



Biosafety Program

Florida Institute of Technology
Environmental Health & Safety
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REVISION HISTORY

Revision Number	Revision Date	Revised By	Description of Change
00	2019-09-17	Charles Cherrito	Initial plan creation and implementation.
01	2020-12-10	Charles Cherrito	Annual Review
02	2021-01-19	Charles Cherrito	Annual review and updated responsibilities.
03	2021-03-09	Charles Cherrito	Updated verbiage on moving BSC's—Page 4.
04	2022-07-12	Charles Cherrito	Annual review. Update UV lamp standards.
05	2023-09-05	Charles Cherrito	Periodic Review. Minor edits.

INTRODUCTION

Florida Institute of Technology (Florida Tech) is committed to providing a safe and healthy environment. The goal of the Institute's biosafety program is to protect the researchers, staff and students from exposure to infectious agents, to prevent environmental contamination, to enhance the research atmosphere, and to comply with federal, state and local regulations.

The Biosafety Program is under the direction of the Biosafety Officer in the Department of Environmental Health and Safety (EH&S), and Florida Tech's Institutional Biosafety Committee (IBC). This program provides the university with safety guidelines for those working with biohazards and outlines general policies and procedures for the use and disposal of infectious or potentially infectious materials.

Laboratories must comply with the biological safety practices and procedures outlined in the Biosafety Program.

PROGRAM CONTACTS

EH&S Director: [x7715 \(321-674-7715\)](tel:3216747715)

Biosafety Officer: [x8881 \(321-674-8881\)](tel:3216748881)

Life Threatening: [911](tel:911)

Campus Security: [x8111 \(321-674-8111\)](tel:3216748111)

Campus Facilities: [x8038 \(321-674-8038\)](tel:3216748038)

RESPONSIBILITIES

Environmental Health and Safety (EH&S)

EH&S provides services, advice, and compliance assistance to ensure employees, students, and visitors follow safe work practices when working in research laboratories. The Biosafety Program within EH&S monitors and audits for compliance and is designed to assist PIs and laboratory personnel in the selection of safe laboratory controls and practices that will ensure a safe working and learning environment. The Biosafety Officer (BSO) develops and conducts appropriate training programs to promote techniques for the safe handling and disposal of potentially infectious and other biohazardous materials. The BSO may work in conjunction with the Institutional Biosafety Committee (IBC) to approve the use of infectious agents, other biohazardous materials such as recombinant/synthetic DNA usage on campus.

Deans/Department Chairs

Deans/Department Chairs are responsible for the implementation of safe practices and procedures in their schools or departments. They should be aware of and approve all research conducted under their purview. They must ensure departmental compliance with applicable laws, regulations, and guidelines covering the use of biological hazards in their facility.

Employees/Students

Employees/Students are responsible to comply with safety guidelines and procedures required for the tasks performed and to report unsafe conditions to the PI, lab supervisor, or EH&S. They must seek guidance from their PI, lab supervisor, or EH&S when they are uncertain how to handle, store, or dispose of any chemical/biological/radiological material. They should not begin working in the laboratory until all technical and safety trainings have been completed.

Principal Investigator (PI) Responsibilities

The ultimate responsibility is placed on the Principal Investigator (PI) due to their in-depth knowledge of their research, relationship with their staff, and physical presence within the laboratory. Each PI must ensure their research staff complies with all federal, state, local regulations, and Florida Tech policies in addition to publications depicting industry standards for scientific research in addition to all laboratory staff being informed as to the hazards involved.

The below bullets fall under the PI's responsibility:

❖ **PERSONAL PROTECTIVE EQUIPMENT (PPE)**

PI's must provide their laboratory personnel with the necessary PPE (at no cost to them) to mitigate occupational exposure and must always ensure the PPE is readily available.

❖ **LABORATORY INSPECTIONS**

All laboratories are subject to inspections by EH&S or any external entities either announced or unannounced. Circumstances may warrant more frequent audits (incident reports, non-compliance, facility updates, etc.) than what is considered typical. The PI must adhere to inspection requirements as dictated by an inspection report/visit.

❖ **PERSONNEL TRAINING**

PI's must ensure their research staff are properly trained in the hazards associated with the research being conducted. Whenever accidents or incidents occur, the PI must consider whether re-training or more in-depth training is needed.

❖ **LABORATORY SAFETY PLAN**

PI's that operate in all Biosafety Levels must develop **site specific** Biosafety Manual. This manual should include safety procedures and SOPs for their laboratory and train all laboratory personnel on its contents. Plans must be reviewed regularly and shall be updated upon any change in status stated of the research that would impact its contents. The PI must include research personnel in the review process to ensure they are kept up to date to the most current procedures.

❖ **SDS DOCUMENTS**

Safety Data Sheets - SDS (formally MSDS) documents must be readily available to all research staff regarding all chemical or drug hazards associated with the research being conducted. Additional information regarding chemical safety can be found here:

<https://www.fit.edu/office-of-environmental-health-and-safety/chemical-safety/>

❖ **EQUIPMENT MAINTENANCE AND/OR CERTIFICATION**

PI's must ensure the equipment they are utilizing remains in good operating, safe order, and is tested for performance regularly whenever personnel or the environment is a factor. (e.g., all BSC's shall be certified at least annually). Additionally, EHS must be notified prior to a BSC being moved and whenever a BSC is expected to be utilized for the first time.

UNDERSTANDING BIOHAZARDS



What is a biohazard

A biohazard is an agent or material of biological origin that has the capacity to pose risk to human health (the risk may also impact with agriculture and the environment).

Some examples of biohazards include:

Blood	Viruses	Bacteria	Fungi	Parasites	Human Cells	Animal Cells	Recombinant DNA
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Hazard Categories

Florida Tech recognizes three types of hazards from a biosafety standpoint. Each hazard poses its own risks and may contain multiple sub-hazards that are associated with each category.

