Rowan University

ENVIRONMENTAL HEALTH & SAFETY

Chemical Hygiene Plan

October 9, 2020

Table of Contents

SECTION 1 – INTRODUCTION AND INSTRUCTIONS:

1.A Introduction

1.A.1 Purpose

This Laboratory Safety Plan was developed by the Office of Environmental Health and Safety (**EHS**).

This Plan sets specific administrative and engineering controls, best management practices, and rules of conduct to protect laboratory personnel from the hazards of exposure to chemicals in the laboratory.

1.A.2 Background

In 1993, The State of New Jersey Public Employees Occupational Safety and Health (PEOSH) Program adopted the federal OSHA Standard entitled "Occupational Exposure to Hazardous Chemicals in Laboratories" (29 CFR 1910.1450) (Appendix A).

A main provision of the PEOSH/OSHA Laboratory Standard is that each laboratory or group of laboratories have a written plan which meets the requirement of the regulation. When the information requested in the Laboratory Specific Chemical Hygiene Plan (Appendix B) in this Plan is completed and the laboratory safety program implemented, it will ensure each laboratory's compliance with section 29 CFR 1910.1450(e) of the Laboratory Standard.

Any questions about the Chemical Hygiene Plan, or any other safety questions should be directed to the Office of Environmental Health and Safety (EHS) at 856-256-5105 or to ehs@rowan.edu.

1.A.3 Scope/Applicability

This Plan applies to all Rowan University laboratory personnel and students working in laboratories either as a volunteer or paid employee who use any quantity of commercial chemical products for research or instruction. Its intention is to set procedures, equipment, personal protective equipment, and work practices that are capable of protecting employees from the health hazards presented by hazardous chemicals used in a laboratory setting at the Rowan University.

1.A.4 Designation of Responsibility

Department Heads shall:

- Ensure compliance with all safety requirements within their departments.
- Ensure that required training has been completed.
- Establish criteria and processes for Departmental review of hazard assessments/Laboratory-Specific Standard Operating Procedures for particularly hazardous chemicals.

Principal Investigators shall:

A Principal Investigator (**PI**) has the overall responsibility for compliance with the Chemical Hygiene Plan and Laboratory-Specific Chemical Hygiene Plan in his or her laboratory. This responsibility may not be shifted to inexperienced or untrained personnel. In addition, research sponsors expect grantees to meet applicable Federal, State, and local health and safety standards and implement the necessary measures to minimize their employees' risk of injury or illness.

The PI must assure that:

- Acquiring the knowledge and information needed to recognize and control chemical hazards in the laboratory.
- Informing employees working in their laboratory of the potential hazards associated with the use of chemicals in the laboratory and instructing them in the safe laboratory practices, adequate controls, and procedures for dealing with accidents involving hazardous chemicals.
- Ensure that action is taken to correct workpractices and conditions that may result in the release of toxic chemicals;
- Obtaining approval, when required, prior to using particularly hazardous substances or prior to performing extremely hazardous operations;
- Properly disposing of unwanted and/or hazardous chemicals and material;
- Identifying hazardous operations, processes, or conditions in the lab. Developing procedures and controls for identified hazardous operations, processes, or conditions in the lab that meet State and Federal regulatory requirements for worker protection. Implementing and enforcing developed procedures and control use in addition to standard safety procedures.
- Establishing standard safety operating procedures using relevant, up-to-date safety and health literature.
- Establishing an approval process for highly toxic, carcinogenic or reproductive toxics use and preapproving users in the laboratory.
- Reviewing proposed new procedures in the laboratory.
- Maintaining an up-to-date chemical inventory for the laboratory.
- Providing personnel under her/his supervision with access to the Laboratory-Specific Chemical Hygiene Plan (CHP); and Standard Operating Procedures (SOP) and Laboratory and Research Hazard Assessment.
- Training personnel who work with hazardous chemicals in the laboratory. This includes informing personnel on the location and availability of the Safety Data Sheets (SDS's), lab specific SOPs and the Laboratory and Research Hazard Assessment.
- Maintaining work place engineering controls (e.g. fume hoods) in functional working order with all manufacturer provided safety controls (machine guarding, sash panels, etc.).
- Maintaining an adequate supply of personal protective equipment appropriate for the task (gloves, face shields, non-venting goggles, etc.), and in functional working order.
- Promptly reporting laboratory accidents and injuries to EHS.

Safety Responsibilities During PI Leaves/Absences

- Whenever a faculty member or lab supervisor will not be present in the laboratory for an extended period of time e.g. during a sabbatical, vacation, or protracted illness, etc., it is their responsibility to identify a colleague to oversee their laboratory operations with respect to safety procedures and requirements.
- The person selected must be familiar with the hazards of the operations occurring in the lab and be empowered to address concerns as they arise. Examples include a fellow faculty member or a full-time research associate or post-doctoral fellow. The individual selected must have a Rowan University ID.
- The faculty member should notify their Department Chair who will be assumeresponsibility for all safety aspects of their laboratory operations.

Laboratory Personnel and Students, under the supervision of the Principal Investigator shall:

- Complete all required training (provided by the University through CITI program and Laboratory Specific training provided by the PI).
- Complete the appropriate sections of the Laboratory Specific Chemical Hygiene Plan (including but not limited to the Laboratory Specific Chemical Hygiene Training Document and the Review of Laboratory Specific Chemical Hygiene Document).
- Plan and conduct laboratory operations in accordance with federal regulation and applicable to this Plan and the Laboratory-Specific Chemical Hygiene Plan.
- Wear appropriate personal protective equipment that includes but is not limited to a lab coat, gloves, and safety glasses in the laboratory.
- Abide by all procedures described in any department or laboratory-specific SOP's.
- Report all injuries, other incidents, and unsafe conditions to their supervisor and PI.

Environmental Health and Safety (EHS) shall:

- Develop and provide general laboratory safety training (provided by the University through CITI program).
- Conduct periodic safety inspections of laboratories.
- Investigate laboratory accidents and injuries.

1.B Instruction on How to Use This Plan

The Rowan University Chemical Hygiene Plan outlines the minimum health and safety procedures which are expected to be in place in every laboratory. The Laboratory-Specific Chemical Hygiene Plan must be completed by each individual Principal Investigator, to reflect any department- or laboratory-specific hazard(s) which may be present.

Information may be added or deleted from this Laboratory-Specific Chemical Hygiene Plan, as appropriate, so that the text reflects the type of operations which are performed in your laboratory. However, the safety practices required in each laboratory must meet the minimum safety standards as outlined in this Chemical Hygiene Plan.

If a section of the Laboratory-Specific Chemical Hygiene Plan does not apply to your specific laboratory, write "Not Applicable" (N/A).

Please keep your Laboratory-Specific Chemical Hygiene Plan readily available in your laboratory.

Your completed Laboratory-Specific Chemical Hygiene Plan should be available at all times to your laboratory personnel, Rowan University administration, EHS, and regulatory agencies. The contents of your Laboratory-Specific Chemical Hygiene Plan should be used in laboratory specific training sessions to inform employees, staff, students, volunteers, etc. who will be working in your laboratory about the specific safety procedures that must be followed.

SECTION 2 – TRAINING PROGRAMS AND REQUIREMENTS:

2.A. Training Overview

The intent of the safety training program is to ensure that all personnel engaged in research activities have received appropriate information concerning physical agents and hazardous materials in their work environment; the nature of the risks associated with handling these materials; and the conditions under which these materials may be harmful. Laboratory personnel include all persons working in the laboratory, regardless of formal Rowan employment status.

Safety Training Programs

The following safety training sessions are available for laboratory personnel:
Rowan University utilizes the online training format at CITI training. CITI training can be found at http://citiprogram.com.
CITI Training requirements are as follows:

General laboratory Training	ALL researchers, including faculty, staff, and students working in a research laboratory or a teaching laboratory irrespective of their work MUST complete **General Laboratory Training**.
General Biological Laboratory Training	ALL Investigators including faculty, staff and students working with biological materials (research and teaching labs), MUST complete **General Biological Laboratory Training.**
rDNA and sDNA Laboratory Training	ALL Investigators, including faculty, staff and students WORKING with rDNA or sDNA MUST complete rDNA and sDNA Laboratory Training.
Hazardous Biological Material and Human Samples Laboratory Training	ALL Investigators, including faculty, staff and students, WORKING with hazardous biological materials and human specimens including commercially available cell lines and blood or blood products MUST complete the course on **Hazardous Biological Material and Human Samples Laboratory Training.**
Shipping and Transporting Biological Materials Training	ALL Investigators, including faculty, staff and students, and research staff who will ship and transport any biological materials MUST complete the course **Shipping and Transporting Biological Materials Training** in addition to the laboratory training as applicable.

General Information regarding CITI training courses:

The modules required to obtain credit for General Biological Laboratory Training are included in rDNA and sDNA Laboratory Training and Hazardous Biological Materials and Human Samples Laboratory Training. If any individual completes either the rDNA and sDNA Laboratory Training or Hazardous Biological Material and Human Samples Training, the individual will receive credit for completing the General Biological Laboratory Training.

Instructions for New Users using CITI:

Go to http://www.citiprogram.org
Click on "register" in the Create new account box on the ***CITI webpage***
Step 1 - In the box titled "Select Your Organization Affiliation" type in Rowan. Rowan University will appear in a box under the type. Click on Rowan University and then click on "Continue to Step 2"

Step 2 - Type in your First and Last Name. In the email box, input your Rowan University email address. Your secondary email address can be a personal email address, such as Gmail or other email provider. Click on "Continue to Step 3" when completed.

Step 3 - Type in your Rowan University username (network username) or other username. Complete the sections for the password and security question. Click on "Continue to Step 4" when completed.

Step 4 - Complete the information for Country of Residence, Gender, Ethnicity and Race. Click on "Continue to Step 5" when completed.

Step 5 - Complete the information for Continuing Education Credits and Survey. Click on "Continue to Step 6" when completed.

Step 6 - Complete the information for Information Requested by Rowan University. Select the role that is most applicable to your purpose of creating a CITI account. Click on "Continue to Step 7" when completed.

Step 7 - Select the training to be completed. Users can select multiple training programs. For example, if you need to complete General Biological Laboratory Training and r-sDNA Training, then you would select both. Click on "Continue" when completed.

Training Requirements for Visitors to the Laboratory:

Visitors and outside contractors who will only be in the laboratory for a short time period shall notify laboratory personnel before they enter the laboratory. The Principal Investigator shall insure that all visitors have been informed of any necessary precautions before they commence their activities. For example, this would include information about the hazards of activities which are being performed while visitors in the laboratory, as well as the need to wear personal protective equipment such as safety glasses or a laboratory coat.

Laboratory Specific Training:

Principal Investigators (PI's) must ensure that their laboratory personnel are knowledgeable about the hazards and safe work practices for hazardous materials and equipment they may encounter or be expected to use in the laboratory. Training documentation must include the name and signature of the participants, as well as the date. This documentation is part of the Chemical Hygiene Plan. Laboratory specific SOPs shall be reviewed with students and employees before they begin working in the laboratory.
A laboratory specific training sheet is part of the Laboratory-Specific Chemical Hygiene Plan. This training sheet must be completed by each individual in your laboratory. A copy must be maintained with the Laboratory –Specific Chemical Hygiene Plan.

SECTION 3 – GENERAL PROCEDURES:

3.A Laboratory Security

Principal investigators need to take specific actions to prevent unauthorized entry to labs, secure highly hazardous materials against theft, and ensure compliance with new security regulations. EHS urges principal investigators to implement procedures necessary to provide security of all hazardous materials in their areas of responsibility. One easy way to increase security is to make sure that your laboratory door is locked whenever the lab is left unattended.

The guidelines are intended to reduce the risk for unauthorized removal of hazardous materials from your laboratory:

- Recognize that laboratory security is related to but different from laboratory safety.
- Control access to areas where hazardous materials are used and stored.
- Know who is in your laboratory space.
- Know what hazardous materials are brought into your space.
- Know what materials are being removed from your space.
- Be familiar with the University's Emergency Plan

3.B Laboratory Door Signage

Each laboratory shall have a door that has a "CAUTION" sign posted. "CAUTION" signs can be obtained from EHS. The "CAUTION" sign shall include Public Safety emergency phone number(s), and information on the presence of specific hazardous materials in the laboratory. In addition, if any personal protective equipment must be worn or special procedures implemented before entering the room, shall be posted as well.

3.C Working Alone

Working with chemicals alone, at night, or otherwise in isolation, places individuals at special risk and should be avoided whenever possible. Personnel should not work alone if acutely toxic or hazardous chemicals will be used.

If it is necessary to work alone, employees are encourages to contact Public Safety to inform them that they are working in the building during off-hours and alone. You may request that patrols in your area specifically check in on you.

Principal Investigators are responsible for ensuring that employees, students, and staff perform only those tasks for which they are qualified by training and experience, especially during off-hours when they are unsupervised. Undergraduate and other non-degree students who will be conducting research before or after regular business hours must have permission from the Principal Investigator of the lab where the work will be conducted.

3.D Unattended Operation of Equipment

When unattended operation of equipment is necessary, the researchers shall ensure that all hose connections are secure, that electrical and other connections pose minimal risk of accident and that proper and continuing drainage (e.g., in washing and rinsing sink) is provided.

Post a sign on the exterior laboratory door describing any unattended process which might cause hazardous conditions if there is a mechanical failure. Clearly label all equipment, bench, entry door or other prominent location(s) with a brief description of the unattended operation.

The Laboratory Contact persons, listed on the laboratory door, should be familiar with the unattended operation, then contact information for the person(s) responsible for the work should be posted.

Unattended operations involving flammable or particularly hazardous chemicals are not permitted in Rowan University laboratories without the permission of the Department Chair.

3.E Visitors

The OSHA Laboratory Standard emphasizes the importance of training personnel who may be exposed to hazardous chemicals.

Consequently, the concern of Rowan University for laboratory safety extends not only to employees, staff, and students, but also to any person visiting our laboratories who may potentially be exposed to hazardous chemicals. Laboratories must NEVER be utilized as a substitute for day care or other child care options. No visitors to the laboratory shall be present during any activity with the potential for exposure to hazardous materials.

3.E.1 Visitors under the age of 18

Persons under the age of 18 may be present in laboratories as observers as part of officially sanctioned educational programs for high school or college students or other supervised, educational programs that have been approved in writing in advance by the Department Chair, Principal Investigator, Human Resources and EHS. NO minor shall be present during any activity with the potential for exposure to hazardous materials.

3.E.2 Laboratory Workers Who Are Under the Age of 18

Rowan University has a procedure in place which allows Principal Investigators to have high school students (16 years of age and older) perform certain activities in a laboratory. After written approval from the Department Chair, Principal Investigator, Human Resources, and EHS has been obtained, follow the procedures and detailed information for obtaining approval.

In general, this program requires that:

The student must

- Be sponsored by a faculty member and under the supervision of the student's school;
- The proposed activities comply with the federal, state, and local regulations including the Fair Labor Standard Act, Child Labor Laws, and ALL regulations pertaining to health and safety; and
- The student receives health and safety training appropriate for the anticipated tasks.

3.F Laboratory Safety Audits

A Laboratory Safety Audit Checklist has been developed by EHS to assist researchers in evaluating the day-to-day operations in his/her laboratory. Details on how to perform a laboratory safety self-inspection or how EHS performs safety inspections is available in Appendix C. EHS and/or the researcher may identify additional lab-specific items to evaluate.

EHS will periodically inspect each laboratory area. A written report will be issued to the Principal Investigator that includes recommended corrective actions. All deficiencies must be corrected. Completed Laboratory Safety Audits should be maintained, as well as forward to EHS to ensure that deficiencies have been corrected.

EHS is available at any time to provide technical assistance to laboratories who are having difficulties correcting any safety issue.

3.G Laboratory Vacating Procedures

Decommissioning a laboratory is a multi-step process which ensures that the laboratory is free of any chemicals, equipment, refuse, and other potential contamination. This process allows for the orderly scheduling of renovations and turning over laboratory space to new occupants. Vacating Laboratory Procedures can be found in Appendix D.

Principal Investigators are responsible for the proper disposition of all chemical materials in the laboratory, as well as for the complete removal of all equipment and supplies. A laboratory will not be decommissioned by EHS until all of the items listed in the Laboratory Vacating Questionnaire (Appendix E) have been completed or deemed not applicable.

Principal Investigators are responsible to notify EHS a minimum of one (1) month before the laboratory will be vacated.

EHS will work with the Principal Investigator or his/her designee, to identify chemicals for disposal. Laboratory personnel will be expected to label and inventory excess or unwanted chemical for disposal through Rowan University's Hazardous Waste Vendor. EHS and the Principal Investigator or his/her designee, will make arrangements to transfer the waste chemicals to the EHS Hazardous Waste Storage Area.

Following the decontamination of work surfaces and the removal of chemicals, as well as equipment and refuse, EHS will perform a final inspection to decommission the laboratory.

Outside contractors, Facilities, and Environmental Services are not permitted to work in a laboratory which has been vacated until EHS has decommissioned the laboratory.

3.H Refrigerators, Warm and Cold Rooms

Cold rooms are not ventilated and warm rooms have only limited ventilation. Dry ice, liquid nitrogen, and other cryogenic liquids must never be used in these spaces because they expand rapidly in air. **Even if a small volume was released in an unventilated room, sufficient oxygen could be displaced to cause asphyxiation.**

Because of the lack of ventilation, use or a spill of volatile chemicals may result in dangerously high airborne concentrations. For this reason, toxic materials must never be used or stored in these locations. Similarly, there is a potential for oxygen displacement if large volumes of compressed gases are used.

Explosion-proof cold rooms are designated with explosion-proof lighting fixtures, thermostats, and compressors. These fixtures have vapor-tight seals to ensure that any vapor from a flammable chemical will not have contact with an ignition source. The cold rooms at Rowan University are **not** explosion proof. Additionally, some cold rooms which were originally designed to be explosion-proof have had standard electrical outlets added to them and are no longer explosion-proof. If any vapors accumulate in the room due to use, leakage, or a spill of flammable liquids, an explosion can result. For this reason, flammable solvents shall not be used or stored in cold rooms unless Facilities, has confirmed that the cold room is explosion-proof.

Standard refrigerators are also inappropriate for storage of flammable materials for the same reason. In standard refrigerators, the light switch, thermostat, or self-defrosting mechanisms can act as an ignition source if there are any flammable vapors. "Laboratory safe" refrigerators are generally used to store small quantities of flammable liquids in laboratories. Laboratory safe refrigerators have all ignition sources location on the outside of the refrigerator. Explosion-proof refrigerators provide additional protection for working in an area where flammable vapors may accumulate on the inside

or outside of the refrigerator. In explosion-proof refrigerators the ignition sources are located on the outside and are sealed in vapor tight enclosures.

3.I Disposal of Broken or Outdated Equipment

Contact your department administrator for Rowan University procedures for disposal of University owned property.

Additionally, the procedures for discarding laboratory equipment (broken, outdated, etc.) are as follows:

- Refrigerator/Freezer

When discarding a refrigerator or freezer, all materials must be removed from the refrigerator or freezer by laboratory personnel. Spills and other visible contamination must be removed by laboratory personnel.

In addition, Facilities must be notified to have the refrigerant removed from the compressor. The cost of refrigerant removal is the responsibility of the laboratory.

- Other Equipment

All other equipment must be free of chemical contamination before disposal.
For chemical residue: Remove visible contamination with a dilute detergent solution.

