



University of New Haven

POLICIES AND PROCEDURES

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Chemical Hygiene Plan

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Table of Contents

1.0 University of New Haven’s Commitment to Safety	4
1.1 Purpose.....	4
1.2 Scope.....	4
2.0 Roles and Responsibilities	4
2.1 Department Chairs of the Science Disciplines	4
2.2 Associate Vice President of Public Safety & Administrative Services.....	5
2.3 Chemical Hygiene Officer (CHO)	5
3.0 Standard Operating Procedures	6
3.1 Laboratory General Safety Procedures	6
3.2 Accident and Incident Reporting.....	6
3.3 Chemical Storage	7
3.4 Hazardous Waste Management and Disposal.....	7
3.4.1 Management.....	7
3.4.2 General Procedures for Disposal	8
3.4.3 Storage and Handling for Hazardous Waste.....	8
3.4.4 Lab-Pack Chemicals.....	9
3.4.5 Biological Waste	9
3.4.6 Sharps Disposal.....	10
3.4.7 Broken Glass Disposal.....	10
3.4.8 Universal Waste Management.....	10
3.5 Chemical Procurement.....	10
3.6 Chemical Inventory Control.....	11
3.7 Housekeeping.....	11
3.8 Emergency Procedures.....	11
3.9 Hazard Assessment	11
3.10 Bonding and Grounding.....	12
3.11 Procedures for Prior Approval	12
3.12 Procedures for Particularly Hazardous Substances (Select Carcinogens, Reproductive Toxins, Highly Toxic Chemicals, and Chemicals of Unknown Toxicity)	13
4.0 Special Procedures for Handling Hazardous Chemicals	13
4.1 Allergens and Sensitizers.....	13
4.2 Asphyxiants	14
4.3 Compressed Gas	14

4.4 Corrosive Chemicals.....	15
4.5 Cryogenic Liquids.....	15
4.6 Flammable and Combustible Chemicals	15
4.7 Irritants.....	16
4.8 Organic Peroxides.....	16
4.8.1 Peroxide Formers	17
4.9 Oxidizers	17
4.10 Pyrophoric Chemicals	18
4.11 Reproductive Toxins	18
4.12 Toxic Chemicals	18
4.13 Unknown Chemicals	19
5.0 Control Measures.....	19
5.1 Substitution.....	19
5.2 Administrative Controls	19
5.2.1 Safety Data Sheets (SDS).....	20
5.2.2 Signs and Labels.....	20
5.3 Engineering Controls	20
5.4 Personal Protective Equipment (PPE).....	21
5.4.1 Eye and Face Protection.....	21
5.4.2 Hand Protection	22
5.4.3 Lab Coats, Protective Suits & Aprons.....	23
5.4.4 Laboratory Attire	23
5.4.5 Foot Protection	23
6.0 Equipment, Maintenance, and Inspections	23
6.1 Fume Hoods	23
6.2 Safety Showers and Eyewash Stations.....	24
6.3 Inspections	24
7.0 Information and Training.....	24
7.1 Information.....	24
7.2 Training.....	25
7.3 Frequency of Training.....	25
7.4 Recordkeeping.....	25
8.0 Medical Examinations and Consultations.....	25
8.1 Medical Surveillance	25

8.2 Information Provided to the Physician.....	26
8.3 Physician's Written Opinion	26
Appendix A: Department of Chemistry and Chemical Engineering Safety Guidelines	
Appendix B: Department of Chemistry and Chemical Engineering Statement on Pregnant Students.....	
Appendix C: Laboratory Guidelines for Working with Biosafety Level 1&2 Human Pathogens.....	
Appendix D: Bleach Disinfection of Biosafety Level 1 and 2 Liquid Waste for Drain Disposal.....	
Appendix E: Hazardous Chemical Spill Signage	
Appendix F: Department of Forensics Student Lab Safety Guidelines and Safety Agreement.....	
Appendix G: Department of Forensics Faculty Lab Safety Guidelines and Safety Agreement.....	
Safety Agreement (Return this signature page to the Lab Manager).....	
Appendix H: Chemical Procurement, Receiving and Inventory	
Appendix I: Peroxide Forming Chemicals Information Sheet	

1.0 University of New Haven's Commitment to Safety

The University of New Haven provides a safe and healthy work environment in accordance with the Occupational Safety and Health Act (OSHA) 29 CFR 1910.1450 "Occupational Exposure to Hazardous Chemicals in Laboratories" also known as the Laboratory Standard. Commitment to health and safety is the responsibility of individuals at all levels to protect the safety and health of all employees, students and the environment.

1.1 Purpose

The purpose of the Chemical Hygiene Plan (CHP) is to provide guidance to University laboratory personnel for working safely in the laboratory environment. The CHP complies with the requirements of OSHA's Laboratory Standard and describes proper laboratory practices, procedures, protective equipment and hazard identification. The CHP is available within the Associate Vice President of Public Safety & Administrative Service's office and within the main office of the Chemistry, Biology, Forensics and Dental departments. A copy of the CHP shall be readily available to all personnel in the laboratory via MyCharger.

1.2 Scope

The provisions of the CHP apply to all University laboratory personnel, other employees who routinely visit or occasionally work in the laboratory and all contractors who might be exposed to laboratory hazards while at the University. All laboratory personnel are encouraged to contribute their skills and knowledge to the CHP such as routine activities, chemical safety, hazardous material handling or procedures to minimize chemical exposure.

The Associate Vice President of Public Safety & Administrative Services will annually review the Chemical Hygiene Plan for effectiveness and amend as necessary. Advice will be sought from the Chemistry, Biology, Forensics and Dental departments as to the effectiveness of the plan at least annually. All new laboratory personnel will be required to review and understand the CHP as part of their New Employee Orientation and all laboratory personnel will receive annual CHP training.

2.0 Roles and Responsibilities

2.1 Department Chairs of the Science Disciplines

- Responsible for the implementation of the CHP within laboratories under their control;
- Assure laboratory staff complete, at least annually, a laboratory specific training on the CHP and its contents;

- Laboratory staff are identified as lab managers, professors, adjunct faculty and teaching assistants.
- Employees can include students, volunteers, minors and researchers;
- Implement safe laboratory practices and engineering controls to minimize the potential exposure to hazardous chemicals;
- Ensure that equipment and protective devices are available and in working order, and that appropriate training has been provided;
- Responsible for performing operations within the provisions of the CHP and other safety and health related procedures;
- Practice good chemical hygiene;
- Complete necessary trainings;
- Review and understand the CHP and applicable laboratory specific procedures in their entirety before beginning work in the laboratory or with hazardous chemicals; and
- In cooperation with the Associate Vice President of Public Safety & Administrative Services, review the CHP for effectiveness and amend as necessary at least annually.

2.2 Associate Vice President of Public Safety & Administrative Services

- Responsible for scheduling CHP training with the Department Chair, faculty, contractors and Facilities Department staff;
- Responsible for assuring safe practices are implemented and practiced within the laboratory setting; and
- Review the CHP for effectiveness in cooperation with the Chemistry, Biology, Forensics and Dental department chairs and amend as necessary at least annually.