➤ **Biological Hazards**

Infectious agents that may be experimentally introduced, indigenous, or zoonotic (includes rDNA and bloodborne pathogens).

➤ **Chemical & Drug Hazards**

Carcinogens, mutagens, teratogens, toxins, chemotherapeutic drugs, and anesthetic gases.

➤ **Radiological Hazards**

Radiological isotopes, x-ray devices, or any material that emits radiation.

What is Biosafety?

In its broad sense, biosafety is both the development and implementation of laboratory practices that help eliminate or reduce the risks associated with pathogenic microorganisms & potentially infectious materials.

Individuals must understand that appropriate laboratory practices (e.g., aseptic techniques) *combined* with proper PPE, safety equipment, hazard containment, hazard communication, and facility design all ensure a successful biosafety program.



ALL INDIVIDUALS have the responsibility to foster a safe laboratory environment!

Additional Hazards

Examples of additional hazards found in the laboratory environment include:

Needle Sticks	Open Flames	Latex Products
Generation of Aerosols	Centrifugation	Gaseous Vapors
Animal Bites & Scratches	Slips, Trips & Falls	Contaminated Bedding
Burns (autoclave, cage wash)	Electrical Shock	Ultraviolet Light
Chemical Burns	Mixing Chemicals	Mouth Pipetting (prohibited)
Metabolite Shedding	Animal Allergens	Broken Glass

Although the above sources of hazards are important to eliminate, aerosols have a high potential for causing pulmonary infection. The following are instances that may lead to the production of aerosols:

- ✓ Pouring of infected liquids
- ✓ Mixing a fluid culture with a pipette
- ✓ Using high speed mixing devices (vortex mixers)
- ✓ Dropping a tube or flask of liquid culture
- ✓ Centrifugation of liquid suspensions
- ✓ Using uncapped carriers or rotors during centrifugation
- ✓ Disturbing animal bedding containing urine, feces and/or dander

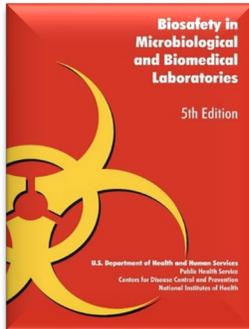
General Safety Precautions & Procedures

The below describes additional safety practices that shall be practiced. Any deviation from the below shall be approved by EH&S following a fully executed Hazard Risk Assessment.

- ✓ Infectious material shall be transported inside a durable, leak-proof container.
- ✓ Spills that result in overt or potential exposure (over 500ml) of infectious material are immediately reported to EH&S.
- ✓ Animals and plants not related to work being conducted are prohibited within the laboratory.
- ✓ Eating, drinking, storage of human food or drink, smoking, handling contact lenses, applying cosmetics, and chewing gum are prohibited within laboratories.
- ✓ Mouth pipetting is prohibited.

REGULATIONS, GUIDELINES, AND REFERENCES

Laboratory workers are strongly encouraged to have a full understanding as to the most current regulations and industry standards regarding acceptable research conduct. In-depth knowledge of professionally adopted practices will allow individuals to foster safe laboratory environment more effectively at the same time satisfying any federal, state, or local requirements.



Biosafety in Microbiological and Biomedical Laboratories (BMBL)

The [BMBL](#) is a nationally recognized publication by the Centers for Disease Control & Prevention (CDC) and National Institutes of Health (NIH) describing the basic standards for research practices. Although the publication is a guidance document (as a whole), many portions are mandatory per other regulatory documents. Florida Tech takes the position that the entire document is mandatory and will serve as the baseline for research practices unless the PI shows sound justification to state otherwise.



Select Agent Regulations

The Centers for Disease Control & Prevention (CDC) within the US Department of Health and Human Services (HHS) regulates the possession, use, and transfer of [Select Agents & Toxins](#) by means of 42CFR73.

NIH Guidelines

The [NIH Guidelines](#) are regulations published by the NIH Office of Science Policy describing the Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules. The publication is entitled, *NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules*.





The Occupational Safety & Health Administration (OSHA)

OSHA regulates the safe handling of human material known or not known to be infected with pathogens within the workplace. KUMC has adopted the [OSHA Bloodborne Pathogens Standard](#) as the standard for working with human material.

Guide for the Care and Use of Laboratory Animals (*The GUIDE*)

An NIH publication, [The GUIDE](#) standard outlines appropriate animal research practices and discusses occupational health concerns for animal users.



American Biological Safety Association (ABSA)

ABSA is a private, non-regulatory organization that is respected worldwide as the premier reference for education and guidance regarding biological safety. In fact, many organizations treat the material they publish as mandatory standards. Their website contains a [“Risk Group Database”](#) that allows individuals to educate themselves as to the proper biosafety level and/or risk group level for bacteria, viruses, fungi, and parasites.

Florida Tech Environmental Health & Safety (EH&S)

The EH&S office helps identify biological, chemical, physical, and radiological hazards to assist in mitigating potential exposures associated with scientific research. The goal of the EH&S office is to assist researchers in maintaining a safe laboratory environment.

<https://www.fit.edu/office-of-environmental-health-and-safety/>

IBC

Institutional Biosafety Committee (IBC)

The Institutional Biosafety Committee (IBC) is charged to formulate policy and procedures related to the use of recombinant/synthetic DNA (rDNA). As mandated by the [National Institutes of Health](#), experiments involving human gene transfer, formation of transgenic animals and the generation of rDNA or synthetic nucleic acid molecules must be reviewed and approved by the IBC. There are certain experiments that are exempted from NIH guidelines, but these low-risk projects must still be registered with the IBC, so the committee can keep track of rDNA protocols on campus. In addition, the IBC may also play a role in approving experiments that involve biohazardous agents, which includes, human pathogens, viruses, and biological toxins.



