### SUNY Cortland – Environmental Health and Safety

### Biohazardous Materials

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### Biohazardous Materials

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### I. Introduction

This program addresses all biohazardous materials that are known to, or suspected to, cause disease in humans. It is developed to:

* protect all laboratory personnel from exposure to biological agents that have the potential to cause disease in humans;
* prevent environmental contamination;
* protect experimental materials;
* specify the university policies, procedures, and requirements for safe handling and use of biological agents; and
* ensure compliance with applicable federal, state, and local regulations.

### II. References

### [Biosafety in Microbiological and Biomedical Laboratories (BMBL), 5th edition, Centers for Disease Control and Prevention (CDC)](http://www.cdc.gov/od/ohs/biosfty/bmbl5/bmbl5toc.htm)

### [Primary Containment for Biohazards: Selection, Installation and Use of Biological Safety Cabinets, CDC /NIH](http://www.cdc.gov/od/ohs/biosfty/primary_containment_for_biohazards.pdf)

### 29 CFR 1910.1030 - [Bloodborne Pathogens Standard](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10051)

### [Risk Group Classifications for Infectious Agents, American Biological Safety Association (ABSA)](http://www.absa.org/riskgroups/index.html)

* SUNY Cortland’s Exposure Control Plan (Bloodborne Pathogens Programs)
* SUNY Cortland’s Worker’s Compensation Injury/Illness Reporting Policy and Procedures
* SUNY Cortland’s Personal Protective Equipment Program
* SUNY Cortland’s Regulated Medical Waste Program

**III. Definitions**

**Biohazard –** An agent of biological origin that has the capacity to produce deleterious effects on humans (i.e., microorganisms, toxins and allergens derived from those organisms), and allergens and toxins derived from higher plants and animals.

**Biohazardous Waste –** Solid or liquid waste potentially contaminated with biological agents which is capable of causing disease in humans, plants and animals or contains materials harmful to the environment. Examples include general zoonotic vectors used in research and cultures used in human, animal, or plant pathology research. Other materials may include recombinant DNA-containing plants, plant-associated microorganisms, and plant-associated small animals such as arthropods. All decontaminated biohazardous, non-infectious solidwaste may be disposed of with household trash provided no “biohazard” wording or symbols are visible on outer containers.

**Biological Agent –** An organic entity, typically microscopic, which may be pathogenic to humans, animals or plants. Examples include bacteria, viruses, prions, protozoa, fungi.

**Biological Safety Cabinet –** A ventilated cabinet which uses a variety of combinations of HEPA filtration, laminar air flow, and containment to provide personal, product, or environmental protection against particulates or aerosols from biohazardous agents. It is distinguished from a chemical fume hood by the presence of HEPA filtration and the laminar nature of the air flow.

**Biosafety Level 1 (BSL-1)** –Containsbiological agents that pose low risk to personnel and the environment. These agents are highly unlikely to cause disease in healthy laboratory workers, animals or plants. Examples of BSL-1 organisms are: *Escherichia coli strain K12, Agrobacterium tumifaciens, Micrococcus leuteus, Neurospora crassa,* and *Bacillus subtilis.*

**Biosafety Level 2 (BSL-2)** –Contains biological agents that pose moderate risk to personnel and the environment. If exposure occurs in a laboratory situation, the risk of spread is limited and it rarely would cause infection that would lead to serious disease. Examples of BSL-2 agents are:

BSL-2 Viruses: Varioloa major virus (Smallpox virus), Venezuelan Equine Encephalitis virus, Viruses causing hantavirus pulmonary syndrome, Yellow Fever virus

BSL-2 Bacteria: *Bacillus anthracis, Brucella abortus, Burkholderia (Pseudomonas) mallei, Burkholderia (Pseudomonas) pseudomallei, Clostridium botulinum,* and *Yersinia pestis.*

BSL-2 Rickettsiae: *Coxiella burnetii, Rickettsia prowasekii,* and *Rickettsia rickettsi.*

BSL-2 Fungi *Coccidioides immitis.*

BSL-2 Toxins: Abrin, Aflatoxins, Botulinum toxins, Clostridium perfringens epsilon toxin, Conotoxins, Diacetoxyscirpenol, Ricin, Saxitoxin, Shigatoxin, Staphylococcal enterotoxins, and Tetrodotoxin.

