



Biological Safety Manual

Revised February 16, 2023

Revision Table

Date	Description of addition/modification
April 2016	New Sections: Roles and Responsibilities, Training Requirements, Emergencies, Dual Use Research of Concern, Medical Surveillance
April 2016	Registration Information for Researchers, Select Agent use requirements, and Possession of Exempt Quantities of Select Agent Toxins
April 2016	Biological Safety Definitions, Biological Spill Kit contents
June 2016	Reformatted, Revised, Reissued
August 2019	Revised and reissued
October 2019	Update to EHS Website Links
January 2022	Revised, reissued and weblinks updated
February 2023	Update to EHS website links and Appendix A

Required Signatures

I understand that the agents used in the laboratory are potentially hazardous. I have read, reviewed, and understand this manual. I agree to follow the stated policies and procedures contained herein.

Name	Signature	Date

Table of Contents

1.0 INTRODUCTION.....	1
1.1 POLICY STATEMENT AND SCOPE OF THIS MANUAL.....	1
1.2 COMMON DEFINITIONS USED IN THIS MANUAL	1
1.3 BEFORE RESEARCH BEGINS.....	2
1.4 ADDITIONAL RESPONSIBILITIES BEFORE BEGINNING RESEARCH	3
1.5 IN THE EVENT OF AN ACCIDENT RESULTING IN INJURY OR EXPOSURE	3
2.0 ROLES AND RESPONSIBILITIES	4
2.1 ENVIRONMENTAL HEALTH AND SAFETY (EHS)	4
2.2 INSTITUTIONAL BIOSAFETY COMMITTEE (IBC).....	4
2.3 PRINCIPAL INVESTIGATORS (PI), SUPERVISORS, OR DESIGNATED CONTACT PERSON	5
2.4 LABORATORY PERSONNEL	5
2.5 ADDITIONAL TRAINING & RESPONSIBILITIES.....	6
2.5.1 <i>Laboratory Safety and Biological Safety</i>	6
2.5.3 <i>Biological Hazard Registration with IBC</i>	6
2.5.4 <i>Bloodborne Pathogens and Biomedical Waste</i>	7
2.5.5 <i>Respiratory Protection</i>	7
2.5.6 <i>Packaging and Shipping Biohazardous Materials</i>	7
2.6 CONTROLLED SUBSTANCES	8
2.7 SIGNAGE.....	8
2.8 THE OCCUPATIONAL HEALTH PROGRAM.....	8
2.8.1 <i>Animal Exposure Program</i>	8
2.8.2 <i>Immunizations</i>	9
2.8.3 <i>Obtaining Immunizations at UCF</i>	9
2.8.4 <i>Statement on the Hepatitis B Vaccination Series</i>	9
2.8.5 <i>Additional OHP Services</i>	9
3.0 ESTABLISHING A LABORATORY FOR BIOLOGICAL WORK.....	9
3.1 FINALIZING REGISTRATION WITH EHS.....	10
3.2 MAINTAINING PROPER DOCUMENTATION.....	10
3.3 DEVELOPING LABORATORY STANDARD OPERATING PROCEDURES (SOPs)	10
3.4 LABORATORY INSPECTIONS.....	11
3.5 STATEMENT ON THE USE OF SELECT AGENTS AND TOXINS	11
3.6 SECURITY IN UCF FACILITIES.....	12
4.0 LABORATORY SAFETY EQUIPMENT	12
4.1 COMMONLY UTILIZED ENGINEERING CONTROLS	13
4.1.1 <i>Biological Safety Cabinets (BSC) aka Biosafety Cabinets</i>	13
4.1.2 <i>Laminar Flow Hoods</i>	13
4.1.3 <i>Safety Sharps and Needleless Systems</i>	14
4.1.4 <i>Chemical Fume Hoods</i>	14
4.1.5 <i>Vacuum Lines</i>	14
4.1.6 <i>Centrifuges</i>	14
4.1.7 <i>Equipment with a Potential to Generate Biohazardous Aerosols</i>	14
4.1.8 <i>Autoclaves</i>	15
4.2 PROPER USE OF PERSONAL PROTECTIVE EQUIPMENT (PPE)	15
4.2.1 <i>Eye Protection</i>	15

4.2.2	<i>Facial (Nose and Mouth) Protection</i>	15
4.2.3	<i>Laboratory Clothing</i>	15
4.2.4	<i>Gloves</i>	16
4.2.5	<i>Respirators</i>	16
5.0	MANAGEMENT OF BIOHAZARDOUS SPILLS	17
5.1	BIOLOGICAL SPILL CLEAN-UP SUPPLIES	17
5.2	FOR SPILLS OCCURRING OUTSIDE A BIOLOGICAL SAFETY CABINET	17
5.3	FOR SPILLS OCCURRING INSIDE A BIOSAFETY CABINET	18
5.3.1	<i>Small Spills inside the BSC (Spills Less Than 100 mL)</i>	18
5.3.2	<i>Large Spills inside the BSC (Spill Greater Than 100 mL)</i>	19
5.4	FOR BIOHAZARDOUS SPILLS INSIDE A CENTRIFUGE	19
5.5	FOR SPILLS INSIDE A TISSUE CULTURE INCUBATOR	20
5.6	FOR PACKAGES DAMAGED IN TRANSIT	21
5.7	FOR SPILLS IN PUBLIC AREAS	21
6.0	MANAGING BIOHAZARDOUS AND BIOMEDICAL WASTE	21
6.1	STORAGE AND LABELING OF SOLID BIOHAZARDOUS WASTE	22
6.2	STORAGE AND LABELING OF SOLID BIOMEDICAL WASTE	22
6.3	DECONTAMINATION OF BIOHAZARDOUS WASTE	23
6.4	DISINFECTION OF LIQUID BIOHAZARDOUS WASTE	23
6.5	DECONTAMINATION OF SOLID BIOHAZARDOUS WASTE	23
6.6	OTHER METHODS OF DECONTAMINATION FOR CONTAMINATED EQUIPMENT	25
	VAPORS AND GASES	25
6.7	RADIATION	25
7.0	EMERGENCY PROCEDURES	25
7.1	FIRE PROCEDURES	25
7.1.1	<i>Fire Alarm and Basic Evacuation Procedures</i>	25
7.2	IN THE EVENT OF FIRE OR EXPLOSION	26
7.3	IN THE EVENT OF FLOODING	27
7.4	IN THE EVENT OF POWER FAILURE	27
7.5	IN THE EVENT OF SEVERE WEATHER	27
	APPENDIX A: CONTACT INFORMATION	28
	APPENDIX B: BIOLOGICAL SPILL HAZARD SIGN	30
	APPENDIX C: LABORATORY BIOSAFETY LEVEL CRITERIA	31
	APPENDIX D: REFERENCES IN THIS MANUAL AND ADDITIONAL RESOURCES	39

1.0 Introduction

1.1 Policy Statement and Scope of This Manual

It is the policy of the University of Central Florida (UCF) to provide a safe environment for research and study. This manual has been developed for faculty, staff, students, and the greater community in order to minimize their risk of exposure or harm from biohazardous agents and materials from UCF research and teaching facilities. The guidelines and recommendations laid out in this manual are applicable to all personnel and students working with biohazardous agents and materials and may not be deviated from without prior approval from Environmental Health and Safety (EHS) department. This policy has been developed using the mandates, guidelines, and recommendations laid out in the 6th edition of the [Center for Disease Control's \(CDC\) *Biosafety in Microbiological and Biomedical Laboratories*](#) (BMBL, 6th ed.), the [American Biological Safety Association](#) (ABSA), [National Institute of Health](#) (NIH), the [Occupational Health and Safety Administration](#) (OSHA), the [World Health Organization](#) (WHO), and the [Florida Department of Health](#). Links to these sources can be found in [Appendix D](#) of this manual. By adhering to the procedures and policies laid out in this manual, UCF is creating a standardized metric for the proper usage, storage, and disposal of biological agents and the biohazardous materials and wastes associated with them.

If researchers or staff have questions about the policies in this manual or are uncertain how its mandate to properly handle, store, treat, or dispose of any biologically derived material is best implemented, they must contact EHS for assistance. The mishandling of biohazardous agents and materials could have serious health consequences for researchers, their staff, the environment, or the greater community. Failure to comply with the procedures and policies laid out in this manual can result in disciplinary action on behalf of the university.

1.2 Common Definitions Used in This Manual

Biosafety

Biosafety is the combination of principles and practices employed to protect laboratory personnel and the environment from exposure while working with biological agents and contaminated materials (biohazards). An important part of this concept is the proper use of engineering controls along with appropriate personal protective equipment (PPE), which will be addressed extensively in this manual.

Biosafety Level

Established guidelines based upon the type of safety equipment required, the lab practices and procedures that are needed to work with an agent safely, and the requirements of the physical facility in which you are working to handle the agent of concern with minimal risk to you, your colleagues, and the environment.

Biological hazards

Organisms or contaminated materials posing a risk to humans, animals, plants, and the environment. Some examples of these organisms include, but are not limited to:

- Bacterial, Viral, Fungal, Parasitic, and Algal Agents
- Various Mycoplasma spp.
- Immortalized Cell Cultures, i.e. 293T, CHO, MDCK Cell Lines
- Biological Toxins Derived from Animal, Plant, Fungal, and Bacterial Origins
- Human and Non-Human Primate Blood, Blood Products, Bodily Secretions, Tissues, and Cell Lines (referred to as Biomedical Waste)
- [Recombinant DNA](#) of Biological and Synthetic Origin
- Genetically Modified Organisms, Especially Those Modified with Properties of Antibiotic Resistance, Increased Virulence, or Novel Functions

Risk Assessment

A process used to identify the hazardous characteristics of a known infectious or potentially infectious agent or material, the activities that can result in a person's exposure to an agent, the likelihood that such exposure will cause a laboratory-acquired infection (LAI), and the probable consequences of such an infection.

Risk Group

Systems of classification established by the NIH and the World Health Organization (WHO) organizing biological agents by severity and ability to cause harm, using such metrics as the ability to infect susceptible organisms and virulence of disease, available controls and treatments, and the characteristics of transmission. An agent's risk group is not to be confused with the recommend biosafety level at which that organism should be handled.

1.3 Before Research Begins

Before any research involving biohazardous agents or materials may be conducted in UCF facilities, or before any alterations to approved experimental procedures are implemented, principal investigators (PIs) must seek approval from the Institutional Biosafety Committee (IBC). This committee consists of research faculty and members of EHS who will conduct a risk assessment of the proposed research and offer corrections and/or recommendations to ensure the research is conducted responsibly and within all applicable guidelines. To begin this process, the PI must complete the [Biological Agent Registration Application](#) located on the EHS website and submit it before the next IBC meeting. A committee member of the IBC will review the application, and your proposal will be discussed and submitted for approval at the next IBC general meeting. Research may not begin until this approval is given, and any violations of the IBC guidelines or approvals may be subject to disciplinary action.