SECTION 4 – FIRE SAFETY:

4.A In the event of a fire

4.A.1 If you Hear or See a fire alarm/strobe

- When you hear/see a fire alarm/strobe, never assume that it is a false alarm or drill
- Follow the specific emergency procedures for your area
- Once you have evacuated the building, do not re-enter the building unless told by someone with authority to do so.
- To prevent fires, report all unsafe conditions
- Smoking is prohibited in **all** University buildings
- If your clothing is on fire, **STOP, DROP, and ROLL**
- Stay low – crawl under smoke
- Never use a fire extinguisher unless the fire alarm pull station has been activated. Fire extinguisher use is discouraged at Rowan University for all but the smallest of fires. After activating the fire alarm pull station, a person might consider the use of a fire extinguisher providing the fire does not block a safe exit route and he/she takes no chances of personal injury.
- Use fire extinguishers for small fire-defense and only if you are trained. Remember the "PASS" procedure:

P – PULL	Pull the pin. This will break the tamper seal.
A – AIM	Aim the nozzle low, at the base of the fire.
S – SQUEEZE	Squeeze the lever continuously, and
S – SWEEP	Sweep slowly from side to side at the base of the fire until it appears out. Watch the area. If the fire reignites, repeat steps 2-4.

Make sure that your exit is clear and you can extinguish the fire with your back to the exit.

NEVER use more than one fire extinguisher to extinguish a fire. If you need a second fire extinguisher to extinguish the fire, it is time to evacuate the building.

4.A.2 If you discover Fire or Smoke

It is important that you and your staff are prepared to respond to fires and other emergencies. Follow the R.A.C.E. acronym if these is a fire or suspected fire in your area:

R – RESCUE	Immediately stop what you are doing and remove anyone in immediate danger to a safe area. Get out as safely and quickly as possible.
A – ALARM	Activate the nearest fire alarm pull station.
C – CONTAIN	Close all doors and windows that you can safely reach to contain the fire. During evacuation, close all doors behind you.
E – EXTINGUISH	Only attempt to extinguish the fire if you have been trained to use a fire extinguisher AND if it is safe for you to do so, **OR**
E – EVACUATE	Following the designated emergency exit route for your area and proceed to your assigned meeting location.

4.A.3 Clothing Fires

STOP, DROP, and ROLL

In the event of a clothing fire, the **STOP, DROP, and ROLL** method should be used. A person should immediately drop to the floor, and roll on the floor to smother the flames, while calling for help. NEVER run, as this will intensify the clothing fire. If another person's clothing is on fire, the observer should force that person to the floor while being careful to avoid the flames, and should help the victim roll around to smother the flames.

4.A.4. Maintenance of Egress Corridors

Occupational Safety and Health Administration (OSHA), Public Employee's Occupational Health and Safety (PEOSH), and New Jersey Uniform Fire Code require that corridors remain unobstructed so that it is possible to safely exit the building during a fire or other emergency condition and to facilitate the movement of emergency equipment.

Corridors leading to EXITS or any other means of egress must be maintained in a safe condition and available for immediate utilization and free of all obstructions at all times.

Obstructions such as tables, showcases, holiday decorations, powered equipment, display boards, signs, coat racks, and other movable equipment that may interfere with emergency responder access are prohibited.

Storage of combustible or flammable material, and other hazardous materials in any portion of an exit, elevator car is prohibited. Chairs, tables, and other furniture or equipment in each room shall be arranged to provide ready access to each egress door.

NO storage is allowed under the staircase.

4.A.5. Maintenance of Areas Around Emergency Equipment

At no time shall emergency safety showers, emergency eyewashes, fire extinguishers, or other emergency equipment be obstructed.

4.B Bunsen Burners

Bunsen burner hoses should be made out of thick butyl rubber. Other materials are more likely to develop pinholes, which can allow leakage of gas.

The hoses should be replaced periodically before they start to develop cracks. Hose length should be limited to 1.5 feet to minimize the chance of hose contact with the flame. Bunsen burners should not be used in the vicinity of flammable materials. Bunsen burners with pilot lights shall be utilized when feasible.

SECTION 5 – STORAGE AND HANDLING OF CHEMICALS:

5.A Introduction

It is the obligation of Rowan University to develop a culture of safety in our laboratories. A culture of safety consciousness, accountability, organization, and education is vital to provide a safe work and educational environment. Learning to participate in a culture of habitual risk assessment, experiment planning, and consideration of worst-case possibilities for oneself and one's fellow workers is as much a part of scientific education as learning the theories behind what happens on the lab bench.

In order to perform work in a prudent manner, you must consider the health, physical, and environmental hazards of the chemicals to be used. The ability to accurately identify and assess laboratory hazards must be taught and encouraged through training and ongoing organization support. This is the core of every good health and safety program. For management to lead, for personnel to be able to assess worksite hazards, and for hazards to be eliminated or controlled everyone involved must be trained and be a part of the culture of safety.

EHS is available to evaluate Safety Data Sheets (SDS's), assist in preparing the Laboratory Specific Chemical Hygiene Plan, and/or conduct project specific training when hazardous chemical substances are to be used.

In addition to compatibility concerns, safe chemical handling requires regular inspections of chemical storage areas and maintenance of stringent inventory control by the Principal Investigator.

5.B Identification of Chemical Substances

Hazardous chemical substances are frequently used to perform the complex research protocols carried out at Rowan University. The chemicals can be flammable, corrosive, toxic, carcinogenic, reproductive hazards, or have unknown health effects. Proper handling and storage of these materials requires that research staff plan and implement safety procedures, including safe storage procedures, before ordering the materials.

Safe storage of chemicals begins with well-identified containers. Original chemical container labels should be maintained in the original condition. If an original label becomes damaged a new label with all the same
information should be placed on the container. Supervisors shall ensure that labels on hazardous chemicals are not removed or defaced. All containers, regardless of size, must be labeled with a common chemical name and percentage (as applicable).

Containers other than original chemical containers at a minimum must have the following information clearly written on them or attached to them:

- Common chemical name(s). If it is a mixture all chemicals (and percentage or concentration) in the container must be included on the label.
- Percentage or concentration of the chemical(s).
- Date

5.C Chemical Inventories

The New Jersey Right-To-Know law requires that all laboratories prepare, maintain, and update a complete and accurate chemical inventory for all hazardous chemicals present in each separate laboratory area. This inventory is required for all laboratories.
The chemical inventory list will be useful for acquiring SDS's as needed, for replacing outdated chemicals, for organizing chemicals, and for conducting work safely and in compliance with PEOSH standards.

The inventory for both pure chemicals and chemical product mixtures should include the CAS (Chemical Abstract Service) number(s); percent of each constituent; average quantity of containers; maximum amount in the container(s); unit (e.g.; ml, L, gal, oz, lb., mg, etc.); type of container (e.g.; glass bottle, plastic jug, etc.); and the physical state (solid, liquid, or gas).

The Right-To-Know regulation requires that inventories be updated yearly regardless of whether software or paper inventories are used.

5.D Storage of Hazardous Chemical Substances

Hazardous materials and chemicals shall be stored, handled, and used in accordance with the requirements of the New Jersey Uniform Fire Code (NJUFC) and other applicable National Fire Protection Association (NFPA) Standards. The types of hazardous materials include: flammable and combustible liquids, oxidizing materials, unstable (reactive) chemicals, highly toxic materials and poisonous gases.

Chemicals may not be stored in the laboratory if:

- They have exceeded the manufacturer's expiration date or the expiration intervals described in this section of the CHP or in any applicable SOPs.
- The container is leaking, broken, or shows signs of vapor leakage and/or chemical reaction (e.g. salt formation around cap)
- The chemical is highly hazardous and is not anticipated to be used in the next year.

Each chemical must be stored in a manner which minimizes the risks associated with the hazards. In general:

- Chemicals must be segregated according to the hazards that they present.
- Chemicals should be stored on sturdy shelving or in flammable storage cabinets, with containers located no higher than eye level. Shelving units should be attached to the wall.
- Heavier materials/larger containers should be stored closer to the floor.
- Caps must be intact and tightly fastened.
- Highly toxic, narcotic or other controlled substances, and other sensitive materials should be stored in a locked cabinet.
- All chemical containers that are not in active use should be tightly capped
- No chemical container shall be stored on a laboratory floor without proper containment
- Limit the quantities of flammable liquids to ten gallons per laboratory, and combustible liquids to thirty gallons per laboratory.
- Laboratories are expected to purchase any containers needed for the handling, storage, and disposal of hazardous materials.

All storage cabinets located in hallways and equipment corridors must be placarded with the name of the principal investigator and also with identification of the cabinet's contents (examples available in Appendix F). This information is critical for emergency personnel. Chemicals stored in areas outside of the laboratory must be included on the laboratory's chemical inventory.

Primary Storage Locations

The primary storage location for a chemical is determined by the hazards of the material. Chemical incompatibility (segregation) and chemical instability are discussed later.

Primary storage locations include:

- Refrigerator or freezer: Chemicals that must be stored at low temperature for safety or stability
- Corrosive liquids storage cabinet: Corrosive chemicals
- Flammable liquids storage cabinet: Flammable chemicals and pyrophorics
- Ventilated storage: Chemicals with strong odors and/or low odor thresholds
- Dry box or desiccator: Moisture-sensitive chemicals
- Glove box: Air-sensitive chemicals
- Open shelving or regular cabinets: Chemicals with no specified storage requirements

Chemical Storage in Refrigerators and Freezers

Chemicals that must be stored at low temperature for safety or stability can be stored in laboratory refrigerators or freezers. Flammable materials may only be stored in refrigerators/freezers if the equipment is designed for flammable material storage and UL-listed/labeled for this purpose. Contact your Principal Investigator if you are unsure whether your lab refrigerator or freezer is approved for flammable liquids storage. EHS is available for guidance if requested.

Explosion-proof refrigerators/freezers are not the same as flammable-storage refrigerators/freezers. Explosion-proof devices are only required in areas where a flammable atmosphere is anticipated. In most lab situations, an explosion-proof refrigerator/freezer is not required. If you are not sure whether the model of refrigerator/freezer you wish to purchase for your laboratory is appropriate, contact EHS for guidance.

Use of household-grade refrigerators/freezers in laboratories is discouraged.
Where household-grade refrigerators/freezers are used, the storage of flammable materials within them is prohibited. The refrigerator/freezer must be labeled so that it is clear that both the storage of food/drink and the storage of flammable materials are prohibited within (examples available in Appendix G).

When ice accumulates in a laboratory freezer, the freezer must be defrosted. The build-up of ice can cause a number of problems for chemical storage including: uneven shelf surfaces, conditions making it difficult to remove or access chemical containers, and a higher likelihood of moisture entering chemical containers. Some newer freezers are designed to prevent ice build-up, but older equipment will need to be defrosted regularly.

Hazardous chemicals must not be stored in cold rooms because cold rooms have recirculating ventilation systems. Likewise, compressed gas cylinders, liquid nitrogen dewars, and dry ice are also prohibited in cold rooms.

5.E Steps to Organize Hazardous Substances According to Hazard Class

Generally, a good chemical segregation system has the flowing elements: color coding of chemicals by hazard or class; separation of organic and inorganic substances; a storage pattern which prevents the side by side or vapor interaction of incompatible chemicals; and ensuring that incompatible chemicals are separated from each other.

If a laboratory buys most of its chemicals from a single supplier, then that supplier's chemical organization system can be used. However, the chemical containers from other supplier's should then be labeled with symbols, colors, or text to match the overall chemical segregation scheme.

5.F Segregation of Chemicals

When certain hazardous chemicals are stored or mixed together, violent reactions may occur because the chemicals are unsuitable for mixing, or are incompatible. Classes of incompatible chemicals should be segregated from each other during storage, according to hazard class. Use the following general guidelines for hazard class storage:

- Flammable/Combustible Liquids and Organic Acids
- Flammable Solids
- Mineral Acids
- Caustics
- Oxidizers
- Perchloric Acid
- Compressed Gases

Before mixing any chemicals, refer to this partial list below, the chemicals' SDS's to verify compatibility:

INCOMPATIBLE CHEMICALS

A wide variety of chemicals react dangerously when mixed with certain other materials. Some of the more widely –used incompatible chemicals are given below, but the absence of a chemical from this list should not be taken to indicate that it is safe to mix it with any other chemical.

Examples of chemical incompatibilities are:

Chemical	Incompatible Chemical(s)
Acetic acid	Chromic acid, nitric acid, hydroxyl compounds, ethylene glycol, perchloric acid, peroxides, permanganates
Acetone	Concentrated nitric and sulfuric acid mixtures
Alkali and alkaline earth metals (such as powdered aluminum or magnesium, calcium, lithium, sodium, potassium)	Water, carbon tetrachloride or other chlorinated hydrocarbons, carbon dioxide, halogens
Ammonia (anhydrous)	Mercury (e.g., in manometers), chlorine, calcium hypochlorite, iodine, bromine, hydrofluoric acid (anhydrous)
Ammonium nitrate	Acids, powdered metals, flammable liquids, chlorates, nitrites, sulfur, finely divided organic combustible materials
Aniline	Nitric acid, hydrogen peroxide
Arsenical materials	Any reducing agent
Azides	Acids
Bromine	See chlorine
Calcium oxide	Water
Carbon (activated)	Calcium hypochlorite, all oxidizing agents
Chlorates	Ammonium salts, acids, powdered metals, sulfur, finely divided organic or combustible materials

Chromic acid and chromium trioxide	Acetic acid, naphthalene, camphor, glycerol, alcohol, flammable liquids in general
Chlorine	Ammonia, acetylene, butadiene, butane, methane, propane (or other petroleum gases), hydrogen, sodium carbide, benzene, finely divided metals, turpentine
Chlorine dioxide	Ammonia, methane, phosphine, hydrogen sulfide
Copper	Acetylene, hydrogen peroxide
Cumene hydroperoxide	Acids (organic or inorganic)
Cyanides	Acids
Flammable liquids	Ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, halogens
Fluroine	All other chemicals
Hydrocarbons (such as butane, propane, benzene)	Fluorine, chlorine, bromine, chromic acid, sodium peroxide
Hydrocyanic acid	Nitric acid, alkalis
Hydrofluoric acid	Ammonia (aqueous or anhydrous)
Hydrofluoric acid	Acids, activated carbon
Hypochlorites	Acids, activated carbon
Iodine	Acetylene, ammonia (aqueous or anhydrous), hydrogen
Mercury	Acetylene, fulminic acid, ammonia
Nitrates	Acids

Nitric acid (concentrated)	Acetic acid, aniline, chromic acid, hydrocyanic acid, hydrogen sulfide, flammable liquids and gases, copper, brass, any heavy metals
Nitrites	Acids
Nitroparaffins	Inorganic bases, amines
Oxalic Acid	Silver, mercury
Oxygen	Oils, grease, hydrogen; flammable liquids, solids, and gases
Perchloric acid	Acetic anhydride, bismuth and its alloys, alcohols, paper, wood, grease, oils
Peroxides, organic	Acids (organic or mineral), avoid friction, store cold
Phosphorus (white)	Air, oxygen, alkalis, reducing agents
Potassium	Carbon tetrachloride, carbon dioxide, water
Potassium chlorate	Sulfuric and other acids
Potassium perchlorate	Sulfuric and other acids
Selenides	Reducing agents
Silver	Acetylene, oxalic acid, tartaric acid, ammonium compounds, fulminic acid
Sodium	Carbon tetrachloride, carbon dioxide, water
Sodium nitrite	Ammonium nitrate and other ammonium salts
Sodium peroxide	Ethyl and methyl alcohol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerin, ethylene glycol, ethyl acetate, methyl acetate, furfural

Sulfides	Acids
Sulfuric acid	Potassium chlorate, potassium perchlorate, potassium permanganate (similar compounds of light metals, such as sodium, lithium)
Tellurides	Reducing agents

(**Resource:** Prudent Practices in the Laboratory: Handling and Disposal of Chemicals)

The material on the left should be stored and handled so that it does not contact the incompatible chemical(s) on the right, in order to prevent the possibility of a potential violent reactions or generation of toxic reaction products.

5.G Storage of Flammable and Combustible Chemicals

Flammable and combustible liquids shall be stored, handled and used in accordance with the requirements of the New Jersey Uniform Fire Code (NJUC) and other applicable National Fire Protection Association (NFPA) Standards. Extensive use of flammable solvents in laboratories presents a potentially serious fire and explosion hazard. Even a very small quantity involved in a fire can significantly increase the potential of fire spreading. To ensure compliance, each laboratory shall:

- Maintain an up-to-date inventory of all hazardous chemicals, including flammable and combustible liquids, as required by the New Jersey Worker and Community Right to Know.
- Restrict the container size to one gallon for all flammable liquids, i.e., liquids with flash point less than one hundred degrees Fahrenheit. Flammable liquids received in original approved containers, which are of five gallon or less capacity, are exempt from this requirement.
- All flammable and combustible liquid containers shall:
  - Be properly capped when not in active use.
  - Be stored in a cool area, away from sunlight or any sources of ignition or heat
  - Not be stored on a laboratory floor without proper containment
  - Not be stored near any corrosives or oxidizers

Flammable liquids not in active use shall be stored in an approved flammable storage cabinet. Storage of flammable liquids is not permitted outside of an approved flammable storage cabinet in laboratories constructed or renovated after December 2001.

Flammable liquids in quantities of one gallon or more shall not be dispensed by gravity. Approved pumps taking suction from the top of a container shall be utilized, except when the viscosity of the liquid makes such a restriction impractical. To prevent the hazards of static electricity, any transfer of flammable liquid, utilizing electrically conductive containers, shall be bonded and grounded. Transferring more than five gallons of flammable liquid is not allowed inside a building, except in a specifically designed storage area.

Collect flammable and combustible liquid waste in appropriate containers as specified in Rowan University Hazardous Waste Management Program. Once a container is full, it shall be transferred to the Designated Hazardous Waste Store Room within three working days.

Limit the quantities of flammable liquids to ten gallons per laboratory, and combustible liquids to thirty gallons per laboratory.
In open type laboratories, where several labs operate in one common fire area, more stringent quantity restrictions may apply to ensure regulatory compliance.

5.H Storage of Corrosives

- Separate acids (i.e., hydrochloric acid) from alkalis (i.e., sodium hydroxide)
- Keep in a well ventilated, cool area, away from other materials, especially organic solvents.
- Store in a wooden, corrosion-proof cabinet or use secondary containment, like a Nalgene tub
- Organic acids, like acetic acid and propionic acid, must be separated from inorganic acids and alkalies.
- Use a bottle carrier when moving these materials around the lab.

5.I Toxic or Poisonous Materials

Chemicals which are toxic may also have other undesirable hazardous physical or chemical properties.

Highly acutely toxic materials should be ordered in small quantities. Less toxic materials should be stored with compatible materials (i.e., if the toxic material is flammable, it should be stored with flammable materials).

5.J Oxidizers

Oxidizers act as an oxygen source, especially during a fire. They may also present a fire and explosion hazard when they come in contact with organic or combustible materials.

Examples of oxidizers include, but are not limited to: nitric acid, hydrogen peroxide, sulfuric acid, nitrates, nitrites, perchlorates, peroxides, chromates, dichromates, permangantes, hypochlorites, bromates, iodates, chlorites, and chlorates.

The following precautions should be taken when storing oxidizers:

- Isolate oxidizers from all flammable or combustible materials
- Store in cool dry place
- Do not store on wooden shelves
- Do not store near organic substances or reducing agents
- Strong oxidizing agents, such as chromic acid, should be stored and used in glass or other inert containers.

5.K Compressed Gases, Cryogenic Liquids and Dry Ice

All compressed gases, dry ice, and cryogenic liquids shall be stored, handled and used in accordance with the requirements of the applicable New Jersey Uniform fire Code (NJUFC) and the Laboratory Safety Plan to minimize the hazards of fire, explosion and personal injury.

