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**Safety Manual for Name of Experiment/Protocol – BSL 1 or 2 Containment**  
(All research deemed non-exempt by the IBC is required to be performed using BSL-2 laboratory practices unless otherwise specifically stated.)

**Name of Laboratory**

**Name of Department**

**Binghamton University, SUNY**

**Prepared by:**

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Principal Investigator

Date



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## INTRODUCTION/PURPOSE

This safety manual was prepared by Dr. X for XYZ Lab at building XX, room 1234 to provide information and procedures to follow to preserve laboratory biological safety in experiments involving ABC samples. We incorporate recommendations from the Binghamton University Institutional Biosafety Committee.

## EMERGENCY PHONE NUMBERS

Medical Emergency:	911
Fire Emergency:	911
Poison Control Center:	607-723-8929
Hazardous Spills (Chemical, Biological or Radiological):	
Physical Facilities Customer Service Center:	607-777-2226
Physical Facilities Emergency Customer Service:	607-777-2341 or 911
(M-F 3:30 pm-7:00 a.m./Sat-Sun 24 hrs.)	
BU Decker Health Services:	607-777-2221
BU Police:	607-777-2393
PI (X)	607-XXX-XXXX (Office)
	607-XXX-XXXX (Cell)

## ABBREVIATIONS

BSC-Biosafety Cabinet  
BU-Binghamton University  
CDC-Center for Disease Control  
EH&S-Environmental Health and Safety  
IBC-Institutional Biosafety Committee  
PI-Principle Investigator  
OSHA-Occupational Health and Safety Administration  
PPE-Personal Protective Equipment  
SOP-Standard Operating Procedure

## EMERGENCY PROCEDURES

### Hazardous Spill Cleanup

**A Minor Biological Spill** is one that the laboratory staff is capable of handling safely without the assistance of safety and emergency personnel.

- a. Alert people in the area of the spill.
- b. Remove and disinfect any material that has been splashed on you and remove and disinfect grossly contaminated clothing.
- c. Secure the affected area and post biohazard warning signs.
- d. Assess the situation and don the appropriate PPE for the cleanup operation.

- e. **Spill Cleanup Procedure**
  - Cover the spill with paper towels or other absorbent material to absorb the spill and to prevent further aerosolization.
  - Pour 10% bleach gently over the covered spill, working from the outside inward.
  - Wait at least 30 minutes for the bleach to penetrate through the contained spill.
  - Remove the absorbent material and place in a biohazard bag for disposal.
  - Repeat Spill Cleanup Procedure over the original spill area to ensure disinfection and cleanup.
  - Notify PI-Dr. X (607-XXX-XXXX /607-XXX-XXXX)

**A Major Biological Spill** requires the assistance of safety and emergency personnel. This involves the release of microorganisms requiring BSL 2+ containment.

- a. Alert people in the area of the spill to evacuate.
- b. Remove and disinfect any material that has been splashed on you and remove and disinfect grossly contaminated clothing.
- c. Secure the affected area and post biohazard warning signs.
- d. Call for Biological Spill Emergency Response: 607-777-2341
- e. Evacuate the affected area.
- f. Have person knowledgeable of incident and laboratory assistance emergency personnel.
- g. Notify Dr.X of the incident.

### Loss of Electrical Power

The Biosafety Cabinet (BSC) is connected to an emergency power. In the event of a power outage in the lab when virus work is in progress, **STOP** the work immediately, close the cabinet sash and post a sign on the cabinet to keep the sash closed until power is restored.

### Medical Emergencies

1. Provide immediate first aid. Stop the bleeding of wounds and wash the affected area with disinfectant/soap.
  2. In the event of an exposure incident, report the incident to **Dr. X** and contact EHS, who will record the details of the exposure incident, including the route of exposure, the infectious agent and an estimate of the dosage.
  3. In the event of a major medical emergency, **dial 911**.
- a. Report for treatment at:

BU Decker Health Services:	607-777-2221
BU Police:	607-777-2393
PI (XXXX)	607-XXX-XXXX (Office)
	607-XXX-XXXX (Cell)

### Building Emergencies

1. In the event of a fire in the lab, **dial 911**. Suspend work in the BSC as soon as possible, lower the sash, and attach a sign to the cabinet to keep the sash closed. Evacuate the building by proceeding to the nearest exit.