1.4 Additional Responsibilities before Beginning Research

It is the responsibility of the PI to identify and ensure that all regulations and policies relevant to the research are reviewed and any necessary training, permits or registrations are completed and filed prior to beginning the research. In addition, it is the responsibility of the PI to ensure that all lab members are registered with EHS, that they read and sign off on the Biological Safety Manual, and that they have completed all required training and are proficient with all duties or assignments related to handling or manipulating biological hazards or any materials or waste which may be contaminated by contact with biological hazards. Lists of personnel must be kept current and updated with EHS at least annually. Researchers are also reminded that they are responsible for completing and remaining up to date on all additional applicable training material and official manuals, including the [Laboratory Safety Manual](#). Researchers are responsible for seeking approval and remaining in close communication with other committees and regulatory bodies tasked with oversight responsibilities for their particular field of research, i.e. the Institutional Review Board (IRB), Radiation Safety Committee (RSC), and Institutional Animal Care and Use Committee (IACUC).

1.5 In the Event of an Accident Resulting in Injury or Exposure

UCF takes workplace safety very seriously. In the event of an incident or biohazardous exposure, the PI must notify the Biosafety Officer within 24 hours of an incident occurring. Students who are injured in UCF research or teaching labs should seek treatment at [UCF's Health Services](#). Staff or university employees who are injured should notify the Dept. of Human Resources as soon as possible to begin the process of submitting workers compensation claims. Additionally, they should contact [AmeriSys](#) (1-800-455-2079) as soon as possible to initiate post-exposure evaluations and seek treatment. EHS also requires the incident be documented using the [Incident Report Form](#) available on the EHS website. These must be completed and submitted to the Biosafety Officer within 24 hours of an incident occurring. Upon submission, the Biosafety Officer will contact you and a follow-up of the incident will be conducted.

UCF offers first aid and wilderness first aid classes through the [Recreation and Wellness Center](#). Researchers are encouraged to take advantage of this opportunity to be better prepared in the event a non-life threatening accident should occur.

IN THE EVENT OF A LIFE THREATNING EMERGENCY YOU MUST IMMEDIATELY CALL 911. DO NOT ATTEMPT TO MOVE ANY INJURED PERSON AT THE SCENE OF AN ACCIDENT UNLESS A DANGEROUS SITUATION CALLS FOR YOU TO DO SO. YOU SHOULD INFORM FIRST RESPONDERS OF ANY POTENTIAL THREATS TO THEIR SAFETY, INCLUDING THE PRESENCE OF HAZARDOUS MATERIALS OR ANY BIOHAZARD(S) OR AGENTS PRESENT.

2.0 Roles and Responsibilities

2.1 Environmental Health and Safety (EHS)

Environmental Health and Safety department is responsible for the following:

- Will implement and update the Biosafety Program at UCF, including the Biosafety Manual;
- Will register and monitor research utilizing biohazardous agents and materials through the Institutional Biosafety Committee (IBC);
- Shall provide training to PIs and their staff regarding safe work practices with biohazardous agents and materials;
- Will evaluate and provide guidance on the proper practices and procedures for PIs and their staff working with biohazardous agents and materials;
- Will facilitate emergency response through the UCF Police Department and Work Control;
- Shall conduct annual assessments of work groups falling under the scope of the Biosafety Program and, when necessary, enforce corrective actions;
- Will administer the Occupational Health Program (OHP) and retain non-medical records for authorized personnel;
- Shall implement and maintain deadline-enforcement improvement plans for work spaces demonstrating issues with repeat non-compliance, repeat incident reports, or for failure to make necessary improvements identified during inspections; and
- In the event of willful non-compliance with university policy and/or directives of the Institutional Biosafety Committee, and in situations immediately dangerous to life and health, EHS shall enforce the suspension of research and denial of access to the laboratory space.

2.2 Institutional Biosafety Committee (IBC)

Institutional Biosafety Committee is responsible for the following:

- Will approve and monitor all research activity at UCF involving the use of hazardous biological agents and materials;
- Shall conduct a thorough risk assessment of all proposed research activities with biohazardous agents and materials, offering recommendations and alterations to proposed work practices in order to minimize risk of exposure or harm;
- Will assist UCF Police Department and EHS department with emergency response;
- Shall advise EHS to all necessary OHP requirements of proposed research projects; and
- Shall enforce its directives and research safety compliance through the suspension of access privileges or research projects for violations of its policies, procedures, or recommendations.

2.3 Principal Investigators (PI), Supervisors, or Designated Contact Person

Principal Investigators (PI), Supervisors, or Designated Contact Person are responsible for the following:

- Are required to be knowledgeable and compliant with all federal, state and local regulations involving their research and to adhere to UCF policies and procedures regarding the safe conduct of that research;
- Shall supervise staff and ensure compliance with all UCF policies and procedures described in this manual;
- Must register and gain approval for research projects and amendments with the IBC for the possession or use of any hazardous biological material;
- Shall train and inform staff and visitors of potential hazards and practices to minimize risk of exposure or harm;
- Shall conduct risk assessments with EHS and the IBC to determine best working practices for procedures involving hazardous biological materials;
- Must promptly notify IBC and EHS of all exposures, injuries, and medical emergencies which occur in the laboratory or associated with any UCF sponsored research;
- Must ensure they, their staff, and students remain compliant with all required trainings and demonstrate competence in the handling and use of hazardous agents and materials in their facilities;
- Shall purchase and maintain personal protective equipment and contamination control supplies approved by EHS for use in UCF facilities, providing it to staff and visitors;
- Shall develop, as needed, EHS compliant SOPs governing the proper operation of the laboratory and ensure safe working conditions; and
- Shall comply with EHS assessments of workplace safety and implement EHS recommendations and/or corrective actions to reduce risk in their work spaces.

2.4 Laboratory Personnel

Laboratory Personnel are responsible for the following:

- Are required to read and sign the biosafety manual, and in so doing agree to adhere to its guidelines and requirements;
- Are required to remain compliant with all mandatory trainings and prerequisites to work in their assigned laboratory spaces;
- Shall participate in the OHP, if required to do so;
- Shall conduct themselves professionally at all times, adhere to all established SOPs, and practice good situational awareness to minimize their risk while working with biohazardous agents and materials; and
- Shall report major spills, accidents, injuries, exposures, releases, safety hazards, near misses, or loss/theft of materials to their PI and UCF Work Control (407-823-5223).

2.5 Additional Training & Responsibilities

2.5.1 Laboratory Safety and Biological Safety

All UCF personnel and visitors who work in laboratory spaces are required to take the Laboratory Safety Orientation (EHS201) and Biological Safety Orientation (EHS102) online training series prior to beginning their work. These courses consist of online learning modules designed to inform you of the risks you may encounter while working with biohazardous agents and materials and the steps you must take to minimize your risk. Additionally, you may be required to register for an additional practical session to demonstrate competency in these subjects (either EHS202, EHS103 or EHS116). Completion of this training must be documented with EHSA. Upon completion, refresher training shall be required annually.

2.5.2 NIH Guidelines for the Use of Recombinant or Synthetic Nucleic Acids in Research

All UCF personnel and visitors with access to or are involved in research involving recombinant or synthetic nucleic acids are required to take the EHS administered NIH Guidelines for the Use of Recombinant or Synthetic Nucleic Acids in Research online training prior to beginning their work with any recombinant or synthetic nucleic acid materials. This course consists of an online learning module designed to inform you of the regulations and risks concerning research with recombinant or synthetic nucleic acids and the steps you must take to minimize your risk. Completion of this training must be documented with EHS and upon completion, refresher training shall be required on a biannual basis.

2.5.3 Biological Hazard Registration with IBC

All principal investigators utilizing research laboratory spaces at UCF are required to register the following biological hazards for storage or use in their laboratories using the Biological Agent Registration Application (BARA) form.

- Recombinant or synthetic nucleic acid molecules capable of replication in a prokaryotic or eukaryotic organism, whether acquired from commercial vendors or created by the PI at UCF.
- Risk Group 2 or Risk Group 3 agents and novel or exotic infectious agents which may be detrimental to either the indigenous or domesticated plants or animals if released to the environment. Risk Group 4 agents are **NOT** allowed to be stored or used in UFC facilities.
- Biological toxins including Select Agents and Toxins listed toxins at below threshold levels.
- Human or non-human primate blood, bodily fluids, tissues or cells (including cell lines) not otherwise registered in an UCF Institutional Review Board (IRB) protocol.

2.5.4 Bloodborne Pathogens and Biomedical Waste

All UCF personnel working with human blood, body fluids, tissues, human cell lines, or other potentially infectious materials of human or non-human primate origin are at a higher risk of encountering bloodborne pathogens (BBP) in their work. Special safety training is required in these circumstances and will be provided by EHS along with annual refresher training. Additionally, all personnel falling under this category must read and sign UCF's [Bloodborne Pathogen Exposure Control Plan](#). No personnel falling under this category may begin their work without completing training and signing off on this manual, documenting their compliance with EHS upon completion.

2.5.5 Respiratory Protection

All UCF personnel using respirators as part of their PPE requirements for working safely with biohazardous agents and materials are required to undergo medical clearance and fit testing before using this equipment in their work or implementing any substantial change to their work procedures or environment. Additional training requirements along with annual refresher training are required by EHS, and all personnel utilizing respirators must be documented with EHS.

2.5.6 Packaging and Shipping Biohazardous Materials

All UCF personnel shipping or transporting biohazardous agents and materials are required by federal mandate to comply with all Hazardous Materials Shipping and Transportation requirements. These materials fall under the regulation of the US [Department of Transportation](#) (DOT) and the [International Air Transport Association](#) (IATA). Prior to receiving or sending biohazardous agents and materials, all UCF personnel are required to complete **Shipping Biological Substances and Dry Ice** online training modules. The online training modules clearly explain the requirements and regulations for shipping these kinds of materials, and completion of this training must be documented with EHS. For more information regarding the rules and regulations of shipping hazardous materials, refer to the [UCF Laboratory Safety Manual](#). **Personnel are reminded that dry ice constitutes a hazardous material when shipping biologicals.** EHS provides additional training on the proper methods for shipping dry ice with samples, and under no circumstances should personnel ship dry ice who have not received proper training be permitted to ship dry ice. Biologicals may fall under the jurisdiction of the USDA, FDA, or other governmental agencies and may require special [APHIS](#) documentation and permits. It is the responsibility of the researcher to know these requirements and seek assistance from EHS if needed.

2.6 Controlled Substances

University research may require the possession of restricted or experimental materials that fall under the [Controlled Substances Act](#). UCF requires all researchers to adhere strictly to all applicable federal, state, and local regulations regarding these substances and their use in research. EHS has specific procedures for research falling under these policies, and it is the responsibility of PIs and research personnel to ensure they comply at all times. Non-compliance can incur severe institutional, state, or federal penalties including fines and criminal prosecution.

2.7 Signage

All UCF facilities where biohazardous agents and materials are manipulated or stored must have hazard signage at their entrances with biohazard labeling, the biosafety level and description of hazards present, and emergency contact information. EHS issues this signage and must be contacted for new issuance or updates to existing placards.

