Reed College Biology Safety Manual

December 2025

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 Biosafety 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, broken glassware, and broken equipment, no matter how minor, to your instructor immediately.
2. Know location of safety equipment and 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 drying 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. Instructos 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.

For more information, see Reed College Environmental Health and Safety 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 a 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.

2.13 Working With Vertebrate Animals

The Biology Department may conduct research with live vertebrate animal subjects or tissues. Working with animals poses unique safety risks that differ from other laboratories at Reed College. Animal subjects are to be treated with respect and handled in a professional manner, and care should be taken to protect both the subject and the researchers from unnecessary harm.

2.13.1 Responsibilities

2.13.1.1 IACUC

The Institution Animal Care and Use Committee (IACUC) oversees how live animal research subjects are utilized and housed at Reed College. Any research using live animal subjects must be approved by the IACUC.

2.13.1.2 Faculty and Academic Course Instructors

Instructors of any courses that involve contact with animals, or use animals in a research setting with student workers, must inform students of the risks associated with the animal contact, the need to follow safety protocols, and this written program. Instructors will review this policy annually or whenever they assign new or modified tasks or use new technologies. They will provide students with personal protective equipment, as needed. In the event of an incident involving a student, instructors must contact the Health and Counseling Center (HCC).

2.13.1.3 Affected Students

All students who are exposed to animals in any of their coursework or research settings will comply with procedures established by their instructors in accordance with safety protocols and this program to minimize the risk of exposure. They must fulfill all training requirements. They must use universal precautions at all times. They must inform their instructors immediately of any incident.

2.13.2 Procedures

2.13.2.1 Occupational Health Service Notification

Supervisors, faculty, and instructors must ensure that individuals who have contact with or are exposed to live vertebrate animals or tissues in research or teaching settings, receive information about the risks associated with animal research. Employees may be enrolled in the Reed College Occupational Health Program. For more information contact EHS.

2.13.2.2 Training

- Supervisors, faculty, and instructors of individuals who may be exposed to living animal subjects or tissues must provide training and information about zoonoses, allergies, physical injuries, sharps use, and experimental hazards associated with animal subjects.
- The training should also cover personal hygiene and other considerations, such as precautions to be taken by individuals in their child-bearing years.
- Hazards, including animal bites and allergies, and methods for preventing and treating them must be included in the training.

2.13.2.3 Treatment of Illness or Injury

- In the event of a life-threatening emergency call Community Safety (503-788-6666) or seek immediate medical attention. Individuals who suffer illness or injury are responsible for reporting the incident to their immediate supervisor as soon as possible.
- Individuals must notify their supervisor of suspected zoonosis or any illness accompanied by diarrhea, numbness, dizziness, stiff neck or joints, cough, or fever. If the disease is thought to be work-related, it must be reported immediately to HR and EHS.
- Injured students should report to the HCC. Staff may recommend further medical intervention.
- Injured staff and faculty must report to Kaiser Permanente or other specified medical care facilities for treatment or referral of an occupational injury.
- Bites and scratches must be flushed immediately with water and then scrubbed with soap and water prior to reporting for treatment. Specific departmental protocols must be followed based on the animal species and source of the injury.
- Supervisors must report work-related illness or injury to HR and EHS within 24 hours.

2.13.3 Animal Specific Information

2.13.3.1 Rats

Potential Zoonotic Diseases

Colony-born rodents are generally docile, but may occasionally inflict injury such as a bite or scratch. Larger laboratory rodents such as rats and guinea pigs can inflict particularly painful bites. While rodents may carry organisms that may be potentially infectious to humans, the most common health risk to individuals working with rodents is the development of an allergy. If you have an immune-compromising medical condition or you are taking medications that impair your immune system (steroids, immunosuppressive drugs, or chemotherapy) you may be at higher risk for contracting a rodent-borne disease and should consult your physician. The following is a partial list of known and potential rat or mouse zoonoses.