2. In the event of a fire drill or other building evacuation notice, suspend work in the BSC as soon as possible, lower the sash, attach a sign to the cabinet to keep the sash closed, and evacuate the building, by proceeding to the nearest exit.

## AGENTS USED, LOCATIONS OF USE, STORAGE

### A. Agents used:

**Description.** Add description of samples or materials here.

**Biosafety Level (BSL):** Appropriate biosafety precautions will be followed when working with these Samples. All research deemed non-exempt by the IBC is required to be performed using BSL-2 laboratory practices. Samples distributed by XYZ are intended for research purposes only and are not intended for use in humans.

**Content and Storage:** List sample size (aliquot size), temp, and type of storage.

### B. Locations of Use:

Samples will be handled in XX, 1234. The sign of biohazard warning label is posted on main entrance of the lab. The lab has three BSL 2 cabinets.

### C. Storage:

1. Cell culture medium should be kept in a dedicated space in a refrigerator in XX, 1234.
2. Biohazards and other post-it stickers, labels, marker pens, adhesive tapes are available in the cabinet drawer marked (look for the labels on the drawers) in XX, 1234 including the tissue culture room.
3. Stock of soap solution and bleach are in the cabinet under the sink X (sink with bottle draining area).

## ROUTINE PROCEDURES

### A. Biosafety Cabinet (BSC) Work Practices

1. Switch on the UV light 15 minute prior to the experiment.
2. Cabinet blowers should be operated at least 3 to 5 minutes before beginning work to allow cabinet to "purge". This purge will remove any particulates in the cabinet. The work surface, the interior walls (not including the supply filter diffuser), and the interior surface of the window should be wiped with a 10% solution of household bleach. Then, a second wiping with sterile water is needed to remove residual chlorine, which may eventually corrode stainless steel surfaces. Wiping with non-sterile water may recontaminate cabinet surfaces. Similarly, the surfaces of all materials and containers placed into the cabinet should be wiped with 70% ethanol to reduce the introduction of contaminants to the cabinet environment.
3. Place all necessary materials in the BSC before beginning work. This will serve to minimize the number of arm movement disruptions across the fragile air barrier of the cabinet. The rapid movement of a worker's arms in a sweeping motion into and out of the cabinet will disrupt the air curtain and may compromise the partial barrier containment provided by the

BSC. Moving arms in and out slowly, perpendicular to the face opening of the cabinet, will reduce this risk. Other personnel activities in the room (e.g., rapid movement, opening/closing room doors, etc.) may also disrupt the cabinet air barrier. For this reason, access to the work area is restricted when work is in progress.

4. Before beginning work, the investigator should adjust the stool height so that his/her face is above the front opening. Manipulation of materials should be delayed for approximately 1 minute after placing the hands/arms inside the cabinet. This allows the cabinet to stabilize and to "air sweep" the hands and arms to remove surface microbial contaminants. When the user's arms rest flatly across the front grille, room air may flow directly into the work area, rather than being drawn through the front grille. Raising the arms slightly will alleviate this problem. The front grille must not be blocked with research notes, discarded plastic wrappers, pipetting devices, etc. All operations should be performed on the work surface at least 4 inches from the inside edge of the front grille.
5. Equipment that causes turbulence (centrifuge, vortex, etc.) should be placed in the back 1/3 of the work surface. All other work in the cabinet should stop while the apparatus is running.
6. Separate clean and contaminated items. Minimize movement of contaminated items over clean items (work from clean to dirty). Remove contaminated items only after decontaminated or sealed in a red biohazard bag.
  1. Solid waste generated in the BSC is collected in a red biohazard bag near the cabinet. At end of session, or when 2/3 full, the bag is then closed, the outside of the bag is sprayed with 10% bleach.
  2. Liquid waste is aspirated into a flask using the vacuum line in the biosafety cabinet. The flask contains bleach, which will disinfect the liquid, and we have installed a HEPA filter on the vacuum line. At the end of each work session, bleach is aspirated through the vacuum line to disinfect it. The liquid waste will be in contact with the bleach at least 30 minutes and up to 2 hours. The mixture is then carefully poured down the sink. Additional bleach is poured down the drain, and the sink is rinsed with copious amounts of water.
7. Only the materials and equipment required for immediate work should be placed in the BSC. Do not use as a storage area.
8. At the end of the work session, all materials are surface decontaminated and removed from the cabinet. The work surface, the interior walls, and the interior surface of the window are again wiped with 10% bleach (or other lab approved disinfectant, followed by sterile water).