2.8 The Occupational Health Program

UCF has instituted an Occupational Health Program (OHP) as a preventative measure for the early identification of conditions that could pose a risk for adverse health effects related to certain tasks. This program is coordinated through EHS, and PIs who wish to enroll personnel in the program should contact EHS to begin the process. For the services provided by the OHP, EHS partners with AdventHealth Centra Care, located on University Blvd and Lake Nona. These facilities are available for consultation with physicians, to perform diagnostic testing, provide necessary immunizations, and to have monitoring done as needed. Participation in this program is a job requirement for certain types of work. Although some personnel may not be required to participate in this program, it is highly recommended that they enroll. It is the responsibility of the PI to ensure strict compliance with this program for all personnel. In most cases, these services are provided free of charge when offered as part of occupational health. EHS is available to discuss any concerns about cost.

2.8.1 Animal Exposure Program

All personnel whose job requirements bring them into contact with animals in UCF facilities or as part of their field research are required to enroll in the UCF Animal Exposure Program and complete the EHS administered online training course EHS180 Animal Exposure in a Research Setting before their research tasks may begin. It is the responsibility of the PI or the research supervisor to ensure that all staff required to enroll and trained in this program do so. Contact EHS to begin the enrollment process.

2.8.2 Immunizations

All personnel working in laboratory facilities at UCF where there is a risk of encountering a bloodborne pathogen or another pathogenic organism for which effective vaccination is available are encouraged take these immunizations. In some instances, the internal bodies governing the scope of research at UCF may require personnel to receive these vaccinations before they are allowed to work in these spaces or as a prerequisite to approving research projects.

2.8.3 Obtaining Immunizations at UCF

To request immunizations for personnel in UCF facilities, PIs should request an Occupational Health Exam Request Form from EHS and instruct staff to complete it. UCF's occupational health services provider will be contacted to set up immunizations and speak with staff who may have health concerns or questions regarding immunizations.

2.8.4 Statement on the Hepatitis B Vaccination Series

All personnel working in facilities where bloodborne pathogens are present should be current on the hepatitis B vaccination series. If any personnel wish to decline this vaccination series, they are free to do so but must sign required documentation stating it is their wish to decline vaccination. This form must remain on file with both the research supervisor and the EHS department.

2.8.5 Additional OHP Services

Additional OHP services include: Respirator Program Evaluation, Spirometry/Pulmonary function testing, audiometry, and evaluation for occupational exposure to certain chemical contaminants.

3.0 Establishing a Laboratory for Biological Work

Environmental Health and Safety is available to assist any PI establishing a laboratory for biological work at UCF. New PIs moving to the university must first register their spaces and personnel with EHS before work begins. A more detailed explanation of this process is found in the [Laboratory Safety Manual](#). In addition to submitting a completed chemical inventory, emergency contact information, and a Laboratory Hazard Assessment Tool (LHAT), PIs working with hazardous biological materials must also complete the following additional items:

- The [Biological Agent Registration Application](#) for the IBC (Note: any hazardous biological or material requiring a MTA for transfer to UCF must have that agent or material registered with the IBC for approval of the MTA);
- Application for any import/export permits falling under APHIS;
- Licensing and applications for use with any controlled substances;
- Registration with EHSA;
- Initial safety orientations with the Laboratory Safety Coordinator;
- All applicable additional trainings and practical sessions;

- Required applications and documentation for other governing bodies related to research, specifically the Institutional Review Board (IRB), Radiation Safety Committee (RSC), and the Institutional Animal Care and Use Committee (IACUC); and
- An established laboratory-specific decontamination protocol.

3.1 Finalizing Registration with EHS

As part of registering new laboratory space at UCF, EHS will schedule a visit to the space with the PI to survey the area and ensure that it is suited to the nature of the work being proposed. EHS will also evaluate any concerns raised during the hazard assessment and check the location of equipment. During this time, it may be necessary to submit work order requests, either minor or major, to bring the space into compliance with the PI's needs, or perform maintenance in the space if any areas need attention. Upon ensuring that the area is ready to begin operations, EHS will have the PI complete the [signage request form](#) for all rooms requiring registration.

3.2 Maintaining Proper Documentation

It is required by EHS that researchers maintain certain documentation not only for reference, but to provide to EHS, inspectors and regulators, or emergency responders upon request. This documentation may consist of physical copies as well as digital information. Keeping this documentation centrally located also allows laboratory personnel to easily access it when needed. Some of this documentation includes, but may not be limited to, the following items:

- A physical copy of the Laboratory Safety Manual and the Biological Safety Manual, signed by personnel working in the space,
- Training records for personnel,
- A completed chemical inventory for the work space,
- Laboratory-specific SOPs (see Section 3.3 Developing Laboratory Standard Operating Procedures (SOPs)),
- Safety Data Sheets (SDSs) for Hazardous Materials,
- Copies of permits and licenses,
- Equipment maintenance records, and
- Shipping invoices.

3.3 Developing Laboratory Standard Operating Procedures (SOPs)

PIs are responsible for developing laboratory-specific SOPs using the guidelines laid out in this manual for acceptable use of equipment, engineering controls, and PPE in UCF facilities. Many of these guidelines were developed using the *6th edition of Biosafety in Microbiological and Biomedical Laboratories*. The relevant sections of this manual are included in Appendix C. Laboratory-specific SOPs should contain the following information:

- The PI's name and work spaces where this SOP applies,
- PPE required for this SOP,
- Potential hazards and risk mitigation strategies, and
- Justification for any proposed deviation from required PPE or engineering controls, with approval granted by EHS.

In addition to the information that should be contained in laboratory-specific SOPs, each laboratory group should have the following SOPs on file:

- A laboratory-specific decontamination plan,
- A detailed plan for the management of (bio)hazardous waste,
- An SOP detailing the location of safety supplies and devices, and
- A laboratory evacuation plan, posted at the exit to the work space (see the [Departmental Emergency Evacuation Plan](#)).

3.4 Laboratory Inspections

EHS regularly inspects laboratories on UCF property to ensure compliance with federal, state, and local regulations. These inspections follow a standardized set of focus areas, and upon completion of the inspection, the PI is sent a copy of the inspection report detailing areas of workplace safety or practice needing improvement. EHS is available to consult with the PI whose inspections show the need for improvement in work practices. As stated in the Roles and Responsibilities section of this manual, PIs and research personnel are required to comply with EHS inspections and implement recommended changes. Failure to do so may result in disciplinary actions against the university. A list of scheduled inspections can be found on the EHS website. Laboratory inspections are divided into the following categories:

- CBRL (Chemical, Biology, Radiation, and Laser), performed annually
- RGS (Radiation and General Safety), performed quarterly
- Fume hood Inspection, performed biannually
- Chemical Inventory Inspection, as needed

In addition to the above inspections covered by EHS, certain pieces of equipment such as biosafety cabinets require annual re-certification, which can only be performed by licensed technicians who work for the equipment manufacturer. The PI or the department is responsible for the cost. It is the responsibility of the PI to ensure that equipment to be inspected on a regular basis is serviced accordingly and that records of this service are kept.

3.5 Statement on the Use of Select Agents and Toxins

The [Federal Select Agent Program](#) was created to provide guidance and oversight to entities utilizing particularly high risk agents and toxins. It is a joint effort of the [Centers for Disease Control and Prevention](#) (CDC) and the [US Department of Agriculture](#) (USDA) [Animal and Plant Health Inspection Services](#) (APHIS). It is the goal of this program to promote laboratory safety and ensure the integrity of these agents. This program regularly inspects approved entities and works closely with the [Federal Bureau of Investigation](#) (FBI) to ensure that unauthorized individuals do not gain access to these materials. The agents and toxins falling under this program are reviewed every two years.

The University of Central Florida does not have current approval for a program where researchers may use [Select Agents and Toxins](#). EHS is available to assist any PI whose scope of research may expand into this area. Establishing an approved Federal Select Agent Program at UCF is a lengthy but rewarding process, and there should be proper planning on the part of the PI regarding the

nature of the approval process and the operation of a select agent program. Exempt quantities of select agents and toxins require registration with and approval through the IBC, an SOP for use and inactivation of the toxin, and inventory records.

3.6 Security in UCF Facilities

UCF takes the security of its facilities seriously. Personnel working in laboratory spaces should take the following precautions to safeguard their work spaces and research from theft, loss, or misuse:

- Keep laboratory spaces locked and do not leave them open when workers are not present.
- Do not prop open locking doors or emergency exits. Do not tamper with security enhancements to buildings such as alarms or surveillance equipment.
- Never leave electronic equipment unsecured or bring it outside designated work spaces.
- Do not grant unauthorized access to any individuals seeking to enter UCF facilities or leave visitors unescorted in work areas.
- Keep an inventory of biohazardous agents and toxins used in the laboratory.
- Avoid working after hours. If necessary, utilize the buddy system.
- Report missing equipment, electronics, notebooks, biological stocks, controlled or hazardous substances, and materials with the potential for misuse (i.e. needles, syringes, etc.) to the PI immediately.
- Utilize good situational awareness. Report suspicious persons or activity immediately to UCF Police at 407-823-5555. **Do not attempt to confront any unauthorized person caught attempting to break into UCF facilities and laboratory spaces.**
- For emergency situations, refer to the [EHS Policies and Procedures](#) page and the section of this manual titled “Emergency Procedures.”

4.0 Laboratory Safety Equipment

This section of the manual provides guidelines for what constitute approved safety equipment when working with biohazardous agents or materials at UCF. In any laboratory working with these materials, the primary means utilized to minimize risks are engineering controls and the proper use of personal protective equipment. These types of safety equipment shall be used properly and at all times when working in areas where biohazards are present. Researchers are reminded that the use of engineering controls is not a substitute for the proper use of PPE and vice versa. Rather, the use of PPE is meant to supplement the use of proper engineering controls to minimize risks. If a researcher has developed any SOPs requiring a variation or exception to the accepted use of engineering controls or PPE, EHS must be contacted and approve this variance before it is implemented.

4.1 Commonly Utilized Engineering Controls

4.1.1 Biological Safety Cabinets (BSC) aka Biosafety Cabinets

The BSC is designed to provide personal, environmental, and product protection (Class II & III) when used correctly and according to the manufacturer's instructions. All BSCs in use at UCF must be certified by a licensed technician before they are put into active use and recertified at least annually thereafter. If moved, the BSC must be recertified before it can return to service. For information on the different types of BSCs and the protections they offer, and which type of BSC is appropriate for a particular application, consult Appendix A of the BMBL. It is the responsibility of the PI to ensure that the BSCs in the laboratory space are functioning adequately and are approved for their particular needs in research, and that all staff are trained and competent in their proper usage. The following practices shall be observed when using BSCs at UCF:

- The BSC will only be used according to the manufacturer's instructions.
- Use of open flame in a BSC is not permitted.
- Materials which release or generate hazardous gases or vapors may not be used in BSCs where the air recirculates into the laboratory space.
- The BSC will be kept free of clutter and unnecessary materials when not in use.
- The metal gratings shall remain unobstructed to ensure the proper flow of air through the cabinet.
- The BSC shall be kept clean and properly decontaminated before and after each use. Spills must be cleaned and not allowed to dry on the surface of or under the metal grille. The space underneath the metal grille must not be obstructed with any materials.
- Chlorinated disinfectants are a corrosion hazard to the BSC. When using these compounds for decontamination, surfaces must be washed with a 70% ethanol solution or equivalent immediately thereafter to prevent damage to units.
- The BSC will not be used for storage of any kind or as an alternative for a chemical fume hood.
- The ultraviolet (UV) light in the BSC shall not be used as the primary form of decontamination of the work space in the BSC. Liquid disinfectants must be used as the primary surface decontaminates inside the BSC. In order to be used for decontamination, the UV source must be kept clean and used properly. It is the responsibility of the PI to ensure that the UV light maintains the necessary intensity needed to provide decontamination of the work space inside the BSC and all items must be emptied from the BSC to eliminate any shadowed areas which will not be disinfected by the UV source.