Lymphocytic choriomeningitis
Lymphocytic choriomeningitis (LCM) is an arenavirus commonly associated with house mice. LCM is rare in laboratory animal facilities, but more common in the wild. Transmission to humans is through contact with tissues including tumor, feces, urine, or aerosolization of any one of these. Disease in humans is generally flu-like symptoms that range from mild to severe. Pregnant individuals are at increased risk of spontaneous abortion, particularly in their first trimester.

Leptospirosis
A bacterium found in many animals, including laboratory rodents. *Leptospires* are shed in the urine of infected animals. Direct contact with urine or tissues via skin abrasions or contact with mucous membranes has been reported. Transmission can also occur through inhalation of infectious droplet aerosols and by ingestion, as well as with water contaminated by urine from infected animals contacting abraded skin. Disease in humans is flu-like symptoms generally mild to severe.

Rat Bite Fever
Rat Bite Fever is caused by the bite of a rat infected with *Streptobacillus moniliformis* or *Spirillum minus*. Rats may be asymptomatic carriers of these bacteria, which are considered normal flora in the pharynx of rats. Transmission is via the bite of an infected rat, or contact with urine or mucus secretions. Symptoms of disease in humans include fever, lymphadenopathy, swelling at the site of the wound, and may cause arthritis in untreated humans. Incubation period is generally 1-3 days but may be up to 6 weeks.

Hantavirus Infection
Hantaviruses occur among wild rodent and shrew populations in certain portions of the world. Rats and mice of numerous species have been implicated in outbreaks of the disease. Numerous Hantavirus infections from rats have occurred in laboratory animal facility workers. Rodents shed the virus in their respiratory secretions, saliva, urine, and feces. Transmission to humans is via inhalation of infectious aerosols. Disease manifestations in humans from the most common *Hantavirus* documented from laboratory animal exposure, Seoul Virus—hosted by *Rattus noryegicus*–is characterized by fever, headache, myalgia and petechiae and other hemmorhagic symptoms including anemia and gastrointestinal bleeding.

Other Pathogenic Diseases
There are several other diseases that have been documented as occupationally acquired. These include bacterial pathogens *Salmonella spp*. from guinea pigs and *Shigella spp*. from mice, rats, and guinea pigs; and fungal agents *Microsporum* and *Trichophyton spp.* from mice and guinea pigs. Good hand washing technique and appropriate use of gloves are critical in reducing the risk of infection. In addition, because the clinical manifestations from the infections described above are so similar to flu, annual flu vaccinations are recommended for laboratory animal workers, such that flu may be discounted as a potential cause.

Allergic Reactions to Rats

By far the greatest occupational risk to working with rodents is allergic reaction or developing allergies. Those workers that have other allergies are at particular risk. Animal or animal products such as dander, hair, scales, fur, and saliva, and body wastes, urine in particular contain powerful allergens that can cause both respiratory and skin disorders. Allergy is most often manifested by nasal symptoms, itchy eyes, and rashes. Symptoms usually evolve over a period of exposure 1-2 years. It is estimated that 30% of individuals working with rodents will develop allergies. Occupation-related asthma, a more serious disorder, might develop in about 10% of persons with allergic disease who work with laboratory animals. The National Institute for Occupational Safety and Health (NIOSH) has developed a set of recommendations for "Preventing Asthma in Animal Handlers." We encourage reviewing this document. The link is https://stacks.cdc.gov/view/cdc/111139 .