**Bloodborne Pathogen –** Any pathogenic microorganism that is present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV).

**Decontamination –** Use of physical or chemical means to render an area, device, item, or material safe to handle (i.e., safe in the context of being reasonably free from a risk of disease transmission). The primary objective is to reduce the microbial load so that infection transmission is eliminated. Steam sterilization by using an autoclave is the preferred method when processing biohazardous waste.

**Desk Procedure** – A written document that outlines how tasks are performed or how materials are used safely. These documents will specify control methods that must be implemented.

**Disinfection –** The chemical or physical treatment that destroys most vegetative microbes (or viruses), but not spores, in or on inanimate objects/substances.

**Infectious Substance –** A substance containing a viable microorganism, such as a bacterium, virus, rickettsia, parasite, or fungus that is known or reasonably believed to cause disease in humans or animals.

**Infectious Waste –** Any solid or liquid waste that is capable of producing an infectious disease in humans. This includes waste potentially contaminated with agents likely to be pathogenic to healthy humans, such as those not routinely or freely available in the community, and which may be present in sufficient quantities and with sufficient virulence to transmit disease.

**Regulated Medical Waste –** Waste capable of producing an infectious disease in humans.

**Sanitization –** The reduction of microbial load on an inanimate surface levels unlikely to pose a significant public health threat.

### IV. Responsibilities

This program applies to all personnel working in laboratories engaging in potentially biologically hazardous activity. This may include: faculty; instructional support staff; paid graduate students; and work study students. Work areas this program may apply to include: microbiology and molecular biology laboratories; and animal care facilities. All persons must share biosafety responsibility by mindful conduct and reporting of incidents and biologically hazardous circumstances.

## Environmental Health and Safety (EH&S) Office

The EH&S Office is responsible for:

* reviewing and updating this program;
* evaluating this program’s effectiveness;
* reviewing regulations involving biohazardous materials;
* assisting with risk assessment;
* evaluating control methods, including reviewing and recommending personal protective equipment;
* assisting with implementing controls for biohazardous materials;
* conducting inspections;
* providing laboratory safety training and other related training; and
* maintaining training records.

## Users of Biohazardous Materials

Users of biological substances must:

* be familiar with program requirements;
* conduct risk assessments;
* implement appropriate control methods (e.g., engineering controls, safe work practices, personal protective equipment);
* prepare, or assist with preparing, research-specific policies and procedures;
* use and maintain safety equipment properly;
* follow good personal and laboratory hygiene practices;
* receive all required training;
* read and understand laboratory-specific procedures;
* identify and correct unsafe conditions, and report unsafe conditions to supervisors and the EH&S Office;
* report injuries and illnesses involving biological exposures to supervisors and the EH&S Office (Note: an Employee Injury, Illness Medical Emergency Report form, Form WC-1, should be used to report occupational injuries and illnesses);
* promptly dispose of hazardous materials that are no longer required; and
* know what to do in case of an emergency.

## Department Chairs and Supervisors

Department Chairs and Supervisors must:

* assist with conducting risk assessments and implementing the requirements of this program in the department;
* ensure that users of biological substances are properly trained;
* assist with correcting unsafe conditions, and report unsafe conditions to the EH&S Office; and
* report injuries and illnesses involving biological exposures to the EH&S Office (Note: an Employee Injury, Illness Medical Emergency Report form, Form WC-1, should be used to report occupational injuries and illnesses).