Institutional Animal Care & Use Committee (IACUC)

Per the Animal Welfare Act, institutions performing animal research must have an IACUC to oversee animal care and use standards. The [IACUC](#) reviews all Animal Care and Use Protocols (ACUPs) to ensure animal welfare is not in jeopardy. Additionally, they also consider occupational health of animal users.

Radiation Safety Committee (RSC)

All projects that involve radioactive materials must be approved through the [Radiation Safety Committee](#).



Human Subjects Committee (HSC)

All projects that involve human research or the acquisition of patient samples must be approved by the [Institutional Review Board \(IRB\)](#).

BIOSAFETY LABORATORY LEVELS

The BMBL categorizes laboratories into four different biosafety levels (BSL). Various factors play a role in the determination of the BSL (e.g., route of exposure, pathogenicity and/or treatment options). Corresponding to each “Biosafety Level” (*in-vitro*) is an “Animal Biosafety Level” (*in-vivo*) represented by ABSL-1, ABSL-2, ABSL-3, and ABSL-4. Unless stated otherwise, this plan will use the term “BSL” to represent both BSL and ABSL conditions.

At times, laboratories may voluntarily (or be required) to conduct work with some practices being “enhanced” to a higher risk biosafety level. For example: research involving a particular pathogen may only be required to use BSL-2 practices by the nature and definition of the pathogen, but depending on the research details, may require a BSL-2 facility with *enhanced* practices (usually PPE, lab security, or waste disposal) that would be indicative of a BSL-3 environment. There are also scenarios in which the BSL for a project may be reduced (e.g., work with an attenuated strain).

Biosafety Level 1 (BSL-1)

BSL-1 is appropriate for projects in which work is done with defined and characterized strains of viable microorganisms not known to consistently cause disease in healthy adult humans. Examples include: *Bacillus subtilis*, *Nigeria gruberi*, infectious canine hepatitis virus, exempt organisms under the *NIH Guidelines* and the nonpathogenic strain of *E. coli*.

Biosafety Level 2 (BSL-2)

BSL-2 is appropriate for a broad spectrum of indigenous moderate-risk agents that are present in the community and associated with human disease of varying severity. Additionally, routes of exposure (usually aerosol) are limited. Examples include: Hepatitis B virus, HIV, *Salmonella*, *Toxoplasma*, and most human material (e.g. cancer cell lines, tissue culture, or blood).

Biosafety Level 3 (BSL-3)

BSL-3 is appropriate for work with indigenous or exotic agents with a potential for respiratory transmission, and which may cause serious or potentially lethal infection. Examples include: *Mycobacterium tuberculosis*, *Coxiella burnetii*, and *Bacillus anthracis*.

SPECIAL NOTE: BSL-3 work is currently prohibited at Florida Tech.

Biosafety Level 4 (BSL-4)

BSL-4 is appropriate for work with dangerous and exotic agents that pose a high individual risk of life-threatening disease, which may be transmitted via the aerosol route and for which there is no available vaccine or therapy. Examples include: viruses such as Marburg, Congo-Crimean hemorrhagic fever and Ebola.

SPECIAL NOTE: BSL-4 work is currently prohibited at Florida Tech.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Inevitably, some form of PPE is necessary and required for laboratory workers. Depending on the biosafety level and other factors, a proper risk assessment may help determine the PPE required to effectively mitigating occupational exposure.

Gowns

Disposable, fluid resistant, solid-front gowns are the most effective and offer the best protection. Most gowns can be reused after a visual inspection to ensure no overt contamination has occurred but should be disposed of after multiple uses. Cloth lab coats are *strongly discouraged* unless regular laundry practices are performed.



Bouffant Caps



Ideally, bouffant caps are disposable, fluid resistant hair covers that protect the user from contamination in the cranial region. They are placed over the head covering all hair and ears. Bouffant caps can be reused after a visual inspection indicates no overt contamination.

Eyewear or Face Shields

Eyewear and/or face shield protection can effectively protect the user from splashes or debris from entering the eyes. Face shields offer more line of protection extending the protected area to the entire face and sometimes even the neck area. They are usually non-disposable and should be disinfected after each use.



Shoe Covers

Shoe covers are disposable fluid resistant covers that are placed over shoes or clogs. They should also be slip resistant and be of appropriate size as utilizing incorrect sizes will result in tearing of the covers exposing shoes or may become a trip hazard.



Surgical Gloves

Gloves are **never reused**. Workers are encouraged to double-glove. Using nitrile gloves vs. latex will help reduce risks associated with allergic reactions and may provide better protection due to hazard compatibility.



Surgical Masks



Surgical masks are a form of *minimal* respiratory protection (mainly debris that can be seen with the unaided eye or splashes), but they are NOT considered a respirator. They are designed to keep animals/samples free of pathogens from saliva and to protect users from gross dander/debris or splashes.

N-95 Respirator

N-95 particulate respirators are appropriate for some work involving BSL-2, enhanced BSL-2, or BSL-3 conditions. Use requires no facial hair between the seal and face. They are designed to be disposable. If you plan to utilize an N95 (required or voluntary), you must contact EH&S as there are specific federal requirements that are to be satisfied before wearing respirators.



Other Respirators

Other types of respirators may be required. These can vary in type, purpose, and protection. Contact EH&S if you require the use of such PPE.

- Powered Air Purifying Respirator (PAPR)
PAPR particulate units are battery operated devices acceptable for work involving BSL-2, enhanced BSL-2 or BSL-3 conditions or in circumstances in which allergic reaction to animal dander is a hazard for any biosafety level.
- Half-Face or Full-Face Units

Surgical Scrubs & Clogs

Scrubs and clogs *may* be required to be worn under disposable PPE when working with live organisms, infected cultures, or infected animals for BSL-2 (or BSL-3) conditions, although individuals may voluntarily choose to do so for BSL-1 conditions as well.