2.3 Chemical Hygiene Officer (CHO)

- With intimate knowledge of laboratory practices, the acting CHO's have been identified as the laboratory managers within the Biology, Chemistry, Forensics, Fire Science, Engineering and Dental Hygiene departments;
- The CHO along with the assistance from the department chair and the Associate Vice President of Public Safety & Administrative Services shall work with staff within their respective departments to ensure compliance with the CHP;
- Assist in providing guidance in the development and the implementation of the CHP within their specific laboratory area/department;
- Review the CHP with appropriate committees as necessary and at least annually with the

Associate Vice President of Public Safety & Administrative Services;

- Assist laboratory personnel in the development of laboratory-specific safety procedures and selection of engineering controls and personal protective equipment; and
- Assist in the investigation of accidents, spills and near misses within their department's laboratory.

3.0 Standard Operating Procedures

The University supports the implementation of prudent laboratory practices when working with chemicals in a laboratory. These include general and laboratory-specific procedures for work with hazardous chemicals, emergency procedures and laboratory waste procedures. Procedures have been put in place to protect laboratory personnel from health hazards and physical hazards within the University laboratories. In addition to this document, further requirements in department specific laboratories can be found in appendices A, B, C and D.

3.1 Laboratory General Safety Procedures

The University has established general lab procedures to ensure that laboratory personnel maintain healthy and safe work practices in the laboratory. All laboratory personnel working in laboratories must adhere to the following policies when laboratory work involves the use of hazardous chemicals. Failure to do so will be reported to the CHO.

- Always read and understand the safety data sheet (SDS) for the chemicals you work with before handling;
- Do not use broken or chipped glassware, and dispose of it in a designated marked container (e.g., "broken glass only");
- Never pipette by mouth; always use a pipette aid or suction bulb;
- Do not apply cosmetics in the laboratory;
- Wash hands and arms thoroughly before leaving the laboratory, even if gloves have been worn;
- Food and drink are forbidden in the laboratory;
- All chemical containers such as test tubes, beakers and flasks must be labeled with the full chemical name; and
- Do not work alone in the laboratory if the procedures being conducted are hazardous.
- Always wear appropriate PPE.

3.2 Accident and Incident Reporting

All accidents, incidents and near misses that result in personal injury or illness, damage and/or a potential for significant injury or property loss to University property shall be properly reported

within 24 hours through use of the University's Accident, Incident, & Near-Miss Report Form submitted to ehs.safety@newhaven.edu. All accidents or near misses should be carefully investigated by Environmental Health and Safety with the results distributed to all who might benefit.

If emergency care is needed, call 911 or an EMT can be requested by calling the Campus Police Emergency Line at 203.932.7070 or extension 7070.

3.3 Chemical Storage

- All chemicals in the laboratory should have a designated storage area and should be returned after each use or at the end of each class whichever occurs first;
- Avoid storing chemicals on bench tops and floors;
- Storage trays or secondary containers should be used to minimize spillage of material if a container breaks or leaks;
- Avoid storing virgin chemicals in the fume hood because containers and equipment can interfere with airflow, clutter the workspace and increase the amount of material that could become involved in a hood fire;
- Avoid storing chemicals in direct sunlight or near a heat source;
- Physically separate incompatible chemicals using a secondary containment bin or tray and/or store at another designated location;
- All chemical containers must be properly labeled and stored in designated storage areas;
- Avoid storing hazardous chemicals above eye level; and
- Refrigerators used for storage of flammable chemicals must be properly rated for flammable storage, laboratory-safe units.

3.4 Hazardous Waste Management and Disposal

The University will collect and dispose of hazardous waste in accordance with local, state and federal hazardous waste regulations.

The CHO and/or EH&S Department will periodically monitor and arrange for pick-up/cleaning out of both the satellite accumulation areas (SAA) and main accumulation areas (MAA).

3.4.1 Management

Hazardous waste chemicals regulated by the Environmental Protection Agency and Connecticut Department of Energy and Environmental Protection must be collected, labeled, packaged and disposed of according to federal and state hazardous waste regulations. Hazardous waste is any solid, liquid, sludge or containerized gas that is discarded, has served its intended use, or is

manufacturing by-product, and exhibits any of the characteristics identified below:

- Flammable
- Corrosive
- Reactive
- Toxic

It is the responsibility of the waste generator to adhere to proper waste management and disposal policies. Hazardous waste shall be collected in an appropriate container pending transfer to the MAA or SAA for chemical waste handling or pickup by a licensed third-party hazardous waste contractor.

3.4.2 General Procedures for Disposal

- Any material that meets the criteria of a hazardous waste shall not be treated or otherwise changed to alter its characteristics as a hazardous waste;
- Drain disposal of any chemicals is prohibited, with the exception of properly disinfected liquid biological waste;
 - Refer to Appendix D for *Bleach Disinfection for Biosafety Level 1 & 2 Liquid Waste for Drain Disposal*.
- Containers collecting waste deemed to be hazardous must be labeled with a University approved hazardous waste label at the time the first drop is added to the collection container;
- Empty containers of hazardous materials shall be rinsed three times before disposal. The first rinse shall be collected as hazardous waste;
 - Empty containers of acutely hazardous waste (p-listed) must be collected as hazardous waste or can be triple rinsed with all three rinses being collected as hazardous waste.
- Dispose of all waste in designated, labeled containers. Any questions about proper disposal methods should be directed first to the designated laboratory manager and then to the Associate Vice President of Public Safety & Administrative Services;
- Do not combine different waste streams (i.e. biohazardous and hazardous or incompatible hazardous materials);
- Do not overfill containers; and
- Manage common laboratory waste (uncontaminated gloves, paper towels, etc.) in the general trash.

3.4.3 Storage and Handling for Hazardous Waste

- All hazardous waste generated at University must be accumulated and stored in a SAA before being transferred to the MAA;

- The SAAs are marked by a sign defining the SAA. The area is used for the accumulation of waste generated at the point of generation;
- All SAA waste containers must be labeled with SAA labels or the words “Hazardous Waste” with the full chemical name and hazard class (e.g. flammable);
- When a SAA waste container becomes full, date the container with the ‘full date’ and inform the laboratory manager;
- SAA containers can remain in the SAA indefinitely or until they become full. Full containers must be moved into the MAA within three days of being full;
- All containers must be closed and sealed when not in use;
- Waste must be stored in containers compatible with the constituents of the waste;
- MAA’s are located within secure areas in the Chemistry, Biology and Forensics departments and must remain locked at all times; and
 - The Dental department does not have a MAA and has been trained to call the Associate Vice President of Public Safety & Administrative Services once their collection containers have become full.
- Secondary containment bins must be used to prevent mixing incompatible waste streams.

3.4.4 Lab-Pack Chemicals

Expired or unwanted chemicals should not remain in chemical stock areas; they should be appropriately labeled with hazardous waste labels and moved to the MAA for pick-up by a licensed hazardous waste hauler.