## V. Risk Assessment

Prior to beginning research, users of biohazardous materials should conduct a risk assessment for the material that will be used. Characteristics of the material, how it will be handled, quantities or concentrations desired, consequences of exposure, and availability of vaccines or other treatment measures should be evaluated. The Department Chair or supervisor, and the EH&S Office should be involved in assisting with the risk assessment. Additionally, this risk assessment may require approvals from campus safety committees if the research will use vertebrate animals, recombinant DNA/RNA, or human subjects. Appendix A contains a Biosafety Level 2 Laboratory Self-Assessment Safety Checklist to assist with this assessment.

## VI. Establishing Control Methods

## After a risk assessment is conducted, control methods should be evaluated for eliminating or minimizing exposures to a biohazardous material. It is through **a combination** of engineering controls, safe work practices, and personal protective equipment that effective controls are achieved. Users of biohazardous materials, the Department Chair or supervisor, and the EH&S Office should be involved in evaluating and implementing appropriate control methods.

## SUNY Cortland’s Bloodborne Pathogens Program, Personal Protective Equipment Program, and several other EH&S Office programs provide useful information and guidelines for handling, storing, and disposing of biohazardous materials. Aside from these programs, it might be necessary to establish a special desk procedure for a biohazardous material. Desk procedures are developed by users of biohazardous materials with input from the EH&S Office.

## Containment devices and personal protective equipment are crucial for controlling exposures to biohazardous materials. These aspects of control are discussed further in Sections VII and VIII.

## ****VII. Containment Devices****

## Whenever it is practical, Class II or Class III biosafety cabinets must be used for all manipulations of potentially infectious materials to minimize the risk of exposure to aerosols. Biosafety cabinets must be certified: 1) at installation and at least annually thereafter; 2) after any repair; or 3) if moved to another location. Biosafety cabinets require internal and work surface decontamination prior to moving, maintenance, or disposal when they are used for Risk Group 2 agents. Work surface decontamination with an appropriate disinfectant may be performed by lab personnel.

## Biosafety cabinets must be located away from doors, areas of high traffic, air supply registers, or other equipment that may create air movement. Only minute quantities of volatile or toxic chemicals used as an adjunct to the research may be used in a biosafety cabinet. The biosafety cabinet is the principal device used to contain infectious materials generated by many microbiological procedures. Its proper use is essential to ensuring infectious aerosols are contained at the source. Biosafety cabinets must not be used for procedures with hazardous chemicals.

## If it is impractical to work in a biosafety cabinet, other physical containment devices must be used whenever possible to minimize exposures to biohazardous materials. For example, centrifuges must be used with safety buckets or sealed rotors with sealed centrifuge tubes.

## In the event a biosafety cabinet cannot be used for a procedure, a respiratory hood with HEPA filters must be used to protect against splashes and potential airborne contaminants.

## VIII. Personal Protective Equipment

## Required and recommended personal protective equipment are outlined in department hazard assessments and desk procedures. At a minimum, gloves, eye protection, and protective apparel must be used when handling biohazardous materials. Face protection might also be required when there is a potential for a splash hazard.

## ****Gloves****

## Gloves must be worn to protect hands from exposure to hazardous materials. Glove selection should be based on a risk assessment. Alternatives to latex gloves should be available. Gloves are not to be worn outside of the lab or work area.

## The following protocol must be observed when using gloves:

## Change gloves when contaminated, when integrity has been compromised, or when otherwise necessary.

## Wear two pairs of gloves when appropriate.

## Remove gloves and rigorously wash hands when work with biohazardous materials has been completed and before leaving the lab for non-lab areas.

## Do not wash or reuse disposable gloves.

## Dispose of used gloves with other contaminated material.

## ****Eye and Face Protection****

## Eye and face protection (e.g., goggles, mask, face shield, or other splatter guard) should be used for potential contact exposures. It is important to mention that contact lenses are not recommended for use in the laboratory.

## The following protocol must be observed when using eye and face protection:

## Disinfect eye or face protection that becomes contaminated. Heavily contaminated or damaged eye protection should be disposed of appropriately.