5.K.1 Compressed Gases

Each department or laboratory storing or using compressed gases shall, at a minimum, ensure that:

- Quantities of compressed gas supplies in laboratories do not exceed a two month supply and/or the maximum quantities specified by the NJUFC or other applicable Fire Code. Consult EHS for assistance in determining compliance.
- Flammable compressed gas cylinders in laboratories are limited to only those in current use.
- Excess cylinders are stored in a separate ventilated room or in a secure area outside of the building, approved for that use.
- Valve covers are removed only when a cylinder is in use.
- All cylinders (in service or storage, full or empty) are:
  - Adequately secured with chains or by proper nesting to prevent falling or being knocked over,
  - Never allowed to be dropped or banged together violently
  - Kept away from fire and spark producing operations
  - Grouped according to their properties
  - Stored such that flammable gases are separate from oxidizing gases, and empty cylinders are separate from the full cylinders, and
  - Properly marked with the name of the contained gas.
- Compressed gases are never transferred from one container to another.
- Any damaged cylinder or valve is immediately reported to the supplier and to the Public Safety emergency number.

5.K.2 Cryogenic Liquids

Cryogenic liquid tanks are checked periodically to ensure that they:

- Have not lost vacuum or insulation (a cold outside jacket of the tank indicates the need for tank service)
- Are checked at the neck of the tank opening for any ice accumulation to prevent any blockage and subsequent pressure buildup within the container
- Are checked for sabotage of the pressure relief devices on the tank.
- Always use and store cryogenic liquids in a well-ventilated area. If allowed to vent into a closed space, a cryogenic liquid will vaporize, displacing oxygen and possibly causing asphyxiation. For example, liquid nitrogen expands in air to 700 times its volume. Therefore, never store a container of cryogenic liquid in a cold room or unventilated area.
- Wear protective equipment, including face shield, cryogenic gloves, and a laboratory apron. Cryogenic liquid and vapors can rapidly freeze human tissue. Delicate eye tissues can be damaged (by frostbite) even when the contact is too brief to affect the skin of the hands and face.
- Place cryotubes in a desiccator, heavily walled container or behind a safety shield while thawing.
- Exercise care that cryogenic liquids are never contained in a closed system. Liquefied gases boil, with a resultant rapid increase in pressure.
- Boiling and splashing usually occurs when filling a warm container, or when inserting warm objects into a liquid. Stand clear and perform these operations slowly to minimize the possibility of contact with the cryogenic liquids.
- Do not dispose of cryogenic liquids down the drain!! Ordinary materials, like plumbing, for use under ambient conditions may not be able to withstand cryogenic temperatures without failure.

5.K.3 Special Precautions for the Use of Dry Ice

- Do not handle dry ice with an unprotected hand
- Avoid putting dry ice into a sink (can embrittle the sink material, causing it to crack)
- Use in a well - ventilated area (i.e., not the cold room)
- Many departments have a recycling program, or a designated place to store dry ice. Ask the Principal Investigator, or the department administrator to find out if this is available.

5.L Low Hazard Materials

These are chemicals which present little or no danger in the laboratory, like buffers, salts, and media. They may be stored on sturdy shelving or in cabinets, below eye level.

5.M Peroxide – Forming and Shock Sensitive Compounds

Most chemicals that are used in research laboratories are stable and non-explosive at the time of purchase. But over time, certain chemicals can oxidize, become contaminated, dry out, or otherwise destabilize to become a potentially explosive chemical. The chemical can then literally detonate when exposed to heat, light, friction, or mechanical shock.

5.M.1 Examples of Peroxide – Forming and Shock Sensitive Compounds

- Organic chemicals (e.g., cyclohexane, most ethers, dioxane, and tetrahydrofuran) that form peroxides through exposure to air or light. These peroxides are not always in crystalline form; some are soluble and essentially invisible.
- Hydrated picric acid that becomes dry or becomes contaminated with metals that form metal picric salts
- Sodium amide that reacts with air or moisture to form superoxides, as evidenced by yellow or brown discoloration
- Some normally stable perchlorates (e.g., pyridium perchlorates or tetraethylammonium perchlorate) may become unstable at elevated temperatures

5.M.2 General Precautions for Peroxide – Forming and Shock Sensitive Compounds

Purchase these chemicals in limited quantity – buy only what is needed for short term use
Record the date the container is received and the date which it is opened. If there is an expiration date, keep in mind that the material must be given to EHS as a hazardous waste at least three (3) months before that date.

Keep explosive chemicals away from all ignition sources such as open flames, hot surfaces, spark sources and direct sunlight

Store in a cool area, but not in standard refrigerators.

Keep the materials dry. Do not store near sources of water (e.g., sink or water bath).

Store containers in low traffic areas to reduce the possibility of shock or vibration.

Compounds which have reached their expiration date should be handled with the utmost care. It is extremely important that such containers not be opened or moved until they have been evaluated by

EHS. Also, do not open any containers if the compound is overly viscous, has formed crystals, or looks aged.

5.N Sodium Azide

Sodium azide can violently decompose if heated near its decomposition temperature (275^{o}C).

Violent reactions can also occur if sodium azide comes in contact with copper, lead, carbon disulfide, nitric acid, dimethyl sulfate. Contact with water and acids forms hydrozoic acid, which is both toxic and explosive.

Sodium azide should never be allowed to come into contact with heavy metals and/or their salts, which could result in the formation of shock-sensitive, explosive heavy metal azides.

DO NOT store sodium azide on metal shelves or use metal lab utensils when working with it.

5.O Perchloric Acid

A highly corrosive, non-combustible material, perchloric acid is used to denature proteins and stain gels. Laboratories will usually purchase gallon or smaller containers of 70-72% perchloric acid. Perchloric acid presents an additional hazard in that perchloric acid mist and vapor can condense in ventilation systems to form metallic perchlorates, which can be explosive.

Special Precautions for Using Perchloric Acid

- Whenever possible, substitute a less hazardous chemical for perchloric acid
- If possible, perchloric acid should not be purchased in concentrations greater than 60% by weight.
- Work must be performed under a chemical fume hood. No benchtop digestions are permitted.
- There must be no other chemicals in the chemical fume hood when using perchloric acid. Contact with organic substances may result in a violent reaction.
- Perchloric acid must never be heated in the types of hoods available at Rowan University. Special hoods with a wash down feature are required when perchloric acid is heated.
- To prevent injury, goggles or a face shield, gloves, and lab coat should be worn when handling perchloric acid.
- When diluting perchloric acid (or any other acid) always add ACID TO WATER, not the reverse.
- Perchloric acid must be segregated from all other chemicals and inside a glass or porcelain secondary containment.
- Store perchloric acid away from organic acids such as acetic acid. Do not store it near bases, or near other organic or flammable or combustible material.
- Perchloric acid waste must not be mixed with any other waste. Place it in a chemically compatible container (e.g., the original container), then label and dispose of it as hazardous waste. More information is available in the Hazardous Waste Management Section of this Plan.
- Make sure that you have an appropriate acid-neutralizing agent (for example, J.T. Baker Liquid “Low Na+ Neutralizer) and clean up spills immediately. DO NOT use paper towels, spill pillows, or any other organic absorbent material to clean up spills of perchloric acid. Contact between 70% perchloric acid and wood, paper, or cotton can produce fires and explosions.
- Anhydrous perchloric acid is exceptionally dangerous; do not order it.

5.P Controlled Substances

The purchase of controlled substances is strictly regulated.
If you wish to possess a controlled substance, you must register with the State of New Jersey Drug Control Unit located within the Department of Consumer Affairs and register with the Department of Justice, Drug Enforcement Administration, Office of Diversion Control.

If you currently possess a controlled substance, you must already have a license with the State of New Jersey Drug Control Unit and registration with the Department of Justice, Drug Enforcement Administration, Office of Diversion Control.

Storage of controlled substances must adhere to the Controlled Substance Act. Access to controlled substances must be restricted to specific personnel who will use these substances. Controlled substances should not be stored in a cabinet with other, general use chemicals, even if it locks. Laboratories must maintain an accurate, signed, up-to-date inventory of all the narcotics and controlled substances in their possession.

Individuals with a DEA license are also required to maintain a log book for drug dispensing, which includes the date, amount dispensed, and amount remaining. Each entry must be dated and signed. ALL DEA registered substances must be disposed of in accordance with DEA regulations, through a licensed vendor.

Contact EHS to arrange for disposal of your narcotics and/or controlled substances.

5.Q Select Agents

In order to comply with the regulations from the Public Health Service, all possession and transfers of infectious agents and potentially hazardous materials listed on the Select Agents List must be registered with the federal government and Rowan University Institutional Biosafety Committee (IBC).

The Federal Select Agent Program, providing information on what is a select agent; how to comply if you wish to possess a select agent; what are the regulations and policies for possession of a select agent; the required forms; and resources to assist you in the process; can be found here.

A list of select agents and toxins, as well as those that are exclusions from regulations, are found on the following page.

Contact EHS for assistance.

The biological agents and toxins listed below have been determined to have the potential to pose a severe threat to both human and animal health, to plant health, or to animal and plant products. An attenuated strain of a select agent or an inactive form of a select toxin may be excluded from the requirements of the Select Agent Regulations. A list of excluded agents and toxins can be found here.

Select Agents and Toxins List

HHS and USDA Select Agent and Toxins
7CFR Part 331, 9 CFR Part 121, and 42 CFR Part 73

HHS SELECT AGENTS AND TOXINS	OVERLAP SELECT AGENTS AND TOXINS
Abrin	*Bacillus anthracis**
Bacillus cereus Biovar anthracis*	*Bacillus anthracis* Pasteur strain
Botulinum neurotoxins*	*Brucella abortus*
Botulinum neurotoxin producing species of Clostridium*	*Brucella melitensis*
	Brucella suis
Conotoxins (Short, paralytic alpha conotoxins containing the following amino acid sequence $X_1CCX_2PACGX_3X_4X_5X_6CX_7)_1$	*Burkholderia mallei**
	*Burkholderia pseudomallei**
Coxiella burnetii	Hendra virus
Crimean-Congo haemorrhagic fever virus	Nipah virus
Diacetoxyscirpenol	Rift Valley fever virus
Eastern Equine Encephalitis virus[3]	Venezuelan equine encephalitis virus[3]
Ebola virus*	**USDA SELECT AGENTS AND TOXINS**
Francisella tularensis*	African horse sickness virus
Lassa fever virus	African swine fever virus
Lujo virus	Avian influenza virus[3]
Marburg virus*	Classical swine fever virus
Monkeypox virus[3]	Foot-and-mouth disease 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)	Goat pox virus
	Lumpy skin disease virus
	Mycoplasma capricolum[3]
	Mycoplasma mycoides[3]
Ricin	Newcastle disease virus[2,3]
Rickettsia prowazekii	Peste des petits ruminants virus
SARS-associated coronavirus (SARS-CoV)	Rinderpest virus*
Saxitoxin	Sheep pox virus
South American Haemorrhagic Fever viruses: Chapare	Swine vesicular disease virus
Guanarito	
Junin	
Machupo	**USDA PLANT PROTECTION AND QUARANTINE (PPQ) SELECT AGENTS AND TOXINS**
Sabia	
Staphylococcal enterotoxins A,B,C,D,E subtypes	*Peronosclerospora philippinensis (Peronosclerospora sacchari)*
T-2 toxin	
Tetrodotoxin	*Phoma glycinicola (formerly Pyrenochaeta glycines)*
Tick-borne encephalitis complex (flavi) viruses: Far Eastern subtype	*Ralstonia solanacearum*
Siberian subtype	*Rathayibacter toxicus*
Kyasanur Forest disease virus	*Sclerophthora rayssiae*
Omsk hemorrhagic fever virus	*Synchytrium endobioticum*
Variola major virus (Smallpox virus)*	*Xanthomonas oryzae*
Variola minor virus (Alastrim)*	
Yersinia pestis*	

**Denotes Tier 1 Agent*

[1] C = Cysteine residues are all present as disulfides, with the 1st and 3rd Cysteine, and the 2nd and 4th Cysteine forming specific disulfide bridges; The consensus sequence includes known toxins α-MI and α-GI (shown above) as well as α-GIA, Ac1.1a, α-CnIA, α-CnIB; X1 = any amino acid(s) or Des-X; X2 = Asparagine or Histidine; P = Proline; A = Alanine; G = Glycine; X3 = Arginine or Lysine; X4 = Asparagine, Histidine, Lysine, Arginine, Tyrosine, Phenylalanine or Tryptophan; X5 = Tyrosine, Phenylalanine, or Tryptophan; X6 = Serine, Threonine, Glutamate, Aspartate, Glutamine, or Asparagine; X7 = Any amino acid(s) or Des X and; "Des X" = "an amino acid does not have to be present at this position." For example if a peptide sequence were XCCHPA then the related peptide CCHPA would be designated as Des-X.

[2] A virulent Newcastle disease virus (avian paramyxovirus serotype 1) has an intracerebral pathogenicity index in day-old chicks (Gallus gallus) of 0.7 or greater or has an amino acid sequence at the fusion (F) protein cleavage site that is consistent with virulent strains of Newcastle disease virus. A failure to detect a cleavage site that is consistent with virulent strains does not confirm the absence of a virulent virus.

[3] Select agents that meet any of the following criteria are excluded from the requirements of this part: Any low pathogenic strains of avian influenza virus, South American genotype of eastern equine encephalitis virus, west African clade of Monkeypox viruses, any strain of Newcastle disease virus which does not meet the criteria for virulent Newcastle disease virus, all subspecies Mycoplasma capricolum except subspecies capripneumoniae (contagious caprine pleuropneumonia), all subspecies Mycoplasma mycoides except subspecies mycoides small colony (Mmm SC) (contagious bovine pleuropneumonia), and any subtypes of Venezuelan equine encephalitis virus except for Subtypes IAB or IC, provided that the individual or entity can verify that the agent is within the exclusion category.

SECTION 6 – SAFETY DATA SHEETS (SDS)

Safety Data Sheets must be readily available to those who work in a research laboratory. The location of the Safety Data Sheets must be identified in the Laboratory Specific Chemical Hygiene Plan.

The Hazard Communication Standard (HCS) (29 CFR 1910.1200(g)), revised in 2012, required that the chemical manufacturer, distributor, or importer provide Safety Data Sheets (SDSs) for each hazardous chemical to downstream users to communicate information on these hazards.

SDSs are now presented in a consistent user-friendly 16-section format.

Sections 1 through 8 contain general information about the chemical, identification, hazards, composition, safe handling practices, and emergency control measures (e.g., firefighting). This information should be helpful to those that need to get the information quickly. Sections 9 through 11 and 16 contain other technical and scientific information, such as physical and chemical properties, stability and reactivity information, toxicological information, exposure control information, and other information including the date of preparation or last revision. The SDS must also state that no applicable information was found when the preparer does not find relevant information for any required element.

The SDS must also contain Sections 12 through 15, to be consistent with the UN Globally Harmonized System of Classification and Labeling of Chemicals (GHS), but OSHA will not enforce the content of these sections because they concern matters handled by other agencies.

The following provides a description of the 16 sections of a SDS:

Section 1: Identification

This section identifies the chemical on the SDS as well as the recommended uses. It also provides the essential contact information of the supplier. The required information consists of:

- Product identifier used on the label and any other common names or synonyms by which the substance is known.
- Name, address, phone number of the manufacturer, importer, or other responsible party, and emergency phone number.
- Recommended use of the chemical (e.g., a brief description of what it actually does, such as flame retardant) and any restrictions on use (including recommendations given by the supplier).

Section 2: Hazard(s) Identification

This section identifies the hazards of the chemical presented on the SDS and the appropriate warning information associated with those hazards. The required information consists of:

- The hazard classification of the chemical (e.g., flammable liquid, category1).
- Signal word.
- Hazard statement(s).
- Pictograms (the pictograms or hazard symbols may be presented as graphical reproductions of the symbols in black and white or be a description of the name of the symbol (e.g., skull and crossbones, flame).
- Precautionary statement(s).
- Description of any hazards not otherwise classified.
- For a mixture that contains an ingredient(s) with unknown toxicity, a statement describing how much (percentage) of the mixture consists of ingredient(s) with unknown acute toxicity. Please note that this is a total percentage of the mixture and not tied to the individual ingredient(s).

Section 3: Composition/Information on Ingredients

This section identifies the ingredient(s) contained in the product indicated on the SDS, including impurities and stabilizing additives. This section includes information on substances, mixtures, and all chemicals where a trade secret is claimed. The required information consists of:

Substances

- Chemical name.
- Common name and synonyms.
- Chemical Abstracts Service (CAS) number and other unique identifiers.
- Impurities and stabilizing additives, which are themselves classified and which contribute to the classification of the chemical.

Mixtures

- Same information required for substances.
- The chemical name and concentration (i.e., exact percentage) of all ingredients which are classified as health hazards and are:
  - Present above their cut-off/concentration limits or
  - Present a health risk below the cut-off/concentration limits.
- The concentration (exact percentages) of each ingredient must be specified except concentration ranges may be used in the following situations:
  - A trade secret claim is made,
  - There is batch-to-batch variation, or

- The SDS is used for a group of substantially similar mixtures.

Chemicals where a trade secret is claimed

- A statement that the specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret is required.

Section 4: First-Aid Measures

This section describes the initial care that should be given by untrained responders to an individual who has been exposed to the chemical. The required information consists of:

- Necessary first-aid instructions by relevant routes of exposure (inhalation, skin and eye contact, and ingestion).
- Description of the most important symptoms or effects, and any symptoms that are acute or delayed.
- Recommendations for immediate medical care and special treatment needed, when necessary.

Section 5: Fire-Fighting Measures

This section provides recommendations for fighting a fire caused by the chemical. The required information consists of:

- Recommendations of suitable extinguishing equipment, and information about extinguishing equipment that is not appropriate for a particular situation.
- Advice on specific hazards that develop from the chemical during the fire, such as any hazardous combustion products created when the chemical burns.
- Recommendations on special protective equipment or precautions for firefighters.

Section 6: Accidental Release Measures

This section provides recommendations on the appropriate response to spills, leaks, or releases, including containment and cleanup practices to prevent or minimize exposure to people, properties, or the environment. It may also include recommendations distinguishing between responses for large and small spills where the spill volume has a significant impact on the hazard. The required information may consist of recommendations for:

- Use of personal precautions (such as removal of ignition sources or providing sufficient ventilation) and protective equipment to prevent the contamination of skin, eyes, and clothing.
- Emergency procedures, including instructions for evacuations, consulting experts when needed, and appropriate protective clothing.
- Methods and materials used for containment (e.g., covering the drains and capping procedures).
- Cleanup procedures (e.g., appropriate techniques for neutralization, decontamination, cleaning or vacuuming; adsorbent materials; and/or equipment required for containment/clean up)

Section 7: Handling and Storage

This section provides guidance on the safe handling practices and conditions for safe storage of chemicals. The required information consists of:

- Precautions for safe handling, including recommendations for handling incompatible chemicals, minimizing the release of the chemical into the environment, and providing advice on general hygiene practices (e.g., eating, drinking, and smoking in work areas is prohibited).
- Recommendations on the conditions for safe storage, including any incompatibilities. Provide advice on specific storage requirements (e.g., ventilation requirements)

Section 8: Exposure Controls/Personal Protection

This section indicates the exposure limits, engineering controls, and personal protective measures that can be used to minimize worker exposure. The required information consists of:

- OSHA Permissible Exposure Limits (PELs), American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs), and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the safety data sheet, where available.
- Appropriate engineering controls (e.g., use local exhaust ventilation, or use only in an enclosed system).
- Recommendations for personal protective measures to prevent illness or injury from exposure to chemicals, such as personal protective equipment (PPE) (e.g., appropriate types of eye, face, skin or respiratory protection needed based on hazards and potential exposure).
- Any special requirements for PPE, protective clothing or respirators (e.g., type of glove material, such as PVC or nitrile rubber gloves; and breakthrough time of the glove material).

