Reed College Biology Safety Manual

June 2024

0.1 Preface

This manual serves as a resource document for the department of Biology in compliance with Reed College Environmental Health and Safety, accreditation boards, and various state and federal organizations (Environmental, Occupational Health, and Safety).

Laboratories must develop written manuals which include specialized safety procedures, respective to discipline, for all facets of laboratory activities. For more information regarding biological hazards at Reed College, please read Reed College's Biological Safety Manual.

Emergency Information

Fire, Ambulance/Rescue, Police.....911

Community Safety.....503-788-6666

Poison Control Center (OHSU).....800-222-1222

Reed Health Services (M–F 9 am – 5 pm).....503-777-7281

Reed Environmental Health and Safety 503-777-7788

Providence Hospital Emergency Room.....503-215-6000

Reed Physical Plant Maintenance.....503-777-7283

Reed Public Affairs.....503-777-7289

Radiation Safety Officer.....503-777-7788

Chemical Hygiene Officer.....503-777-7788

Please note the location of your nearest:

Fire Alarm Pull Station: _____

Fire Extinguishers – 2 of them: _____

Emergency Shower/Eyewash: _____

First Aid Kit: _____

Spill Kit: _____

Automated External Defibrillator: _____

Outside Assembly Point Location: _____

Shelter-in-Place Location: _____

1.0 Instructor Compliance and Enforcement:

1. It is the responsibility of the instructor to ensure the safety of each person working or volunteering in the laboratory.
2. Instructors must know the laboratory safety guidelines and procedures applicable to the Biology Department.
3. Instructors must abide by all safety policies and procedures particular to their discipline.
4. At the start of each semester, instructors must provide and review the safety policies associated with their particular laboratory.
    a. Provide demonstration/ explanation about the location and use of safety equipment and proper use of laboratory items.
    b. Review emergency procedures related to a fire emergency, earthquake, act of violence, needle/stick/sharp object injury, etc.
5. Instructors will ensure compliance with the approved safety policies with all students, volunteers or other people who enter their laboratory.
6. Instructors will document and report any lab-related incident to the laboratory personnel, EHS, and the department chair.
7. The Biology Department Chair will be responsible for addressing any situation involving non-compliant students, staff, or faculty.
8. The Biology Department Chair will be responsible for enforcing consequences in cases of non-compliance in relation to the approved safety policies.

2.0 Biology Safety Manual

This manual provides general guidelines and basic rules within the biology department to:

a. encourage awareness of the risks in doing laboratory procedures
b. promote safe and best practices in the laboratory
c. protect the wellness and health of students, instructors, and laboratory personnel

All courses involving biological agents must follow guidelines in Reed College's Biosafety Manual (https://www.reed.edu/ehs/assets/downloads/safety-information-forms/biosafety-manual.pdf), which contains the minimum precautions and procedures required in Biosafety Levels 1 and 2. Additional references include:

1. Reed College, Environmental Health and Safety https://www.reed.edu/ehs/
2. Journal of Microbiology and Biology Education, May 2013, p. 78-83.
3. Biohazards in Microbiological and Biomedical Laboratories, 5th edition, Centers for Disease Control and Prevention, 2009.

2.1 Agent Risk Group

The biological and physical nature of human pathogens can be categorized into risk groups (RG) based on the transmissibility, invasiveness, virulence (i.e., ability to cause disease), and the lethality of the specific pathogen. Risk groupings of infectious agents (RG1 through RG4) generally correspond to biosafety levels (BL1 through BL4), which describe containment practices, safety equipment, and facility design features recommended for safe handling of these microorganisms. A parallel series of animal biosafety levels (ABSL1 through ABSL4) applies to handling of infected or potentially infected animals.

1. **Risk Group 1** agents are not associated with disease in healthy human adults[1] (ex. *Bacillus subtilis, Escherichia coli K12, adeno-associated virus* (AAV)).
2. **Risk Group 2** agents are associated with human disease which is rarely serious; treatment is usually available (ex. *Staphylococcus aureus, Salmonella sp., Herpes simplex viruses, Adenovirus*).
3. **Risk Group 3** agents are associated with serious or lethal human disease; treatment may be available; low community risk (ex. *Mycobacterium tuberculosis, Bacillus anthracis, HIV*). **Not currently permitted for use at Reed College.**
4. **Risk group 4** agents are associated with serious or lethal human disease; treatment is not usually available; high community risk (ex. *Ebola virus, Marburg virus, Lassa virus*). **Not currently permitted for use at Reed College.**

[1] If you are immunocompromised or otherwise fall outside of this description, consult sections 3.2.3 and A.II of the Reed Biosafety Manual and consult with your Lab supervisor for protocol.