How to Protect Yourself

- Wash your hands. The single most effective preventative measure that can be taken is thorough, regular hand washing. Wash hands and arms after handling rats. Never smoke, drink or eat in the animal rooms or before washing your hands.
- Wear gloves. When working with rats, wear gloves appropriate for the task. The use of latex gloves can cause an allergic reaction over time. EHS recommends using nitrile or other suitable alternative glove material. Leather gloves or leather gloves with cuffs and Kevlar lining may be appropriate when working with *Rattus* or similar or large animals that may bite (*Cavia, Cricetomys*, etc.)
- Wear respiratory protection if needed. Respiratory protection can be worn when working with rodents, especially if there is a risk of aerosol transmission of a zoonotic agent or triggering of allergy symptoms. Contact EHS for additional information on recommendations on respirator type, training, and general information on respiratory protection.
- Wear other protective clothing. Lab coats should be available and worn when working with the rodents. Avoid wearing street clothes while working with animals. Since lab coats are considered personal protective equipment they should not be taken home to launder. Departments are responsible for laundering soiled lab coats. Note that all lab coats worn in an animal room should stay in the animal room rather than being worn to and from labs, class, etc.

2.13.3.2 Fish

African cichlid (*Cichlidae spp.*)
Zebrafish (*Danio rerio*)

Potential Zoonotic Diseases

Pathogens associated with fish are most commonly transmitted to humans through ingestion of infected tissue or contaminated water or direct contact with broken, abraded or chapped skin. Persons who are immune-compromised, including those who have a medical condition or are

taking medications that affect the immune system, such as steroids or chemotherapy, are at greater risk of developing disease after exposure to fish pathogens.

Mycobacterium
M. marinum, M. fortuitum, M. chelonae and *M. abscessus* are nontuberculosis mycobacterium species that infect zebrafish. Infections in humans are rare and occur primarily after exposure through direct contact of the bacteria with broken or abraded skin. After exposure, symptoms may appear in 7-14 days and can include dermatitis, nodules under the skin, lesions or skin loss. The infection can spread to nearby lymph nodes and has caused arthritis and bone infections. The more serious forms of disease are seen in immunocompromised persons.

Aeromonas spp.
Aeromonas hydrophila, a bacterium found worldwide in tropical fresh water, is part of the normal intestinal microflora of healthy fish. In humans, exposure can cause gastroenteritis or localized skin infections. Immune-compromised individuals are more likely to acquire infections

Other Zoonotic Organisms
The following organisms have been found in fish and/or aquarium water. Transmission to humans is typically through accidental ingestion of contaminated tank water or contamination of skin wounds.
Bacteria: *Plesiomas shigelloides*, *Pseudomonas fluorescens*, *Escherichia coli*, *Salmonella spp.*, *Klebsiella Spp., Edwardsiella tarda, Streptococcus spp., Staphyloccus spp., Clostridium spp., Erysipelothrix spp., Nocardia spp*.
Protozoa: *Cryptosporidium spp*.

How to Protect Yourself

- Wash your hands. The single most effective preventative measure that can be taken is thorough, regular hand washing.
- Wash hands and arms after handling fish and aquarium water. Never smoke, drink or eat in the animal rooms or before washing your hands.
- Wear gloves. If you are in a situation in which you will spend a significant amount of time with your hands immersed in water, if you have any cuts or abrasions on your hands or arms, or if you are directly handling the fish, you should wear sturdy, impervious gloves.
- Wear other protective clothing. Lab coats should be available and worn when working with the animals. Avoid wearing street clothes while working with animals. Since lab coats are considered personal protective equipment they should not be taken home to launder. Departments are responsible for laundering soiled lab coats. Note that all lab coats worn in an animal room should stay in the animal room rather than being worn to and from labs, class, etc.

2.13.3.3 Frogs

Potential Zoonotic Diseases
Aside from incidents relative to contact with poisonous species, the overall incidence of transmission of disease producing agents from frogs/newts to humans is low. There are, however, a number of agents that are found in frogs/newts and aquarium water that have the potential to be transmitted to humans. In general, humans contract frog/newt disease through ingestion of infected frog/newt tissues or aquarium water, or by contamination of lacerated or abraded skin. An important feature of many bacterial and protozoal organisms is their opportunistic nature. If you have an immune-compromising medical condition or you are taking medications that impair your immune system (steroids, immunosuppressive drugs, or chemotherapy,) you are at-risk for contracting a frog/newt disease and should consult your physician. The following paragraphs include a partial list of potential frog/newt zoonosis.