4.1.2 Laminar Flow Hoods

Laminar flow hoods are used only in specific instances to protect the product being used, such as pouring agar plates or creating clonal cuttings of plant tissue. They do not protect researchers or the environment from biohazards, and for this reason are rarely utilized at UCF. At no time shall a laminar flow hood be used for manipulating or storing any infectious agents or biohazardous materials. All laminar flow hood in use at UCF must be certified by a licensed technician before they are put into active use and recertified at least annually thereafter.

4.1.3 Safety Sharps and Needleless Systems

The use of sharps such as needles, intravenous delivery devices, scalpels and surgical tools, and other materials such as razor blades present a high risk for exposure when misused or mishandled in any laboratory where biohazardous agents and materials are present. Researchers are strongly recommended to utilize safety sharps, such as devices with retractable needles or sheathing, whenever possible. Sharps must always be disposed of in the properly designated sharps containers, and sharps not in use must always be properly sheathed or remain in their original packaging.

4.1.4 Chemical Fume Hoods

Chemical fume hoods present in the laboratory are not to be used for the manipulation or storage of any biohazardous agents or materials whatsoever.

4.1.5 Vacuum Lines

In some laboratories, vacuum suction may be utilized for certain procedures, such as aspiration. To prevent contamination of the work space or inhalation of hazardous aerosols, vacuum lines should be equipped with a liquid waste trap containing bleach or agent-appropriate disinfectant and a HEPA filter to protect the vacuum line.

4.1.6 Centrifuges

At all times, centrifuge rotors shall be properly balanced and used according to the manufacturer's instructions to minimize the risk of mechanical failures and generation of biohazardous aerosols. It is highly recommended that personnel utilize safety bucket lids with centrifuge rotors and properly load/unload these buckets inside of BSCs to ensure containment of any biohazardous materials. In the event an accidental spill or breakage occurs in a centrifuge, consult the section of this manual titled "[Management of Biohazardous Spills](#)."

4.1.7 Equipment with a Potential to Generate Biohazardous Aerosols

Certain types of laboratory equipment such as blenders, ultrasonic disrupters, tissue grinders, and lyophilizers have the potential to generate significant amounts of aerosols. It is the responsibility of all research personnel to limit the use of this equipment to specific tasks, and not to use them outside of containment when there is a risk of generating biohazardous aerosols, especially biohazardous aerosols that may contain infectious material. These devices should only be used according to the manufacturer's instructions for their intended purposes. **Research personnel are reminded to refine their work practices to minimize the overall generation of aerosols in laboratory spaces, and to keep all biohazardous aerosols contained inside a biosafety cabinet.**

4.1.8 Autoclaves

There are many different types of autoclaves in use at UCF. Each working group must have specific SOPs in place for their usage and access to the manufacturer-specific operating manual. It is the responsibility of PIs to ensure that their staff are properly trained and can demonstrate competence in the use of these devices. Autoclaves shall never be used for purposes contrary to the manufacturer's instructions. For the autoclaving of biohazardous materials for the purpose of decontamination, consult the section of this manual titled "[Decontamination of Biohazardous and Biomedical Waste](#)."

4.2 Proper Use of Personal Protective Equipment (PPE)

Personal Protective Equipment (PPE) is an important part of working in any laboratory where potential biohazards are present, and is designed to keep personnel from coming into contact with biohazardous materials or these materials from contaminating other areas in the work space. Using PPE effectively minimizes the risk of harm due to biohazards present in your work space, but they are only effective provided personnel dress properly for work in the laboratory environment. The UCF Laboratory Personal Protective Equipment Policy can be found in Appendix Z of the UCF Laboratory Safety Manual. At all times, personnel working in any laboratory environment at UCF where biohazardous agents and materials may be present shall observe the following PPE requirements:

4.2.1 Eye Protection

Safety glasses with side shields conforming to ANSI standard Z87.1 must be worn at all times in UCF laboratories. Splash goggles shall be worn when the risk of splash with biohazardous materials is significant. Wearers of contact lenses shall wear appropriate eye covering and face protective devices in a hazardous environment. In certain situations, chin-length face shields may substitute for safety glasses or splash goggles. This is at the discretion of the supervising researcher.

4.2.2 Facial (Nose and Mouth) Protection

In the event that small splashing or splattering may occur during work, surgical masks must be worn along with the approved eye protection. Surgical masks are not an appropriate substitution for work in a BSC, and do not protect against infectious or other hazardous aerosols. At the discretion of the research supervisor, chin-length face shields may substitute for surgical masks in certain situations.

4.2.3 Laboratory Clothing

Laboratory clothing includes such items as lab coats, smocks, scrub suits, and tissue culture gowns. These articles of clothing should have sleeves long enough to cover the skin and prevent contamination. The following guidelines shall be observed for laboratory clothing:

- Laboratory clothing must not leave the laboratory work space.
- Sleeveless shirts, shorts, and open-toed shoes are prohibited in the work areas.

- If work involves liquids or splashing is anticipated, the laboratory clothing worn must be water-resistant.
- Laboratory clothing that is not disposable must be capable of withstanding sterilization by autoclaving. Laboratory clothing that becomes contaminated must be immediately removed and disposed of, or replaced if it can be sterilized and laundered.
- Any personal clothing that becomes contaminated must remain in the laboratory and be laundered by trained UCF staff. Personnel and students must never take contaminated clothing home with them to launder personally.
- For PPE designed to prevent penetration, researchers should consult the manufacturer's recommendation on ASTM results for blood penetration (ASTM-21) and virus penetration (ASTM-22) on gowns used as PPE.

4.2.4 Gloves

Gloves are a requirement when working in any space where biohazardous agents and materials may be present. To prevent penetration or exposure, the kind of glove worn must be appropriate to the circumstances of the work being carried out in the laboratory space. The PI is responsible for ensuring that staff are using the appropriate gloves for their work and that gloves are being used correctly. PIs are responsible to provide adequate substitutions for personnel who are unable to wear certain types of gloves due to medical issues such as latex allergies. Questions about which gloves are appropriate to which task can be found in Appendix N of the Laboratory Safety Manual.

Gloves should never be worn outside the designated work space and disposable gloves shall never be washed and reused. When wearing gloves, the following guidelines apply:

- Only wear gloves of the appropriate size. Gloves that are too big or too small may constrain the motion of work or may fail unexpectedly while working with biohazardous agents or materials.
- Gloves must not be worn outside of the laboratory in common use areas such as hallways, offices or break areas.
- Wounds or cuts on hands must be bandaged properly before donning gloves. Jewelry must not be worn under gloves to avoid stretching or cutting into the material.
- Gloves must be disposed of properly and replaced as soon as they become contaminated.
- Gloves must be donned/doffed using proper techniques.
- Hand washing is required after doffing gloves and before leaving the laboratory.

4.2.5 Respirators

For some work procedures or in certain situations where biohazardous aerosols are a particular risk of concern, personnel are required to wear respirators when engineering controls do not sufficiently mitigate potential hazards. All personnel who require respirators must be on file in EHS as participants in the [UCF Respiratory Protection Program](#). Participation in this program may require personnel to undergo a medical evaluation and fit testing. Respirators should not be used before approval is given to do so. More information about the use of respirators in UCF facilities can be found in the Laboratory Safety Manual.

5.0 Management of Biohazardous Spills

In the event of a large biohazardous spill (>1 Liter), the PI of the work group must be notified as soon as possible, and EHS must be contacted immediately through UCF Work Control at 407-823-5223. Each laboratory group must have group-specific SOPs in place to deal with the decontamination of biohazardous spills specific to their work. The following are suggestions for preparing spill kits. Each work group is encouraged to tailor spill kits to their needs with agent-appropriate disinfectants and additional supplies that may be required.

5.1 Biological Spill Clean-up Supplies

Biohazardous spills occurring in UCF facilities must be immediately treated and cleaned. Each group working with biohazardous agents and materials is required to maintain the necessary supplies to clean-up a biological spill in the laboratory. The following spill clean-up supplies should be available in the laboratory:

- Group-specific SOPs for decontamination of biohazardous spills;
- Pair of safety glasses;
- Several pairs of disposable gloves;
- Lab coat or disposable gown;
- Pair of disposable booties (shoe covers);
- Container of undiluted bleach (less than six months old) or an agent-specific disinfectant;
- Absorbent Materials;
- Tongs or dust pan for collecting broken glass;
- Container for broken glass;
- Autoclavable biohazardous waste bags; and
- N95 respirator (if applicable).

5.2 For Spills Occurring Outside a Biological Safety Cabinet

For biohazardous spills occurring outside a BSC, the PI of the work group must be notified as soon as possible, and EHS must be contacted through UCF Work Control at 407-823-5223. An [Incident Report](#) must be filed with EHS within 24 hours. Should such a spill occur, take the following steps:

- Notify others of the spill and instruct the people in the area to leave while keeping clear of the spill.
- Doff PPE properly and wash hands before leaving the area as long as it is safe to do so. If the spill blocks access to handwashing, use hand sanitizer and perform handwashing at another sink as quickly as possible.
- **Do not bring any contaminated clothing outside the lab.** Any articles of clothing that become contaminated must be removed and remain in the space until they can be laundered by the facility, or they must be disposed of as contaminated waste.
- Wash exposed skin or shower if necessary. If exposure was significant or involved spilled materials in open wounds or mucous membranes, medical evaluation may be required.
- Place the Biohazardous Spill Warning on the door to the work area. This sign is found in [Appendix B](#) of this manual.

- Allow 30 minutes to elapse for any potential aerosols to settle in the room. Ensure that no injuries are present, and use this time to alert the PI of the work group of the incident.
- After 30 minutes have elapsed and your supervisor approves, don new PPE and enter the affected area with the spill kit.
- Cover the spill with absorbent material and saturate the spill with the appropriate disinfectant, starting from the outside of the spill and moving inwards. Allow for 20 minutes of contact time.
- **If broken glass or sharps are present, do not clean the spill with your hands.** Using the tongs or dustpan provided, dispose of these sharps into an appropriate container. Discard the absorbent material into the autoclavable biohazardous waste bag. Wet a paper towel with more of the disinfectant and wipe the area down again. Dry with additional material and dispose of these and your gloves in the biohazardous waste bag.
- Store the biohazardous waste properly until it can be decontaminated and disposed according to UCF policies.
- File an incident report with EHS within 24 hours of an incident.