SPECIAL NOTE 1:

PPE is not to be worn outside the laboratories. However, wearing a glove on one hand (“one hand method”) when traveling short distances between rooms with biohazard materials may be an option after consulting with EH&S.

SPECIAL NOTE 2:

Utilization of respiratory equipment requires a medical evaluation clearance, training, and fit testing. You must contact EH&S to initiate the process. The Florida Tech’s [Respiratory Protection Program](#) details requirements.

GENERAL HOUSEKEEPING & MAINTENANCE

Maintaining an organized and clean laboratory is essential to mitigating injuries. General upkeep and cleanliness of the laboratory is the responsibility of all laboratory workers. If maintenance is required, in which laboratory workers are incapable of performing, they are to contact the Florida Tech Facilities Department.

General Laboratory Personnel Tasks

- ✓ Surface decontamination of BSC's, counter-tops, and equipment after each use.
- ✓ Floors are to be swept of gross debris and mopped if necessary.
- ✓ Lighting is to be adequate, and outages are to be reported to the Facilities Department.

Regular Waste vs. Biohazard Waste

Researchers must understand that all biohazard waste (*regulated* waste) differs from regular non-infectious waste, in that, regular waste (commonly called “trash”) is not expected to harbor material that may cause disease or illness and thus, is treated as non-hazardous.



Regular Waste is disposed of through a third-party contractor. As personnel from this contractor enter the labs, researchers are required to maintain a safe environment to alleviate injuries of non-laboratory workers.



Solid Biohazard Waste is disposed of through EH&S. Red biohazard containers are provided for each laboratory. These barrels are to be lined with red biohazard bags (also provided). Upon the barrel being full, the researcher is to notify EHS by completing a [“Biomedical Waste Pick-up Form”](#). EH&S will pick-up the full bag and provide the lab with a new liner.

Examples of Potential **SOLID** Biohazardous Waste:

- ✓ Consumables (gloves, paper towels, wipes)
- ✓ Culture/petri dishes/plates/tubes—e.g., falcon and/or centrifuge
- ✓ Streakers
- ✓ Animal carcasses
- ✓ Unpreserved specimens
- ✓ Biohazardous sharps containers
- ✓ Any solid material containing human blood, tissue, and bodily fluids
- ✓ Plastic pipettes/pipette tips



Liquid Biohazard Waste should be collected in a container so that it can be appropriately treated before disposal into the regular sewer or drain. A 10% bleach solution is sufficient. This treatment consists of at least 30-min contact time. After disinfected, it may be discarded down the general laboratory drain.

Examples of Potential **LIQUID** Biohazardous Waste:

- ✓ Liquid media/cultures

SPECIAL NOTE:

Do not dispose of non-biohazardous material in any biohazardous bin.



Uncontaminated Glassware

Plastic-ware should be used whenever possible rather than glassware. Broken glassware should be picked-up by using a brush and dustpan and then placed into a broken glass bin.

Non-hazardous broken glass should be placed in a broken glass container. Never use biohazard bags to line these containers.

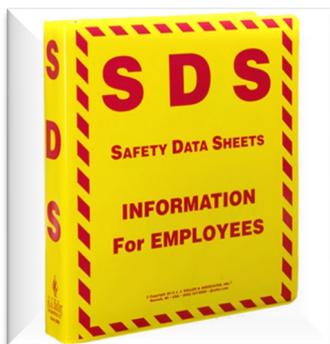
Examples of normal lab glassware that can be disposed in this manner may include empty glass containers, glass pipettes, microscope slides/coverslips, and broken beakers or flasks. Upon being full, a third-party vendor will remove the containers. Each department is responsible for maintaining an inventory of glass-boxes.

CHEMICAL USAGE

Hazard Communication

Florida Tech's Chemical Hygiene Plan is the main reference for use with chemicals, however, this Biosafety Plan will briefly discuss chemical usage.

If personnel use hazardous chemicals, they are required to take Hazard Communication and Resource Conservation & Recovery Act (RCRA) trainings.



Safety Data Sheets (SDS)

SDS's (formally known as Material Safety Data Sheet (MSDS)) are documents that allow individuals to gain a better understanding of the chemical or drug hazard they are working with. Each SDS is required to be reviewed prior to using the hazardous chemical or drug. All laboratory workers must have access to Safety Data Sheets (SDS), readily available regarding all chemicals pertaining to their research.

Note: it is the responsibility of the PI to ensure these SDS's are made readily available to all personnel involved in their research projects.

Chemotherapeutic Drugs

Chemotherapeutic drugs (commonly called, "Chemo Drugs") are a growing portion of today's research. PIs are required to inform users as to the hazards from handling these drugs. Metabolic factors, animal feces, urine, and dander all play a role as vectors for transferring hazards. Enhanced equipment and lab practices may be required for individuals working with hazardous drugs.

DECONTAMINATION PROCEDURES

Routine decontamination of equipment may be required at times. It's imperative that the researcher has an understanding as to the type of disinfectant they are using and its efficacy regarding the agent(s) that encompass their projects. Additionally, using improper methods for decontamination could result in injury, death, and equipment malfunction or damage.

Types of Decontaminations

Surface Decontamination

Scenarios in which low exposure risks are associated, surface decontamination is acceptable using 70% alcohol, 10% bleach solution, or other approved chemicals. A minimum contact time of 30 minutes shall be allowed for an effective kill.



Gas Decontamination

Scenarios in which moderate or high exposure risks are associated, gas decontamination of equipment or rooms may be required. This may include pyrolysis of paraformaldehyde or hydrogen peroxide vapors. Gas decontaminations must be approved by EH&S.