## **B. Centrifuge**

1. Safety caps are available for the centrifuge in XX, 1234. After each session, the inside of centrifuge, tube holders, and safety caps are decontaminated by spraying with 10% bleach and wiping clean.

### C. Pipette Usage

1. Never mouth pipette. Mechanical pipetting aids are to be used when pipetting all material.
2. Always perform aerosol generating pipetting operations in a biosafety cabinet.
3. Use plugged pipettes for transfer or measurement of biohazardous materials when available. This blocks the escape of aerosolized material.
4. Do not mix biohazardous fluids by repeated suction and expulsion from pipettes. This generates aerosols.
5. Do not bubble air through biohazardous fluids. This generates aerosols.
6. Do not forcibly expel liquids from pipettes. This generates aerosols. Discharge as close as possible to the fluid or down the side of the container.
7. Avoid accidentally dripping infectious liquids from pipettes.
8. Disposable pipettes must only be disposed to a red biohazardous bag.

## SAFETY

### A. Basic Biosafety Guidelines

1. Mechanical pipetting aids are to be used when pipetting all material. Mouth pipetting is prohibited no matter what the material or manipulation.
2. Eating, drinking, storing food, and applying cosmetics are not permitted in laboratory work areas. Food should not be stored in refrigerators or freezers used to store biohazardous material.
3. Hands should be washed immediately after procedures involving biohazardous materials and routinely before leaving the laboratory.
4. Workers should decontaminate their work area following work with biohazardous material and immediately after any spill. The laboratory area should be kept free of materials not pertinent to the work.
5. Safety glasses should be worn to protect the eyes from splashes of infectious material that will enter the body through the conjunctival capillaries. Contact lenses should not be worn in the laboratory because they impede the removal of foreign objects and may entrap materials beneath them.
6. Gloves should be worn to protect personnel from infection through contact with biohazardous materials and entry into the body via skin abrasions.
7. Laboratory coats should be worn in the laboratory to protect personnel from spilled material. Laboratory coats should not be worn outside the laboratory and must be disinfected or clearly labeled as infective before being removed from the laboratory.
8. All technical procedures should be performed in a manner to reduce the generation of aerosolized material that may enter the body *via* inhalation. Procedures or activities expected to produce infectious aerosols must be performed in an approved/certified BSC. Operations such as centrifugation, sonication, or vortexing are known aerosol generating procedures. Materials which are placed in centrifuge buckets and sealed in the biosafety cabinet may be centrifuged in the laboratory desktop centrifuge.



9. The “buddy system” should be instituted in all laboratories. Personnel should not be working alone on hazardous projects.
10. Always remember that you are the individual with the ultimate responsibility for your own health and safety. You will directly benefit from active involvement and commitment to the health and safety program of the laboratory. When you see a potential for exposure or the release of infectious material, be proactive and point this out to the person or persons involved or someone who can resolve the situation. Be persistent in seeing that the situation is resolved and assist any personnel you find not using good laboratory technique.

#### **B. Safety Equipment**

1. Personal Protective Equipment (PPE) will be worn during all work sessions involving biohazardous materials. This includes a lab coat, safety glasses, and either latex or nitrile gloves. More information will follow under the PPE section of this SOP.
2. Eye wash station(s) are located along at XX inside the XX 1234. Eyewash is checked weekly and a log sheet is posted.
3. Fire extinguishers: Fire extinguishers are located inside XX, 1234 near the XYZ.
4. Emergency phone numbers are posted on [location] in XX 1234.
5. Limited first aid supplies are kept in the [location].
6. Bleach, ethanol, and working dilutions of each are kept in the lab for disinfection purposes in [location].