3.4.5 Biological Waste

Biological waste is characterized as waste which may pose a health hazard. Biological waste consists of contaminated animal carcasses, needles and syringes, cell culture wastes and any biologically contaminated laboratory debris. All biohazardous waste must meet the following criteria prior to disposal:

- Waste shall be placed in red bio-waste bags marked with the universal biohazard symbol;
- Do not place leaking or liquid waste into the bags;
- All biohazardous sharps should be disposed of in a red sharps container labeled with the universal biohazard symbol;
- Do not overfill bags; and
- Do not leave or dispose of red bio-waste bags near the general trash.

3.4.6 Sharps Disposal

- All contaminated sharps (needles, syringes, broken glass, razor blades, glass pipettes, etc.) shall be disposed of in an approved sharps container;
- All needle/syringe assemblies are to be disposed of intact. In order to prevent needle stick injuries, needles are not to be recapped, bent or broken;
- All used needles and syringes are considered contaminated sharps and should be disposed of in sharps containers;
- Syringes/needles used with potentially infectious materials shall be disinfected prior to being placed into the sharp's container; and
- When the sharps container is full, cap the top of the container and affix the cap with tape. Notify building services to schedule a pick-up and disposal.

3.4.7 Broken Glass Disposal

- Broken glass and sharp objects shall never be disposed of in general trash receptacles, autoclave bags or recycling bins.
- Glass bottles (not eligible for recycling) shall be triple rinsed with water and their labels defaced before discarding.
- Glass bottles or broken glass must be disposed of in cardboard "Deposit Glass Here" boxes. These boxes are available in each academic laboratory.
- Seal the top of the box closed with tape when it is full and label it 'trash'.

3.4.8 Universal Waste Management

- Fluorescent lamps, cathode ray tube (CRT) screens, Nickel Cadmium or rechargeable batteries, and mercury containing devices such as thermostats are classified as Universal Waste in Connecticut and cannot be disposed of in the general trash. For disposal contact the Facilities Department.

3.5 Chemical Procurement

When purchasing chemicals, the purchaser must follow the Chemical Procurement, Receiving, and Inventory Program located in Appendix H of CHP and on the Env. Health and Safety policy and procedure page on MyCharger. Before a chemical is ordered, information on proper handling, storage and disposal should be reviewed by consulting the safety data sheet (SDS). No container should be accepted without an adequate label. Preferably, all chemicals should be received in one central location.

3.6 Chemical Inventory Control

Each department (Chemistry, Biology, Forensics, Dental Hygiene, Fire Science, Engineering, Facilities) will maintain an accurate chemical inventory for each classroom, laboratory, and main chemical storage area. Inventory lists are maintained on MSDSOnline and will be made available upon request.

3.7 Housekeeping

- Laboratory fume hoods and work areas should be kept clean and free of debris at all times;
- Do not allow trash to accumulate in any area. It can be a fire hazard and or obstruct emergency equipment and egress;
- Do not store food or drink in any chemical laboratory; and
- Access to exits, emergency equipment and utility controls should never be blocked.

3.8 Emergency Procedures

In the event of a hazardous materials spill or incident in which assistance is needed, the following steps must be followed.

- If the incident is indoors, close all doors in order to isolate the area if it is safe to do so.
- From a safe area call the University Police department at 203.932.7070 or extension 7070 and provide them with the following information:
 - Location of the incident;
 - If anyone has been injured or exposed to the spilled material;
 - If a fire or explosion is involved with the incident;
 - Name of the spilled material;
 - Quantity of the material spilled;
 - Time of the incident;
 - Your name, phone number and location.
- For more detailed instructions refer to the Laboratory Emergency Spill Response Procedure located on the MyCharger website Environmental Health and Safety page;
 - [Environmental Health and Safety - myCharger \(newhaven.edu\)](https://myCharger.newhaven.edu/Environmental-Health-and-Safety)
- Follow instructions provided by the emergency responders;
- If necessary, evacuate the area.

3.9 Hazard Assessment

A hazardous chemical means a chemical for which there is statistically significant evidence that acute or chronic health effects may occur in exposed laboratory personnel. An acute health effect is an

adverse health effect characterized by severe symptoms that develop rapidly. A chronic health effect is an adverse health effect with symptoms that develop slowly over a relatively long period of time.

A hazard assessment located on MyCharger must be completed to identify the physical and health hazards of chemicals used in the laboratory and determine the risk of exposure to the body. A physical chemical hazard is a chemical that is proven to be a combustible liquid, flammable, compressed gas, explosive, an organic peroxide or an oxidizer. A health hazard means a chemical for which there is statistically significant evidence that acute or chronic health effects may occur in exposed employees.

A hazard assessment should include identifying the hazard type (s), selection of appropriate PPE, training laboratory personnel, storage and handling requirements, control measures, signs and symptoms of an exposure, and spill and decontamination procedures.

3.10 Bonding and Grounding

Bonding and grounding of flammables is extremely important to reduce the risk of explosion and fire due to static electricity that builds up during the transfer of flammable liquids. Bonding prevents the generation of static electricity by minimizing the electrical potential between two objects, such as a dispensing drum and a safety can. Grounding minimizes the electrical potential between the containers and the ground. Bonding and grounding shall be used when transferring Class I flammable liquids, those with a flash point below 100 F (ethyl ether, benzene, xylene, and acetone) in metal equipment in order to avoid static generated sparks.

3.11 Procedures for Prior Approval

Whenever there is a significant change in chemical amounts, new equipment, a situation where one must work alone or highly hazardous chemicals or procedures, approval must be given by the applicable department chair prior to starting procedure. General safety considerations include:

- Experimental design;
- Equipment design;
- Workspace adequacy;
- Development of an SOP;
- Work preparedness; and
- Hazard assessment.

3.12 Procedures for Particularly Hazardous Substances (Select Carcinogens, Reproductive Toxins, Highly Toxic Chemicals, and Chemicals of Unknown Toxicity)

The following procedures must be followed when performing laboratory work with particularly hazardous substances.

- These substances must be used and stored only in areas with restricted access.
- Designated areas may be used for work with these materials and may be the entire laboratory, a glove box, an area of a laboratory, or a device such as a chemical fume hood. The designated area must be clearly posted with signs that;
 - Identify the hazards;
 - When the hazardous material is in use;
 - No untrained personnel allowed in the work area; and
 - Clearly define the designated area.
- Only the smallest amount of a chemical required by the procedure shall be used or stored.
- When possible, only order the required amounts to avoid unnecessary decanting or weighing out the material.
- Specific spill procedures for the hazardous materials must be developed and posted in the designated area.
- All laboratory personnel working with these chemicals shall be familiar with the hazards and proper procedures for accidental release.
- General PPE to be worn at all times when working with these materials are safety glasses, gloves, long sleeve laboratory coats, and no open toed shoes.
- The designated work area shall always be decontaminated after each process, experiment, or when the work is completed.
- All waste products from the process shall be managed in a compatible container.