2.2 Personal Protection Requirements

1. To protect yourself from possible injury, wear safety goggles whenever working in teaching laboratories. Contact lenses or eyeglasses may be worn in combination with eye protection (goggles). If your eyeglasses do not fit under eye protection, talk to your lab supervisor about obtaining prescription eye protection before working in the laboratory.
2. Protective clothing (lab coat or apron) is required whenever working with hazardous chemicals, heated substances, or biological agents (RG2 or BSL2).
3. Tie back long hair when working with hazardous materials or other lab equipment.
4. Remove or tie back any loose articles of clothing or jewelry including scarves & bulky shirts or jackets. Shirts should have tight-fitting long sleeves and pants/slacks with socks that cover your ankles. Short skirts are not appropriate — add tights underneath for full protection. Bare midriffs and low-cut necklines are not safe in the lab and will not be allowed.
5. Gloves are required whenever there is the potential for contact with hazardous materials, including biological agents, and should never be reused. Do not attempt to wash disposable gloves. Change them when they are dirty, contaminated or ripped. Dispose of properly.
6. Shoes must have closed toes and closed backs. Do not wear sandals or open toed shoes in the laboratory.

2.3 General Rules and Standard Laboratory Practices

1. Conduct yourself in a responsible manner at all times in the laboratory. Never leave your lab activity unattended.
2. All doors must be closed when lab begins.
3. Be sure you understand all procedures in any lab investigation and possible hazards associated with it.
4. Read ALL directions for an investigation several times, and follow directions EXACTLY as they are written. Ask questions if you are not sure how to proceed.
5. Never perform unauthorized experiments.
6. Never handle equipment unless you have specific permission.
7. If spills occur, notify your instructor immediately.
8. No eating, drinking, smoking, applying make-up, and no mouth pipetting.
9. Notify your instructor of any medical conditions you may have, such as pregnancy, allergies, asthma, or epilepsy. It is recommended that you discuss your condition with your family physician for guidance and monitoring. Be sure your instructor has your emergency contact information.
10. Keep your laboratory area clean. Store bags, packs & purses in appropriate places and off the lab tables. Do not handle electronic devices, phones or keys while working in the lab without the permission of your instructor or lab supervisor.
11. Be sure to clean your area thoroughly 5-10 minutes before the end of the class and keep the lab space clean for the next class period. Wipe down the counters, put away all equipment in clean, cool & dry condition. Wash your hands before leaving the lab area.
12. The location of exits, safety showers, eye wash, fire extinguishers and the nearest telephone (emergency) should be ascertained before beginning work.

2.4 First Aid

1. Report all accidents, spills or broken glassware & equipment, no matter how minor, to your instructor immediately.
2. Know location of safety equipment & proper use.
3. Complete and submit the appropriate incident report form for each incident that occurs during lab time.
    a. The form can be found online on the EHS website at https://www.reed.edu/ehs/assets/downloads/safety-information-forms/Accident-Report-Form.pdf

2.5 Using Microorganisms and Stock Cultures

1. Wash hands upon entering and before exiting the laboratory. Hand washing is performed by washing with soap and water, and dry with paper towels.
2. Always observe proper aseptic technique as directed by your instructor.
3. Do not touch the face or bite nails during laboratory work.
4. Disinfect working areas before and after the laboratory session with disinfectant (70% alcohol) known to kill the organisms handled.
5. Instructor will inform students of safety precautions relevant to each exercise before beginning the exercise.
6. Instructor must emphasize to students the importance of reporting accidental spills and exposures.

2.6 Using Chemicals Safely

1. Chemicals must be mixed only following the experimental procedure and only when the instructor is present.
2. Never touch, taste, or smell a chemical unless instructed to do so by your instructor. Keep your hands away from your face when working with chemicals.
3. If fumes are potentially dangerous, conduct procedure in a well-ventilated fume hood.
4. Notify your instructor IMMEDIATELY if chemicals are spilled.
5. Dispose of all chemicals as directed by your instructor.
6. Always use the pipets provided with reagent bottles to avoid contamination of reagents.
7. Use extra caution when working with acids or bases.
8. When diluting acids, ALWAYS pour acid into water to dissipate the heat produced. NEVER pour water into a concentrated acid.
9. Become familiar with safety precautions for each chemical to be used in an experiment. Know where eye-wash stations and fire safety equipment are located, as well as proper use.
10. Always label your chemicals with full chemical name, hazard class, and contact information.
11. Store waste properly with a closed lid and in a fully labeled container.