#### **C. Maintenance**

1. To insure everyone’s safety, all lab personnel in XX, 1234 must agree to maintain the space in a clean and orderly manner. Each individual will “clean up after use”.
2. There will be a sign-up sheet posted for users to log their use-time in the lab.

## **INFECTIOUS WASTE DISPOSAL**

#### **A. Solid Waste**

1. Solid waste generated in the BSC is collected in a red biohazard bag near the [location]. At end of session, or when 2/3 full, the inside of the bag is sprayed with disinfectant (10% bleach). The bag is then sealed, the outside of the bag is sprayed with 10% bleach. Place the solid materials into a biohazard cardboard box with a red bag liner. Once this box is nearly full, tie or otherwise seal the red bag, tape the box up and go online to the link below [https://www.binghamton.edu/ehs/biowaste/biowaste\\_pickup.html](https://www.binghamton.edu/ehs/biowaste/biowaste_pickup.html) to have the box removed by EHS.

#### **B. Liquid Waste**

1. Liquid waste is aspirated into a flask using the vacuum line in a BSC. The flask contains bleach to disinfect the liquid. At the end of the session, bleach

is aspirated thru the vacuum line to disinfect it. The disinfected liquid waste is then poured down the sink. This should be done carefully to avoid splashing and aerosol generation. Afterwards the drain should be flushed with disinfectant of sufficient quantity to at least fill the trap, then the sink is rinsed with copious amounts of water.

### C. Sharps

1. Sharps, such as hypodermic needles, razor blades, or glass Pasteur pipettes, must be segregated from other wastes. All sharps are discarded in labeled, puncture-resistant “sharps” containers. A small “sharps” container is kept in the hood to collect contaminated sharps. Sharps containers are sealed and placed in the large biohazard box, as for other solid waste. Do not recap sharps prior to disposal.

### D. Additional Specific Considerations

1. All the general lab safety measures described in this document apply to the usage and handling human blood samples in the BSL-2 containment.

### E. Handling of Material

1. Flasks, pipettes, and any other solid material that encounter reagents containing – XXXXS must be thoroughly deactivated by subjecting exposed surfaces with 10% bleach for at least 30 minutes up to 2 hours. Furthermore, after deactivation of XXXX by bleach, they can be discarded. All the liquid material that contains or may contain any XXXX are inactivated by disposal into flasks containing concentrated bleach.

2. Already addressed in the solid waste section

## PERSONAL PROTECTIVE EQUIPMENT (PPE)

### A. Whole Body Protection

1. Personal protective equipment (PPE) is designed to protect the those in the lab from contact with biohazardous agents as well as to protect the work from contamination. PPE is considered a secondary line of defense against the infection of lab staff. The primary line of defense is the use of Universal Precautions (OSHA and CDC) and good laboratory techniques. Our skin provides a barrier to protect the body from invasion by foreign materials. Cuts, abrasions, and open wounds must be occluded to maintain the integrity of this barrier. Lab coats are to be worn to provide additional protection for the body against exposure to biohazardous agents. As with the skin, protection is provided only if the barrier remains intact. Coats with holes or tears must be discarded or repaired. Lab coats are to be removed when leaving the lab. If the coat becomes contaminated, it should be treated with a disinfectant reagent. All soiled coats are to be cleaned via [method/location].

## B. Hand Protection

1. Gloves, either latex or nitrile, are worn to provide barrier protection for the hands. Cuts and abrasions on the hands must be occluded before gloves are put on. The integrity of the gloves must be checked before use to ensure their barrier function. Gloves should be long enough to enclose the lower sleeve of the lab coat. Used gloves are disposed of as biohazardous waste.

## C. Eye Protection

1. Our eyes have very little natural barrier protection. Biohazardous agents can gain direct access to the blood stream by penetrating the very vulnerable conjunctival membranes. **Therefore, safety glasses will be worn at all times when working with any biohazardous material.** An emergency eyewash station is located [location].