Autoclave Decontamination

Heat/steam sterilization is an effective tool for rendering material pathogen free. The PI must ensure that all employees /students who are tasked with using an autoclave must be trained prior to using the equipment.

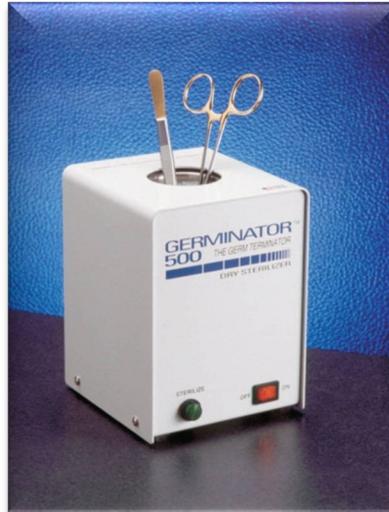
Chemical Submersion Decontamination

Certain items (e.g., broth, culture plates or flasks) can have liquid disinfectants placed into them for disinfection. Some items (e.g., scissors) can be submerged into disinfectants for an effective kill. Care must be taken to ensure the chemical being used does not damage the equipment.



Glass-Bead Sterilization

Glass-bead sterilization is a very effective method for rendering some items sterile. This method has limitations as due to the logistics (bead unit size and heat), therefore, not all items can be subjected to this type of decontamination.



Loop Sterilizers

Loop sterilizers are used to sterilize inoculating loops, tube mouths and needles by using infrared heat. These safeguard the laboratory personnel and decrease the risks associated with using an open flame. However, researchers should be made aware that, due to the heat emitted, these units can alter the airflow within biosafety cabinets.



Ultraviolet Light (UV) Decontamination

UV light can be an effective **SECONDARY METHOD** for rendering items free of infectious materials, but it shall be used as only a secondary method and not the primary source. Additionally, the lamp output should not be less than 40 microwatts per square centimeter at a wavelength of 254 nanometers.

SPECIAL NOTE:

The premier reference guide for biosafety practices (BMBL) discourages the use of UV lights as a *primary source* of decontamination (specifically in BSC's). See the below excerpt:

UV Light Use (page 385, BMBL)

Ultraviolet (UV) lamps should not be used as the sole disinfection method in a BSC. If installed, UV lamps should be cleaned regularly to remove any film that may block the output of the lamp. The lamps should be evaluated regularly and checked with a UV meter to ensure that the appropriate intensity of UV light is being emitted. Replace the bulb when the fluence rate is below 40 $\mu\text{W}/\text{cm}^2$. Unshielded UV lamps must be turned off when the room is occupied to protect eyes and skin from UV exposure. If the cabinet has a sliding sash, close the sash when operating the UV lamp. Most new BSCs use sliding sashes that are interlocked when operating the UV lamp to prevent exposure.

SAFE HANDLING OF SHARPS

Items capable of penetrating the skin are considered a hazard and must be handled appropriately.

Sharps Categories

- ❖ The following items are always considered sharps hazards; therefore, they must be placed in a sharp's container. These include needles, syringes containing needles, vacutainers, and attached tubing as well as blades (razors, scalpels, exacto, etc.).
- ❖ The following items must be placed in a red biohazard sharps container if they are contaminated with biohazardous material: broken glassware, glassware with sharp edges or points, and glass slides.



Standard Operating Procedures

The general rules shall be implemented below. Any deviations must be authorized by EHS.

- ❖ Needles shall not be recapped, bent, sheared, broken, removed from disposable syringes, or otherwise manipulated by hand prior to disposal (*see note below*).
- ❖ Sharps items or containers are never discarded inside regular trash. If sharps items are found in regular trash, label the trash “**SHARPS**” and notify EH&S immediately.
- ❖ Sharps items contaminated with radioactive isotopes or hazardous chemicals are placed inside a separate sharp's container for disposal by EH&S.
- ❖ Sharps containers shall be easily accessible and close to the immediate area where sharps are used or generated.
- ❖ Unless otherwise specified, all sharps' containers will be comprised of the following:
 - ✓ Puncture resistant and Leak-proof on sides and bottom.

Re-capping Needles

Although it is common practice to require or suggest needles are never to be re-capped, both OSHA and the CDC recognize that there are times in which re-capping may be warranted for the task being performed. Some examples of re-capping methods that *may* be acceptable include:

- ❖ Utilizing self-sheathing needles
- ❖ Performing the one-hand scoop
- ❖ Utilizing forceps as a mechanical means

Only a properly executed risk assessment can determine if re-capping is warranted, and if so, what method is best suited. Any employee who feels re-capping is necessary to perform their task **MUST** contact EH&S prior so that a risk assessment can be performed. **Re-capping without a risk assessment being conducted is strictly prohibited!**

BIOHAZARD SPILLS

Biological Spill Kits

Laboratories that work with biohazardous material must make or purchase and store a biological spill kit. A prepared spill kit will allow for a more effective and safer clean up and will ensure each area that contains biologic material is better prepared for a spill. A good kit should include the following:

- ✓ Gown
- ✓ Gloves
- ✓ Eyewear
- ✓ Mask
- ✓ Kitty Litter
- ✓ Whiskbroom
- ✓ Paper Towels
- ✓ Dustpan
- ✓ Household Bleach/Chemical Germicide
- ✓ Biomedical Waste Red Bags
- ✓ Sharps Container

Biological Spills

Biohazard spills can potentially be a danger to human life. Therefore, taking the proper steps to contain and render the spill of harm is vital to preventing exposure. Lab personnel may contain and clean up the spill providing the following is satisfied:

- The appropriate PPE is available;
- The proper spill cleanup materials are available;
- The personnel involved have received Bloodborne Pathogens Training.