Section 9: Physical and Chemical Properties

This section identifies physical and chemical properties associated with the substance or mixture. The minimum required information consists of:

- Appearance (physical state, color, etc.);
- Upper/lower flammability or explosive limits;
- Odor;
- Vapor pressure;
- Odor threshold;
- Vapor density;
- pH;
- Relative density;
- Melting point/freezing point;
- Solubility(ies);
- Initial boiling point and boiling range;
- Flash point;
- Evaporation rate;
- Flammability (solid, gas);
- Partition coefficient: n-octanol/water;
- Auto-ignition temperature;
- Decomposition temperature; and

- Viscosity.

The SDS may not contain every item on the above list because information may not be relevant or is not available. When this occurs, a notation to that effect must be made for that chemical property. Manufacturers may also add other relevant properties, such as the dust deflagration index (Kst) for combustible dust, used to evaluate a dust's explosive potential

Section 10: Stability and Reactivity

This section describes the reactivity hazards of the chemical and the chemical stability information. This section is broken into three parts: reactivity, chemical stability, and other. The required information consists of:

Reactivity

- Description of the specific test data for the chemical(s). This data can be for a class or family of the chemical if such data adequately represent the anticipated hazard of the chemical(s), where available.

Chemical stability

- Indication of whether the chemical is stable or unstable under normal ambient temperature and conditions while in storage and being handled.
- Description of any stabilizers that may be needed to maintain chemical stability.
- Indication of any safety issues that may arise should the product change in physical appearance.

Other

- Indication of the possibility of hazardous reactions, including a statement whether the chemical will react or polymerize, which could release excess pressure or heat, or create other hazardous conditions. Also, a description of the conditions under which hazardous reactions may occur.
- List of all conditions that should be avoided (e.g., static discharge, shock, vibrations, or environmental conditions that may lead to hazardous conditions).
- List of all classes of incompatible materials (e.g., classes of chemicals or specific substances) with which the chemical could react to produce a hazardous situation.
- List of any known or anticipated hazardous decomposition products that could be produced because of use, storage, or heating. (Hazardous combustion products should also be included in Section 5 (Fire-Fighting Measures) of the SDS.)

Section 11: Toxicological Information

This section identifies toxicological and health effects information or indicates that such data are not available. The required information consists of:

- Information on the likely routes of exposure (inhalation, ingestion, skin and eye contact). The SDS should indicate if the information is unknown.
- Description of the delayed, immediate, or chronic effects from short- and long-term exposure.

- The numerical measures of toxicity (e.g., acute toxicity estimates such as the LD50 (median lethal dose)) - the estimated amount [of a substance] expected to kill 50% of test animals in a single dose.
- Description of the symptoms. This description includes the symptoms associated with exposure to the chemical including symptoms from the lowest to the most severe exposure.
- Indication of whether the chemical is listed in the National Toxicology Program (NTP) Report on Carcinogens (latest edition) or has been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest editions) or found to be a potential carcinogen by OSHA

Section 12: Ecological Information (non-mandatory)

This section provides information to evaluate the environmental impact of the chemical(s) if it were released to the environment. The information may include:

- Data from toxicity tests performed on aquatic and/or terrestrial organisms, where available (e.g., acute or chronic aquatic toxicity data for fish, algae, crustaceans, and other plants; toxicity data on birds, bees, plants).
- Whether there is a potential for the chemical to persist and degrade in the environment either through biodegradation or other processes, such as oxidation or hydrolysis.
- Results of tests of bioaccumulation potential, making reference to the octanol-water partition coefficient (Kow) and the bioconcentration factor (BCF), where available.
- The potential for a substance to move from the soil to the groundwater (indicate results from adsorption studies or leaching studies).
- Other adverse effects (e.g., environmental fate, ozone layer depletion potential, photochemical ozone creation potential, endocrine disrupting potential, and/or global warming potential).

Section 13: Disposal Considerations (non-mandatory)

This section provides guidance on proper disposal practices, recycling, or reclamation of the chemical(s) or its container, and safe handling practices. To minimize exposure, this section should also refer the reader to Section 8 (Exposure Controls/Personal Protection) of the SDS. The information may include:

- Description of appropriate disposal containers to use.
- Recommendations of appropriate disposal methods to employ.
- Description of the physical and chemical properties that may affect disposal activities.
- Language discouraging sewage disposal.
- Any special precautions for landfills or incineration activities

Section 14: Transport Information (non-mandatory)

This section provides guidance on classification information for shipping and transporting of hazardous chemical(s) by road, air, rail, or sea. The information may include:

- UN number (i.e., four-figure identification number of the substance)[1].
- UN proper shipping name[1].
- Transport hazard class(es)[1].
- Packing group number, if applicable, based on the degree of hazard[2].

- Environmental hazards (e.g., identify if it is a marine pollutant according to the International Maritime Dangerous Goods Code (IMDG Code)).
- Guidance on transport in bulk (according to Annex II of MARPOL 73/78[3] and the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (International Bulk Chemical Code (IBC Code)).
- Any special precautions which an employee should be aware of or needs to comply with, in connection with transport or conveyance either within or outside their premises (indicate when information is not available).

Section 15: Regulatory Information (non-mandatory)

This section identifies the safety, health, and environmental regulations specific for the product that is not indicated anywhere else on the SDS. The information may include:

- Any national and/or regional regulatory information of the chemical or mixtures (including any OSHA, Department of Transportation, Environmental Protection Agency, or Consumer Product Safety Commission regulations)

Section 16: Other Information

This section indicates when the SDS was prepared or when the last known revision was made. The SDS may also state where the changes have been made to the previous version. You may wish to contact the supplier for an explanation of the changes. Other useful information also may be included here.

SDS may be maintained (***and obtained***) in one of the following ways:

- Rowan University has purchased and put in place a new automated data base called "BioRAFT" which allows Principal Investigators, Researchers and affected laboratory personnel (including students) to search through a comprehensive on-line library of SDSs that includes specific SDSs that cover chemicals used at Rowan University. Note that use of the BioRAFT data base is the preferred method for gaining or maintaining SDS information at the University. For more detail on BioRAFT, please see Appendix C or contact EHS at email: EHS@rowan.edu or via phone call at: 856.256.5105.

In *addition to* the use of "BioRAFT," SDS may also be managed as follows:

- hard copies may be printed out in an organized fashion such as a binder/file.

- SDS may be stored on a computer as an electronic file. If this method is used, each person in the laboratory must be trained to access and print a SDS. If a laboratory chooses to use electronic access, desktop icons or shortcuts must be used on the computer or posted in a conspicuous location to facilitate easy access. These electronic copies must be updated and current.

Vendors provide Safety Data Sheets with hazardous chemicals and products supplied to Rowan University, including samples. New copies must be sent to the specific ordering department at Rowan University whenever revisions are made to the Safety Data Sheet. Individual departments are responsible for securing a SDS if it is not sent by the manufacturer. Each Specific ordering department/person will then be responsible for adding new chemicals to their "BioRAFT" chemical inventory, electronic file, or paper SDS binder. This will ensure proper maintenance of all applicable SDSs.

SDSs are accessible to employees during their work shift in their department upon request to department supervisors and/or EHS. They are also readily available on the web:

SDS can be obtained from manufacturer's website or http://www.hazard.com/msds/.

Safety Data Sheets are also available at the following links:

- 3M Products (link is external) -- Searchable
- Acros Chemicals(link is external) -- Same as Fisher Scientific.
- Aldrich Chemicals (link is external) – Searchable
- Alfa Aesar (link is external) -- Searchable
- Amersham Biosciences (link is external) -- Searchable
- Avantor (link is external) -- formerly JT Baker
- Eastman Kodak (link is external) -- Searchable, available in several languages
- E.I. duPont de Nemours and Company (link is external) -- Searchable
- Fisher Scientific Co. (link is external) --Searchable
- Fluka (link is external) - Same as Sigma Aldrich. Searchable.
- JT Baker (link is external) - Now Avantor Performance Materials
- Linde Gases (link is external) - Searchable
- Mallinckrodt (link is external) -- Same as Avantor, searchable
- Matheson Tri-Gas (link is external) -- Index
- Pierce Biotechnology (link is external) Same as Thero Scientific, Searchable
- Praxair (link is external) -- Index
- Scientific Instrument Services (link is external)-- Index
- Sigma-Aldrich (link is external) – Searchable
- Supelco (link is external) - Same as Sigma Aldrich. Searchable.
- Xerox Toners And Ink (link is external)-- Searchable
- VWR Scientific Products (link is external) --Searchable

Additional resources containing chemical information, not in SDS form, can be found at the following links:

- ATSDR (link is external)-- Agency for Toxic Substances and Disease Registry - chemical toxicology FAQs
- EPA Toxic Substance Data Sheets (link is external) - Health and environmental hazards
- National Academy of Science Laboratory Safety Summaries (link is external) -- From the Howard Hughes Medical Institute
- National Toxicology Program (link is external) - Searchable health and safety info for ~2000 chemicals
- New Jersey Hazardous Chemical Fact Sheets (link is external)
- Pesticide Information Profiles (link is external)-- From EXTOXNET

SDSs are available to outside contractors upon request.

Creation of a Safety Data Sheet

In the event that Rowan University needs to create an SDS, EHS should be consulted for assistance. This would only be required if a University worker or student is producing a new chemical and sending it to someone else to work with or use.

New Jersey Right To Know Hazardous Substance Fact Sheets

New Jersey Right To Know Hazardous Substance Fact Sheets are prepared for substances that appear on the New Jersey Right to Know Hazardous Substance List. The Hazardous Substance Fact Sheets are prepared on pure substances and contain information on health hazards, exposure limits, personal protective equipment, proper handling, first aid, and emergency procedures for fires and spills.

New Jersey Right To Know Hazardous Substance Fact Sheets are available in both English and Spanish.

You can search for a New Jersey Right To Know Hazardous Substance Fact Sheet here.

Specific New Jersey Right To Know Hazardous Substance Fact Sheets for carcinogens can be found here.

Safety Data Sheets and New Jersey Right To Know Hazardous Substance Fact Sheets are only one source of chemical safety information. In a research setting, more information about the chemical may be needed to conduct a thorough hazard assessment for the process involving the chemical in question.
If you are trying to determine chemical reactivity and incompatibility hazards or are planning hazard controls for a procedure, work with your PI and EHRS in addition to consulting a safety data sheet.

These are a few additional resources for chemical safety information:

Pub Chem Laboratory Chemical Safety Summaries
http://hdl.library.upenn.edu/1017/13802

Sittig's Handbook of Toxic and Hazardous Chemicals
https://app.knovel.com/web/toc.v/cid:kpSHTHCC12/viewerType:toc/root_slug:sittigs-handbook-of
Hazardous Substances Data Bank (HSDB)
http://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm

NIOSH International Chemical Safety Cards
http://www.cdc.gov/niosh/ipcsneng/nengname.html

CAMEO database of Hazardous Materials (helpful with chemical reactivity)
https://cameochemicals.noaa.gov/

In addition, laboratories are required to maintain an up-to-date inventory of hazardous chemicals by type and quantity, as per the New Jersey Uniform Fire Code and New Jersey Worker and Community Right to Know. Contact EHS if you require assistance.

SECTION 7 - ADDITIONAL PRECAUTIONS FOR PARTICULARLY HAZARDOUS SUBSTANCES:

7.A. Introduction

"Particularly hazardous Substance" is a term used in the OSHA Laboratory Standard, and includes:

- Acutely toxic materials – substances that meet having a rat oral LD_{50} of 50 mg/kg or less. In addition, microbial toxins with an LD_{50} of 50 mg/kg are considered an acutely toxic substance. See Table 4.1 for examples.
- Select Carcinogens – substances which meet one of the following criteria are considered select carcinogens:
  - It is regulated by OSHA as a carcinogen; or
  - It is listed under category, "known to be carcinogens" in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or
  - It is listed under Group I ("carcinogen to humans") by the International Agency for Research on Cancer Monographs (IARC) (latest edition); or
  - It is listed in either Group 2A or 2B by IARC or under the category, "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals.
- Reproductive Toxins – agents which affect reproductive capabilities including causing chromosomal damage and/or tetragenic effects on fetuses.

7.B Standard Operating Procedures (SOPs)

It is crucial to carefully plan experiments and procedures involving particularly hazardous substances.
Therefore, a written Standard Operating Procedure (SOP) is recommended for work involving particularly hazardous substances.

EHS will provide assistance in the development of the written SOP, if requested, even if the chemical does not meet the definition of a particularly hazardous substance.

The written SOP and Safety Data Sheet (SDS) for each particularly hazardous substance must be reviewed by personnel who will work with the substances.

EHS will provide generic SOPs for select carcinogens, reproductive toxins, and acutely toxic chemicals. A template is also provided if an existing SOP is not readily available. SOPs and an SOP template are appended to this Plan (available on the EHS website).

7.B.1 Topics To Be Included In A Written SOP

A written SOP should include the following:

1. Name of chemical(s) to be used;
2. Details as to the type of required personal protective equipment (e.g., safety glasses or goggles; glove type; laboratory coat; closed toed shoes; and appropriate clothing);
3. Personal Hygiene Procedures, including but not limited to:
   a. All personnel must wash their hands immediately after the completion of any procedure in which a particularly hazardous substance has been used.
   b. Immediately after any known or perceived exposure, employees must wash or shower and notify her/his supervisor.
   c. No food or drink of any kind may be consumed or stored in areas where particularly hazardous substances are in use.
4. Emergency Procedures. The SOP should detail chemical – specific emergency procedures including any specific first aid treatment or antidote required by the type of particularly hazardous substance(s) handled in the laboratory.
5. Other procedures for safe handling of the material, including but not limited to:
   a. Limiting its use to the chemical fume hood;

b. Requiring that acutely toxic chemicals be manipulated over plastic-backed disposable paper work surfaces, or in secondary containers or trays, where feasible;
c. Waste disposal procedures;
d. Cleaning procedures for contaminated areas;
e. Procedures for decontaminating equipment and glassware before removing them from the designated area;
f. Procedure for safely weighing out powders
g. All containers of a particularly hazardous material shall be labeled with hazard warnings, and stored in non-permeable, unbreakable secondary containers, which are also labeled with hazard warnings.
h. Only the smallest amount of these materials necessary for use should be present in the work area.
i. A knowledgeable colleague who can provide assistance should be available at all times when a highly toxic material is being used.

6. The location of the areas within the laboratory designated for the use of the material. In addition, the locations within the laboratory where particularly hazardous substances are handled should be demarcated with "Designated Area" signs. See Section 4.D for more information.
7. The SOP should described medical evaluation and/or surveillance, which may be indicated for work with specific substances.

7.C DESIGNATED AREAS FOR USE OF PARTICULARLY HAZARDOUS SUBSTANCES

Reducing the potential for exposure to particularly hazardous chemicals is achieved by restricting the use of these materials to designated areas which are equipped with proper control devices. Examples of designated areas include control device such as a glove box or chemical fume hood, or using materials on a specific bench within the laboratory. An entire room may be a designated area only when the nature of ongoing operations requires that any person who enters the room wear the required protective equipment.

The PEOSH Laboratory Standard requires that particularly hazardous substances are stored, used, and prepared for disposal only in DESIGNATED AREAS. Laboratory doors where particularly hazardous substances are stored/used must have a DESIGNATED AREA WITHIN sticker affixed (Appendix H). The designated area must be identified by a designated area sticker; tape with Designated Area hand written (legibly), or signs so those entering the area are aware that a particularly hazardous material may be in use. For example:

"Acutely toxic chemical (hydrofluoric acid)" over the chemical fume hood where it is used.

"Reproductive Toxin (Ethidium Bromide)" over balance area where it is weighed.

The Laboratory Standard also requires that consideration be given to the appropriateness of establishing specific procedures for the safe removal of containers with particularly hazardous substances and decontamination procedures for designated areas.

7.D Training

There is an added risk for persons using particularly hazardous substances. Therefore, each person must be up to date on their laboratory safety training and must be knowledgeable of the specific hazards of the material in order to use or to give prior approval for the use of particularly hazardous substances. This requirement applies to all laboratory personnel.

A Laboratory Specific Chemical Hygiene Training Document is available in the Laboratory Specific Chemical Hygiene Plan. This document can be used to verify laboratory specific training.

7.E Containment Equipment

Personnel should always verify that containment equipment such as chemical fume hoods, biological safety cabinets, and local exhaust ventilation is working appropriately before beginning work involving particularly hazardous materials.

In certain facilities, operation of the ventilation system may be affected by a number of conditions. For example, air supply and exhaust rates may be reduced during off-hours or when the lights are turned off in the room. This information can be obtained by contacting Facilities.

7.F Reproductive Hazard Evaluation Program

Reproductive toxins are materials that can interfere with reproductive functions or can cause damage to an exposed adult's ova, sperm, embryo, fetus, or child. Examples of reproductive effects including the following:

- Effects on the reproductive organs (e.g., enlarged breasts, atrophied testicles, damaged ova)
- Effects on adult sexual function (e.g., ovulation, libido, fertility, menstruation)
- Effects on the offspring of males or females who were exposed, by causing structural abnormalities, functional deficiencies, diseases or altered growth or death of the conceptus
- Effects on the health of the neonate by concentrating in breast milk
- Increased risk of cancer early in life or in adulthood from transplacental carcinogens crossing the placenta.

Mutagens effect the offspring through changes in the DNA of paternal spermatogonia or material oocytes prior to conception. Teratogens effect the developing embryo or fetus via exposures in the uterus.

There are few proven human teratogens. However, the vast majority of chemicals have not been conclusively studied for teratogenicity. Teratogens effect the developing embryo or fetus via exposure in the uterus.
Pregnancy is often not confirmed until well into the first trimester. For this reason employees should not wait to assess any potential risk related to their jobs until pregnancy is confirmed. Employees should be knowledgeable about the toxicological properties of materials that are being used in the laboratory. Safety Data Sheets (SDSs) are available for this purpose. In addition, exposure to potentially hazardous materials should be minimized at all times by the use of good laboratory practices, a properly functioning chemical fume hood and other control measures described in this Laboratory Safety Plan.

Exposure to certain chemicals may affect male reproductive organs and may be manifested as reduced fertility. Spermatagonia are continuously developed and mature during the course of the lives of adult males. Spermatagonia continuously develop and mature over a 73-86 day period in adult males and are susceptible to mutations or other damage during this time.
Birth defects or death of the conceptus and heritable changes in chromosomes are possible if conception occurs from a sperm which has been damaged or mutated.

Breast feeding employees may also need to take special precautions to prevent exposures to chemicals which could concentrate in breast milk resulting in exposure to their babies.

Any employee who is concerned about potential exposures to reproductive toxins on the job should request a Health Hazard Evaluation of their work area from EHS. The purpose of the Health Hazard Evaluation is to ascertain employee's potential for exposure to chemicals or other hazardous materials.

7.G Substances with Unknown Toxicity

Insufficient data exist to characterize the toxicity of certain substances that may be used at Rowan University. We are obliged to assume that they are toxic, and handle them accordingly. Special consideration should be given to the possibility of dermal contact and inhalation exposure. Always handle these materials with gloves. Use the chemicals in the chemical fume hood if there is any possibility of aerosol generation, or if the chemicals are of low molecular weight. Special attention should also be given to decontamination of work surfaces and materials by thorough cleaning with a detergent following the use of these substances.

7.H Weighing Techniques for Hazardous Substances

Dilutions of particularly hazardous substances should take place in a chemical fume hood. To minimize exposure to the particularly hazardous substance during weighing, a closed vessel can be tarred on the open bench, with the drug added to it in the chemical fume hood, followed by reweighing outside of the chemical fume hood.
Adding of solvent, and any additional dilutions of the material should take place in the chemical fume hood.