2.7 Using Glassware

1. Never force glass tubing into a rubber stopper. Use a lubricant such as glycerin to make the glass slide in easier.
2. Test glassware to be sure it is not hot before picking it up.
3. Never use broken or chipped glassware. If glassware breaks, notify your instructor and dispose of the glassware in the proper broken glass container.
4. Never eat or drink from laboratory glassware. Do not eat or drink in the laboratory.
5. Clean glassware thoroughly before putting it away. Wet glassware should be put into the strainers to dry.

2.8 Using Sharp Instruments

1. Never cut material toward you; cut away from you.
2. Notify your instructor immediately if you cut yourself or receive a cut.

2.9 Disposal of Intravascular Sharps

Intravascular sharps waste such as hypodermic needles, syringes (with/without the attached needles), scalpel blades, and suture needles are considered biomedical waste and should be disposed of in your red biomedical waste container. You may also deposit any other type of sharps waste into this container. Note that in Oregon, unlike other states, the entirety of the instrument, including tubing (as opposed to just the needle or sharp end), is considered biomedical waste and must be disposed of as such. For more information on biomedical waste and its disposal, consult Appendix E of the Reed Biosafety Manual.

2.10 Evacuation and Emergency Situations

1. Familiarize yourself with the evacuation routes and the nearest exits.
2. When the building alarm sounds all must evacuate via the nearest designated emergency exit and proceed to the designated assembly areas location.
3. Follow directions given to you by your instructor, supervisor, manager, and/ or emergency officer.
4. During emergency power shut down, the power sources should be shut off (heaters, agitation equipment, motor, vacuum pumps, UV lamps, and any electrical equipment). Do not work with chemicals or equipment under emergency lighting.
5. In case of a fire, immediately evacuate the building through the nearest exit route. Do not use elevators. Assist disabled persons in exiting the building.

Fore more information, see Reed College Emergency Policies and Procedures

(https://www.reed.edu/ehs/emergency_procedures/)

2.11 PPE Requirements Table

PPE	Biosafety Level 1	Biosafety Level 2	Biosafety Level 3 (not currently approved at Reed)
Gloves	Recommended to prevent skin or clothing contact with BL1 materials. Note: work that may involve radioactive materials or chemicals will require the use of a lab coat and gloves.	Required	Required
Lab Coat	Recommended to prevent skin or clothing contact with BL1 materials. Note: work that may involve radioactive materials or chemicals will require the use of a lab coat and gloves.	Required	Solid front protective clothing such as back-fastening gown with tight fitting cuffs must be worn to protect street clothing and skin from contact with infectious agents.
Face/Eye Protection	Goggles are required in all teaching laboratories.	Wear protective eyewear(goggles) and surgical mask or chin length face shield whenever splashing, splattering or spraying is anticipated to prevent contact with mucous membranes of the eyes, nose and mouth. Researchers may choose to augment eye protection by performing experiments behind a protective splash shield.	Face protection is not required when performing all work inside a biological safety cabinet. However, if there is a potential for splashing, such as from a dropped container during transport, face/eye protection must be worn.
Respiratory Protection			The use of respiratory protective equipment such as a powered air purifying respirator (PAPR) will be recommended or required by the Office of Environmental Health and Safety (EHS) on a case by case basis. The use of PAPRs is required for response and cleanup of a BL3 spill. All those who may wear a respirator must be enrolled in the EHS Respiratory Protection Program.

Other		Other PPE such as Tyvek coveralls, booties, sleeve guards, plastic aprons, and household rubber gloves will be recommended on a case by case basis. Generally, additional protective clothing is required whenever there is a high potential for splashing of potentially infectious material or large spill response and clean up.	Other PPE such as Tyvek coveralls, booties, sleeve guards, plastic aprons, and household rubber gloves will be recommended on a case by case basis. Generally, additional protective clothing is required whenever there is a high potential for splashing of potentially infectious material or large spill response and clean up.