The following procedure shall be implemented upon a spill:

1. Notification to personnel in the immediate area that a spill has occurred;
2. A sign indicating that a spill has occurred is placed on the entrance of the area;
3. Personnel will don appropriate PPE;
4. Sharps material involved in the spill shall be removed;
5. The spill area is saturated with 10% bleach solution for a minimum contact time of 30-minutes;
6. All contaminated materials shall be disposed in red bio-hazard bags;
7. Any equipment used to clean up spills (e.g. mops, etc.) must be either decontaminated with the appropriate germicide or disposed in biohazard bags;
8. All non-reusable PPE used shall be disposed in biohazard bags;
9. EH&S is contacted for biomedical waste disposal;
10. A Safety Incident Report is to be completed by the personnel involved (or representative);
11. EH&S reviews the incident report, addressing any safety concerns.

SHIPPING BIOLOGICAL MATERIALS

Shipping biological materials involves inherent dangers. Multiple events can occur, all of which, have the potential to expose human, animals, or agriculture products to infectious materials that may cause illness, death, or crop devastation. Transportation accidents, accidental loss, incorrect destination delivery, and malicious theft all can result in hazardous exposure. For these reasons, there are multiple regulations and governing bodies that strictly mandate and oversee all shipments (ground, air, marine, and rail).

Any biological material being shipped outside of Florida Tech shall be shipped per the U.S. Department of Transportation's (DOT's) Hazardous Materials Regulations (HMR; [49 CFR Parts 171-180](#)). You may contact EHS for guidance on both training and shipping such material.



HAZARD RISK ASSESSMENT

In order to help prevent accidents or illnesses, a proper Hazard Assessment must be conducted. This is one of the most important aspects to safety.

The Occupational Safety & Health website provides links to numerous templates for initiate a Workplace Hazard Assessment. This form, after submission, will be reviewed by EH&S and we will provide advice and assistance to personnel in order to ensure they understand the hazards involved as well as practices to implement to avoid risk.

<https://www.fit.edu/office-of-environmental-health-and-safety/occupational-safety--health/>

PEST CONTROL

This section establishes the practice for the detection of insect and rodent (vermin) infestation and the process for insect and rodent control. All personnel are responsible for reporting of insect, rodent, or other vermin presence.

Detection of Pests

Signs of rodents include feces on the floor, sighting of a rodent and/or the presence of a rodent “nest”. Signs of insects include sighting an insect on the floor, in flight and/or the presence of carcasses. If any signs of rodents or insects are observed in the laboratory. Personnel should contact the Facilities Department for pest eradication.



EQUIPMENT OPERATION

This section describes procedures for the safe operation of equipment that, although may help contain infectious agents, may potentially be a vector for exposing hazardous materials to laboratory workers. All equipment shall be decontaminated regularly to reduce the risk of cross-contamination.



Centrifuges

Centrifugation can create aerosols. All swinging-bucket centrifuge rotors shall have bucket covers with safety seals. All fixed-angle centrifuge rotors shall have rotor covers with seals. Any centrifuge lacking these safety features must be operated within a BSC.



Incubators

Incubators usually do not generate aerosols but may accumulate residues that contain bacteria. All culture or experimental plates should be placed in a leak-proof secondary container for transport.



Autoclaves

Items containing chlorine (bleach), (para) formaldehyde, volatile chemicals or radioactive materials are not to be autoclaved. Researchers shall utilize only autoclavable biohazard bags. Autoclaved waste is placed into red biohazard bins for disposal. All individuals that utilize autoclaves require training.

Quality Control

Autoclave (steam sterilization) indicator tape is attached to each bag prior to loading. Additionally, biological indicators should be exposed to a complete autoclave cycle on a quarterly basis and documented.



Troubleshooting

Personnel should always check the cycle print-out to ensure the cycle reached the appropriate temperature for the appropriate duration. If the print-out indicates a cycle failed, the user should try and start another cycle from the dirty side. If the cycle fails again, notify your department's contact.

Reference

Autoclaves use saturated steam under pressure of approximately 15 pounds per square inch to achieve a chamber temperature of at least 250°F (121°C) for a prescribed time—usually 30–60 minutes.

<https://www.cdc.gov/infectioncontrol/pdf/guidelines/disinfection-guidelines-H.pdf>

<https://www.cdc.gov/infectioncontrol/guidelines/disinfection/tables/table7.html>

PRIMARY CONTAINMENT DEVICES

Although this section will not cover all aspects of every device, it will give the user a basic understanding of the proper use and purpose for each unit.

The word “hood” is frequently used to describe devices that protect the product or personnel from hazards. It must be understood that this word is often used in the incorrect context and should be avoided. Devices may look similar and even operate in similar fashion but may be two ***completely different types*** of units designed for two ***completely different types*** of practices. For example: a laminar flow hood and a chemical fume hood are both “hoods” but serve two completely different purposes and if used interchangeably can cause injury or even death. If an individual is unaware as to how to use a device, what purpose it serves, or which device to purchase, they are encouraged to contact EH&S. All devices must be certified at least annually by an EH&S approved vendor. Below are “general” and “basic” images of the four devices this plan will discuss.



Chemical Fume Hood



Laminar Flow Hood



Animal Cage Changing Station



Biological Safety Cabinet

Chemical Fume Hoods

Chemical fume hoods are designed to be utilized for reducing chemical exposure to personnel when hazardous chemicals, gases or drugs are involved. Chemical fume hoods offer **NO PRODUCT PROTECTION**, but rather personnel and environment protection only, therefore are NOT considered a “clean environment”. Airflow draws inward and is 100% exhausted to the outside by hard duct to the exterior environment. They *typically* do not contain exhaust filters.