4.0 Special Procedures for Handling Hazardous Chemicals

The CHO shall ensure that all lab personnel are aware of the locations, hazards and appropriate control measures for work involving hazardous chemicals. In some cases, laboratory-specific procedures may be required for working with highly hazardous materials. Review the SDS for specific handling and storage requirements of hazardous chemicals. Some specific hazards that may be present in various laboratories at the University are listed below.

4.1 Allergens and Sensitizers

A chemical allergy is an adverse reaction by the immune system to a chemical. Allergic reactions

result from previous sensitization to a chemical or a structurally similar chemical. Once sensitization occurs, allergic reactions can result from exposure to extremely low doses of the chemical. Allergic reactions can be immediate, occurring a few minutes after exposure. Anaphylactic shock is a severe immediate allergic reaction that can result in death if not treated quickly. Allergic reactions can also be delayed, taking hours or even days to develop. It is important to recognize that a delayed chemical allergy can occur even some time after the chemical has been removed. Examples of substances that may cause allergic reactions include diazomethane, formaldehyde, various isocyanates, benzylic and allylic halides and certain phenol derivatives.

4.2 Asphyxiants

Asphyxiants are substances that interfere with the transport of an adequate supply of oxygen to the vital organs of the body. Simple asphyxiants are substances that displace oxygen from the air being breathed to such an extent that adverse effects result. Acetylene, carbon dioxide, argon, helium, ethane, nitrogen and methane are common asphyxiants. It is important to recognize that even chemically inert and biologically benign substances such as carbon monoxide can be extremely dangerous under certain circumstances.

4.3 Compressed Gas

Gas cylinders contain either compressed liquids or gases. Gas cylinders represent the most insidious hazard, as puncture, heat, faulty valves, pressure or regulators may result in a rapid release of the entire contents. The following safety considerations should be implemented where applicable:

- The cylinder contents must be clearly identifiable.
- Handle cylinders carefully and do not roll, slide, or drop. Use a cart or hand truck to transport.
- Do not lift a cylinder with its cap.
- Secure all cylinders while in storage, transport, or use.
- Never tamper with cylinder valves, force connections, or use homemade adapters. Use only approved equipment. Never repair or alter cylinders, valves, or safety relief devices.
- Only use a regulator compatible with the cylinder contents.
- Close the cylinder valve when not in use.
- When empty, turn off the cylinder valve and label the cylinder as empty. Store separately from full cylinders.
- Store cylinders in a well-ventilated area away from ignition sources, heat, flames, and flammable chemicals.
- Keep the protective caps on the cylinders at all times except when the cylinders are in active use.
- Check for gas leaks using soapy water around the connections.

- Do not store flammable gas cylinders with oxidizers such as nitrous oxide or oxygen. They must be separated by a minimum of 20 ft. or a 5-foot fire wall.

4.4 Corrosive Chemicals

The Resource Conservation and Recovery Act (RCRA) defines a corrosive chemical as a liquid with a pH ≤ 2 or >12.5 . Acids and bases can cause severe tissue damage depending on the corrosivity of the chemical. The primary means of protection from corrosive chemicals is the use of gloves, goggles, face shields, aprons, lab coats and other chemical resistant clothing. Exercise extreme caution when handling corrosive chemicals. The following safety considerations should be implemented where applicable:

- Transport acids and bases in a bottle carrier or cart. Do not handle by the neck alone; support the weight of the bottle from the bottom when handling or pouring.
- Do not store acid and bases with flammable liquids or oxidizing chemicals. Store perchloric acid by itself.
- Isolate corrosive chemicals from incompatible chemicals.
- Reference the chemical's SDS for proper handling, PPE, and storage requirements.
- If an acid or base comes in contact with your skin or clothing, thoroughly wash the affected areas utilizing safety showers or eyewash units.

4.5 Cryogenic Liquids

Cryogenic liquids are liquefied gases that are kept in their liquid state at very low temperatures and are associated with various hazards including: extreme cold, asphyxiation, explosion, cold contact burns, and toxicity. The most common cryogenic liquids at the University include oxygen and nitrogen. Laboratory personnel should be thoroughly trained in the hazards and the proper steps to avoid them. Training should include emergency procedures, operation of equipment, safety devices, appropriate engineering controls, knowledge of the properties of the materials used, and personal protective equipment required. Insulated gloves should always be worn when handling anything that comes into contact with cryogenic liquids or vapors. Considerations must be made to prevent cryogenic material from contacting skin. Clothing such as a lab coat, pants, closed toed shoes, safety glasses, goggles, and face shields should be worn.

4.6 Flammable and Combustible Chemicals

Flammable chemicals are considered to be liquids with a flashpoint below 100 °F and solid materials that readily sustain combustion. Liquids with a flashpoint between 100 °F and 200 °F are generally classified as combustible; the same basic procedures should be applied when handling combustible

liquids.

- Do not allow smoking or other sources of open flames in areas where flammable chemicals are used.
- Know the location of fire extinguishers, fire alarms, and emergency exits in the laboratory.
- Do not store flammable liquids in domestic-type refrigerators. Use only refrigerators rated for flammables.
- Do not store flammables with oxidizing agents (e.g., nitric and sulfuric acids).
- Do not expose flammable liquids to potential sources of ignition such as electrical equipment, heat, burners, or open flames.
- To prevent accidental electrical charge, the use of bonding and grounding equipment should be used whenever applicable. The use of non-sparking tools can prevent an ignition source.
- Store flammable liquids in an approved fire rated flammable storage cabinet.
- Do not store flammable liquids on the floor, unless protected by secondary containment.
- Minimize the amount flammable liquids that are in use, being stored, and that are generated as waste.
- Storage of flammable liquids greater than 10 gallons within a laboratory fire area must be in an approved and labeled flammable storage cabinet.
- The SDS shall be reviewed by the owner/user of the materials for additional safety requirements and precautions.

4.7 Irritants

An irritant is a chemical, which is not corrosive, but which causes a reversible inflammatory effect on living tissue by chemical action at the site of contact. A wide variety of organic and inorganic chemicals are irritants; thus, skin contact with all laboratory chemicals should be avoided. Use a properly functioning chemical fume hood when handling irritants that can be inhaled. At minimum, safety glasses, lab coat, long pants, protective gloves, and closed toed shoes should be worn.

4.8 Organic Peroxides

Organic peroxides are hazardous because of their extreme sensitivity to shock, sparks, heat, light, strong oxidizing and reducing agents, and other forms of detonation. Organic peroxides may cause fire, create explosion hazards, and may be toxic or corrosive. Some organic peroxides are dangerously reactive, decomposing very rapidly or explosively if they are exposed to slight heat, friction, mechanical shock or contamination with incompatible materials. Precautions for handling peroxides should include the following:

- Limit the quantity of peroxides.
- Store away from sunlight and increased temperatures; avoid humidity. Keep containers capped,

clean, and undamaged.