5.3 For Spills Occurring Inside a Biosafety Cabinet

For spills within a BSC, the spill is considered contained as long as no fluid leaves the cabinet. Before cleanup begins, the cabinet should be allowed to operate for a minimum of 10 minutes to filter out any potentially hazardous aerosols that may have been generated by the spill. The type of BSC in use in your workplace may have different requirements and air flow rates. It is the responsibility of the researcher to be aware of these different requirements and adjust the aerosol clearance time accordingly.

5.3.1 Small Spills inside the BSC (Spills Less Than 100 mL)

In the event a small volume of biohazardous material is spilled in the BSC, use the following procedures:

- Do not continue working in the BSC and leave it running. Leave contaminated gloves in the cabinet and allow the air flow to operate normally for the time required to clear the space of hazardous aerosols (usually about 10 minutes.)
- Don new PPE.
- Place absorbent material on the spill and saturate the material with the agent-appropriate disinfectant, working from the outside of the spill inwards. Allow for the appropriate amount of contact time as stated in the manufacturer's instructions. For freshly prepared 10% bleach, the contact time is 20 minutes.
- **If any broken glass or potential sharps are present, do not attempt to clean up the spill with your hands.** Use tongs or forceps to place all sharps materials into the appropriate disposal box.
- Place absorbent materials into a biohazardous waste bag inside the BSC. Wipe the spill again with absorbent material and dispose of this in the biohazardous waste bag.
- Remove gloves and dispose of them in the biohazardous waste bag.
- Allow the BSC to run for another 10 minutes.

- Don new PPE and close the bag. Remove the biohazardous waste bag and store it properly until it will be decontaminated.
- Inspect the hood for any sharps or unattended areas of the spill that may be left behind before returning to work.

5.3.2 Large Spills inside the BSC (Spill Greater Than 100 mL)

Large spills or spills in which biohazardous material spills through the grating and into the underside of the BSC require more care and attention to detail to properly clean. In the event of a large spill inside a BSC, the following procedures shall be used:

- Do not continue working in the BSC and leave it running. Leave contaminated gloves in the cabinet and allow the flow of air inside to clear any infectious aerosols present (usually about 10 minutes).
- Place the Biohazardous Spill Warning sign located in [Appendix B](#) at the entrance to the work space to alert personnel not to enter the room and risk exposure during the cleanup of the spill.
- Don new PPE and decontaminate the working area of the BSC as outlined in the procedures above. Remove all items from the inside of the BSC.
- Pour agent-appropriate disinfectant down the grating of the BSC and allow for 30 minutes of contact time.
- Remove the top grille of the BSC and soak up the spill with absorbent material. Discard this material into a biohazardous waste bag.
- Using additional absorbent material soaked with disinfectant, then clean and dry the area. Doff gloves and dispose of these as biohazardous waste.
- Inspect and ensure that the spill has been completely cleaned.
- Replace the top grille in the BSC and allow the air flow to continue uninterrupted for at least 10 minutes.

5.4 For Biohazardous Spills inside a Centrifuge

Spills or breakage of containers inside of an operating centrifuge pose a serious potential for exposure due to the creation of aerosols. In the event a primary container was broken in a centrifuge without a closed rotor or bucket, the following procedures shall be used:

- Immediately suspend use and do not perform actions that could further generate any biohazardous aerosols (opening safety buckets, etc.).
- Notify personnel working in the room that a spill has occurred inside the centrifuge and instruct them to doff PPE. Exit the laboratory following exit procedures.
- If the PI is not aware of the spill, alert the PI of the incident and contact EHS through UCF Work Control at 407-823-5223.
- Place the biohazardous spill sign located in [Appendix B](#) on the door as you leave and allow a minimum of 30 minutes to elapse before re-entering the room in order for aerosols to settle.
- After 30 minutes have elapsed, don new PPE and enter the room. **Be careful not to spread the spill. Use secondary containment in transport so potentially biohazardous liquids**

do not spill on the floor. Be aware of any sharps that may be present in the centrifuge and do not reach with hands if sharps present.

- After the centrifuge has been properly cleaned, don new PPE and begin cleaning the buckets and rotor inside a BSC. Open the buckets carefully and use tongs or forceps to remove any broken glass or sharps, placing them in the appropriate waste container.
- Inspect and verify that all sharps materials have been removed.
- Soak the buckets, bucket lids, and rotors in the agent-appropriate disinfectant for a minimum contact time of 30 minutes.
- Rinse the rotor and buckets with a mild detergent and clean with 70% ethanol. Allow these components to air dry.
- Verify that the centrifuge and its components are fully dry before beginning operation. Arrange for an equipment inspection if uncertain that the centrifuge can safely return to service.
- An incident report must be filled out and submitted to the EHS within 24 hours of the incident.

5.5 For Spills inside a Tissue Culture Incubator

Tissue culture incubators are particularly sensitive to corrosive damage from chemical treatment because the stainless-steel plating inside them is constantly exposed to a warm and humid environment. It is not recommended to clean with bleach or other disinfectants, which present a corrosion hazard to steel. Rather, select an agent-appropriate disinfectant designed for use on these kinds of surfaces. When a spill occurs inside a tissue culture incubator, the following procedures should be used:

- Immediately suspend use and do not perform actions that could further generate any biohazardous aerosols.
- Turn off the incubator and notify personnel working in the room that a spill has occurred inside the incubator and instruct them to doff PPE. Exit the laboratory following exit procedures.
- If the PI is not aware of the spill, alert the PI of the incident and contact EHS through UCF Work Control at 407-823-5223.
- Place the biohazardous spill sign located in [Appendix B](#) on the door as you leave and allow a minimum of 30 minutes to elapse before re-entering the room in order for aerosols to settle. This spill must be treated as if it occurred outside a BSC.
- After 30 minutes have elapsed, don new PPE and re-enter the area.
- Add an appropriate amount of agent-appropriate disinfectant to the water tray. If there are any flasks or plates in the incubator that can be transferred, remove them and wipe them with absorbent material soaked with disinfectant before transfer. **Do not allow potentially biohazardous materials to drip onto the floor. Do not touch any broken glass or sharps with your hands.**
- Inspect the incubator during the initial contact time. If biohazardous spills or dried spills are observed on the incubator grating, place absorbent material on these areas and soak in the agent-appropriate disinfectant. Allow for 20 minutes of contact time.
- Clean up the absorbent material and dispose of it in a biohazardous waste bag. If broken glass or sharps are present, use tongs or forceps to dispose of this material into the

appropriate container. Soak additional absorbent material in disinfectant and wipe down the incubator. Dry the surfaces and dispose of this material along with gloves as biohazardous waste.

- Some incubators have their own decontamination cycles using distilled water and heat. If the incubator in question has this option, it should be performed after cleanup and the incubator started normally the following day.
- An incident report should be filled out and submitted to the EHS no later than 24 hours after the occurrence.

5.6 For Packages Damaged in Transit

Packages containing biohazardous materials that arrive damaged and/or leaking should not be opened under any circumstances. Place the package in secondary containment and contact EHS through UCF Work Control immediately at 407-823-5223.

5.7 For Spills in Public Areas

It is a UCF policy that all biological materials be transported in sturdy, leak-proof secondary containment, to which a clearly visible orange red sticker is attached containing the international symbol for biohazardous materials and the word “BIOHAZARD”. Material should be transported using reliable carts with raised edges to contain any potential spills or leaks. Prevent accidents by planning transport ahead of time and being aware of any difficulties that may be encountered. If a spill were to occur in any public area while transporting biological materials, the following procedures should be used:

- Keep the affected area clear of the public and, if possible, cordon off the spill.
- Contact EHS through UCF Work Control immediately at 407-823-5223.
- Under no circumstances shall anyone attempt to clean the spill without the proper PPE.
- Be available to inform any responders of potential hazards they may encounter.
- An incident report must be submitted to EHS within 24 hours of the incident.

6.0 Managing Biohazardous and Biomedical Waste

Work spaces dealing with biohazardous agents and materials inevitably generate biohazardous waste. This section of the manual creates a university-wide metric by which all researchers working with biohazardous agents and materials must label, store, and dispose of waste. As stated in the definitions section of this manual, this type of waste is referred to as biomedical waste if it contains human or non-human primate products or materials infectious to humans. Biomedical waste must be treated differently than conventional biohazardous waste. When dealing with biomedical waste, UCF falls under the scope of the [State of Florida Department of Health](#) (FDH) regulations Chapter 64E-16. These regulations outline the way biomedical waste must be labeled and stored in addition to the acceptable methods of disposal. Personnel are encouraged to take steps to minimize the amount of biohazardous and biomedical waste generated in their spaces at all times and never to dispose of these wastes improperly.

6.1 Storage and Labeling of Solid Biohazardous Waste

UCF requires that all biohazardous waste always be segregated from regular trash at its point of origin and properly labeled as soon as it is generated. Biohazardous waste includes the actual biological materials in addition to disposable laboratory items used to contain or handle them. This may include such items as tissue culture flasks, plastic serological pipettes, and gloves worn while handling potential biohazards. All solid biohazardous waste must be double-bagged only in the approved red bags labeled with the international symbol for biohazards and the words “BIOHAZARD” clearly visible. In addition to this label, each bag of biohazardous waste must be labeled legibly with the following:

- The University’s Full Name: **University of Central Florida**
- Point of Generation: **Building # and Room #**
- Point of Contact: **PI’s Name and Phone Number**

These bags must never be overfilled or filled with liquid or chemically hazardous products. Store in sturdy secondary containment labeled properly with a clearly visible sticker containing the international symbol for biohazards on a red or orange-red background along with the word “BIOHAZARD.” Biohazardous waste should be stored where it cannot be accessed by unauthorized personnel and stored for a period no longer than 30 days before disposal. When not in use, secondary waste containers for all biohazardous wastes must be covered.

Sharps generated as part of biohazardous or biomedical waste must never be placed in these bags or any other trash in the work space. These must be placed only in the approved and properly labeled sharps receptacles. Needles should never be recapped before disposal in these containers nor items such as disposable scalpels re-sheathed unless these are part of the item’s safety features.

6.2 Storage and Labeling of Solid Biomedical Waste

As defined in the Florida Department of Health, biomedical waste is referred to as:

“Any solid or liquid waste which may present a threat of infection to humans, including non-liquid tissue, body parts, blood, blood products, and body fluids from humans and other primates; laboratory and veterinary wastes which contain human disease-causing agents; and discarded sharps.”

This definition is also extended to absorbent materials and disposable materials contaminated with these products. For collection and disposal, UCF contracts with a licensed transporter to haul away biomedical waste. This contractor supplies appropriately labeled bags and secondary storage containers to work facilities at UCF. As with the above guidelines, these bags must not be overfilled or filled with liquid or chemically hazardous products. They must be stored in an area inaccessible to unauthorized personnel, and they may not be stored for more than 30 days from the point at which they begin collecting material. When not in use, these receptacles must remain covered at all times. There are spaces on these bags and containers for the appropriate contact information to be included as outlined above.