While preparing dilutions, ensure that the sash of the chemical fume hood is lowered to operating height. Wear eye protection, gloves and a lab coat and/or a gown with low permeability when performing this task.
Surfaces should be covered with disposable bench paper. Contaminated bench paper and any remaining solutions should be disposed of as hazardous chemical waste. The bench paper should be changed after work is done for the day, at the end of the work shift, and after a spill.

SECTION 8 – PRIOR APPROVAL:

8.A System for Situations Requiring Prior Approval

The PEOSH Laboratory Standard requires that the written Laboratory Safety Plan include a description of circumstances when prior approval must be obtained for activities associated with laboratories. At Rowan University, prior approval must be obtained before certain procedures or activities are carried out. These procedures, as well as who the approval must be from, are summarized below. All persons who are granting or obtaining approval must be up to date on their Laboratory Safety training.

Procedure	Approval Required by:

Visitors who are under the age of 18 in the laboratory	Department Chair
Initial purchase and use of substances which are acutely toxic, carcinogenic, or reproductive toxins	Principal Investigator or Designee. Institutional Biosafety Committee (IBC) approval (Forms A and C)
Live animals use with hazardous substances	Institutional Animal Care and Use Committee (IACUC) Institutional Biosafety Committee (IBC)
Use of chemicals in a ductless chemical fume hood	EHS
Use of Respiratory Protection	EHS and Physician
Purchase of radionuclide-labeled hazardous chemicals	Radiation Safety Officer
Research classified as "non-exempt" as per the NIH Guidelines	Institutional Biosafety Committee (IBC)
Non-laboratory storage areas for flammable materials	EHS
Moving into a vacated laboratory	EHS
Disposal of hazardous chemical waste in a non-traditional method	EHS
Outside contractors working in a laboratory	Facilities and Principal Investigator
Permission for undergraduate students to work during off-hours	Principal Investigator
Renovations to an existing laboratory	Facilities and EHS must review and approve plans.
Use of CDC/USDA listed Select Agents	Institutional Biosafety Committee (IBC) and EHS
High School Students Working in the Laboratory	Department Chair, Principal Investigator, Human Resources, and EHS

SECTION 9 – EMERGENCY PROCEDURES AND EQUIPMENT:

9.A Emergency Equipment

At a minimum, each laboratory area should have/access to the following emergency and containment equipment available:

- An ABC type multi-purpose fire extinguisher mounted in the laboratory. Equivalent clean agent fire extinguisher (e.g.; CO2, water mist, or other clean agent) may be substituted for an ABC dry powder fire extinguisher in consultation with EHS to accommodate any special needs of each lab. Use of flammable metals requires that a D type extinguisher be available.
- Appropriate eye protective devices for staff, students, and visitors, and a means to maintain them in a sanitary condition.
- Laboratory coats or rubber aprons.
- An emergency eye wash device capable of a 15 minute flow of water
- An emergency shower capable of a 15 minute flow of water
- A chemical fume hood capable of exhausting toxic and offensive vapors to the exterior
- Gloves which are resistant to the chemicals in use. Autoclave or cryogenic gloves should also be available.
- Spill cleanup kit for acids, bases, and organic solvents. Additional chemical resistant bags should be available to contain solid chemical spills.

9.B Chemical Spill

9.B.1 Notes and Precautions

- Because of the types and characteristics of hazardous materials used in laboratories, preplanning is required for safe and effective response in the event of a spill.
- Chemical spills should be cleaned up by knowledgeable and experienced personnel who have received the appropriate training and information.
- Clean up response equipment, including chemical spill kits and personal protective equipment, must always be available
- Laboratory staff are responsible for cleaning up minor chemical spills. A minor spill means < 1 liter of any chemical that is not a carcinogen, acutely toxic, or a reproductive hazard. Other emergency response personnel will handle all other chemical spills.

9.B.2 Minor Chemical Spills

- Assess whether you are able to clean up the spill, based on your experience and training, as well as the availability of hazard information and clean-up response equipment. If you feel that you are unable to do the clean-up yourself, treat the spill as a “small or large” spill (see instructions below).
- Alert people in the immediate area and post a hand written warning sign on the door(s) to the area.
- Evacuate from the area all personnel not involved in the clean-up and isolate the area

- Turn off ignition and heat sources if the spill material is flammable
- Review the Safety Data Sheet (SDS) [formerly Material Safety Data Sheet]. If you do not have this information or need other technical assistance, contact EHS.
- Wear appropriate personal protective equipment to prevent exposure to skin, eyes, and respiratory system, if applicable.
- Use the appropriate spill clean-up kit
- Form a dike with the absorbent and mix with spilled material. Collect the residue, place it in a bag and label it as hazardous waste. Dispose of the clean –up material with other chemical waste through EHS
- Call Environmental Services to wet mop the cleaned spill area.

9.B.3 Small or Large Chemical Spill

- NOTIFY Public Safety Emergency Number immediately
- ISOLATE the area to prevent the spread of contamination (e.g.; close doors to affected area and post a warning sign)
- ALERT personnel in the immediate area to EVACUATE the room

9.C Safety Showers

A safety shower is an essential component of any laboratory where chemicals are used. It must be accessible to all personnel who work in the laboratory. All laboratory personnel should be familiar with the location of safety showers in or near the laboratory.

9.C.1 Directions for use of a safety shower

- Position the contaminated/injured person under the safety shower, and activate it by pulling down on the bar or chain. (NOTE: Some safety showers required repeated pulling of the chain to maintain the flow of water)
- Assist the victim by helping to remove contaminated clothing
- Continue rinsing for a minimum of 15 minutes
- Contact Public Safety at 856-256-4911 to advise them of the emergency.
- A disposable laboratory coat should be readily available to cover the victim after using a safety shower.

9.C.2 Inspections of Safety Showers

Facilities is responsible for periodically inspecting safety showers to ensure the flow of water is sufficient to rapidly drench a person following a chemical exposure. The inspection will be documented by either a tag or sticker located on or near the safety shower.

9.D Eyewash Fountains and Hoses

Eyewash stations provide protection against injuries to the eyes – one of the most common types of injuries in laboratories using chemicals. All employees are required to be familiar with the location of the eyewash in the laboratory. The station must be in a prominent and easily accessible location.

9.D.1 Directions for use of an eyewash

In the event of a splash, it is essential to rinse for 15 minutes. For this reason, plumbed units are required rather than bottled units. While rinsing, the victim or someone in attendance must keep the eyes of the injured person open. It is essential to call the Public Safety Emergency Number so that the afflicted individual may be brought to an Emergency Room immediately after rinsing the eye(s).

9.D.2 Inspection of Eyewash Fountains and hoses

Eyewash units located in the corridors shall be tested and tagged by Facilities periodically. Some laboratories have an eyewash mounted at the sink. Laboratory staff are responsible for testing these units on a monthly basis to ensure adequate clean water flow, and that access is unobstructed.

9.E Medical Emergencies

Contact the Public Safety Emergency Number (856-256-4911) for medical emergencies.

9.E.1 Planning for medical emergencies

If unusual treatments or vaccines are needed in case of an accident, emergency care providers should be notified before work begins so that the appropriate materials are available for emergency treatment. For example, calcium gluconate should be available for hydrofluoric acid users and atropine should be available for organophosphate users.

9.E.2 Reporting Incidents

Any incident that results in injury, symptoms that may be related to exposure to a hazardous material, or a significant exposure to a hazardous material must be reported to the Risk Management & Insurance using the Rowan University "Incident Report" form. A form is available on the Rowan University website http://www.rowan.edu/president/rmi/reporting/. A copy of the University's Incident Report form is also appended to this Plan.

Completion of this form facilitates proper follow-up medical care and compliance with state law. The Principal Investigator is responsible for determining the cause of accidents that occur in the laboratory.

EHS may be called upon to provide assistance, as necessary. These investigations will focus on methods which can be implemented to prevent the recurrence of similar accidents.

9.F Flooding Situations

A flood from a burst pipe, hole in the roof, or excessive rain can create a dangerous condition in a laboratory. When flooding situations occur, contact Facilities during normal working hours. If you discover a flooding situation after hours, contact the Public Safety Emergency Number (856-256-4911).

9.F.1 Flooding Situations and Electrical Hazards

Do not walk through flooded areas to unplug electrical equipment. The flood waters may be in contact with live electricity. Evacuate the area and let Facilities evaluate the situation.

Call the Public Safety Emergency number (856-256-4911) and explain what is happening. Ask them to dispatch Facilities to the location.

While the power is off, the appliance can be unplugged, and the water can be safely cleaned up. Environmental Services will clean up the flood situation. Facilities can then restore power to the laboratory, and the appliance or instrument can be turned back on, if it is safe to do so. EHS is available for consultation if requested by Environmental Services and/or Facilities.

9.F.2 Flooding Situations and Chemical Contamination

Flood waters may have come in contact with chemical storage or use areas and become contaminated.

In some cases, the flood water may have to be collected as hazardous waste. EHS will be able to assist in this determination.

9.G Loss of Utilities

Laboratory work may have to be curtailed or even stopped when an essential utility is lost. In addition, the laboratories will have to take steps to ensure the continued safety in the laboratory, and to preserve valuable work. For example:

9.G.1 Loss of Electricity

Emergency power only provides Life Safety lighting and does not provide lighting appropriate for work with hazardous materials. Laboratories could lose the use of chemical fume hoods, incubators, and refrigerators and freezers.

Therefore, laboratory work is restricted until electricity service is restored.

Laboratory staff should turn off items such as hot plates, centrifuges, and any other equipment which has the potential to create a dangerous situation if electricity is restored while equipment is unattended.

Some laboratory spaces are equipped with electrical outlets which are connected to emergency back-up power. If you are unsure, check with Facilities to find out if a piece of equipment is connected to emergency power.

9.G.2 Loss of water

Of greatest concern is the inability of a contaminated/injured person to rinse a chemical out of the eyes or off the body because of the lack of water.

Therefore, laboratory work is restricted until water service is restored.

9.G.3 Loss of Telecommunications

The threat to laboratory staff is the inability to summon help in the event of an emergency. In fact, if the phone lines are down, then the fire alarm system may also not work.

If this were to occur, a fire watch would have to be established in the building(s).

SECTION 10 – METHODS TO CONTROL EXPOSURES TO HAZARDOUS SUBSTANCES:

10.A General Work Practice

The following work practices are in effect in all laboratory areas, regardless of the type of research being conducted:

- Wear eye protection and a lab coat when anyone in the laboratory is working with hazardous chemicals. Wear appropriate protective gloves when working with hazardous chemicals.
- Do not eat, drink, smoke, chew gum, store food, apply cosmetics, etc. in a laboratory or chemical storage areas.
- If you are working with a Particularly Hazardous Substance
    - ✓ Use secondary containment while working (bench paper, Nalgene tub, etc.)
    - ✓ Post designated area signs
    - ✓ Weigh and use all the materials in a chemical fume hood

- Label all containers according to requirements outlined in this Plan.
- Wash hands and decontaminate surfaces after work
- Be prepared with appropriate spill containment items
- Plan ahead. Know what you are going to do with any waste generated.

10.B Elimination or Substitution of Toxic Materials

The first step in evaluating a new experiment, process or operation is to investigate the possibility of eliminating the use of hazardous materials or substituting a less hazardous material. For example:

- Many gross anatomy labs have eliminated the use of formaldehyde-based formulations
- Instead of using an organic solvent or chromic acid based material for washing glassware, a laboratory can substitute an aqueous based detergent.
- Aromatic compounds (e.g.; benzene) and chlorinated hydrocarbons (e.g.; methylenechloride) used in experiments may sometimes be replaced with aliphathic compounds or non-chlorinated hydrocarbons.
- Mercury based temperature/pressure sensing devices can be replaced with non-mercury devices
- Isoflurane is a less toxic anesthetic compared tohalothane
- Commercially-prepared chromatography columns for DNA and plasmid preparations are available to replace phenol/chloroform extractions

The particular process, experiment, or operation may also be modified to reduce the quantity of the hazardous material(s) used or to limit the potential emission release rate or exposure time. For example, the use of microscale techniques may be applicable in measuring boiling points of a material.

Upon request, EHS will assist laboratory personnel in performing the necessary research to identify alternatives to particularly hazardous chemicals or environmental toxins which can be employed in specific procedures.

Lastly, purchase any chemical substance in the smallest practical quantity.

10.C Use of Chemical Fume Hoods

Chemical fume hoods are intended to provide protection from toxic, offensive and flammable vapors by maintaining a steady flow of air away from the user and out of the building.
When the sash is down it also offers protection from splashing or minor explosions that may result from vigorous chemical reactions.

However, no chemical fume hood offers 100% containment of materials that are used within it. Effectiveness depends on the hood's design, location within the room, fan speed, as well as how it is used and maintained.
EHS or an approved vendor, performs an annual inspection of chemical fume hoods to ensure that the hoods are effectively able to contain contaminants generated inside. Staff shall not work with hazardous materials in a chemical fume hood unless it has an inspection sticker indicating it passed inspection in the past year. Chemical fume hoods that fail inspection will have a notice indicating that the hood must not be used for work with hazardous materials until it has been repaired.

In general, the following safe work practices shall be used when working in a chemical fume hood:

- Work well inside the chemical fume hood, at least 6 inches from the face
- Maintain sash height as low as feasible for the manipulations performed

- Do not block the air exit slots at the lower rear of the hood. Large equipment in the chemical fume hood creates potentially dangerous zones of turbulence. If this use is necessary, the chemical fume hood should be dedicated and not used for other purposes.
- Chemical storage should be minimized in the hood. If chemical storage is necessary, contact EHS for assistance.
- Do not store loose Kim wipes and other light papers in the chemical fume hood. These can get sucked up into the exhaust duct and reduce the performance of the chemical fume hood.
- If your chemical fume hood is not equipped with a pressure gauge, keep a "Kim wipe" or other light paper "flag" taped to the sash to verify continued operation. If particularly hazardous materials are often used in the chemical fume hood, a pressure gauge that can be easily mounted on the chemical fume hood or a low air-flow alarm is highly recommended. If you believe that your chemical fume hood is not operating properly, contact Facilities to have it checked.
- Do not use a chemical fume hood which has not been inspected within the past year or which has a sign which indicates that the chemical fume hood failed inspection. Contact Facilities to have your chemical fume hood repaired. Contact EHS to have the chemical fume hood re-inspected.
- If particularly hazardous materials are to be used in the chemical fume hood, a more stringent chemical fume hood test is recommended. This testing will be performed by EHS upon request. The more stringent inspection test involves the use of a smoke generator in the chemical fume hood. The smoke allows the air patterns and any leakages from the chemical fume hood to be visualized.

10.D Use of Ductless Hoods

Ductless hoods are extremely limited in terms of the range and quantity of toxic materials that they can handle. They should be used only as an auxiliary device in a lab which has a functioning ducted chemical fume hood. They would only be permitted for use of nuisance vapors and dusts that do not present a fire or toxicity hazard. In addition, they should not be used in rooms where the air which is leaving the laboratory is recirculated into another room. Written procedures must be in place and implemented to ensure that appropriate filters are utilized and that the filters are replaced before they become saturated. The Principal Investigator shall contact EHS for approval before ductless chemical fume hoods are purchased.

10.E Use of Glove Boxes

Glove boxes are to be used when the extreme toxicity of a material warrants virtually 100% protection from exposure to the material. Laboratories who are planning to use materials with such extreme toxicity must consult with EHS.

10.F Use of Clean Benches

Clean benches, also known as "blow out hoods" have air passed through a HEPA filter in the back of the unit and flows in the direction of the person working at the clean bench. These "clean benches" provide a particle free environment within the work chamber but NO protection for the person working at the clean bench. Since the operator sits in the immediate "downstream" exhaust from the clean bench this equipment is never used for toxic, infectious, or sensitizing materials.

10.G Secondary Containers

The use of a secondary containment device such as a Nalgene pan, bench paper, and absorbent laboratory mats or under-pads can be helpful in preventing or minimizing the effects of chemical spills. Use of secondary containment is recommended when using particularly hazardous substances.

10.H Personal Protective Equipment

Laboratory staff are expected to wear personal protective equipment that is appropriate to the work being performed.

Laboratory coats, gloves, goggles, and other safety equipment provide protection when working inside of the laboratory; and there are few instances where their use outside of the laboratory should be necessary to provide protection from laboratory-associated hazards.

10.I Eye Protection

The chemical fume hood provides both eye and inhalation protection against volatile chemicals. In addition, working in the chemical fume hood with the sash lowered to 12 – 14 inches provides important protection against chemical splashes or small explosions which could injure the eyes.

Choosing and wearing the correct eyewear is also an important protection against splashes or small explosions. For prescription eyeglass wearers, eye protection must either fit over prescription glasses or incorporate the wearer's prescription. Each individual who works in the laboratory must be issued his/her own pair of safety glasses.

When material which requires eye protection are used on a frequent basis throughout the day, it can be difficult for laboratory personnel to remember to put on their eye protection for each operation. In this circumstance, eye protection should be worn at all times while in the laboratory.

10.I.1 Safety Glasses

Because safety glasses do not fit tightly against the face and do not completely surround that eye area, safety glasses with side shields offer only minimal protection from chemical splashes. Safety glasses are only appropriate when using small quantities of hazardous chemicals in procedures with a low potential for producing splashes, spills, or other means of ocular exposure.

Safety glasses with solid side shields are the minimum eye protection for laboratory personnel when they are present in a laboratory work area where hazardous chemicals are being used. PI's must provide a pair of safety glasses for each individual working in the laboratory for his/her own exclusive use. Also, it is prudent to have several spare pairs of safety glasses available for the use of visitors to the laboratory.

10.I.2 Safety Goggles

Safety goggles are designed to provide protection from splashed and flying glass and other objects that may result from a small explosion. Vented models are recommended to prevent fogging. Fog-preventing solutions are also available.

There have been serious eye injuries from activities as innocuous as opening a microfuge tube which could have been prevented with goggles.
Goggles must be worn for activities where a moderate risk for splashes with corrosives or other hazardous liquids exist, including, but not limited to pouring corrosive or hazardous liquids

10.I.3 Face Shields

Face shields are necessary for high risk activities where there is a need to protect the face in addition to the eye. Face shields are designed to be worn with safety glasses or goggles. Examples of when goggles and face shields must be worn include:

- Pouring large amounts of corrosive or toxic liquids
- Removing a closed container from liquid nitrogen
- Handling glassware under reduced or elevated pressure
- Handling glassware apparatus in combustion or other high temperature operations.
- The use of undiluted cleaning agents and disinfectants
- When highly reactive chemicals are used.

10.I.4 Determining What Type of Eyewear to Use in Special Procedures

OSHA's Personal Protective Equipment standard (29 CFR 1910.132) require that employers assess the hazards of each employee's job to determine the need for gloves, eye protection, and other equipment. The PI is most familiar with the type of operations being performed in each laboratory and should determine which type of eye protection is necessary.

Specific goggles and masks for protection against laser hazards and ultraviolet or other intense light sources, as well as glassblowing goggles, and welding masks and goggles are required if these activities are conducted in the laboratory.

10.J Protective Clothing

10.J.1 Laboratory Coats/Rubber Aprons

A fully fastened laboratory coat, with the sleeves rolled down, must be worn in the laboratories when hazardous chemicals are being used. (If chemicals are being used periodically throughout the day then laboratory coats should be worn at all times while in the laboratory).

Laboratory coats which have been worn as personal protective equipment shall not be worn in offices or outside of laboratory areas. Contaminants which are on the laboratory coats can be transferred to clean surfaces which can lead to an inadvertent exposure at a later time.

When handling large quantities of hazardous chemicals, a rubberized apron should be worn for added protection. Laboratory coats that are grossly contaminated with hazardous chemicals shall be disposed of as chemical waste unless they can be safely decontaminated by laboratory personnel who are knowledgeable of the hazard involved. Contact EHS to determine if an item which is grossly contaminated by a chemical should be disposed of as chemical waste.