Laminar Flow Hoods

Laminar flow hoods are HEPA filtered (99.97% efficient or better at 0.3 microns), devices designed for research that involves NO hazardous material. The units provide **NO PERSONNEL** protection, but rather product protection only. The term “clean bench” is often used to describe the laminar flow hood. They can have horizontal or vertical airflow.

Animal Cage Changing Stations

Cage changing stations are modified vertical HEPA filtered laminar flow units that provide the animal and *some* personnel protection. The personnel protection is limited to low risk biologics and allergens caused by animal dander or bedding (gross debris). Low risk hazards at low levels are safe to use if the user is practicing aseptic techniques.

Biological Safety Cabinets (BSC)

BSC's are designed for working with infectious agents and can literally save lives! It's important for users to understand they are typically very costly devices to purchase, maintain, service, and are **USELESS** if not utilized properly; therefore, ensuring they operate at optimal levels and that users are properly operating them is vital. They can also be utilized for cage changing. Only the Class II, Type B2 units are designed to be used with volatile chemicals or hazardous drugs.

Procedures involving infectious materials or infected animals are to be conducted within a BSC as they protect the product, personnel, and environment—making them the primary containment choice for most types of biological research. If a procedure cannot be performed within the BSC (e.g. use of a large instrument), a risk assessment must be performed by EH&S.

Individuals are strongly encouraged to utilize the BMBL or visit the websites of the preferred BSC manufactures ([Nuair](#), [Labconco](#) & [Baker](#)) for in-depth operation instructions, references, and educational schematics of BSC properties.

The “Do’s” of BSC’s

The below bullets are items that should be performed as a part of properly using a BSC:

- ✓ Let the BSC run for 5 minutes before utilizing.
- ✓ Perform procedures at least 4” inside the cabinet from the sash.
- ✓ Ensure the sash is at proper height.
- ✓ Disinfect the work surface after each use.

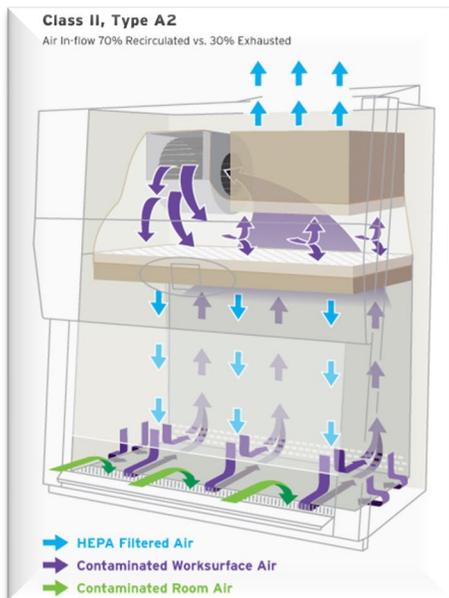
The “Don’ts” of BSC’s

The below bullets are items that shall be avoided as a part of properly using a BSC:

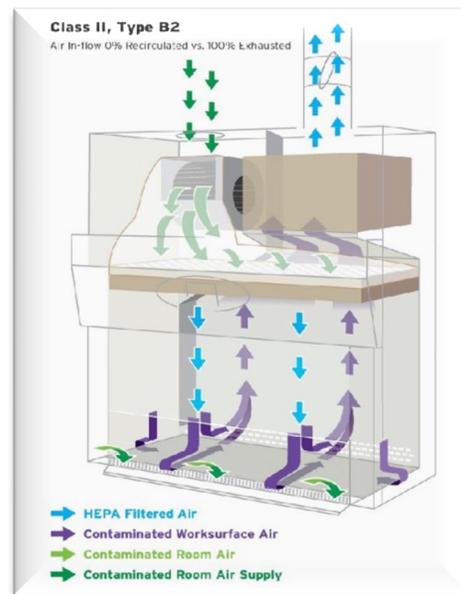
- ✓ Do not cover perforated slots.
- ✓ Do not perform rapid arm movement in/out of cabinet.
- ✓ Do not rely on UV lights for primary decontamination.
- ✓ Do not over-store items in BSC.
- ✓ Do not touch the HEPA filter.
- ✓ Do not use if unfamiliar sounds arise.

Below are typical schematics of Class II, Type A2 & B2 BSC’s (most common is A2 BSC’s). Although there are numerous differences, the fundamental safety difference is that 70% of the A2 cabinets air is recirculated back into the room while the B2 has zero recirculation; meaning the B2 cabinet is 100% exhausted to the outside of the room (known as “total exhaust”).

Class II Type A2



Class II Type B2



TRAINING OF PERSONNEL

Principle Investigators are responsible for ensuring all individuals working on their projects are adequately trained according to the specific hazards associated with each **project**. Additional training can be taken through the **Florida Tech** online **Training System**. The types of trainings required will depend on the hazard's personnel are potentially exposed to.

LABORATORY BIOSECURITY

An area often overlooked in research is Biosecurity. This must be considered for Florida Tech laboratories to protect vital research, human life, animal life, Florida Tech interests, and overall entity integrity. Each PI shall be responsible for the overall security of any physical location of infectious materials (this includes electronic data).

Laboratory Access

All labs shall have some sort of lockable barrier separating the lab from common public areas. Access into the labs shall be permitted by individuals with specific business associated with that lab or a university related task. The level of access restriction and the mechanisms used to restrict will depend on the hazards associated with the research. For example: BSL-1 environments will require less restrictive measures than that of BSL-2. Unless a door is kept open by an electric device that releases it during a fire alarm. All lab doors to outside corridors shall remain closed when not being used.

Visitors

Researchers are expected to make appropriate professional decisions regarding allowing visitors access into laboratories. Some visitors may require constant escort depending on the reason for the visit, the visitors comfort level, and nature of research being conducted. For example: a regular service provider performing maintenance on an autoclave in a BSL-1 or BSL-2 environment may be able to conduct business without an escort. On the contrary, a visitor from a local college wanting to visit Florida Tech for the first time for prospective career opportunities should always be escorted regardless of the biosafety level.