- Do not return unused peroxides to the container.
- Clean up all spills immediately. Solutions of peroxides can be absorbed using vermiculite or other absorbing materials.
- Do not permit smoking, open flames, and other sources of heat near peroxides. Areas should be labeled as peroxides so that this hazard is evident.
- Avoid friction, grinding, and other forms of impact near peroxides, especially solid peroxides. Glass containers that have screw-cap lids or glass stoppers should not be used. Polyethylene bottles that have screw-cap lids may be used.
- Isolate from incompatible materials such as strong acids and bases, flammable and combustible liquids, and reducing agents.

4.8.1 Peroxide Formers

Peroxide formers are compounds that can potentially change to form Organic Peroxides. As such, the recommendations for storing Organic Peroxides should apply to Peroxide Formers. Refer to Appendix D for more detailed information regarding peroxide formers.

- There are three categories of Peroxide Formers
 - List A contains compounds that can form peroxides while stored; such as, vinyl monomers and potassium metal
 - List B contains compounds that can form peroxides from concentration; such as, ether and dioxane.
 - List C contains compounds that can form peroxides via polymerization reaction; such as vinyl monomers.
- Peroxides may have formed if one detects
 - Increased viscosity
 - Changes in color
 - Formation of crystals

4.9 Oxidizers

Oxidizers are chemicals other than a blasting agent or explosive as defined in § 1910.109(a), that initiates or promotes combustion in other materials, causing fire either of itself or through the release of oxygen or other gases. Precautions for handling oxidizers should include the following:

- Minimize the number of oxidizers used and stored.
- Isolate from incompatible chemicals (e.g., organics, flammable, dehydrating, or reducing agents).
- Do not store oxidizers in wooden cabinets or on wooden shelves.

- Do not return unused material to the original container.
- Store in a tightly closed container and in a cool, dry, ventilated area.

4.10 Pyrophoric Chemicals

Pyrophoric chemicals are extremely reactive toward oxygen and/or water and must never be exposed to the atmosphere. Examples include sodium hydride and magnesium. Exposure of these chemicals to the air could result in spontaneous combustion, which could cause serious burns or other injuries to the person handling the chemical or others in the immediate area. In addition, all combustible materials, including paper products, should not be allowed to come in contact with any pyrophoric at any time. Pyrophoric material can be handled and stored safely as long as all exposure to atmospheric oxygen and moisture is avoided. Solids must be transferred under an inert atmosphere in an efficient glove box. Glass bottles of pyrophoric material should not be handled or stored unprotected. The metal container shipped with each bottle should be retained as a protective container for each bottle for transporting and storage.

4.11 Reproductive Toxins

Reproductive toxins are chemicals which affect the reproductive capabilities including chromosomal damage and effects on fetuses. Reproductive toxins have adverse effects on various aspects of reproduction, including fertility, gestation, lactation, and general reproductive performance. Reproductive toxins can affect both men and women. Reproductive toxins include lead, carbon disulfide and mercury.

4.12 Toxic Chemicals

Toxic is defined by OSHA 29 CFR 1910.1200 as a chemical which fall in any of these three categories:

- A chemical that has a median lethal dose (LD50) of more than 50 milligrams per kilogram but not more than 500 milligrams per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.
- A chemical that has a median lethal dose (LD50) of more than 200 milligrams per kilogram but not more than 1,000 milligrams per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between two and three kilograms each.
- A chemical that has a median lethal concentration (LC50) in air of more than 200 parts per million but not more than 2,000 parts per million by volume of gas or vapor, or more than two milligrams per liter but not more than 20 milligrams per liter of mist, fume, or dust, when

administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each.

4.13 Unknown Chemicals

Unknown chemicals, or those for which complete physical and chemical hazards are not known, must be assumed to be hazardous and highly toxic. Should an unknown chemical be identified, the CHO and Associate Vice President of Public Safety & Administrative Services should be notified immediately.

5.0 Control Measures

For the laboratory use of OSHA regulated substances, the University shall assure that laboratory personnel exposure to such substances do not exceed the permissible exposure limits (PEL) specified in 29 CFR 1910, subpart Z. To minimize laboratory personnel exposure to hazardous chemicals the following control measures should be implemented:

- Substitution of less hazardous chemical or processes
- Engineering controls
- Administrative controls
- Personal protective equipment (PPE)

Substitution, engineering controls, administrative controls, and personal protective equipment (PPE) are basic principles used to control hazards and exposures. Before the proper control (s) can be selected, a hazard assessment of the process, activity, or material should be conducted.

5.1 Substitution

Every hazard assessment should first determine if the hazardous conditions can be prevented, e.g., substituting with a less hazardous chemical or process. Substitution is one of the most effective ways to eliminate or reduce exposures because it removes the hazard at the source. The hazard assessment form can be found on MyCharger Environmental Health and Safety Webpage.

[Blank Hazard Assessment Form](#)

5.2 Administrative Controls

Administrative controls are changes in work procedures such as written safety guidelines, rules, supervision, schedules, signs, labels, SDS's, and training to reduce employee exposure to hazardous chemicals.

5.2.1 Safety Data Sheets (SDS)

SDS's are documents created by the chemical manufacturer that describe the substance. Some information found on an SDS includes chemical and physical characteristics, handling requirements, storage and disposal information, and signs and symptoms of exposure. SDS's are required for all chemicals at the University and must remain on file for 30 years after employment. OSHA requires up to date SDS's that are readily available for each chemical. The Facilities Department is responsible for obtaining SDS's for chemicals used and stored within their department and the CHO is responsible for obtaining SDS's within the laboratory areas at the University. SDS's shall be uploaded to MSDSOnline to ensure accessibility to all personnel and regulatory inspectors as needed. Laboratory personnel have a right to access any or all SDS's.

5.2.2 Signs and Labels

All hazardous materials, hazardous waste and chemical storage areas shall be appropriately labeled indicating the hazards present and any other relevant regulatory requirements. All chemical containers at the University must be labeled regardless of size and whether or not they are hazardous. Labeling of all chemical containers assists emergency personnel and others in identifying what is and what is not hazardous should a spill occur, or other emergency situation arise. Original labels on chemical containers must not be removed or defaced. Labels must be in English, and they must contain the complete name of the chemical and be traceable or easily linked to the appropriate SDS (chemical formulas are not allowed). The manufacturer's label is generally sufficient to meet OSHA labeling requirements and should be replaced only if it becomes damaged or illegible. All containers into which chemicals are transferred also need to be legibly labeled in English and include the name of the chemical and appropriate hazard warnings (chemical formulas are not allowed). In addition to OSHA's Globally Harmonized System pictograms, the National Fire Protection Association (NFPA) 704 diamond may be utilized. The NFPA system requires the chemical name to be listed along with health, flammability, reactivity and specific hazard ratings. Refrigerators or freezers containing either chemicals or food should be appropriately labeled, e.g., chemicals only, no food or drink, or food and drink only.

All laboratories shall be posted with signage addressing the hazards of the materials contained in the lab, requirements for personal protective equipment, and any special hazards located in the lab.