Laundry for laboratory coats must be performed as necessary, at the expense of the department or laboratory. Laboratory coats shall not be laundered at home.

10.J.2 Other Clothing considerations

In addition to equipment designed specifically for protection, the way in which people dress for work (e.g.; their "street clothes") may also affect their on-the-job safety.

Long pants, rather than shorts, are recommended for wear in laboratories. Pants provide some protection from skin exposure which may result from a spill. This protection may mean the difference between just a ruined article of clothing and a serious injury. Laboratory personnel who wear shorts should consider keeping a change of clothing at work. The spare set of clothing should be appropriate for working with chemicals in case the need unexpectedly arises.

Open toed/heeled shoes are not allowed in laboratories due to the potential risks posed by dropped objects and skin exposure to spilled liquids.

Loose or overly large laboratory coats should also be avoided because of the relative ease with which they may dip into chemicals or become ensnared in apparatus or moving machinery. The same adverse consequences may result from unrestrained long hair.

10.K Hand Protection

Proper selection and use of gloves is essential for most procedures involving the use of chemicals.

In general, gloves provide only short term protection. When contaminated, they should be immediately removed and discarded. Afterwards you should immediately wash your hands. Frequent changing of gloves is a more effective technique of preventing penetration of materials through the glove than is double gloving.

Remember that "like dissolves like." The composition of gloves must be different than any chemicals they are to protect against.
Select the most appropriate glove for the chemical you are using. Gloves charts from various manufacturers are provided below:

ANSELL PRO Glove Chart
https://www.ansellpro.com/download/Ansell_7thEditionChemicalResistanceGuide.pdf

ANSELL Guardian – Search by CAS or Chemical Name
https://www.ansellguardianpartner.com/home

Cole Palmer
Safety Glove Chemical Compatibility Database
https://www.coleparmer.com/safety-glove-chemical-compatibility

Kimberly Clark
Nitrile Glove Chemical Resistance Guide
http://www.na.kccustomerportal.com/Documents/Upload/Application/2811/Learning%20Center/Article/K4556_10_01%20Ntrl_Chem_pstr_v3.pdf

MAPA Professional
http://www.mapa-pro.com/our-gloves/protections/chemical-protection/b/handled_product.

Microflex Chemical Resistance Guide for Microflex Latex & Nitrile Gloves

http://www.microflex.com/Products/~/media/Files/Literature/Domestic%20Reference%20Materials/DOM_Reference_Chemical%20Resistance.ashx

NORTH Chemical Resistance Guide
https://www.newpig.com/wcsstore/NewPigUSCatalogAssetStore/Attachment/documents/ccg/NORTH_NITRILE.pdf

If the manufacturer of your gloves is not listed above and you cannot find their glove chart, contact EHS at 856-256-5105 or at ehs@rowan.edu for assistance.

Gloves are to be removed when leaving the laboratory. The use of secondary containers (e.g.; a clean beaker) for transporting material outside of the laboratory will eliminate the need to use gloves in this situation.

Latex "surgical gloves" provide very little protection against chemicals. In addition, use of latex gloves can trigger both allergic contact dermatitis and latex allergies.

Allergic contact dermatitis is the result of exposure to chemicals added to latex during harvesting, processing and/or manufacturing.
These chemicals can cause skin reactions 24 to 48 hours after exposure and may progress to oozing skin blisters or spread away from the area of skin touched by the latex.

Latex allergy (immediate hypersensitivity) is a more serious reaction to latex. Certain proteins in latex may cause sensitization (positive blood or skin test, with or without symptoms). Although the amount of exposure needed to cause sensitization or symptoms is not known, exposure to even very low levels can trigger allergic reactions in some sensitized individuals. Reactions usually begin within minutes of exposure to latex, but they can occur hours later. Mild reactions to latex involve skin redness, hives, or itching. More severe reactions to latex involve respiratory symptoms such as runny nose, sneezing, itchy eyes, scratchy throat, and asthma (difficult breathing, coughing spells, and wheezing). Rarely, shock may occur, but this life threatening reaction is seldom the first sign of a latex allergy.

More information on latex allergies can be found at National Institute for Occupational Safety and Health (NIOSH), Preventing Allergic Reactions to Natural Rubber Latex in the Workplace https://www.cdc.gov/niosh/docs/97-135/pdfs/97-135.pdf and National Institute for occupational Safety and Health (NIOSH)Latex Allergy: A Prevention Guide https://www.cdc.gov/niosh/docs/98-113/.

10.L Respiratory Protection

OSHA/PEOSH has very stringent requirements concerning individuals wearing respirators in the workplace. Wearers have to receive a medical evaluation to ensure that they are physically capable of wearing the respirator and must receive fit testing to ensure that there is no leakage around the facepiece. In addition a written program is required, as well as detailed training.

Another issue with the use of respirators in the laboratory is that, while the wearer may be protected from exposure, co-workers and support personnel who enter the room may not be adequately protected.

Respiratory protection should not be necessary in Rowan University laboratories. A chemical fume hood should be adequate protection against the vast majority of chemicals being used in the laboratory as long as it is operating properly.

If you have reason to suspect that you are breathing in chemicals or that you may be absorbing chemicals through your skin, notify your PI immediately. EHS can perform monitoring to determine if the control measures currently in place need to be augmented with respiratory protection. If any type of respiratory protection is to be used by laboratory personnel, EHS must be contacted to ensure compliance with PEOSH's stringent legal requirements. These requirements are designed to ensure that a comprehensive program is implemented including testing, cleaning, medical fit-testing, and medical surveillance.

10.M Ban of Food and Drink in the Laboratory

Laboratory personnel may become exposed to chemicals or other contaminants without the occurrence of an obvious incident. Contamination of food is possible if it is eaten with unclean hands or if it has had contact with chemicals or other contaminants which are stored or used in the laboratory. For this reason, eating, drinking, and storage of food and drink in Rowan University laboratories is prohibited.

10.N Preventing Contamination of Surfaces

A regular schedule of cleaning and decontamination of surfaces must be an integral part of any laboratory housekeeping program.
Skin contact with contaminated surfaces may lead to absorption of hazardous materials into the body or ingestion of materials due to unclean hands.

Surfaces should be wiped after a spill and periodically thereafter.

SECTION 11 – MEDICAL CONSULTATION, MEDICAL SURVEILLANCE AND EXPOSURE MONITORING:

11.A Medical Consultation

Personnel who work with chemicals must be provided with an opportunity to receive medical consultation under the circumstances listed below:

- Whenever an employee develops signs or symptoms due to exposure to hazardous chemicals in the laboratory
- When exposure monitoring reveals an exposure level routinely above the action level (or in the absence of an action level, the Permissible Exposure Limits PEL) for an OSHA/PEOSH regulated substance for which there are exposure monitoring and medical surveillance requirements
- Whenever an event takes place in the work area such as a spill, leak, explosion, or other occurrence resulting in the likelihood of a hazardous exposure

Medical examinations and consultations must be performed by or under the direct supervision of a licensed physician, and must be provided without cost to the employee, without loss of pay and at a reasonable time and place.

The following information must be provided to the physician:

- The identity of and a Safety Data Sheet (SDS) for the hazardous chemical(s) to which the employee may have been exposed.
- A description of the conditions under which the exposure occurred including quantitative data, if available
- A description of the signs and symptoms of exposure that the employee is experiencing, if any

The examining physician must provide the employer with a written opinion which includes the following:

- Any recommendations for further medical follow-up
- Any medical restrictions which may be found to be necessary in the course of the examination as a result of medical conditions which may place the employee at increased risk as a result of exposure to a hazardous chemical found in the workplace

11.B Employee Health Program

11.B.1 Rowan University Staff, Faculty, Employees

Cooper Medical School at Rowan University:

Faculty and Staff

Emergency – dial 4-9-1-1 for assistance or report to an Emergency Room.

ALL needlesticks/bloodborne pathogens exposures report to an Emergency Room.

Non-Emergency - Initiate paperwork with supervisor and report to WorkNet (300 South Broadway, #101, Camden, NJ; 856-342-2990).

Glassboro Campus:

Faculty and Staff

Emergency – dial 4-9-1-1 for assistance or report to an Emergency Room.

ALL needlesticks/bloodborne pathogens exposures report to an Emergency Room.

Non-emergency - report to the Wellness Center, Winans Hall (201 Mullica Hill Road, Glassboro, 856-256-4333) to initiate paperwork and be directed to the WC provider, American Work Care (1125 Delsea Drive, Glassboro, NJ; 856-218-7600)

Stratford Campus:

Faculty and Staff

ALL needlesticks/bloodborne pathogen exposures report to an Emergency Room immediately.
Emergency (other): dial 4-9-1-1 for assistance or report to an Emergency Room.

Non-Emergency – Initiate paperwork with Human Resources who will direct you to Rowan SOM's WC provider, WorkNet (37 South White Horse Pike, Stratford, NJ; 856-435-2680)

Complete and send a Rowan University Incident Report Form to Risk Management within 24 hours. EHS will conduct an accident investigation after any exposure incident.

Illnesses and injuries for Rowan University employees are addressed by the supervisor in the department by completing an Incident Report Form. Medical surveillance and consultation services are available for Rowan University employees by arrangement through their department's administrative office.
Any necessary medical surveillance services for Rowan University employees who provide support to Rowan University laboratories (e.g.; Environmental Services, Facilities, EHS, Receiving, etc.) is provided by arrangement with their respective departments.

11.B.2 Medical Consultation for Students

Cooper Medical School at Rowan University:
Students
Emergency – dial 4-9-1-1 for assistance or report to an Emergency Room.
ALL needlesticks/bloodborne pathogens exposures report to an Emergency Room.
Non-Emergency - Initiate paperwork with supervisor and report to WorkNet (300 South Broadway, #101, Camden, NJ 856-342-2990).

Glassboro Campus:
Students
Emergency – dial 4-9-1-1 for assistance or report to an Emergency Room.
ALL needlesticks/bloodborne pathogens exposures report to an Emergency Room.
Non-emergency - report to the Wellness Center, Winans Hall (201 Mullica Hill Road, Glassboro, 856-256-4333).

Stratford Campus:
Students:
ALL needlesticks/bloodborne pathogen exposures contact Garden State Infectious Diseases (709 Haddonfield-Berlin Road, Voorhees, 856-566-3190) immediately.
Emergency (other): dial 4-9-1-1 for assistance or report to an Emergency Room.
Non-Emergency – report to Family Medicine, 2nd Floor Rowan Medicine (42 East Laurel Road, Stratford.

11.B.3 Medical Surveillance for Employees working with animals

Health screening and approval for employees is provided by arrangement with Family Medicine, Rowan University School of Osteopathic Medicine, 42 East Laurel Road, Stratford, NJ 08084. This facility is open Monday through Friday from 8 am until 5pm.

Contact the Vivarium for additional information.

11.B.4 Medical Consultation and Surveillance for Volunteers

Medical consultation, immunizations, and surveillance described in this section of the Laboratory Safety Plan must be made available, independent of the employee status of individuals working in laboratories.
Medical services for volunteers which are not covered under any medical service is the responsibility of the Principal Investigator in whose laboratory the volunteer works and may be negotiated with their department.

11.C Exposure Monitoring

Monitoring to determine employee exposures to chemicals shall be performed as necessary. In general, EHS will be called upon to perform or oversee monitoring.

11.C.1 Initial Monitoring

Employee exposure assessment and monitoring for hazardous chemicals, regulated by OSHA/PEOSH, will be performed if there is reason to believe that the action level (generally, the action level is half the regulated level) is being exceeded. In the absence of an established action level, monitoring will be conducted to determine if the permissible exposure limit (PEL) is being exceeded.

11.C.2 Periodic Monitoring

If the initial monitoring discloses employee exposure over the action level (or in the absence of an action level, the permissible exposure limit), the exposure monitoring provisions of the relevant standard shall be complied with. Steps will also be taken to ensure that exposure has been minimized to the maximum extent feasible using substitution, engineering (e.g.; ventilation), and work practice controls.

11.C.3 Termination of Monitoring

Monitoring may be terminated in accordance with the requirements of the relevant standard, or when changes in control measures have been shown to provide a consistent reduction in exposure levels.

11.C.4 Monitoring for Circumstances Not Addressed by Regulations

Even when exposure to chemicals is below permissible levels, some personnel may experience transient symptoms such as eye irritation. Occasionally, more serious effects may occur. In addition, in certain circumstances, personnel may be concerned about exposures to a chemical for which there are no regulations regarding permissible exposures. In these cases, monitoring will be compared to applicable recommended limits, and EHS will make recommendations for reducing personnel exposures.

SECTION 12 – HAZARDOUS WASTE MANAGEMENT:

12.A Introduction

Planning for chemical waste disposal begins in the design phase of an experiment and before ordering the required chemicals. Civil and criminal statutes govern disposal of hazardous chemicals, and fines for non-compliance can be high.

EHS has a comprehensive program in place to identify, collect, and dispose of all materials that are considered hazardous waste. Employees working in laboratories should presume that all hazardous chemicals must be disposed through the Rowan University's hazardous waste vendor.

12.B Waste Minimization

Each person generating hazardous waste has an obligation to implement practices and procedures that minimize the amount of hazardous waste generated. Rowan University certifies that the University has tried, to the extent feasible, minimized the amount of hazardous waste generated at our institution.

Meeting the objectives of waste minimization at Rowan University requires the cooperation of everyone producing hazardous wastes. Waste minimization means any process modification that results in the prevention or reduction of hazardous chemical waste. Common waste minimization practices include:

- Product Substitution
  - Use non-toxic detergents and enzymatic cleaners in place of chromic acid and hydroxide/ethanol-based solutions.
  - Use non-hazardous liquid scintillation cocktails in place of toluene and xylene-based cocktails.
  - Use preservatives that do not contain mercury or sodium azide.
  - Substitute ethanol for formaldehyde in specimen preservation. *(Ethanol is a Class 1 flammable; be sure to observe the safe storage requirements)*.
  - Use water-based inks and paints in place of solvent and oil-based inks and paints.
  - Use non-halogenated solvents *(e.g., acetone, toluene, xylenes)* instead of halogenated solvents *(e.g., chloroform, methylene chloride)*.
  - Purchase commercially available chromatography columns for nucleic acid preparations instead of phenol/chloroform.
  - Use alcohol, digital or color metric thermometers in place of mercury thermometers.

- Scale Down
  - Use micro scale techniques to reduce or eliminate waste.
- Waste Segregation
  - Keep waste streams separate. Do not mix non-hazardous waste with hazardous waste.
- Waste Recovery
- Chemical Deactivation
  - Neutralize weak or dilute acids and bases rendering them sewer disposable. Acids greater than pH 3.0 and bases less than pH 12.0 can be neutralized. Only liquids with a pH from 5.5 to 9.0 can be drained-disposed.

    Acids with a pH less than or equal to 2.0 and bases with a pH greater than or equal to 12.5 *legally cannot be treated or neutralized*. Such waste streams must be disposed as a hazardous chemical waste.
  - Design experiments to include neutralization or detoxification of by-products at the conclusion of an experiment *(e.g., commercially available formaldehyde detoxification products)*.
- Sound Management Practices
  - Purchase the minimum amount of hazardous chemicals that will suffice for the current use. Disposal costs are usually greater than the purchase price.

- Keep chemical inventory (as required by the New Jersey Worker Right to Know Law) for each area of responsibility. This can help prevent duplicate purchases.
- Date peroxide forming and shock sensitive chemicals with the date received and date opened. Make note of an expiration date and dispose of the product before the date.

12.C How to Determine if a Waste is Hazardous

Rowan University has to follow requirements that specifically apply to hazardous chemical wastes and certain categories of non-hazardous chemical wastes. Non-hazardous chemical wastes are materials that have no intended use or re-use.

A chemical waste may be considered hazardous due to a general characteristic or because it is specifically listed by name. Generators should use the systematic approach outlined in this section to decide whether a chemical waste is hazardous.

- Safety Data Sheets (SDSs) are the first step in information gathering. Use the chemical's SDS to learn the physical and chemical properties of the waste.
- Characteristic Wastes are chemical wastes exhibiting any of the characteristics outlined below
  - Ignitability (EPA code D001)
    - Liquid organic chemicals with a flashpoint below 140 F (60 C), *e.g., acetonitrile, ethanol, toluene, xylene.*
    - Solids that can cause a fire by friction, absorption of moisture or spontaneous chemical change and when ignited burns vigorously, *e.g., picric acid, sodium dithionite.*
    - Oxidizing chemicals: substances that yield oxygen to stimulate combustion, *e.g., potassium permanganate, sodium chlorate and nitrate, perchloric and nitric acid.*
    - Flammable compressed gases, *e.g., ethylene, hydrogen, methane.*
  - Corrosivity (EPA code D002)
    - Aqueous solutions with a pH equal to or less than 2.0 (acids).
    - Aqueous solutions with a pH equal to or greater than 12.5 (bases).
    - Liquid chemicals that can corrode steel at a specific rate and temperature.
  - Reactivity (EPA code D003)
    - Substances that react with water violently or produce toxic gases or explosive mixtures when contacting water, *e.g., potassium, sodium, sodium hydride.*
    - Chemicals containing cyanide or sulfide that generate toxic gases when exposed to a pH between 2.0 and 12.5, *e.g., potassium cyanide, sodium sulfide.*
    - Substances that are inherently unstable or explosive, *e.g., phosphorous.*
  - Toxic Waste (EPA code series D004 through D043)
    - Materials containing certain heavy metals or organic constituents at or above the Toxicity Characteristic Leaching Procedure criteria. Contact EHS at 856-256-5105 or ehs@rowan.edu if assistance is required.
- Specialty Listed Wastes

- The EPA regulates approximately five hundred chemicals as hazardous waste. Chemical wastes named as the following
    - P-listed, acutely toxic;
    - U-listed, toxic;
    - F-listed, wastes from non-specific sources; and
    - K-Listed, waste from specific sources

Contact EHS with any questions about whether a chemical waste is considered hazardous waste.

12.D Laboratory Hazardous Waste Operating Procedures

12.D.1 Storage Containers

- Chose containers that are chemically compatible with the waste to be stored in them. (For example, hydrofluoric acid should not be in a glass container).
- Empty food containers must never be used to store hazardous waste.
- The best source of suitable containers is the reuse of the cleaned, empty 1 gallon chemical bottles.
- Never collect waste in a container larger than 5 gallons.
- In most cases, the container will not be returned to the laboratory.

12.D.2 Labeling of Hazardous Waste Containers

Each hazardous waste container must have a Rowan University Hazardous Waste Label on it as soon as you start putting waste into the container.

Contact EHS with any questions about the hazard classification.

-See label on next page-

The Rowan University Hazardous Waste Label is shown below:

HAZARDOUS WASTE

Container Full Date:_____

Department:_____ Bldg./Room#_____

Name:_____ Phone #:_____

Chemical Name/Contents	%

		
Environmental Hazard ☐	Corrosive ☐	Flammable☐
		
Chronic Health Hazard ☐	Toxic ☐	Sensitizer ☐

Envtl. Health & Safety (**EHS**) 856-256-5105 ehs@rowan.edu

- List all ingredients including water. Spell out the full chemical name of each ingredient. No abbreviations.
- List the percentage of each ingredient including water.
- Indicate the Hazard Class of each ingredient.

Copies of this Hazardous Waste Label can be found on the EHS website or copies may be obtained by contacting EHS at: EHS@rowan.edu or via phone at 856.256.5105***.***

12.D.3 Container Storage

- Keep all containers closed with an appropriate lid/cap (not a funnel) on at all times, with the exception of when filling the container.
- Containers do not need to be stored in the chemical fume hood. Instead, store the containers with compatible chemicals (e.g.; acid wastes with acids)
- The outside of the container must be free of precipitate and drips.
- The container must be removed from the laboratory within 3 CALENDAR DAYS of the container full date.