## HAZARDS COMMUNICATION

### A. Signage

1. All signs and labels are required to have the universal biohazards symbol and be fluorescent orange or orange-red.

### B. Laboratory Signs

1. Biohazard warning label is posted at the entrance to the lab. The lab is a **Biosafety Level X** room, and access is limited to authorized individuals only.

### C. Stored Material

1. Regulated waste containers: biohazard label or red container
2. Freezers holding samples: biohazard label
3. Containers used for storage or transport: biohazard label or red container
4. Centrifuge or other equipment used with samples: biohazard label
5. Contaminated equipment: biohazard label and label specifying where contamination exists

## FIRE RESPONSE

### A. Procedure

1. Call the Emergency Phone Number 911. Suspend work in the BSC as soon as possible, lower the sash, and attach a sign to the cabinet to keep the sash closed.
2. Evacuate the building by proceeding to the nearest exit and assemble in the designated area [location].

## TRAINING REQUIREMENTS

### A. Biohazards Training should include information on the following:

1. Infectious agents being used in the lab
  - a. Modes of transmission to humans
  - b. Signs and symptoms of infection
  - c. Methods of disinfection and decontamination

- d. Use of hazard warnings and rationale
- 2. Personal Protective Equipment (PPE)
  - a. Equipment available (i.e. gloves, lab coats, goggles, etc.), their location, proper use and maintenance instructions
  - b. Operating principles of hoods and biosafety cabinets
  - c. Use and maintenance of pipetting aids
  - d. Use and maintenance of centrifuges
- 3. Universal Precautions Training
  - a. Assume everything in the lab is infectious
  - b. Shipping and receiving procedures
  - c. Handling and disposing of sharps
  - d. Pre- and post-work cleanup procedure
- 4. Emergency Response Training
  - a. Procedure for spills and leaks
  - b. First aid
  - c. Decontamination techniques
  - d. Fire response
  - e. Power failure procedure
- 5. Waste Disposal Procedure
  - a. Decontamination/disinfection methods
  - b. Analysis of decontamination/disinfection efficacy
  - c. Hazard Communication requirements
  - d. Storage and disposal procedure

**B. Undergraduate Training (Research Labs only)**

- 1. All undergraduates on a biosafety protocol that has a correlative IACUC protocol must complete CITI Initial Biosafety Training.
- 2. All undergraduates on a biosafety protocol that has a correlative stem cell protocol must complete CITI Initial Biosafety and OSHA Blood Borne Pathogen Training.
- 3. It is the responsibility of the PI to ensure all Undergraduates are properly trained who are working under an approved IBC protocol for a Research Lab, including training in working with pathogenic microorganisms.
- 4. Training can be conducted by a trained member of the lab (PI, Staff or Graduate Students) or through formal training in a microbiology laboratory course, the BBRC Working with Microorganisms Workshop, or a similar.
- 5. The PI should ensure that proper documentation of trainings is maintained and be prepared to provide such documentation should it be requested by the IBC.

**C. Required Training for work with Biosafety I/II (PIs, Staff, and Graduate Students)**

- 1. CITI Initial Biosafety Training
- 2. EH&S Lab Safety Training or We Comply online training

**D. Suggested Training for work with Biosafety I/II**

- 1. CITI OSHA Bloodborne Pathogens (if you are working with any Human derived material)
- 2. Working with Microorganism Workshop conducted by the BBRC (Strongly Suggested)
- 3. Applicable course work and research activities (Identified by the PI and/or the IBC)

**E. Suggested Trainings for Undergraduates (Research Labs only):**

1. CITI Initial Biosafety Training
2. EH&S Lab Safety Training
3. Additional necessary procedural and safety trainings specific to the research being conducted.

## **SDS (Safety Data Sheets)**

All the relevant SDS are stored as soft copy/electronic version in the computers in “Dr X’s lab” (a common drive mapped in each lab computer). Hard copies of the SDS are available in the cabinet in XX, 1234.