5.3 Engineering Controls

Engineering controls eliminate or reduce exposure to a chemical or physical hazard through the use or substitution of engineered machinery or equipment. Engineering controls include process change,

substitution, isolation, ventilation, and source modification.

- **Process change** consists of changing a process to make it less hazardous (e.g., paint dipping in place of paint spraying).
- **Substitution** consists of substituting for a less hazardous material, equipment, or process (e.g., use of soap and water in place of solvents, use of automated instead of manually operating equipment).
- **Isolation** is applied when a barrier is inserted between a hazard and those who might be affected by that hazard. Separating personnel from hazardous operations, processes, equipment, or environments using a physical barrier or distance may provide the necessary isolation.
- **Ventilation** can be either local (direct air movement) or general (dilution of air contaminants) that exhausts or supplies air properly.
- **Source modification** consists of changing a hazard source to make it less hazardous (e.g., wetting dust particles or lowering the temperature of liquids to reduce off-gassing and vaporization).

5.4 Personal Protective Equipment (PPE)

The University is required to determine if PPE should be used to protect their laboratory personnel. PPE should be used in conjunction with guards, engineering controls and administrative controls. PPE may be required to reduce laboratory personnel exposure to hazards when engineering and administrative controls are not feasible or effective in reducing these exposures to acceptable levels. PPE should always be worn if there is a possibility that personal clothing could become contaminated with hazardous materials. Examples include laboratory coats, aprons, jumpsuits, boots, shoe covers, and gloves. Review SDS's to determine the necessary PPE to limit exposure. The kind of PPE needed depends on how the chemical enters the body. This is called route of exposure and is listed on the SDS. The four major routes of exposures are skin absorption, inhalation, ingestions and injection.

5.4.1 Eye and Face Protection

Safety glasses with side shields that conform to ANSI standard Z87.1-1989 are required for work with hazardous chemicals. Ordinary prescription glasses with hardened lenses do not serve as safety glasses. If prescription safety glasses are needed, please contact the Associate Vice President of Public Safety & Administrative Services. Although safety glasses can provide protection from injury from flying particles, they offer little protection against chemical splashes. Splash goggles should be worn if there is a splash hazard in any operation involving hazardous chemicals. Full face shields are worn in conjunction with either safety glasses or splash goggles. When there is a possibility of liquid splashes, both a face shield and splash goggles should be worn; this is especially important for work with highly corrosive liquids. Full-face shields with throat

protection and safety glasses with side shields should be used when handling highly hazardous chemicals. If work in the laboratory could involve exposure to lasers, ultraviolet light, infrared light, or intense visible light, specialized eye protection should be worn. Safety glasses should be provided for visitors in the laboratory.

5.4.2 Hand Protection

When handling hazardous chemicals, laboratory personnel shall select and wear the appropriate gloves. No single glove can provide appropriate protection in every work situation. It is important to assess the hazards in each task and select a glove that provides the required protection. Below are general recommendations for glove selection and use:

- Similar gloves supplied by different manufacturers may not offer the same level of protection; therefore, the manufacturer's glove selection chart may need to be reviewed.
- Select gloves which are resistant to the chemicals you may be exposed to. Consult the relevant SDS which may recommend a particular glove material.
- Select gloves of the correct size and fitting; gloves that are too small are uncomfortable and may tear whereas larger gloves may interfere with dexterity.
- Before use, check gloves (even new ones) for physical damage such as tears and pin holes.
- When removing gloves, do so in a way that avoids the contaminated exterior contacting the skin.
- Wash hands after removing gloves.

Many factors affect the breakthrough times of gloves including thickness of glove material, chemical concentration, amount of chemical that comes into contact with the glove, length of time the glove is exposed to the chemical, temperature at which the work is done, and possibility of abrasion or puncture. Glove selection guides are available from most manufacturers.

If chemicals do penetrate the glove material, they could be held in prolonged contact with the hand and cause more serious damage than in the absence of a proper glove. Gloves should be replaced immediately if they are contaminated or torn. The use of double gloves may be appropriate in situations involving chemicals of high or multiple hazards. Leather gloves are appropriate for handling broken glassware and inserting tubing into stoppers, where protection from chemicals is not needed. Gloves should be decontaminated or washed appropriately before they are taken off and should be left in the laboratory and not be allowed to touch any uncontaminated objects in the laboratory or any other area. Gloves should be replaced periodically, depending on the frequency of use.

5.4.3 Lab Coats, Protective Suits & Aprons

Appropriate laboratory coats must be worn, buttoned, with the sleeves rolled down. Laboratory coats should be fire-resistant and fully covering. Laboratory coats or laboratory aprons made of special materials are available for high-risk activities. Laboratory coats that have been used in the laboratory should be left there to minimize the possibility of spreading chemicals to eating and office areas, and they should be cleaned regularly. Rings, bracelets, watches, or other jewelry that could trap chemicals close to the skin, come in contact with electrical sources, or get caught in machinery should not be worn. Leather clothing or accessories should not be worn in situations where chemicals could be absorbed in the leather and held close to the skin.

5.4.4 Laboratory Attire

When performing work with hazardous materials, laboratory personnel should cover all exposed parts of their body to prevent unnecessary chemical exposure. Tie long hair back, avoid loose clothing such as neckties and flowing sleeves.

5.4.5 Foot Protection

Closed-toed shoes should be worn in areas where hazardous chemicals are in use or mechanical work is being done. Clogs, perforated shoes, bare feet, sandals, and cloth shoes do not provide protection against chemicals. Shoe covers may be required for work with especially hazardous materials.

6.0 Equipment, Maintenance, and Inspections

6.1 Fume Hoods

The laboratory fume hood is the most common local exhaust method used in laboratories. When working with hazardous chemicals, the use of the fume hood is required at the University. A properly operating and correctly used fume hood will control vapors, dusts, and mists released from volatile liquids. Fume hoods can also protect from accidental spills. Fume hoods are inspected and certified annually by a third-party contractor. However, all laboratory staff are responsible for ensuring that their fume hood(s) has an updated certification label and is functioning properly. Except when adjustments to the apparatus are being made, the hood should be kept closed, with vertical sashes down and horizontal sashes closed, to help prevent the spread of a fire, spill, or other hazards into the laboratory. Basic guidelines for operating a fume hood include the following:

- Confirm that the fume hood has been certified within the last year (label with date).
- Confirm that the chemical can be used in the fume hood.

- Conduct procedure at least six inches behind the plane of the sash.
- Never put your head inside a fume hood to check an experiment.
- Work with the sash at the lowest position possible to protect your face and body.
- Do not clutter the fume hood with bottles, chemicals, or equipment as it restricts airflow and workspace.
- Immediately report any suspected fume hood malfunctions to the Manager of Facilities Operations.
- Limit foot traffic behind while performing operations in the hood.