If the provided containment is not adequate to store all the waste generated in a work area in a given time, researchers may store additional biomedical waste as outlined, only in the bag types approved by the Department of Health Chapter 64E-16.004. Biomedical waste bags are available through many research supply vendors and already conform to these specifications, but it is the responsibility of the researcher to ensure that they comply. Additionally, secondary containment must be labeled visibly and legibly with the international symbol for biohazards and “BIOHAZARD.” As of 2016, the color of this label must be red and must be at least 6 inches in diameter on bags larger than 19” x 14” or one inch in diameter on bags smaller than this size. For questions on how to properly contain biomedical waste, refer directly to [FDH regulations](#) or contact EHS for assistance.

Remember that sharps are never to be disposed of in any container except the approved, red puncture-proof containers that have been appropriately labeled. Do not dispose in regular trash or non-approved biomedical waste containers.

6.3 Decontamination of Biohazardous and Biomedical Waste

There is no safe level of biohazardous waste that may be released from any UCF facility. It is the policy of UCF that all biohazardous waste not hauled away by a licensed transporter be rendered harmless for disposal through disinfection or autoclaving. Each lab group must have group-specific SOPs in place dealing with the decontamination of biohazardous materials specific to their work.

6.4 Disinfection of Liquid Biohazardous Waste

Liquid wastes must be rendered harmless through chemical disinfection before disposal. There are a variety of commercial disinfectants, including freshly prepared 10% bleach solution, which can be used for this purpose. It is the responsibility of the researcher to ensure that the type of disinfectant used is appropriate for the type of waste being disposed and that this disinfectant is used exactly according to the manufacturer’s instructions. Any questions regarding the proper use of chemical disinfectants should be directly addressed to the manufacturer. **At no time shall any disinfected biohazardous waste containing additional hazardous or radioactive materials be disposed down the drains.** Disinfected biohazardous waste may require additional pH balancing before disposal. Consult the [Laboratory Safety Manual](#) for any questions regarding hazardous material disposal and the [Bloodborne Pathogens Exposure Control Plan](#) for questions regarding material infectious to humans.

6.5 Decontamination of Solid Biohazardous Waste

Biohazardous waste must never be disposed of before it has been properly decontaminated. The preferred method for properly decontaminating biohazardous waste is through autoclaving on a liquid cycle. There are a variety of different autoclaves throughout UCF from a number of different manufacturers. It is the responsibility of the researcher to know which type of autoclave can be used for this purpose. PIs are responsible for ensuring that their staff know which autoclaves their work spaces utilize, the types of autoclaves available to the work space, and that staff are trained and can demonstrate competency when using the autoclave. A copy of the autoclave’s operational

manual should always be available. When using any autoclave at UCF, the following guidelines shall be observed:

- **Autoclaving hazardous materials is strictly prohibited and highly dangerous. The explosion risk and resulting exposure to biohazardous materials could seriously harm you, your colleagues, or the surrounding community. Always refer to the Safety Data Sheet (SDS) to know the potential hazards of any chemical or material before you autoclave it.**
- **Researchers are prohibited from autoclaving radioactive material or any biohazardous waste contaminated with radioactivity.**
- **Verify that the autoclave being used is appropriate for biohazardous waste.**
- Each autoclave unit will have its own written SOP detailing its proper operation and necessary exposure times and temperatures to achieve decontamination of the specified materials.
- Personnel must wear proper PPE when using autoclaves. In addition to eye protection and lab coats, personnel must use heat resistant gloves and a face shield over their safety glasses.
- All biohazardous waste shall be placed in secondary containment before autoclaving. This containment must be able to withstand the autoclaving process.
- Biohazardous waste must not be in sealed bags. Bags should be closed in such a way that steam can penetrate the bags during the cycle.
- All biohazardous waste must include a temperature indicator to ensure that the proper decontamination temperature was reached.
- Bottles and tubes must be loosely sealed or unsealed to prevent explosions of the material.
- Check on the autoclave periodically during use to ensure that it is recording the proper temperature and pressure.
- Do not jolt or move any material that is bubbling or boiling.
- Maintain a log of autoclaved biohazardous waste. Be sure to include:
 - The date, time, and operator name;
 - The type and approximate amount of waste treated; and
 - Whether the indicator showed that the proper temperature was reached.
- Autoclaves must be verified monthly through the use of a biological indicator. If personnel are unfamiliar with the proper use of biological indicators for autoclaves, contact EHS for assistance.
- Maintenance logs on autoclaves shall be kept for a minimum of one year.
- If an autoclave is malfunctioning or does not achieve the appropriate temperature/pressure, do not continue to use the unit. The unit must be tagged out of service to alert others. A work ticket to the building's facilities personnel must be submitted as soon as possible. Do not resume using the unit until it is cleared to return to service.

6.6 Other Methods of Decontamination for Contaminated Equipment Vapors and Gases

Vapors and gases are primarily used to decontaminate biological safety cabinets and associated systems, bulky or stationary equipment not suited to liquid disinfectants, instruments, electronics, or optics, which might be damaged by other decontamination methods. Rooms, buildings and associated air-handling systems can be decontaminated by this method as well. Examples of gases used for this purpose are vaporized hydrogen peroxide and ethylene oxide. Special precautions must be taken during use because of the hazardous nature of many of these compounds. **PIs and laboratory personnel may not use these methods themselves.** Many are vendor specific services and use outside contractors. Contact EHS for assistance.

6.7 Radiation

Ultraviolet radiation (UV) can be used for the disinfection of BSCs when used according to the manufacturer's instructions. It is the responsibility of the researchers to ensure that UV bulbs are kept clean and inspected regularly to maintain the intensity needed to work properly.

7.0 Emergency Procedures

In the event of an emergency at UCF facilities where building evacuations are required, each working group will have a designated site away from the facility where all personnel are required to report for a head count. All work groups are required to have a completed [Departmental Emergency Evacuation Plan](#).

7.1 Fire Procedures

In the event of a fire, alerting others to the danger as quickly as possible and knowing what to do could save lives. All personnel who work in UCF facilities should be aware of their surroundings, noting the location of fire alarm pulls and fire extinguishers.

7.1.1 Fire Alarm and Basic Evacuation Procedures

In the event of a fire alarm, all personnel must evacuate the building immediately in an orderly manner using stairs if they reside in upper levels of the building. During a fire alarm, elevators are never to be used. The official EHS policy covering building evacuation can be found on the [EHS Fire Safety](#) page. The following procedures should be followed:

- As soon as the fire alarm goes off, immediately stop working and secure work. Quickly shut off electrical equipment and hazardous processes. Cover lids on open cultures or containers in use, but leave BSCs running to secure biologicals.
- Use normal procedures for doffing any PPE and exit the laboratory in an orderly manner as long as it is safe to do so.
- Evacuate the building in a calm and orderly manner, taking stairs to the ground floor and avoiding elevators.

- Proceed to designated meeting location for your work group outlined in the [Departmental Emergency Evacuation Plan](#).
- Follow all instructions from first responders and be available to answer any questions about potential hazards. Be precise about where these hazards are located. Alert emergency crews to any missing persons from your group who did not report to the meeting area.
- Do not re-enter the building under any circumstances until emergency first responders announce that it is safe to reenter.

7.2 In the Event of Fire or Explosion

If encountering a fire or if smoke is smelled or seen in the laboratory, quickly secure work and begin evacuating the building according to the evacuation plan.

- Notify people in the area who may be in immediate danger as long as there is no immediate life-threatening risk to yourself.
- Perform the minimal number of necessary exiting procedures that can be executed safely.
- If your clothing catches fire, remain calm and do not run. **STOP, DROP, and ROLL.** If there is a drench hose or safety shower nearby, attempt to use it and immediately exit the building.
- Activate the fire alarm using the pull stations or alert somebody to do so while proceeding to the exit. **Never attempt to fight any fire if you are untrained, if the fire is large or uncontained, or if your exit is at risk.** Pull stations for fire alarms are located in the interior of each corridor and at all exits throughout the building.
- If you have successfully attempted to fight a small, contained fire, exit the laboratory using the minimal number of safety procedures that can be executed safely and proceed immediately to the designated meeting spot determined in your work group's [Departmental Emergency Evacuation Plan](#).
- If the fire is not successfully contained, exit the laboratory and proceed immediately to the designated meeting spot for your work group. Under no circumstances should you re-enter the building for any reason.
- Once you have proceeded to your designated meeting location, call 911. Be sure to alert them to any potential hazards in your work space that may pose a risk to them. Alert them to any missing persons who have not proceeded to the designated meeting site.
- Follow all instructions given to you by first responders and under no circumstances should you re-enter the facility unless first responders have given you the clearance to do so.
- If your PI is not already aware of the situation, you must notify your PI immediately along with EHS of the incident.

7.3 In the Event of Flooding

If flooding is discovered upon entry into any UCF facility, Work Control must be immediately notified at 407-823-5223 (available 24 hours a day). When encountering flooding, use the following procedures:

- Attempt to locate the source of flooding and if able to do so, stop it.
- If a leak occurs or if flooding begins in a laboratory, secure all work. Biologicals should be covered and secured in BSCs or incubators/freezers, not left on benches where they will present a risk to work crews.
- Contact Work Control at the number above and report the situation.
- If the water is clean and not contaminated with biohazardous agents or materials, attempt to locate the source of flooding and stop the leak. The leak can be cleaned up with a mop and bucket. If the leak is not contained, exit the laboratory using standard procedures.
- If the water is dirty, contaminated with sewage or biohazardous agents or materials, do not attempt to locate the source and stop the leak. Immediately exit the work space executing the number of exit procedures reasonably safe to perform. Inform Work Control of these hazards and wait for their instructions before re-entering the work area.
- If you suspect the water may be electrified, do not attempt to enter into the water or stop the leak. Immediately exit the work space. Inform Work Control of the potential electrical hazard and wait for their instructions before re-entering the work area.
- If the PI of the designated work space is not yet aware of the situation, alert the PI as soon as possible.

7.4 In the Event of Power Failure

Power failures can occur at any time. Most laboratories in UCF facilities run on backup power, and power interruptions should be minimal. However, should any interruption to power occur, take the following steps:

- Stop all work immediately and secure all biologicals. Doff PPE properly and exit the work area.
- Immediately call UCF Work Control at 407-823-5223 and notify the PI for the work space. Do not return to work until instructed that the issue has been resolved.

7.5 In the Event of Severe Weather

In the event of severe weather such as hurricanes, consult the UCF [Office of Emergency Management](#) and pay attention to the [UCF Alert](#) system for weather updates. Prepare your work space for the event. For especially severe storms, such as a Category 3 or higher, work groups should prepare for potentially long interruptions to power. Steps should be taken to secure biologicals from loss.

Appendix A: Contact Information

UCF Work Control	UCF Police Department
Facilities Operations 407-823-5223 Available 24 hours	3610 Libra Drive Orlando, FL 32816 407-823-5555 (non-emergency) In the event of a life-threatening emergency, call 911.