2.12 Hazard Communication

2.12.1 GHS Pictograms and Hazard Classes

Flame Over Circle  • Oxidizers	**Flame**  • Flammables • Self-Reactives • Pyrophorics • Self-Heating • Emits Flammable Gas • Organic Peroxides	**Exploding Bomb**  • Explosives • Self-Reactives • Organic Peroxides
Skull and Crossbones  • Acute Toxicity (severe)	**Corrosion**  • Corrosive to Metal • Skin Corrosion • Serious Eye Damage	**Gas Cylinder**  • Gases Under Pressure • Liquified Gas
Health  • Carcinogen • Respiratory Sensitizer • Reproductive Toxicity • Target Organ Toxicity • Germ Cell Mutagen • Aspiration Toxicity	**Environment**  • Environmental Toxicity	**Exclamation Mark**  • Skin Irritant • Dermal Sensitizer • Acute Toxicity (harmful) • Narcotic Effects • Respiratory Irritation • Eye Irritation

2.12.2 Biohazardous Symbol

All laboratory entryways working with RG2 materials or higher must be labeled with the universal biohazard symbol. Warning labels shall be affixed to containers of medical waste, refrigerators, freezers, incubators, and centrifuges containing BL2 or BL3 agents, human blood or "other potentially infectious material." Other equipment such as water baths, sonicators, and biological safety cabinets do not require a permanent biohazard label if decontaminated after each use. In these situations, a biohazard label should be temporarily posted on the equipment while in use with human blood, other potentially infectious materials, or an infectious agent.

2.12.3 Radioactive Material Symbol

All laboratory entryways and storage areas working with radioactive materials must be labeled with the radioactive material use sign below. Warning labels shall be affixed to containers of waste, refrigerators, freezers, incubators, and centrifuges containing radioactive materials.

Appendix A Biology Laboratory Student Agreement

All students registered for a Biology lab section are responsible for reading, reviewing and signing the safety policies each semester. The rules are designed to give you and fellow students a safe and educational lab experience. Most accidents or injuries can be prevented by using common sense and following the policies listed below. Violation of the agreement could result in removal from the lab.

Laboratory Policies

1. Never enter the laboratory without the presence of the laboratory instructor, laboratory staff, or other laboratory personnel who have attended safety training.
2. Proper apparel must be worn by all students in the laboratory. No open-toed shoes, shorts, short skirts or halters will be tolerated. If students come to lab wearing inappropriate apparel, they will be asked to cover the exposed area or leave.
3. Splash resistant, indirect vent goggles must be brought to ALL laboratories and worn when instructed.
4. Food, drinks, candy, and gum must not enter the laboratory. Food and drink is to be left outside the lab. This includes capped bottled water and soft drinks.
5. Please report any accidents/injuries/spills immediately to your instructor. The instructor will determine the best way to address the problem.
6. Students must familiarize themselves with the safety equipment in the laboratory. Fire extinguishers, eyewash, safety shower, spill kits, and fire exits.
7. Broken glassware should be swept up with a broom and dust pan and placed in the “Broken Glass Box”. Never place broken glass in the regular garbage can.
8. Chemicals must be mixed only following the experimental procedure and not arbitrarily. 9. Do not remove chemicals from the laboratory.
9. Never leave lab experiments unattended.
10. Cell phones should not be used in the laboratory without the permission of your instructor or lab supervisor.
11. Avoid contamination of reagents. Always use the pipets provided with reagent bottles. 13. When using strong acids, bases, or organic solvents gloves must be worn. If asked to note an odor, gently waft the vapors to observe the smell.
12. When using biological agents/microorganisms in the lab, perform proper handwashing (soap and water) before and after each laboratory exercise, observe aseptic techniques,

and disinfect bench before and after the laboratory session with 70% alcohol solution.

13. Gloves are required whenever there is potential for contact with biohazardous materials or hazardous chemicals and should never be reused.
14. Deliberate misuse of instruments or disturbing behavior may result in disciplinary action.
15. Chemicals must be disposed of in the appropriate waste container and must never be put down the drain without the approval of the instructor. The instructor will direct students concerning proper waste disposal.
16. All containers must be labeled with contents and contact information.
17. All heating sources must be turned off and unplugged at the end of each lab period. (i. e. hotplates, Bunsen burners, and sand baths).
18. Student's hands, the lab bench and any equipment should be washed or wiped down at the end of each lab period. This includes hot plates, balances, and any other equipment used. The lab space must be clean and ready for the next class period.
19. Follow any other safety rules given in the lab protocols or issued by your laboratory instructor.
20. When building alarm sounds all must evacuate via the nearest designated emergency exit and proceed to the designated assembly area.
21. In case of a fire, immediately evacuate the building through the nearest exit route. Do not use elevators. Assist disabled persons in exiting the building.

Student Agreement:

I have read and agree to follow the Biology Lab Student Agreement. I am aware that the instructor and/or laboratory staff has the right to report on or remove me from the laboratory if I fail to adhere to these policies. Furthermore, I understand that my instructor may deduct points for failure to obey these laboratory policies.

Print Name: _____

Signature: _____ Date: _____

_____ I wear contact lenses.