## ****Protective Apparel****

## Lab coats, gowns, smocks, or uniforms designated for lab use only must be worn while working with hazardous materials. The following protocol must be observed when using protective apparel:

## Protective apparel must be removed before leaving the lab.

## Reuseable clothing must be decontaminated (either with appropriate disinfectant or by autoclaving) before being laundered. Lab clothing must not be taken home for laundering.

## Laboratory clothing must be changed when: contaminated; integrity has been compromised; or when otherwise necessary.

**IX. Waste Disposal**

Decontaminated solid, infectious waste must be disposed of as Regulated Medical Waste through the EH&S Office.

Categories of infectious waste include:

* All cell culture materials.
* Discarded etiologic agents.
* Wastes from the production of biologicals or antibiotics possibly contaminated by organisms capable of producing human infectious disease.
* Spill clean-up materials.

To disinfect cultures and stocks of microorganisms and biological materials:

* Large quantities (e.g.; 5 mL in a test tube) of liquid wastes must be autoclaved prior to disposal.
* Solid material must be placed in red bags and autoclaved prior to disposal.
* Small quantities of liquid wastes can be disinfected by placing directly in freshly made 10% bleach or other approved disinfecting solution.

## To disinfect equipment:

## Always examine rotors and sealed centrifuge tubes for spills after each use.

## Decontaminate equipment in the event of a spill using an appropriate disinfectant or sterilization method.

## Wipe down biosafety cabinets and other surfaces with an approved disinfectant after each use.

## Collect all clean-up materials for disposal as Regulated Medical Waste.

**X. Appendix A**

**Biosafety Level 2 Laboratory Self-Assessment Safety Checklist**

This checklist is intended to aid in assessing BSL-2 safety protocol. It is based on the Biosafety Level 2 section of “Laboratory Biosafety Manual”, 3rd edition, World Health Organization, 2004. Please use this checklist to ensure BSL-2 procedures are in place.

**Facility Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_ Room # \_\_\_\_\_\_\_\_\_\_**

**Address \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Name of Pricipal Investigator/Teacher**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**\_\_\_\_\_\_\_\_**

(This person must be educated, trained and qualified to supervise microbiological projects.)

Principal Investigator/Teacher Signature\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date of Signature \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Name of Department Chair \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

I attest that this laboratory is a BSL-2 facility and complies with all procedures listed on this form and that the person named above is educated, trained and qualified to supervise microbiological projects and maintain the criterion below.

Signature\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date of Signature \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

If you check any of the following boxes with “NO”, you must take appropriate corrective action before you can classify the lab as a BSL-2 facility.

**Check the appropriate box for each statement**.

|  |  |  |
| --- | --- | --- |
| Yes | No |  |
| € | € | 1. The laboratory has: a Class II Biological Safety Cabinet designed with inward air flow at a velocity to protect personnel (75-100 linear feet/minute); a HEPA-filtered downward vertical laminar airflow for product protection; and HEPA-filtered exhaust air for environmental protection. |
| € | € | 2. Access to the laboratory is strictly limitedwhen BSL-2 experiments are in progress. When BSL-2 experiments are not in progress, the hood and surrounding work areas are decontaminated. |
| € | € | 3. The biological safety cabinet is certified annually, when cabinets are moved, or when HEPA filters are changed. |
| € | € | 4. Face protection (goggles, mask, face shield or other splatter guards) are used for anticipated splashes or sprays of infectious or other hazardous materials to the face. |