Packages

Packages containing specimens, bacterial, virus, or toxins shall be opened only in a BSC or fume hood. The package is to be inspected for damage or loss of material. Any discrepancies should be reported to EH&S and the PI immediately.

Incident Reporting

A vital aspect in maintaining integrity is the reporting of any event or individual that appears suspicious or is conducting unethical/dishonest behavior. All personnel are mandated to report any activity that places Florida Tech security measures at risk.

OCCUPATIONAL HEALTH

Occupational health is an important part of maintaining healthy laboratory workers and preventing injury/illness.

At-Risk Individuals

Although not required, workers with either a known immunodeficiency disease or are taking immunosuppressive medications are encouraged to self-identify to their supervisor any changes in their medical status that might compromise their immune system.

Although infectious agents can infect both sexes of humans, women have an added risk in that there are certain hazards that are potentially harmful to women who are pregnant or are at child-bearing age. Women are strongly encouraged to educate themselves of the risks involved within the lab and the research being conducted. Below are some hazards to consider:

- ✓ Chemotherapeutic hazardous drugs
- ✓ Mutagens
- ✓ Teratogens
- ✓ Drugs targeting rapidly dividing cells
- ✓ Non-human primate material & large animal ruminant material

Vaccines

PIs are required to offer to their research personnel preventative treatments (e.g. vaccines) they are made aware of regarding the specific hazards their project(s) involves. If human blood or other potentially infectious material is involved, personnel must be offered the Hepatitis B vaccine within 10 days of beginning work.

Florida Tech will utilize the Holzer Health Center for occupational health services.

Holzer Health Center (Florida Tech)

Phone: 321-674-8078

Email: healthcenter@fit.edu,

Website: <https://www.fit.edu/health/>

Select Agents & Toxins

Although Florida Tech does not conduct research with Select Agents/Toxins at this time, a brief overview is provided. Both the Centers for Disease Control (CDC) and Animal Plant Health Inspection Services (APHIS) regulate the possession, use, and transfer of select agents/toxins through the Select Agent Regulations. An attenuated strain of a select agent or an inactive form of a select toxin may be excluded from these regulations ([exclusion list](#)).

NOTE: Researchers MUST receive EH&S approval for research involving any select agent or toxin prior to the agent being present on campus (this includes excluded items).

Below is the Select Agent & Toxin list. Asterisk denotes Tier 1 agents.

HHS SELECT AGENTS AND TOXINS	OVERLAP SELECT AGENTS AND TOXINS
Abrin	Bacillus anthracis *
Botulinum neurotoxins *	Bacillus anthracis Pasteur strain
Botulinum neurotoxin producing species of Clostridium *	Brucella abortus
Conotoxins (Short, paralytic alpha conotoxins containing the following amino acid sequence X₁CCX₂PACGX₃X₄X₅X₆CX₇) ¹	Brucella melitensis
Coxiella burnetii	Brucella suis
Crimean-Congo haemorrhagic fever virus	Burkholderia mallei *
Diacetoxyscirpenol	Burkholderia pseudomallei *
Eastern Equine Encephalitis virus ³	Hendra virus
Ebola virus *	Nipah virus
Francisella tularensis *	Rift Valley fever virus
Lassa fever virus	Venezuelan equine encephalitis virus ³
Lujo virus	
Marburg virus *	USDA SELECT AGENTS AND TOXINS
Monkeypox virus ³	African horse sickness virus
Reconstructed replication competent forms of the 1918 pandemic influenza virus containing any portion of the coding regions of all eight gene segments (Reconstructed 1918 Influenza virus)	African swine fever virus
Ricin	Avian influenza virus ³
Rickettsia prowazekii	Classical swine fever virus
SARS-associated coronavirus (SARS-CoV)	Foot-and-mouth disease virus *
Saxitoxin	Goat pox virus
South American Haemorrhagic Fever viruses:	Lumpy skin disease virus
Chapare	Mycoplasma capricolum ³
Guanarito	Mycoplasma mycoides ³
Junin	Newcastle disease virus ^{2,3}
Machupo	Peste des petits ruminants virus
Sabia	Rinderpest virus *
Staphylococcal enterotoxins A,B,C,D,E subtypes	Sheep pox virus
T-2 toxin	Swine vesicular disease virus
Tetrodotoxin	
Tick-borne encephalitis complex (flavi) viruses:	USDA PLANT PROTECTION AND QUARANTINE (PPQ) SELECT AGENTS AND TOXINS
Far Eastern subtype	Peronosclerospora philippinensis (Peronosclerospora sacchari)
Siberian subtype	Phoma glycinicola (formerly Pyrenochaeta glycines)
Kyasanur Forest disease virus	Ralstonia solanacearum
Omsk hemorrhagic fever virus	Rathayibacter toxicus
Variola major virus (Smallpox virus) *	Sclerophthora rayssiae
Variola minor virus (Alastrim) *	Synchytrium endobioticum
Yersinia pestis *	Xanthomonas oryzae

REFERENCES

OSHA general duty clause, Section 5(a)(1).

Occupational Exposure to Hazardous Chemicals in Laboratories Standard (29 CFR 1910.1450).

The Hazard Communication Standard (29 CFR 1910.1200).

The Bloodborne Pathogens Standard (29 CFR 1910.1030).

The Personal Protective Equipment (PPE) Standard (29 CFR 1910.132).

The Hand Protection Standard (29 CFR 1910.138).

The Eye and Face Protection Standard (29 CFR 1910.133).

The Respiratory Protection Standard (29 CFR 1910.134).

The Control of Hazardous Energy Standard (29 CFR 1910.147).

59A-7.023 Laboratory Safety and Sanitary Conditions.