Environmental Health and Safety (EHS)

Office of the Director

Director	Renee Michel	407-823-3747	Renee.Michel@ucf.edu
Administrative Assistant	Angela Moreira	407-823-6300	Angela.Moreira@ucf.edu

Research and Environmental Support

Biological Safety Coordinator (Biosafety Officer)	Melina Kinsey	407-823-1526	Melina.Kinsey@ucf.edu
Chemical Safety and Security, Sr. Coordinator	Sandra Hick	407-823-3307	Sandra.Hick@ucf.edu
Environmental Management Coordinator	David Bock	407-823-0707	David.Bock@ucf.edu
Health Sciences Campus Safety Coordinator	Thaismary Morales	407-266-7080	Thaismary.Morales@ucf.edu
Laboratory Safety Coordinator (Chemical Hygiene Officer)	Sean Brennan	407-823-5498	Sean.Brennan@ucf.edu
Radiation Safety Officer	Mario De Vera	407-823-0476	Mario.DeVera@ucf.edu

Research and
Environmental
Support Specialist

Aaron Young

407-823-
2887

Aaron.Young@ucf.edu

Research and
Environmental
Support Specialist

Franco Del Pino

407-823-
2886

Franco.DelPino@ucf.edu

Research and
Environmental
Support Specialist

Marian
Rodriguez

407-823-
6340

Marian.Rodriguez@ucf.edu

Workplace Safety

Environmental
Health & Safety
Manager

Noel Crespo

407-823-
6077

Noel.Crespo@ucf.edu

Occupational
Safety Specialist

Frank Roca

407-823-
1471

Frank.Roca@ucf.edu

Accident
Prevention
Coordinator

Jacob Jackson

407-823-
1472

Jacob.Jackson@ucf.edu

Appendix B: Biological Spill Hazard Sign



Appendix C: Laboratory Biosafety Level Criteria

The material in this section is taken directly from the 6th edition of the CDC/NIH's Biosafety in Microbiological and Biomedical Laboratories (BMBL 6th ed.). The 6th edition of this manual was released by the Dept. of Health and Human Services in 2020 and remains the standard in the application of good biosafety practices. At all times shall researchers adhere to the following criteria in their designated spaces and conform their practices to this standard. It is highly recommended that researchers download this freely available publication and keep it as a reference in their laboratory spaces.

Biosafety Level 1 (BSL-1) is suitable for work involving well-characterized agents not known to consistently cause disease in immunocompetent adult humans and that present minimal potential hazard to laboratory personnel and the environment. BSL-1 laboratories are not necessarily separated from the general traffic patterns in the building. Work is typically conducted on open benchtops using standard microbiological practices. Special containment equipment or facility design is not generally required but may be used as determined by appropriate risk assessment. Laboratory personnel receive specific training in the procedures conducted in the laboratory and are supervised by a scientist with training in microbiology or a related science. The following standard practices, safety equipment, and facility specifications are recommended for BSL-1.

Standard Microbiological Practices

- The laboratory supervisor enforces the institutional policies that control safety in and access to the laboratory.
- The laboratory supervisor ensures that laboratory personnel receive appropriate training regarding their duties, potential hazards, manipulations of infectious agents, necessary precautions to minimize exposures, and hazard/exposure evaluation procedures (e.g., physical hazards, splashes, aerosolization) and that appropriate records are maintained. Personnel receive annual updates and additional training when equipment, procedures, or policies change. All persons entering the facility are advised of the potential hazards, are instructed on the appropriate safeguards, and read and follow instructions on practices and procedures. An institutional policy regarding visitor training, occupational health requirements, and safety communication is considered.
- Personal health status may affect an individual's susceptibility to infection and ability to receive available immunizations or prophylactic interventions. Therefore, all personnel, and particularly those of reproductive age and/or those having conditions that may predispose them to increased risk for infection (e.g., organ transplant, medical immunosuppressive agents), are provided information regarding immune competence and susceptibility to infectious agents. Individuals having such conditions are encouraged to self-identify to the institution's healthcare provider for appropriate counseling and guidance. See Section VII.
- A safety manual specific to the facility is prepared or adopted in consultation with the facility director and appropriate safety professionals. The safety manual is available, accessible, and periodically reviewed and updated, as necessary.

- The safety manual contains sufficient information to describe the biosafety and containment procedures for the organisms and biological materials in use, appropriate agent-specific decontamination methods, and the work performed.
- The safety manual contains or references protocols for emergency situations, including exposures, medical emergencies, facility malfunctions, and other potential emergencies. Training in emergency response procedures is provided to emergency response personnel and other responsible staff according to institutional policies.
- A sign is posted at the entrance to the laboratory when infectious materials are present. Posted information includes: the laboratory's Biosafety Level, the supervisor's or other responsible personnel's name and telephone number, PPE requirements, general occupational health requirements (e.g., immunizations, respiratory protection), and required procedures for entering and exiting the laboratory.
- Long hair is restrained so that it cannot contact hands, specimens, containers, or equipment.
- Gloves are worn to protect hands from exposure to hazardous materials.
 - Glove selection is based on an appropriate risk assessment.
 - Gloves are not worn outside the laboratory.
 - Change gloves when contaminated, glove integrity is compromised, or when otherwise necessary.
 - Do not wash or reuse disposable gloves, and dispose of used gloves with other contaminated laboratory waste.
- Gloves and other PPE are removed in a manner that minimizes personal contamination and transfer of infectious materials outside of the areas where infectious materials and/or animals are housed or manipulated.
- Persons wash their hands after working with potentially hazardous materials and before leaving the laboratory.
- Eating, drinking, smoking, handling contact lenses, applying cosmetics, and storing food for human consumption are not permitted in laboratory areas. Food is stored outside the laboratory area.
- Mouth pipetting is prohibited. Mechanical pipetting devices are used.
- Policies for the safe handling of sharps, such as needles, scalpels, pipettes, and broken glassware are developed, implemented, and followed; policies are consistent with applicable state, federal, and local requirements. Whenever practical, laboratory supervisors adopt improved engineering and work practice controls that reduce risk of sharps injuries. Precautions are always taken with sharp items. These include:
 - Plasticware is substituted for glassware whenever possible.
 - Use of needles and syringes or other sharp instruments is limited in the laboratory and is restricted to situations where there is no alternative (e.g., parenteral injection, blood collection, or aspiration of fluids from laboratory animals or diaphragm bottles). Active or passive needle-based safety devices are to be used whenever possible.
 - Uncapping of needles is performed in such a manner to reduce the potential for recoil causing an accidental needlestick.
 - Needles are not bent, sheared, broken, recapped, removed from disposable syringes, or otherwise manipulated by hand before disposal.

- If absolutely necessary to remove a needle from a syringe (e.g., to prevent lysing blood cells) or recap a needle (e.g., loading syringes in one room and injecting animals in another), a hands-free device or comparable safety procedure must be used (e.g., a needle remover on a sharps container, the use of forceps to hold the cap when recapping a needle).
 - Used, disposable needles and syringes are carefully placed in puncture-resistant containers used for sharps disposal immediately after use. The sharps disposal container is located as close to the point of use as possible.
 - Non-disposable sharps are placed in a hard-walled container for transport to a processing area for decontamination, preferably by autoclaving. Broken glassware is not handled directly. Instead, it is removed using a brush and dustpan, tongs, or forceps.
- Perform all procedures to minimize the creation of splashes and/or aerosols.
- Decontaminate work surfaces after completion of work and after any spill or splash of potentially infectious material with appropriate disinfectant. Spills involving infectious materials are contained, decontaminated, and cleaned up by staff who are properly trained and equipped to work with infectious material. A spill procedure is developed and posted within the laboratory.
- Decontaminate all cultures, stocks, and other potentially infectious materials before disposal using an effective method, consistent with applicable institutional, local, and state requirements. Depending on where the decontamination will be performed, the following methods are used prior to transport:
 - Materials to be decontaminated outside of the immediate laboratory are placed in a durable, leak-proof container and secured for transport. For infectious materials, the outer surface of the container is disinfected prior to moving materials and the transport container has a universal biohazard label.
 - Materials to be removed from the facility for decontamination are packed in accordance with applicable local, state, and federal regulations.
- An effective integrated pest management program is implemented.
- Animals and plants not associated with the work being performed are not permitted in the laboratory.
-

B. Special Practices None required.

C. Safety Equipment (Primary Barriers and Personal Protective Equipment)

- Special containment devices or equipment, such as biosafety cabinets (BSCs), are not generally required.
- Protective laboratory coats, gowns, or uniforms are worn to prevent contamination of personal clothing.
- Protective eyewear is worn by personnel when conducting procedures that have the potential to create splashes and sprays of microorganisms or other hazardous materials. Eye protection and face protection are disposed of with other contaminated laboratory waste or decontaminated after use.
- In circumstances where research animals are present in the laboratory, the risk assessment considers appropriate eye, face, and respiratory protection, as well as potential animal allergens.

D. Laboratory Facilities (Secondary Barriers)

- Laboratories have doors for access control.
- Laboratories have a sink for handwashing.
- An eyewash station is readily available in the laboratory.
- The laboratory is designed so that it can be easily cleaned.
 - Carpets and rugs in laboratories are not appropriate.
 - Spaces between benches, cabinets, and equipment are accessible for cleaning.
- Laboratory furniture can support anticipated loads and uses.
 - Benchtops are impervious to water and resistant to heat, organic solvents, acids, alkalis, and other chemicals.
 - Chairs used in laboratory work are covered with a non-porous material that can be easily cleaned and decontaminated with appropriate disinfectant.
- Laboratory windows that open to the exterior are fitted with screens. 7. Illumination is adequate for all activities and avoids reflections and glare that could impede vision.

Biosafety Level 2 Biosafety Level 2 (BSL-2) builds upon BSL-1. BSL-2 is suitable for work with agents associated with human disease and pose moderate hazards to personnel and the environment. BSL-2 differs from BSL-1 primarily because: 1) laboratory personnel receive specific training in handling pathogenic agents and are supervised by scientists competent in handling infectious agents and associated procedures; 2) access to the laboratory is restricted when work is being conducted; and 3) all procedures in which infectious aerosols or splashes may be created are conducted in BSCs or other physical containment equipment. The following standard and special practices, safety equipment, and facility specifications are recommended for BSL-2.

Standard Microbiological Practices

- The laboratory supervisor enforces the institutional policies that control safety in and access to the laboratory.
- The laboratory supervisor ensures that laboratory personnel receive appropriate training regarding their duties, potential hazards, manipulations of infectious agents, necessary precautions to minimize exposures, and hazard/exposure evaluation procedures (e.g., physical hazards, splashes, aerosolization) and that appropriate records are maintained. Personnel receive annual updates and additional training when equipment, procedures, or policies change. All persons entering the facility are advised of the potential hazards, are instructed on the appropriate safeguards, and read and follow instructions on practices and procedures. An institutional policy regarding visitor training, occupational health requirements, and safety communication is considered.
- Personal health status may affect an individual's susceptibility to infection and ability to receive available immunizations or prophylactic interventions. Therefore, all personnel, and particularly those of reproductive age and/or those having conditions that may predispose them to increased risk for infection (e.g., organ transplant, medical immunosuppressive agents), are provided information regarding immune competence and susceptibility to infectious agents. Individuals having such conditions are encouraged to self-identify to the institution's healthcare provider for appropriate counseling and guidance.