**A. Standard Microbiological Practices**

|  |  |  |
| --- | --- | --- |
| Yes | No |  |
| € | € | 1. All personnel wash their hands after they handle viable materials and animals, after removing gloves, and before leaving the laboratory. |
| € | € | 2. Eating, drinking, handling contact lenses, and applying cosmetics are forbidden in the laboratory. |
| € | € | 3. Mouth pipetting is strictly prohibited and only mechanical pipetting devices are used. |
| € | € | 4. All procedures are performed to minimize the creation of splashes or aerosols. |
| € | € | 5. Work surfaces are decontaminated with an appropriate disinfectant when work is completed at the end of the day and after any spill of viable material. |
| € | € | 6. All contaminated cultures, stocks, glassware, plastic ware and other biologically contaminated waste are treated as biohazardous material to be autoclaved. |
| € | € | 7. Culture fluids and other contaminated liquid wastes are autoclaved or decontaminated with a suitable disinfectant before disposal. |
| € | € | 8. Sharps are discarded in puncture-resistant sharps disposal containers and treated as Regulated Medical Waste. (Sharps include hypodermic syringes and needles, Pasteur pipettes, razor blades, contaminated broken glass and blood vials.) |
| € | € | 9. Materials to be decontaminated outside of the laboratory are placed in durable, leak-proof containers and closed for transport from the laboratory. |
| € | € | 10. Insect and rodent control procedures are in effect. |

**B. Special Practices**

|  |  |  |
| --- | --- | --- |
| Yes | No |  |
| € | € | 1. Persons who are at an increased risk of acquiring infection or for whom infection may be unusually hazardous (e.g., immuno-compromised, immuno-suppressed, pregnant) are not allowed to enter the laboratory when BSL-2 work is in progress. |
| € | € | 2. The Principal Investigator has developed an annually reviewed and updated BSL-2 Biosafety manual that is posted in the lab. |
| € | € | 3. It is documented that students are trained and made aware of hazards and appropriate precautions prior to working in the laboratory. |
| € | € | 4. Policies and procedures are established which limit entrance to the lab to specific individuals who are advised of the potential hazards and are appropriately trained. |
| € | € | 5. Hazard warning signs (e.g., biohazard warning symbol) are posted on the access door to the laboratory. This sign should identify the Biosafety level, the name and the telephone number of the Principal Investigator or other responsible person(s), special requirements and items prohibited, and personal protective equipment required for entry. |
| € | € | 6. A biohazard symbol is placed on equipment (e.g., incubators, freezers) where biohazardous materials are used or stored. |
| € | € | 7. Spills and accidents are immediately reported to the Principal Investigator or Department Chair and an [Injury, Illness form (WC-1)](http://www2.cortland.edu/dotAsset/135057.pdf) is submitted for occupational injuries and illnesses. |

**C. Safety Equipment (Primary Barriers)**

|  |  |  |
| --- | --- | --- |
| Yes | No |  |
| € | € | 1. Protective laboratory coats are worn while in the laboratory. They are removed and remain in the laboratory after use. These coats are never taken home for laundering. They are either disposed of or laundered by a professional laundering service. |
| € | € | 2. Where required, suitable gloves (e.g., latex, nitrile, vinyl) are worn and appropriately disposed of after use. |

**D. Laboratory Facilities (Secondary Barriers)**

|  |  |  |
| --- | --- | --- |
| Yes | No |  |
| € | € | 1. The laboratory has a sink for hand washing. |
| € | € | 2. The laboratory is designed so that it can be easily cleaned and decontaminated. |
| € | € | 3. Bench tops are impervious to water and resistant to moderate heat, acids, alkalis, organic solvents and chemicals that can contaminate the work surface. |
| € | € | 4. The laboratory furniture is sturdy and capable of supporting anticipated loads and uses. |
| € | € | 5. The spaces between benches, cabinets, and equipment are accessible for cleaning. |
| € | € | 6. Vacuum lines, if present, are protected with liquid disinfectant traps, or HEPA or hydrophobic filters. |
| € | € | 7. If the laboratory has windows that open, they are fitted with fly screens. |
| € | € | 8. The laboratory doors are kept closed whenever work with biohazardous materials is conducted. |
| € | € | 9. The laboratory is locked when not in use. |
| € | € | 10. An autoclave is available. |
| € | € | 11. An eyewash facility is readily available within the laboratory. |