6.2 Safety Showers and Eyewash Stations

In case of exposure to hazardous substances, a reliable, clean source of water must be available to rinse contaminants from the body. Safety showers, drench hoses and eye wash stations are either located in each of the laboratories or in adjacent corridors. Laboratory staff must ensure that safety showers and eyewash stations are free from obstruction. Laboratory staff and professors are responsible for ensuring all laboratory personnel are aware of the nearest safety shower and eyewash station location and how to use the device. A member of the University Facilities Department is responsible for inspecting and testing the eyewash and drench hose stations at least monthly.

The safety showers will be tested at least once a month by the Facilities Department. Additional testing information can be found in the university's Eye Wash and Safety Shower Inspection Policy and Procedure. All inspection records are stored on the University's online inspection system, IMEC. These records are available upon request through the Facilities Department.

6.3 Laboratory Safety Inspections

Laboratory safety inspections are completed regularly by each departmental lab manager and are documented in the IMEC system. Please refer to the Laboratory Inspection Policy for more detailed information.

7.0 Information and Training

7.1 Information

The University will provide the following information to laboratory personnel prior to working with any chemical:

- The availability and location of the CHP.
- SDS's for all hazardous chemicals the employee will use.

- Standard Operating Procedures (SOP's) for all of the operations the employee will conduct.
- A description and use of the University labeling system.
- Additional information on the hazards, safe handling, storage and disposal of hazardous chemicals can be obtained from the CHO, Prudent Practices in the Laboratory, OSHA website, NIOSH website and the chemical manufacturers.

7.2 Training

All employees working in a laboratory shall be trained in the contents of the CHP and all applicable SOPs that are pertinent to a procedure, experiment, or task. Training shall include but is not limited to:

- Provisions of the CHP;
- Hazards in the laboratory;
- OSHA regulated substances or recommended exposure limits;
- Signs and symptoms associated with exposures to hazardous chemicals;
- Safe handling, storage, and disposal of hazardous chemicals;
- How to read an SDS; and
- The selection and use of PPE.

7.3 Frequency of Training

Training shall be provided for laboratory personnel prior to starting work in the laboratory; before each new possible hazard exposure; before use of new or altered equipment; and on changes to SOP's or the CHP. Refresher training is required annually.

7.4 Recordkeeping

The Associate Vice President of Public Safety & Administrative Services is responsible for establishing and maintaining records for employee training, employee environmental monitoring and compliance records.

8.0 Medical Examinations and Consultations

The University shall provide all laboratory personnel who work with hazardous chemicals the opportunity for medical attention and follow-up by a competent physician if they show signs and symptoms of exposure.

8.1 Medical Surveillance

All laboratory personnel shall be provided with an opportunity to receive an appropriate medical

examination performed by a licensed physician at a reasonable time and free of cost under the following circumstances.

- At any time, laboratory personnel believe they have been significantly exposed to hazardous materials.
- Whenever laboratory personnel develop signs or symptoms associated with a hazardous chemical to which they may have been exposed in the laboratory
- If an event takes place in the work area such as a spill, leak, explosion or other occurrence resulting in the likelihood of hazardous exposure.
- Where exposure monitoring reveals an exposure level routinely above the action level for an OSHA regulated substance.

8.2 Information Provided to the Physician

The University shall provide the following information to the physician:

- The identity of the hazardous chemical(s) to which laboratory personnel may have been exposed and the SDS;
- A description of the conditions under which the exposure occurred including quantitative exposure data, if available; and
- A description of the signs and symptoms of exposure that laboratory personnel are experiencing, if any.

8.3 Physician's Written Opinion

The University shall obtain a written opinion from the examining physician which shall include the following:

- Recommendation for further medical follow-up.
- The results of the medical examination and any associated tests.
- Any medical condition which may be revealed in the course of the examination may place laboratory personnel at increased risk as a result of exposure to a hazardous workplace.
- A statement that the laboratory personnel have 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.
- The written opinion shall not reveal specific findings of diagnoses unrelated to occupational exposure.



Department of Chemistry and Chemical Engineering



Laboratory Safety Rules, Practices, and Agreement

Instructions

Student: Read carefully the following laboratory rules, safety precautions, and regulations. Your laboratory conduct will be governed by these rules, and any deviation from these rules and regulations may result in dismissal from the laboratory.

After you have read the list, sign your name on the attached acceptance form and return the form to your instructor. You may keep the remainder of the document as a reference or recycle it (turn it in); A bound copy is available in every lab classroom.

Instructor: Read through all items with the class and explain importance and relevance of each. Give a “tour” of the location and operation of the safety items. Complete and sign the instructor checklist. Check off submission of attachment with acceptance signature on your class roster “safety sheet” column, clip the sheets and give them to the safety officer.

Laboratory General Safety Procedures (Good Lab Practices)

1. Unauthorized experiments are prohibited, and only those chemicals required for the experiment to be performed are to be used. Perform the experiments as directed. Do not do anything that is not part of an approved experimental procedure. Follow all instructions given by your instructor.
2. No working alone in the lab. Students are not permitted access to storage rooms, cabinets or refrigerators. Never take chemicals, supplies or equipment out of the laboratory without the knowledge and consent of the instructor.
3. No smoking, drinking, or eating in the laboratory.
4. General horseplay will not be tolerated.
5. No headsets, music, or phones during lab.
6. Maintain an orderly and clean working area.
7. Read the experiment procedure in advance before performing the experiment. When uncertain of laboratory techniques or procedures, it is your responsibility to consult the laboratory manual or other suitable reference or to ask your laboratory instructor or Laboratory Assistant for the proper advice.
8. Keep books, backpacks and coats on the designated racks and shelves. Do not risk contamination by bringing them into the lab.
9. Stools and chairs must be stowed before experiments start to ensure a safe exit in case of an emergency.
10. Laboratory benches and hoods are for experiments. A notebook, pen and laboratory manual are the only items you should need during class. Keep them out of hoods and away from flames, heat sources and chemicals.
11. Never point your test tube or glassware at yourself or your neighbor.
12. Put soap into an item to be washed. Do not contaminate the soap jar with your brush. Wash with hot water. All glassware used in the experiment should be washed with soap and water and dried before being put away.
13. Avoid injuries by using proper procedures and precautions when inserting glass tubing or thermometers through rubber stoppers.
14. Clean your lab bench and hood. Put away all equipment and reagents. Wash your hands at the end of each work session even if you were wearing gloves.
15. Students who are or may be pregnant should inform their professor and consider postponing their work in the lab to another time. Pregnant students who continue in the lab must be aware of the risks they are taking by being in the lab.