Salmonella
Salmonella bacteria inhabit the intestinal tract of many animals and humans. *Salmonella* occurs worldwide and is easily transmitted through ingestion, either direct or indirect. Common symptoms of the illness (Salmonellosis) are acute gastroenteritis with sudden onset of abdominal pain, diarrhea, nausea and fever. Antibiotic treatment is standard for the illness. Prevention is through good personal hygiene, personal protective equipment, including, but not limited to gloves.

Sparganosis
While unlikely in this geographic area, frogs can become intermediate hosts to the pseudophyllidean cestode of the genus *Spirometra*. Disease in humans is primarily through ingestion of the meat or contaminated water. Contact with the muscles of infected frogs is also considered a mode of transmission. Common symptoms include a painful nodular lesion that develops slowly and can be found on any part of the body, including the brain. The main symptom is itching, sometimes accompanied by a urticarial rash. Human sparganosis can be prevented by avoiding ingestion of contaminated water and meat, and avoiding direct contact with infected muscles.

Other organisms
Additional zoonotic organisms that have been documented in frogs/newts include *Escherichia coli* and *Edwardsiella tarda*. Human infections are typically acquired through ingestion of contaminated water resulting in gastroenteritis symptoms or from wound contamination.

Allergic Reactions to frogs/newts
Human sensitivity to frog/newt proteins in the laboratory setting is rare. It remains possible however, to become sensitized to frog/newt proteins through inhalation or skin contact. Cases of occupational asthma caused by proteins have been documented.

How to Protect Yourself
- Wash your hands. The single most effective preventative measure that can be taken is thorough, regular hand washing.

- Wash hands and arms after handling frogs/newts and aquarium water. Never smoke, drink or eat in the animal rooms or before washing your hands.
- Wear gloves. If you are in a situation in which you will spend a significant amount of time with your hands immersed in water or if you have any cuts or abrasions on your hands or arms and are handling animals, you should wear sturdy, impervious gloves.
- Wear other protective clothing. Lab coats should be available and worn when working with the animals. Avoid wearing street clothes while working with animals. Since lab coats are considered personal protective equipment they should not be taken home to launder. Departments are responsible for laundering soiled lab coats. Note that all lab coats worn in an animal room should stay in the animal room rather than being worn to and from labs, class, etc.

Seek Medical Attention Promptly

If you are injured on the job, promptly report the accident to your supervisor even if it seems relatively minor. If you are experiencing symptoms that you think may be related to animal handling, talk to your faculty supervisor for advice and additional guidance. Minor cuts and abrasions should be immediately cleaned with antibacterial soap and then protected from exposure to rats and mice. For more serious injuries or if there is any question, seek medical attention. Tell your physician you work with laboratory animals. Any accident/incident should be reported to your supervisor who must notify HR as soon as possible and must submit an Accident Report to HR (hr@reed.edu) within 72 hours of the incident. Please direct any occupational health and safety questions to EHS (EHS@reed.edu).

Whenever you are ill, even if you are not certain that the illness is work-related, always mention to your physician that you work with laboratory animals. Many zoonotic diseases have flu-like symptoms and would not normally be suspected. Your physician needs this information for a more informed diagnosis.

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.
10. Never leave lab experiments unattended.
11. Cell phones should not be used in the laboratory without the permission of your instructor or lab supervisor.
12. 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.
14. 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.

15. Gloves are required whenever there is potential for contact with biohazardous materials or hazardous chemicals and should never be reused.
16. Deliberate misuse of instruments or disturbing behavior may result in disciplinary action.
17. 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.
18. All containers must be labeled with contents and contact information.
19. All heating sources must be turned off and unplugged at the end of each lab period (i. e. hotplates, Bunsen burners, and sand baths).
20. 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.
21. Follow any other safety rules given in the lab protocols or issued by your laboratory instructor.
22. When building alarm sounds all must evacuate via the nearest designated emergency exit and proceed to the designated assembly area.
23. 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.