All procedures are performed to minimize the creation of splashes and/or aerosols.			
All lab personnel wear close toed shoes that cover the entire foot, and long garment that covers the legs completely.			
Safety glasses are always worn while in the laboratory especially by persons wearing contact lenses.			
Protective laboratory coats and gowns are available.			
Gloves are worn to protect hands from exposure to hazardous materials and based on appropriate risk assessment.			
Any accidents or injuries must be reported to the laboratory director or principal investigator (PI).			

Policies for the safe handling of sharps, such as needles, scalpels, pipettes, and broken glassware are implemented.			
Needles are not bent, sheared, broken, recapped, removed from disposable syringes, or otherwise manipulated by hand before disposal.			
Used disposable needles and syringes are carefully placed in conveniently located puncture-resistant containers used for sharps disposal.			
Non-disposable sharps are placed in a hard walled container.			
Broken glassware is not handled directly. Instead, it must be removed using a brush and dustpan, tongs, or forceps. Plasticware is substituted for glassware whenever possible.			

Materials to be decontaminated offsite are placed in a Regulated Medical Waste (RMW) container with a red liner provided by EHS.			
All cultures, stocks, and other potentially infectious materials are decontaminated before disposal using approved disposal methods listed in the biosafety manual.			
Work surfaces are decontaminated after completion of work and after any spill or splash of potentially infectious material with appropriate disinfectant.			
All laboratory surfaces and furniture must be made of a material that is impervious to water, non-porous and can be effectively decontaminated using an appropriate disinfectant.			
Sharps containers are sealed when ¾ full and placed in the RMW container with a red liner for disposal.			
All biological waste, including aspirators, is stored in a secondary container.			
BSCs are regularly decontaminated with an approved disinfectant listed in <i>Appendix B of the Biosafety in Microbiological and Biomedical Laboratories (BMBL) 5th Edition</i> .			
Laboratory has a spill response plan.			

A sign incorporating the universal biohazard symbol and the name of any infectious agents present is posted at the entrance to the laboratory.			
A biohazard symbol is posted on all equipment i.e., refrigerators, centrifuges, incubators, etc. that store and/or are used in the manipulation of biohazardous agents.			
All laboratories are required to have a door sign created with the EHS sign generator that is kept up to date.			
Laboratory has doors that are self-closing and lockable for access control.			
Laboratory has a sink for hand washing.			
Laboratory windows that open to the exterior are fitted with screens. An insect and rodent control program is also in effect.			
Bench tops must be impervious to water and resistant to chemicals used to decontaminate the work surfaces and equipment.			
Eyewash station is readily available.			
Access to the laboratory is restricted to only personnel who have been fulfilled all necessary training requirements (refer to <i>Training Section</i>)			

All lab personnel have taken general lab safety training provided by Rice EHS within the last year.			
All lab personnel working in BSL 2 labs or with nonexempt rDNA have taken Biosafety/Bloodborne Pathogens training provided by Rice EHS within the last year.			
The laboratory supervisor must ensure that laboratory personnel receive appropriate training regarding their duties, the necessary precautions to prevent exposures, potential hazards present in the laboratory, and exposure evaluation procedures. This training must be documented including general site specific training and biological site specific training.			
All personnel must receive additional training when new hazards are introduced to the lab.			

Biosafety Level 2

Biosafety Level 2 builds upon BSL-1. BSL-2 is suitable for work involving agents that pose moderate hazards to personnel and the environment. It differs from BSL-1 in that: 1) laboratory personnel have specific training in handling pathogenic agents and are supervised by scientists competent in handling infectious agents and associated procedures; 2) access to the laboratory is restricted when work is being conducted; and 3) all procedures in which infectious aerosols or splashes may be created are conducted in BSCs or other physical containment equipment.

The laboratory supervisor must enforce the institutional policies that control access to the laboratory.			
All persons entering the laboratory must be advised of the potential hazards and meet specific entry/exit requirements.			
Biosafety cabinets (BSC) are used when procedures may create infectious aerosols or splashes			
BSCs are used when working with large volumes or high concentrations of infectious materials			
Equipment must be decontaminated before repair, maintenance, or removal from the laboratory			
Vacuum lines are protected with in line HEPA filters and liquid disinfectant trap			
Animals and plants not intended for research are not present in BSL-2 laboratories.			
Protective lab coats are worn while working and laundered by an outside commercial contractor. Lab coats should not be worn or removed outside the laboratory and never taken home to be cleaned.			
High concentrations or large volumes of infectious agents may only be centrifuged in an open lab in sealed rotor heads or safety cups.			

Spills and accidents that result in potential exposure to infectious materials are immediately reported to the laboratory director.			
Laboratory personnel must be provided medical surveillance, as appropriate, and offered available immunizations for agents handled or potentially present in the laboratory.			
A laboratory-specific biosafety manual must be prepared and adopted as policy. The biosafety manual must be available and accessible.			