12.E Peroxide – Forming Chemicals

Most chemicals used in research laboratories are stable and non-explosive at the time of purchase. Over time, certain chemicals can oxidize, become contaminated, dry out, or

otherwise destabilize, becoming a potentially explosive chemical. Such chemicals can then literally detonate when exposed to heat, light, friction, or mechanical shock.

Commonly used chemicals that form peroxides as they age include, ethyl ether, isopropyl ether, butadiene, cyclohexene, tetrahydrofuran, and dioxane. Such chemicals will contain a stabilizing agent or inhibitor in them, which extends the shelf life. However, peroxides can still form over time. As a result, many of these chemicals will have an expiration date on the container. It is the responsibility of the PI to give peroxide forming chemicals to EHS for disposal at least 3 months before the expiration date, so they can be disposed of properly.

PLEASE NOTE: Department of Transportation (DOT) regulations forbid transportation of unstable containers of hazardous chemical waste. If a peroxide forming chemical is past its expiration date, Rowan University must hire a vendor who handles highly hazardous materials to stabilize the containers. The department generating the waste will be charges for this service.

12.F For Further Assistance

Contact EHS if you would like assistance on chemical waste issues such as waste minimization, storage, recycling, labeling, disposal, or other details regarding hazardous waste at Rowan University.

Environmental Health & Safety (EHS) Contact Information:	
Phone #:	856-256-5105
Email:	ehs@rowan.edu

APPENDIX A

Occupational Safety and Health Administration

- **Part Number:** 1910
- **Part Title:** Occupational Safety and Health Standards
- **Subpart:** Z
- **Subpart Title:** Toxic and Hazardous Substances
- **Standard Number:** 1910.1450
- **Title:** Occupational exposure to hazardous chemicals in laboratories.
- **Appendix:** A , B
- **GPO Source:** e-CFR

1910.1450(a)

Scope and application.

1910.1450(a)(1)

This section shall apply to all employers engaged in the laboratory use of hazardous chemicals as defined below.

1910.1450(a)(2)

Where this section applies, it shall supersede, for laboratories, the requirements of all other OSHA health standards in 29 CFR part 1910, subpart Z, except as follows:

1910.1450(a)(2)(i)

For any OSHA health standard, only the requirement to limit employee exposure to the specific permissible exposure limit shall apply for laboratories, unless that particular standard states otherwise or unless the conditions of paragraph (a)(2)(iii) of this section apply.

1910.1450(a)(2)(ii)

Prohibition of eye and skin contact where specified by any OSHA health standard shall be observed.

1910.1450(a)(2)(iii)

Where the action level (or in the absence of an action level, the permissible exposure limit) is routinely exceeded for an OSHA regulated substance with exposure monitoring and medical surveillance requirements paragraphs (d) and (g)(1)(ii) of this section shall apply.

1910.1450(a)(3)

This section shall not apply to:

1910.1450(a)(3)(i)

Uses of hazardous chemicals which do not meet the definition of laboratory use, and in such cases, the employer shall comply with the relevant standard in 29 CFR part 1910, subpart Z, even if such use occurs in a laboratory.

1910.1450(a)(3)(ii)

Laboratory uses of hazardous chemicals which provide no potential for employee exposure. Examples of such conditions might include:

1910.1450(a)(3)(ii)(A)

Procedures using chemically-impregnated test media such as Dip-and-Read tests where a reagent strip is dipped into the specimen to be tested and the results are interpreted by comparing the color reaction to a color chart supplied by the manufacturer of the test strip; and

1910.1450(a)(3)(ii)(B)

Commercially prepared kits such as those used in performing pregnancy tests in which all of the reagents needed to conduct the test are contained in the kit.

1910.1450(b)

Definitions —
Action level means a concentration designated in 29 CFR part 1910 for a specific substance, calculated as an eight (8)-hour time-weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance.

Assistant Secretary means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.
Carcinogen (see *select carcinogen*).

Chemical Hygiene Officer means an employee who is designated by the employer, and who is qualified by training or experience, to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan. This definition is not intended to place limitations on the position description or job classification that the designated individual shall hold within the employer's organizational structure.

Chemical Hygiene Plan means a written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment and work practices that (i) are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace and (ii) meets the requirements of paragraph (e) of this section.

Emergency means any occurrence such as, but not limited to, equipment failure, rupture of containers or failure of control equipment which results in an uncontrolled release of a hazardous chemical into the workplace.

Employee means an individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments.

Hazardous chemical means any chemical which is classified as health hazard or simple asphyxiant in accordance with the Hazard Communication Standard (§1910.1200).

Health hazard means a chemical that is classified as posing one of the following hazardous effects: Acute toxicity (any route of exposure); skin corrosion or irritation; serious eye damage or eye irritation; respiratory or skin sensitization; germ cell mutagenicity; carcinogenity; reproductive toxicity; specific target organ toxicity (single or repeated exposure); aspiration hazard. The criteria for determining whether a chemical is classified as a health hazard are detailed in appendix A of the Hazard Communication Standard (§1910.1200) and §1910.1200(c) (definition of "simple asphyxiant").

Laboratory means a facility where the "laboratory use of hazardous chemicals" occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

Laboratory scale means work with substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily and safely manipulated by one person. "Laboratory scale" excludes those workplaces whose function is to produce commercial quantities of materials.

Laboratory-type hood means a device located in a laboratory, enclosure on five sides with a moveable sash or fixed partial enclosed on the remaining side; constructed and maintained to draw air from the laboratory and to prevent or minimize the escape of air contaminants into the laboratory; and allows chemical manipulations to be conducted in the enclosure without insertion of any portion of the employee's body other than hands and arms.

Walk-in hoods with adjustable sashes meet the above definition provided that the sashes are adjusted during use so that the airflow and the exhaust of air contaminants are not compromised and employees do not work inside the enclosure during the release of airborne hazardous chemicals.
Laboratory use of hazardous chemicals means handling or use of such chemicals in which all of the following conditions are met:

(i) Chemical manipulations are carried out on a "laboratory scale;"

(ii) Multiple chemical procedures or chemicals are used;

(iii) The procedures involved are not part of a production process, nor in any way simulate a production process; and

(iv) "Protective laboratory practices and equipment" are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

Medical consultation means a consultation which takes place between an employee and a licensed physician for the purpose of determining what medical examinations or procedures, if any, are appropriate in cases where a significant exposure to a hazardous chemical may have taken place.

Mutagen means chemicals that cause permanent changes in the amount or structure of the genetic material in a cell. Chemicals classified as mutagens in accordance with the Hazard Communication Standard (§1910.1200) shall be considered mutagens for purposes of this section.

Physical hazard means a chemical that is classified as posing one of the following hazardous effects: Explosive; flammable (gases, aerosols, liquids, or solids); oxidizer (liquid, solid, or gas); self-reactive; pyrophoric (gas, liquid or solid); self-heating; organic peroxide; corrosive to metal; gas under pressure; in contact with water emits flammable gas; or combustible dust. The criteria for determining whether a chemical is classified as a physical hazard are in appendix B of the Hazard Communication Standard (§1910.1200) and §1910.1200(c) (definitions of "combustible dust" and "pyrophoric gas").

Protective laboratory practices and equipment means those laboratory procedures, practices and equipment accepted by laboratory health and safety experts as effective, or that the employer can show to be effective, in minimizing the potential for employee exposure to hazardous chemicals.

Reproductive toxins mean chemicals that affect the reproductive capabilities including adverse effects on sexual function and fertility in adult males and females, as well as adverse effects on the development of the offspring. Chemicals classified as reproductive toxins in accordance with the Hazard Communication Standard (§1910.1200) shall be considered reproductive toxins for purposes of this section.

Select carcinogen means any substance which meets one of the following criteria:

(i) It is regulated by OSHA as a carcinogen; or

(ii) It is listed under the category, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or

(iii) It is listed under Group 1 ("carcinogenic to humans") by the International Agency for Research on Cancer Monographs (IARC) (latest editions); or

(iv) It is listed in either Group 2A or 2B by IARC or under the category, "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in

accordance with any of the following criteria:

(A) After inhalation exposure of 6¿7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m3;

(B) After repeated skin application of less than 300 (mg/kg of body weight) per week; or

(C) After oral dosages of less than 50 mg/kg of body weight per day.

1910.1450(c)

Permissible exposure limits. For laboratory uses of OSHA regulated substances, the employer shall assure that laboratory employees' exposures to such substances do not exceed the permissible exposure limits specified in 29 CFR part 1910, subpart Z.

1910.1450(d)

Employee exposure determination --

1910.1450(d)(1)

Initial monitoring. The employer shall measure the employee's exposure to any substance regulated by a standard which requires monitoring if there is reason to believe that exposure levels for that substance routinely exceed the action level (or in the absence of an action level, the PEL).

1910.1450(d)(2)

Periodic monitoring. If the initial monitoring prescribed by paragraph (d)(1) of this section discloses employee exposure over the action level (or in the absence of an action level, the PEL), the employer shall immediately comply with the exposure monitoring provisions of the relevant standard.

1910.1450(d)(3)

Termination of monitoring. Monitoring may be terminated in accordance with the relevant standard.

1910.1450(d)(4)

Employee notification of monitoring results. The employer shall, within 15 working days after the receipt of any monitoring results, notify the employee of these results in writing either individually or by posting results in an appropriate location that is accessible to employees.

1910.1450(e)

Chemical hygiene plan -- General. (Appendix A of this section is non-mandatory but provides guidance to assist employers in the development of the Chemical Hygiene Plan).

1910.1450(e)(1)

Where hazardous chemicals as defined by this standard are used in the workplace, the employer shall develop and carry out the provisions of a written Chemical Hygiene Plan which is:

1910.1450(e)(1)(i)

Capable of protecting employees from health hazards associated with hazardous chemicals in that laboratory and

1910.1450(e)(1)(ii)

Capable of keeping exposures below the limits specified in paragraph (c) of this section.

1910.1450(e)(2)

The Chemical Hygiene Plan shall be readily available to employees, employee representatives and, upon request, to the Assistant Secretary.

1910.1450(e)(3)

The Chemical Hygiene Plan shall include each of the following elements and shall indicate specific measures that the employer will take to ensure laboratory employee protection;

1910.1450(e)(3)(i)

Standard operating procedures relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals;

1910.1450(e)(3)(ii)

Criteria that the employer will use to determine and implement control measures to reduce employee exposure to hazardous chemicals including engineering controls, the use of personal protective equipment and hygiene practices; particular attention shall be given to the selection of control measures for chemicals that are known to be extremely hazardous;

1910.1450(e)(3)(iii)

A requirement that fume hoods and other protective equipment are functioning properly and specific measures that shall be taken to ensure proper and adequate performance of such equipment;

1910.1450(e)(3)(iv)

Provisions for employee information and training as prescribed in paragraph (f) of this section;

1910.1450(e)(3)(v)

The circumstances under which a particular laboratory operation, procedure or activity shall require prior approval from the employer or the employer's designee before implementation;

1910.1450(e)(3)(vi)

Provisions for medical consultation and medical examinations in accordance with paragraph (g) of this section;

1910.1450(e)(3)(vii)

Designation of personnel responsible for implementation of the Chemical Hygiene Plan including the assignment of a Chemical Hygiene Officer, and, if appropriate, establishment of a Chemical Hygiene Committee; and

1910.1450(e)(3)(viii)

Provisions for additional employee protection for work with particularly hazardous substances. These include "select carcinogens," reproductive toxins and substances which have a high degree of acute toxicity. Specific consideration shall be given to the following provisions which shall be included where appropriate:

1910.1450(e)(3)(viii)(A)

Establishment of a designated area;

1910.1450(e)(3)(viii)(B)

Use of containment devices such as fume hoods or glove boxes;

1910.1450(e)(3)(viii)(C)

Procedures for safe removal of contaminated waste; and

1910.1450(e)(3)(viii)(D)

Decontamination procedures.

1910.1450(e)(4)

The employer shall review and evaluate the effectiveness of the Chemical Hygiene Plan at least annually and update it as necessary.

1910.1450(f)

Employee information and training.

1910.1450(f)(1)

The employer shall provide employees with information and training to ensure that they are apprised of the hazards of chemicals present in their work area.

1910.1450(f)(2)

Such information shall be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations. The frequency of refresher information and training shall be determined by the employer.

1910.1450(f)(3)

Information. Employees shall be informed of:

1910.1450(f)(3)(i)

The contents of this standard and its appendices which shall be made available to employees;

1910.1450(f)(3)(ii)

the location and availability of the employer's Chemical Hygiene Plan;

1910.1450(f)(3)(iii)

The permissible exposure limits for OSHA regulated substances or recommended exposure limits for other hazardous chemicals where there is no applicable OSHA standard;

1910.1450(f)(3)(iv)

Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory; and

1910.1450(f)(3)(v)

The location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including, but not limited to, safety data sheets received from the chemical supplier.

1910.1450(f)(4)

Training.

1910.1450(f)(4)(i)

Employee training shall include:

1910.1450(f)(4)(i)(A)

Methods and observations that may be used to detect the presence or release of a hazardous chemical (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);

1910.1450(f)(4)(i)(B)

The physical and health hazards of chemicals in the work area; and

1910.1450(f)(4)(i)(C)

The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.

1910.1450(f)(4)(ii)

The employee shall be trained on the applicable details of the employer's written Chemical Hygiene Plan.

1910.1450(g)

Medical consultation and medical examinations.

1910.1450(g)(1)

The employer shall provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances:

1910.1450(g)(1)(i)

Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory, the employee shall be provided an opportunity to receive an appropriate medical examination.

1910.1450(g)(1)(ii)

Where exposure monitoring reveals an exposure level routinely above the action level (or in the absence of an action level, the PEL) for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements, medical surveillance shall be established for the affected employee as prescribed by the particular standard.

1910.1450(g)(1)(iii)

Whenever an event takes place in the work area such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure, the affected employee shall be provided an opportunity for a medical consultation. Such consultation shall be for the purpose of determining the need for a medical examination.

1910.1450(g)(2)

All medical examinations and consultations shall be performed by or under the direct supervision of a licensed physician and shall be provided without cost to the employee, without loss of pay and at a reasonable time and place.

1910.1450(g)(3)

Information provided to the physician. The employer shall provide the following information to the physician:

1910.1450(g)(3)(i)

The identity of the hazardous chemical(s) to which the employee may have been exposed;

1910.1450(g)(3)(ii)

A description of the conditions under which the exposure occurred including quantitative exposure data, if available; and

1910.1450(g)(3)(iii)

A description of the signs and symptoms of exposure that the employee is experiencing, if any.

1910.1450(g)(4)

Physician's written opinion.

1910.1450(g)(4)(i)

For examination or consultation required under this standard, the employer shall obtain a written opinion from the examining physician which shall include the following:

1910.1450(g)(4)(i)(A)

Any recommendation for further medical follow-up;

1910.1450(g)(4)(i)(B)

The results of the medical examination and any associated tests;

1910.1450(g)(4)(i)(C)

Any medical condition which may be revealed in the course of the examination which may place the employee at increased risk as a result of exposure to a hazardous workplace; and

1910.1450(g)(4)(i)(D)

A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination or treatment.

1910.1450(g)(4)(ii)

The written opinion shall not reveal specific findings of diagnoses unrelated to occupational exposure.

1910.1450(h)

Hazard identification.

1910.1450(h)(1)

With respect to labels and safety data sheets:

1910.1450(h)(1)(i)

Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced.

1910.1450(h)(1)(ii)

Employers shall maintain any safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible to laboratory employees.

1910.1450(h)(2)

The following provisions shall apply to chemical substances developed in the laboratory:

1910.1450(h)(2)(i)

If the composition of the chemical substance which is produced exclusively for the laboratory's use is known, the employer shall determine if it is a hazardous chemical as defined in paragraph (b) of this section. If the chemical is determined to be hazardous, the employer shall provide appropriate training as required under paragraph (f) of this section.

1910.1450(h)(2)(ii)

If the chemical produced is a byproduct whose composition is not known, the employer shall assume that the substance is hazardous and shall implement paragraph (e) of this section.

1910.1450(h)(2)(iii)

If the chemical substance is produced for another user outside of the laboratory, the employer shall comply with the Hazard Communication Standard (29 CFR 1910.1200) including the requirements for preparation of safety data sheets and labeling.

1910.1450(i)

Use of respirators. Where the use of respirators is necessary to maintain exposure below permissible exposure limits, the employer shall provide, at no cost to the employee, the proper respiratory equipment. Respirators shall be selected and used in accordance with the requirements of 29 CFR 1910.134.

1910.1450(j)

Recordkeeping.

1910.1450(j)(1)

The employer shall establish and maintain for each employee an accurate record of any measurements taken to monitor employee exposures and any medical consultation and examinations including tests or written opinions required by this standard.

1910.1450(j)(2)

The employer shall assure that such records are kept, transferred, and made available in accordance with 29 CFR 1910.1020.

1910.1450(k)

[Reserved]

1910.1450(l)

Appendices. The information contained in the appendices is not intended, by itself, to create any additional obligations not otherwise imposed or to detract from any existing obligation.

[55 FR 3327, Jan. 31, 1990; 55 FR 7967, March, 6, 1990; 55 FR 12777, March 30, 1990; 61 FR 5507, Feb. 13, 1996; 71 FR 16674, April 3, 2006; 77 FR 17887, March 26, 2012]

APPENDIX B

Laboratory Specific Chemical Hygiene Plan

Instructions:
Complete your Laboratory Specific Chemical Hygiene Plan in its entirety. Make a copy of your completed Laboratory Specific Chemical Hygiene Plan, sign it and make it readily available to those who work in your laboratory.

Principal Investigator:

Laboratory Safety Officer:
(Principal Investigator is the Laboratory Safety Officer is one is not assigned)

Building: Room(s):

Completed By: Date:

Checklist for documents to be appended to plan, if applicable.

Check below all items that are appended to this plan. Unless otherwise indicated, copies of appended documents should be sent to EHS.

- ☐ List of particularly hazardous and high risk chemicals (required unless listed in this Plan, or unless you indicate that there are no particularly hazardous or high risk chemicals in the laboratory).
- ☐ Standard Operating Procedures or customized Standard Operating Procedures, if any.
- ☐ Summary of Chemical High Risk Procedures, hazard assessments or laboratory specific SOP's for each high risk procedure(s)
- ☐ Laboratory Emergency Response materials (spill kit)
- ☐ Laboratory specific chemical hygiene training documentation

Safety Data Sheets (SDSs)

Every laboratory employee should be instructed on how to access and understand Safety Data Sheets.

Safety Data Sheets for our chemicals can be found:

- ☐ In this laboratory, located:
- ☐ In the departmental file, located:
- ☐ On a networked computer, located:
- ☐ Other:

Chemical Inventory for chemicals in this laboratory

☐ The chemical inventory for this laboratory is attached or can be found in **BioRAFT** (see ***Appendix C*** info.)

Controlling Exposures & Hazards – Laboratory Specific Strategies

General strategies for controlling chemical exposures are described in the Laboratory Safety Plan. List below any general lab guidelines that are more stringent than the above referenced section.

Indicate below the strategies for safe use of engineering controls in the laboratory:

☐ Our laboratory has a chemical fume hood.
- Chemical fume hoods are certified on an annual basis. If your chemical fume hood has not been certified in the past year, contact EHS at 856-256-5105 or ehs@rowan.edu
- Position sash correctly for work:
  - ☐ Hood sash moves vertically – keep sash in lowest practical position while working. Sash must come down to shoulder height or lower.
  - ☐ Hood has combination sash –
    - For maximum flexibility, route tubes and cords under airfoil or through access panel at side of chemical fume hood. If this is not possible, route these connections under the sash. Avoid running tubes or cords between horizontal side panels.
    - Keep horizontal panels closed and move sash vertically during work. Keep sash in lowest practical position while working. Sash must come down to shoulder height or lower.
    - Close sash vertically. Place one sash panel between body and the work in the hood. Work with arms reaching around this sash panel.