- A safety manual specific to the facility is prepared or adopted in consultation with the facility director and appropriate safety professionals. The safety manual is available, accessible, and periodically reviewed and updated as necessary.
 - The safety manual contains sufficient information to describe the biosafety and containment procedures for the organisms and biological materials in use, appropriate agent-specific decontamination methods, and the work performed.
 - The safety manual contains or references protocols for emergency situations, including exposures, medical emergencies, facility malfunctions, and other potential emergencies. Training in emergency response procedures is provided to emergency response personnel and other responsible staff according to institutional policies.
- A sign incorporating the universal biohazard symbol is posted at the entrance to the laboratory when infectious materials are present. Posted information includes: the laboratory's Biosafety Level, the supervisor's or other responsible personnel's name and telephone number, PPE requirements, general occupational health requirements (e.g., immunizations, respiratory protection), and required procedures for entering and exiting the laboratory. Agent information is posted in accordance with the institutional policy.
- Long hair is restrained so that it cannot contact hands, specimens, containers, or equipment.
- Gloves are worn to protect hands from exposure to hazardous materials.
 - Glove selection is based on an appropriate risk assessment.
 - Gloves are not worn outside the laboratory.
 - Change gloves when contaminated, glove integrity is compromised, or when otherwise necessary.
 - Do not wash or reuse disposable gloves, and dispose of used gloves with other contaminated laboratory waste.
- Gloves and other PPE are removed in a manner that minimizes personal contamination and transfer of infectious materials outside of the areas where infectious materials and/or animals are housed or manipulated.
- Persons wash their hands after working with potentially hazardous materials and before leaving the laboratory.
- Eating, drinking, smoking, handling contact lenses, applying cosmetics, and storing food for human consumption are not permitted in laboratory areas. Food is stored outside the laboratory area.
- Mouth pipetting is prohibited. Mechanical pipetting devices are used.
- Policies for the safe handling of sharps, such as needles, scalpels, pipettes, and broken glassware are developed, implemented, and followed; policies are consistent with applicable state, federal, and local requirements. Whenever practical, laboratory supervisors adopt improved engineering and work practice controls that reduce risk of sharps injuries. Precautions are always taken with sharp items. These include:
 - Plasticware is substituted for glassware whenever possible.
 - Use of needles and syringes or other sharp instruments is limited in the laboratory and is restricted to situations where there is no alternative (e.g., parenteral injection, blood collection, or aspiration of fluids from laboratory animals or diaphragm bottles). Active or passive needle-based safety devices are to be used whenever possible.

- Uncapping of needles is performed in such a manner to reduce the potential for recoil causing an accidental needlestick.
- Needles are not bent, sheared, broken, recapped, removed from disposable syringes, or otherwise manipulated by hand before disposal.
- If absolutely necessary to remove a needle from a syringe (e.g., to prevent lysing blood cells) or recap a needle (e.g., loading syringes in one room and injecting animals in another), a hands-free device or comparable safety procedure must be used (e.g., a needle remover on a sharps container, the use of forceps to hold the cap when recapping a needle).
- Used, disposable needles and syringes are carefully placed in puncture-resistant containers used for sharps disposal immediately after use. The sharps disposal container is located as close to the point of use as possible.
 - Non-disposable sharps are placed in a hard-walled container for transport to a processing area for decontamination, preferably by autoclaving.
 - Broken glassware is not handled directly. Instead, it is removed using a brush and dustpan, tongs, or forceps.
- Perform all procedures to minimize the creation of splashes and/or aerosols.
- Decontaminate work surfaces after completion of work and after any spill or splash of potentially infectious material with appropriate disinfectant. Spills involving infectious materials are contained, decontaminated, and cleaned up by staff who are properly trained and equipped to work with infectious material. A spill procedure is developed and posted within the laboratory.
- Decontaminate all cultures, stocks, and other potentially infectious materials before disposal using an effective method, consistent with applicable institutional, local, and state requirements. Depending on where the decontamination will be performed, the following methods are used prior to transport:
 - Materials to be decontaminated outside of the immediate laboratory are placed in a durable, leak-proof container and secured for transport. For infectious materials, the outer surface of the container is disinfected prior to moving materials and the transport container has a universal biohazard label.
 - Materials to be removed from the facility for decontamination are packed in accordance with applicable local, state, and federal regulations. 1
- 6. An effective integrated pest management program is implemented. Animals and plants not associated with the work being performed are not permitted in the laboratory.

Special Practices

- Access to the laboratory is controlled when work is being conducted.
- The laboratory supervisor is responsible for ensuring that laboratory personnel demonstrate proficiency in standard microbiological practices and techniques for working with agents requiring BSL-2 containment.
- Laboratory personnel are provided medical surveillance, as appropriate, and offered available immunizations for agents handled or potentially present in the laboratory.
- Properly maintained BSCs or other physical containment devices are used, when possible, whenever:
 - Procedures with a potential for creating infectious aerosols or splashes are conducted. These include pipetting, centrifuging, grinding, blending, shaking,

mixing, sonicating, opening containers of infectious materials, inoculating animals intranasally, and harvesting infected tissues from animals or eggs.

- High concentrations or large volumes of infectious agents are used. Such materials may be centrifuged in the open laboratory using sealed rotors or centrifuge safety cups with loading and unloading of the rotors and centrifuge safety cups in the BSC or another containment device.
- If it is not possible to perform a procedure within a BSC or other physical containment device, a combination of appropriate personal protective equipment and administrative controls are used, based on a risk assessment.
- Laboratory equipment is decontaminated routinely; after spills, splashes, or other potential contamination; and before repair, maintenance, or removal from the laboratory.
- A method for decontaminating all laboratory waste is available (e.g., autoclave, chemical disinfection, incineration, or other validated decontamination method).
- Incidents that may result in exposure to infectious materials are immediately evaluated per institutional policies. All such incidents are reported to the laboratory supervisor and any other personnel designated by the institution. Appropriate records are maintained.

Safety Equipment (Primary Barriers and Personal Protective Equipment)

- Protective laboratory coats, gowns, or uniforms designated for laboratory use are worn while working with hazardous materials and removed before leaving for non-laboratory areas (e.g., cafeteria, library, and administrative offices). Protective clothing is disposed of appropriately or deposited for laundering by the institution. Laboratory clothing is not taken home.
- Eye protection and face protection (e.g., safety glasses, goggles, mask, face shield or other splatter guard) are used for manipulations or activities that may result in splashes or sprays of infectious or other hazardous materials. Eye protection and face protection are disposed of with other contaminated laboratory waste or decontaminated after use.
- The risk assessment considers whether respiratory protection is needed for the work with hazardous materials. If needed, relevant staff are enrolled in a properly constituted respiratory protection program.
- In circumstances where research animals are present in the laboratory, the risk assessment considers appropriate eye, face, and respiratory protection, as well as potential animal allergens.

Laboratory Facilities (Secondary Barriers)

- Laboratory doors are self-closing and have locks in accordance with the institutional policies.
- Laboratories have a sink for handwashing. It should be located near the exit door.
- An eyewash station is readily available in the laboratory.
- The laboratory is designed so that it can be easily cleaned.
 - Carpets and rugs in laboratories are not appropriate.
 - Spaces between benches, cabinets, and equipment are accessible for cleaning.
- Laboratory furniture can support anticipated loads and uses.
 - Benchtops are impervious to water and resistant to heat, organic solvents, acids, alkalis, and other chemicals.

- Chairs used in laboratory work are covered with a non-porous material that can be easily cleaned and decontaminated with appropriate disinfectant.
- Laboratory windows that open to the exterior are not recommended. However, if a laboratory does have windows that open to the exterior, they are fitted with screens.
- Illumination is adequate for all activities and avoids reflections and glare that could impede vision.
- Vacuum lines in use are protected with liquid disinfectant traps and in-line HEPA filters or their equivalent. Filters are replaced, as needed, or are on a replacement schedule determined by a risk assessment.
- There are no specific requirements for ventilation systems. However, the planning of new facilities considers mechanical ventilation systems that provide an inward flow of air without recirculation to spaces outside of the laboratory.
- BSCs and other primary containment barrier systems are installed and operated in a manner to ensure their effectiveness.
 - BSCs are installed so that fluctuations of the room air supply and exhaust do not interfere with proper operations. BSCs are located away from doors, windows that can be opened, heavily traveled laboratory areas, and other possible airflow disruptions.
 - BSCs can be connected to the laboratory exhaust system by either a canopy connection (Class IIA only) or directly exhausted to the outside through a hard connection (Class IIB, IIC, or III). Class IIA or IIC BSC exhaust can be safely recirculated back into the laboratory environment if no volatile toxic chemicals are used in the cabinet.
 - BSCs are certified at least annually to ensure correct performance.

Biosafety Level 3 facility design and practices are covered in UCF's separate BSL-3 manual.

Appendix D: References in This Manual and Additional Resources

UCF Environmental Health and Safety ([Environmental Health and Safety Homepage](#))

- [Biological Safety](#)
- [Contacts](#)
- [EHS Policies and Procedures](#)
- [UCF Alert System](#)
- [UCF Respiratory Protection Program](#)
- [UCF Controlled Substances Procedures](#)
- [Office of Emergency Management](#)

Forms Available:

- [Biological Agent Registration Application](#)
- [Incident Report Form](#)

UCF Manuals:

- [Bloodborne Pathogens Exposure Control Plan](#)
- [Laboratory Safety Manual](#)

[Biosafety in Microbiological and Biomedical Laboratories, 6th edition](#)

Other Health Services Resources:

- [AmeriSys](#)
- [UCF Student Health Services](#)

Lists of Government Agencies and Influential Bodies:

- [American Biological Safety Association](#)
 - [American Biological Safety Association Risk Group Database](#)
- [Center for Disease Control](#)
- [Department of Agriculture](#)
 - [APHIS Home Website](#)
- [Department of Transportation](#)
 - [Hazardous Materials Table](#)
- [Drug Enforcement Administration](#)
 - [The Controlled Substances Act](#)
- [Federal Select Agent Program](#)
 - [List of Federal Select Agents and Toxins](#)
- [Florida Department of Environmental Protection](#)
- [Florida Department of Health](#)
 - [Administrative Code Chapter 64E-16 Regulations on Biomedical Waste](#)
- [International Air Transportation Association](#)
- [National Institutes of Health](#)
 - [NIH Guidelines on the Use of Recombinant DNA in Research](#)
- [Occupational Health and Safety Administration](#)
 - [OSHA 29 CFR 1910.1030 Regulations on Bloodborne Pathogens](#)
- [World Health Organization](#)
 - [World Health Organization Biosafety Manual](#)

Helpful Resources for Permitting Information (Consult the EHS)

- [CDC Permitting Information](#)
- [USDA Import/Export Permitting](#)