☐ Our lab uses a ducted biological safety cabinet for handling of powder chemicals or water-based solutions/suspensions. Look for annul certification date on the biological safety cabinet. Ducted biological safety cabinets are certified annually by an approved outside vendor.

☐ Our laboratory has a snorkel exhaust (localized exhaust) to remove hazardous vapors from the benchtop. The snorkel must be placed as close as possible to the point of containment generation (generally 4" – 6")

☐ Our laboratory has other localized exhaust. Safe use instructions are included below ☐ or are attached to this document ☐.
Safe use instructions:

Flammable Chemicals

Where are your flammable chemicals stored:
- ☐ In a storage cabinet beneath the chemical fume hood.
- ☐ In a flammable storage cabinet.
- ☐ Other, list:

Are there refrigerators which can safety store flammables available in your laboratory:
YES ☐ NO ☐ If yes, provide location:

Particularly Hazardous Substances

Where are the designated areas in your laboratory to work with the particularly hazardous substances (list all particularly hazardous substances):

Particularly Hazardous Substance (Acutely Toxic Material)	Designated Area Location (e.g., Chemical Fume Hood)
Particularly Hazardous Substance (Carcinogen)	**Designated Area Location (e.g., Chemical Fume Hood)**
Particularly Hazardous Substance (Reproductive Hazard)	**Designated Area Location (e.g., Chemical Fume Hood)**

Location of closest emergency shower and emergency eyewash for this laboratory?
Emergency Shower:

Emergency Eyewash:

What type of fire extinguishers are available? Where are they located?

Type	Number	Location
Class A		
Class B		
Class C		
Class AB		
Class ABC		
Class BC		

Controlling Exposure & Hazards – Standard Operating Procedures and Safety Guides

Mark below the Standard Operating Procedures that are relevant for this laboratory.
SOPs must be appended to this document.

SOP	Chemical Name or Hazard Class	Notes
☐	Acutely Toxic Chemicals	
☐	Acutely Toxic Gases	
☐	Carcinogens	
☐	Reproductive Hazards	
☐	Compressed Gases	
☐	Strong Oxidizers	
☐	Pyrophoric Chemicals	
☐	Reactive Liquids	
☐	Reactive Solids	
☐	Water Reactive Chemicals	
☐	Peroxide Forming Chemicals	
☐	Corrosive Chemicals	
☐	Chemical Irritants	
☐	Other (specify)	

☐ This laboratory does not have or need SOPs.

-see next page-

The following Chemical Hygiene High Risk Procedures Apply:

	Chemical High Risk Procedure	Approved by the PI
☐	Use of liquid nitrogen or other cryogens in large quantities or in a manner that could displace oxygen. Specify cryogens, amounts, task (if applicable), location, and approximate room dimensions: "Large quantities" include any cryogen piped in from a tank located outside the building. For liquid nitrogen, large quantities would be more than one freezer and one attached liquid cylinder per room. FILLING a cryocart or cooler is a task that could displace oxygen.	☐
☐	Heating of concentrated perchloric acid (60% or more). Indicate location, concentration, amount and frequency of use:	☐
☐	Use of chemicals that are Acutely Toxic Category 1 by inhalation or skin contact in the concentration purchased. List acutely toxic chemicals in the laboratory:	☐

☐	Use of hydrofluoric acid (HF). List quantities and concentration:	☐
☐	Use of reactive, pyrophoric, & explosive chemicals that are considered high risk (examples are as follows: Contact with water liberates toxic gas, reacts violently with water, pyrophoric liquid or solid – Category 1, Explosives –unstable or divisions 1.1 -1.3, self-reactive or organic peroxides (Type A), self heating –Category 1) List materials or classes of materials:	☐
☐	Chemical procedures involving pressure, vacuum, or heat when failure of the container could result in significant physical hazards, exposure to toxic materials or fire. List procedures:	☐
☐	Other, not identified above. Note:	☐

Controlling Exposures & Hazards – Work Practices

Some laboratory work may not meet the definition of "high risk procedures" above, but may introduce additional risk because of when and/or how the work is conducted.

The following work practices require approval from the PI.

Provide details for each if applicable in your laboratory:

Working alone:

Unattended Experiments:

Indicate what safeguards are in place for unattended experiments:

NOTE: If any unattended operation involves the use of a flammable or highly toxic material, prior approval must be obtained from the Department Chair.

Laboratory Specific Information for Chemical Waste Disposal:

☐ Our laboratory generates chemical waste:
Chemical waste is accumulated in the laboratory, provide location:

A satellite accumulation area sign is posted: YES ☐ NO ☐
Chemical waste labels are stored in the laboratory: YES ☐ NO ☐
If yes, provide location:

☐ Our laboratory does not generate chemical waste

Emergency Response

For general emergency response, procedures can be found in the Emergency Action Guide, see the Rowan Emergency Preparedness Information. Specific information on hazardous materials can be found here. Specific information on chemical spills can be found here.

Emergency Assembly Point

Information on building evacuation can be found in the Emergency Action Guide, see Building Evacuation for your Building Assembly Areas.

Our laboratory Emergency Assembly Point is:

Spill Clean Up Supplies and Instructions:

Spill clean-up supplies are located:

Usage information: (Refer to instructions in prepared kits or SOPs, or provide instructions here:

Incident Report Form

The Incident Report Form can be found here.
Use the Incident Report Form to report campus incidents and employee work related injuries. These incidents may include, but are not limited to, slips and falls, laboratory events, needlestick injuries, and/or other incidents that may require medical assistance.

Certification
By signing and dating here, the Principal Investigator certifies that her/his laboratory Specific Chemical Hygiene Plan is accurate and that it effectively provides for the chemical safety of faculty, staff, employees, and students in this laboratory.

Print Name:_____

Signature:_____

Date:_____

Annual Review and Updates

By signing and dating here, the Principal Investigator certifies that the required annual review (and update, if needed) of this Laboratory Specific Chemical Hygiene Plan has been completed, and that it continues to be accurate and to effectively provide for the chemical safety of faculty, staff, employees, and students in this laboratory.

PI Name (print)	PI Name (signature)	Date	Updates (Y/N) State updates in this column

LABORATORY SPECIFIC CHEMICAL HYGIENE TRAINING DOCUMENTATION

(Copy this form and have each member of your lab sign before work with chemicals. A copy must be appended to your Laboratory Specific Chemical Hygiene Plan).

☐ I have received information and training by my PI on the subject of chemical hygiene,including:

☐ I have read and know where to find a copy of the Laboratory Safety Plan.

☐ I have read and know where to find a copy of the Laboratory Specific Chemical Hygiene Plan, including the Standard Operating Procedure(s). I am familiar with the contents of each and agree to follow the written procedures.

☐ I have been instructed on how to locate important reference materials on hazard information about chemicals and safe handling, storage, and disposal practices for the chemicals found in this laboratory.

☐ I know where/how to locate Safety Data Sheets for chemicals in this laboratory.

☐ I have been apprised of the physical and health hazards of chemicals in this laboratory.

☐ I am aware of the engineering controls, work practices, emergency procedures, and personal protective equipment needed to protect myself from the hazards in thelaboratory.

☐ I have been shown the location of the fire extinguisher(s), emergency safety shower, and emergency eyewash for this laboratory.

☐ I have been shown the laboratory's Emergency Assembly Point for emergencyevacuations.

Print Name:_____

Signature:_____

Date:_____

REVIEW OF LABORATORY SPECIFIC CHEMICAL HYGIENE DOCUMENTATION

The laboratory specific chemical hygiene plan should be reviewed by each member of the laboratory annually, or whenever there is a revision to the plan (such as new or revised SOPs).
The signature below certifies review of the following:

- Chemical Hygiene Plan
- Annual Review of the Chemical Hygiene Plan and relevant SOPs
- Review of new and/or revised SOPs or Guidelines

Name (print)	Name (signature)	Date

APPENDIX C

Rowan University
ENVIRONMENTAL HEALTH & SAFETY

MEMORANDUM

DATE: August 12, 2019

TO: All Principle Investigators & Department Chairs

FROM: Michael Swan, Director Environmental Health & Safety (**EHS**)

RE: Support Needed for BioRAFT

The Rowan University Office of Environmental Health and Safety (EHS) is migrating management and tracking of chemical inventories, safety data sheets (SDS) and laboratory inspections to a new automated database called "**BioRAFT**." The main purpose of moving to this database or **BioRAFT** is to:

- Simplify chemical inventory maintenance & reporting requirements
- Eliminate manual reporting tasks involved with chemical inventories and SDS filing that can be tedious and time consuming (***emphasis on work smarter***).
- Allow researchers, chemical users and emergency personnel to easily search for chemicals and associated SDS when needed (by location, area, CAS#, product name, manufacturer name etc.).
- Provide an online data base or electronic copies of all campus wide chemicals (used or stored) that can be accessed even after hours or during emergencies.
- Online documentation and tracking of all required lab or research based inspections. EHS or laboratory safety self-inspection tools will also be provided.
- Maintenance of University required inspections and applicable regulatory compliance.

In order to be effective however, we need your help to support this effort and collect some basic information about your laboratory, the research personnel with whom you work with and the hazards to which they are exposed. This will help us ensure that all relevant laboratory inspections are scheduled and completed. Either you can enter this information, or you can identify a specific compliance liaison for your laboratory to do so (***note:*** *the designated PI for that lab space will have to approve the data entered*). Identifying a laboratory compliance liaison at this stage will mean that future notification emails concerning your laboratory will also be sent to them.

To complete laboratory setup yourself, use your Rowan University login and password to log in to BioRAFT using the link below and follow the instructions on the website. Depending on the number of personnel in your laboratory you should expect this set up to take about 10 minutes.

BioRAFT LINK: https://rowan.bioraft.com/

To assign laboratory setup to your compliance liaison log in using your Rowan University login and password then added this individual to your lab. Be sure to check off any Optional Access that this individual will require. Aside from helping to keep the community safe and reduce accidents, this process is important for the University to maintain compliance with federal and state laws.

Thank you for your time and assistance and for helping to protect the University's research programs.

For questions or additional support, please contact EHS via email at EHS@rowan.edu or by phone at: 856.25**6**.**5105**.

APPENDIX D

Rowan University

Vacating Laboratories Procedure

Introduction

Decommissioning a laboratory is a multi-step process which ensures that the laboratory is free of old chemicals, equipment, refuse, and biological, chemical or radiological contamination. This process allows for the orderly scheduling of renovations and turning over lab space to new occupants.

Principal Investigators are responsible for the proper disposition of all biological, chemical, and radioactive materials in the laboratory, as well as for complete removal of all equipment and supplies. A laboratory will not be decommissioned by EHS until all of the items listed below have been completed or deemed not applicable.

A minimum or two weeks before the laboratory will be vacated, notify EHS, the Radiation Safety Officer, and Environmental Services of your intention to vacate a laboratory. The Radiation Safety Officer requires four (4) weeks notice if fixed equipment is to be moved or discarded, and in the event the laboratory is being decommissioned for a renovation.

EHS will work with the laboratory to identify chemicals for disposal. Laboratory personnel will be expected to label and inventory excess or unwanted chemicals for disposal through the Rowan University Hazardous Waste Vendor. EHS and the laboratory will make arrangements to transfer the waste chemicals to the hazardous waste storage room or in some cases have the Hazardous waste Vendor pack the chemicals in the laboratory.

Following the decontamination of work surfaces and the removal of biological, chemical, and radiological hazards as well as all equipment and refuse, EHS will perform a final inspection to decommission the laboratory.

General Requirements

All areas where biological agents and/or chemicals were used must be cleaned. This includes bench tops, chemical storage cabinets, chemical fume hoods, biological safety cabinets, shelves, ovens, incubators, refrigerators, and freezers. Biological use areas should be cleaned using a 1:10 bleach solution. Chemical areas should be cleaned with a detergent solution, and rinsed afterwards.

Refrigerator/Freezer

When moving or discarding a refrigerator or freezer, all materials must be removed from the refrigerator by laboratory personnel. Spills and other visible contamination must be removed by laboratory personnel. If the refrigerator or freezer was used to store biological or biohazardous materials, then all surfaces must be wiped with a 1:10 bleach solution prior to Environmental Service moving the unit.

If the refrigerator or freezer is to be discarded, in addition to the steps listed above, Facilities must be contacted to have the refrigerant removed from the compressor. The cost of the refrigerant removal is the responsibility of the laboratory.

Biological Safety Cabinet

A biological safety cabinet may only be moved after decontamination by an approved vendor. The cost of decontaminating the biological safety cabinet is the responsibility of the laboratory. Whenever a biological safety cabinet is moved, it must be re-certified prior to use.

Hazardous Waste Disposal

In most cases, chemicals cannot be moved to a new location by laboratory personnel. As you prepare for the move, segregate out any chemical that are no longer wanted or have expired. Any chemicals that are in the original container and are in good shape can be offered to other researchers for their use. Any chemicals that remain after this process must be disposed of as hazardous wastes through EHS.

Contact EHS as early as possible, as this process takes time and can delay the moving process unnecessarily. Laboratory personnel will be expected to label and inventory excess and unwanted chemicals for disposal through the Rowan University hazardous waste vendor. EHS will provide you with labels, an inventory form, and technical guidance to assist you in the proper disposal of your unwanted/excess chemicals.

Preserved Specimen Disposal

Contact EHS for additional information if you need to dispose of preserved tissue specimens.

Medical Waste Disposal

Current regulated medical waste pick-up procedures will be followed when vacating the laboratory.

Compressed Gases

Laboratory personnel are expected to return all used and unused gas cylinders to the supplier. Check with Logistical Services for additional information.

Chemical Fume Hood

The surfaces on the inside of the chemical fume hood should be cleaned with a detergent solution and rinsed prior to any work performed inside by Facilities or an approved outside vendor.

Laboratory Equipment which contains a Radioactive Source

Contact the Radiation Safety Officer (856-566-6189) for assistance.

Radiation Safety

The Radiation Safety Officer must be contacted at least four (4) weeks in advance of the planned moving date, even if radioactive materials are not currently in use.

Lead-Containing Equipment

Contact Facilities for more information.

EHS will assist in the disposal of some lead-containing equipment (e.g.; shielding from around a radioactive source, rechargeable batteries from uninterruptible power sources, etc.)

APPENDIX E

Laboratory Vacating Questionnaire

The Principal Investigator or designee should fill in this questionnaire and **email it to EHS** at ehs@rowan.edu at least eight (8) weeks prior to the date that the laboratory will be vacated.

Who is the Principal Investigator for this laboratory?
Name: Phone: Email:
Laboratory Location:

Laboratory contact for information and to coordinate vacating activities?
Name: Phone: Email:
Laboratory Location:

The targeted move date for this laboratory is:

What is the contact information for the PI after the move is completed?
Name: Phone: Email:
Laboratory Location:

The laboratory is:

- ☐ The laboratory is moving to a Rowan University laboratory in the same building. (NOTE: Contact EHS to discuss the transport of hazardous materials to the new laboratory).
- ☐ The laboratory is moving to a Rowan University laboratory in a different building but same campus. (NOTE: Contact EHS to discuss the transport of hazardous materials to the new laboratory).
- ☐ The laboratory is moving to a Rowan University laboratory in a different building but different campus. (NOTE: Contact EHS to discuss the transport of hazardous materials to the new laboratory).
- ☐ The laboratory is moving off of a Rowan University campus. (NOTE: Contact EHS to discuss the transport of hazardous materials to the new laboratory).
- ☐ The laboratory is completely disbanding (e.g.: due to retirement). (NOTE: Laboratory chemicals and equipment can be offered to other laboratories for use. Any remaining chemicals must be disposed of as hazardous waste through EHS. Biohazardous materials must be disposed of as regulated medical waste).

This is the checklist that EHS will use to decommission a laboratory room. This checklist should be used by the PI as a guide when preparing to move. Other activities may be required, depending on the type and use of the laboratory space.

FINAL CLEARANCE CHECKLIST

ROOM: BUILDING:

☐ Yes ☐ No ☐ N/A	Have all materials (equipment, supplies, chemicals, radioactive materials, and biological agents) been removed from the room?

☐ Yes ☐ No ☐ N/A	Has the refuse been correctly sorted and placed in the appropriate containers for removal by Environmental Services?
☐ Yes ☐ No ☐ N/A	Has all regulated medical waste been removed from the laboratory?
☐ Yes ☐ No ☐ N/A	Have the refrigerator(s) and freezer(s) been cleaned and decontaminated?
☐ Yes ☐ No ☐ N/A	If any refrigerator(s) and freezer(s) have been designated for disposal, has the refrigerant been removed?
☐ Yes ☐ No ☐ N/A	Have all unwanted chemicals and/or chemical waste been transported to the Hazardous Chemical Waste Room?
☐ Yes ☐ No ☐ N/A	Has the Biological Safety Cabinet been decontaminated by an approved vendor, if applicable?
☐ Yes ☐ No ☐ N/A	Is decontamination of the Biological Safety Cabinet available for review?
☐ Yes ☐ No ☐ N/A	Have all of the laboratory's materials and equipment been removed from common rooms (i.e.: warm and cold rooms, tissue culture rooms, etc.)?
☐ Yes ☐ No ☐ N/A	Has unheated perchloric acid been used in the chemical fume hood?
☐ Yes ☐ No ☐ N/A	Has heated perchloric acid been used in the chemical fume hood?
☐ Yes ☐ No ☐ N/A	Have any metal azides (e.g.: sodium azide) been used in the chemical fume hood?

If the laboratory is being vacated for a new user:

☐ Yes ☐ No ☐ N/A	Have all surfaces in the room been wiped and analyzed for the presence of radiation prior to decommissioning by the Radiation Safety Officer?
☐ Yes ☐ No ☐ N/A	If needed, have all contaminated surfaces been cleaned, wiped and reanalyzed prior to decommissioning by the Radiation Safety Officer?
☐ Yes ☐ No ☐ N/A	Have all potentially contaminated pieces of equipment been decommissioned by the Radiation Safety Officer prior to removal from the room?

-*SEE NEXT PAGE*-

Postings

☐ Yes ☐ No ☐ N/A	Has the CAUTION sign been removed from the door by EHS
☐ Yes ☐ No ☐ N/A	Has the DECOMMISSION CLEARANCE notice been posted?

REMINDER: The Principal Investigator or designee should fill in this questionnaire and **email it to EHS** at ehs@rowan.edu at least eight (8) weeks prior to the date that the laboratory will be vacated.

DO NOT WRITE BELOW
FOR COMPLETION BY ENVIRONMENTAL HEALTH AND SAFETY (EHS)

EHS Staff (print): _____

EHS Staff (Signature): _____

Date: _____

APPENDIX F

NAME OF REPSONSIBLE PERSON

EMERGENCY PHONE NUMBER

NAME OF REPSONSIBLE PERSON

EMERGENCY PHONE NUMBER

NAME OF REPSONSIBLE PERSON

EMERGENCY PHONE NUMBER

APPENDIX G

NOTICE

NO FOOD OR DRINK ALLOWED IN THIS REFRIGERATOR

NOTICE

This microwave is for laboratory use only.

No food or drink allowed.

NOTICE

This ice machine is for laboratory use only.

No food, beverage, or ice for human consumption.

DANGER

NOT FOR FLAMMABLE MATERIAL STORAGE

APPENDIX H


DESIGNATED
AREA
WITHIN

DESIGNATED AREA

Reproductive Toxin

(Ethidium Bromide)