16. Inform your instructor or leave a message for the Lab Coordinator or Lab Manager if you see anything unsafe.

Hazardous Chemical and Waste Management

1. Never taste chemicals.
2. Do not smell chemicals directly. If a laboratory procedure requires you to check the odor of a chemical, do so by gently wafting some of the vapor towards your nose with your hand. The lab instructor can demonstrate this procedure for you.
3. Avoid touching chemicals with your hands. Always wash your hands after any chemical contact.
4. Never pipet by mouth. Rubber bulbs or pumps will be provided in the lab.
5. Work in a hood when working with reagents that give off dangerous gases, fumes, or dust. Learn the proper operation of hood sashes and use them appropriately.
6. Never return unused reagents to reagent bottles. Be careful to take only what you actually need. Do not contaminate the reagents. Never insert your own pipettes or medicine droppers into the reagent bottle. Avoid solution contamination by pouring a reagent into a test tube or beaker.
7. Chemicals should always be in a labeled container. All containers must be labeled before placing the chemicals into it. Labels should be read 3 times: when you pick it up; just before you use it; and after you are finished because mixing the wrong chemicals can be very dangerous.
8. Treat all chemicals with the respect they deserve. This includes reading the Safety Data Sheets (SDS) provided in the lab, asking the instructor for more information, and knowing the hazards before handling the material.
9. When weighing chemicals, be sure to keep the area clean to avoid contamination of the balances.
10. Always dilute concentrated acid by adding the ACID to the WATER and never the other way around. Water is inert and adding acid to it will dilute the acid at the point of contact which is far safer in the event of a splash.
11. Use carts or chemical carriers for moving all large volumes or significantly hazardous substances.
12. In each laboratory, a bench top and/or hood will be designated the chemical distribution area. Leave reagent bottles at the transfer location. Bring test tubes or beakers to this location for transferring chemicals and carrying them back to your bench. Chemicals should never be distributed from movable carts; they should be taken to the work area or distribution areas.
13. Do not leave an experiment unattended. Turn off all heat sources when not in use. Unplug apparatus before leaving the lab. Do not put HOT apparatus away in cabinets or drawers.
14. Dispose of chemicals properly. Labeled containers will be provided for chemical waste from each experiment. Follow your instructor's or Lab Assistant's directions on how to properly dispose of chemical waste.

GHS **Global Harmonized System** is used on chemical labels to communicate hazards



Irritant



Acute Health Risk – Carcinogen, Mutagen, Teratogen, Asphyxiant



Corrosive



Flammable



Oxidizer



Toxic



Environmental Toxin



Compresses Gas



Explosive (includes water reactives)

University of New Haven
'Safety Data Sheets'
available through
www.newhaven.edu and
MSDS online

1. Open our campus website www.newhaven.edu
2. Choose 'Main'
3. Choose 'Safety and Security'
4. Choose 'Environmental Health and Safety Department'.
5. Choose 'Chemical Safety Data Sheets (MSDS Site)'
6. A search screen will open.

Emergency Procedures

IMPORTANT CONTACTS:

Campus Police = ext. 7070

Emergency Dispatcher = 9-911

In case of evacuation:

1. Students will be told to leave the building. Use the stairwells. Evacuation routes are posted on each lab exit.
2. If possible, turn off equipment and shut doors to the lab.
3. Activate the fire alarm for the building.
4. Contact emergency personnel.

If a chemical is spilled on the bench or floor:

1. Inform instructor of spill/identity of the chemical spilled.
2. Alert the other students of the spill to keep them away from the contaminated area.
3. All spills, including water, should be cleaned up immediately.
4. Evacuate if necessary.
5. Assist the instructor in cleaning up the spill (and any broken glass) with the appropriate tools.
6. Contact emergency personnel.

If a chemical is spilled on a person or an individual is injured during the lab:

1. Inform instructor of the spill/identity of the chemical spill.
2. Do not leave an injured individual(s) alone.
3. Treat chemical exposure to skin by rinsing the affected area under running water for at least 15 minutes. Eyewash stations and showers are available for extensive spills.
4. Remove any clothing that has been contaminated by chemicals.
5. Contact emergency personnel and fill out incident report.

If there is a fire:

1. If a heat source produced the fire, turn off the source immediately.
2. Inform instructor of the fire.
3. Evacuate if necessary. Evacuation routes are posted at each lab exit.
4. Use a safety shower or fire blanket to extinguish a fire on clothing/individual.
5. If a fire is contained within a beaker, place a watch glass over the beaker to extinguish the flames.
6. Contact emergency personnel (7070) for large or uncontrollable fires and fill out incident report.

Safety Equipment

Each laboratory is equipped with emergency and first aid equipment. Learn the locations and operation of all available safety equipment. Know what to do in case of an emergency. Specific safety equipment may vary from one laboratory to another.

Have your laboratory instructor show you the location of the following:

Fire Extinguisher
Safety Shower
Eyewash Station
Emergency Phone
First Aid Kit
Fire Blanket
Chemical Spill Kits
Materials Safety Data Sheet
Exit Doors of the Lab (and Evacuation Route)

Personal Protective Equipment (PPE)

1. Appropriate protective equipment must be worn at all times. The Campus Bookstore sells VISORGOGS as well as lab coats. Gloves will be provided as required for experiments.
 - a. VISORGOGS, an ANSI Approved Chemical Splash Goggles
 - b. Lab Coats
 - c. Gloves, as required
2. Dress appropriately for lab. This will help protect you from flames and chemicals.
 - a. DO: Tie Back Long Hair.
 - b. DO: Wear long pants.
 - c. DON'T: Wear Sandals or Open Shoes. Footwear should be made of synthetic or natural leather, or any material that does not absorb liquids.
 - d. DON'T: Wear Loose Clothing/Sleeves.
3. Prevent the spread of chemicals to public areas; remove gloves and wash hands before leaving the lab classroom, touching computers, instruments, sample holders, and doorknobs.
4. Students will not be allowed to participate and will receive a zero for the experiment if they are not dressed properly or if they are not properly protected.

Appendix B: Department of Chemistry and Chemical Engineering Statement on Pregnant Students

Department of Chemistry and Chemical Engineering Statement on Pregnant Students Taking Laboratory Courses

Safety has always been the paramount concern of everyone in the Department and this is especially true for safety in lab courses. This statement focuses on students who are pregnant.

All students taking chemistry laboratory courses are required to read and understand the Department's "Laboratory Safety Rules, Practice and Agreement" before commencing lab work and sign the safety agreement. All students are required to wear eye protection and lab coats; for specific experiments, all students wear lab gloves, and, in all cases, a student may request and don lab gloves whenever he/she wishes. Material Safety Data Sheets and related safety information are available for all chemicals being used during the lab courses and a full set of MSDS's are available in the Chemistry Office. The safety precautions in place are to be followed by all students and, when enacted, are regarded as sufficient to minimize health and safety risks for everyone participating in lab courses.

All faculty teaching laboratory classes must inquire about special circumstances that affect students in the lab – particularly medical conditions. If a student does not reveal a relevant medical condition, particularly pregnancy, the instructor cannot properly advise or accommodate that student and the student must assume any untoward risk in participating in the laboratory course.

No student who is eligible can be turned away from a lab class because of a medical problem. Title IX states: "According to the Office of Civil Rights in the Department of Education, Title IX, which prohibits discrimination based on sex, requires three things from institutions receiving any amount of federal money. First, a school cannot treat a woman worse than normal students because she is pregnant, meaning a pregnant student cannot be excluded from any program or activity based on her condition. The second requirement is that schools must accommodate pregnancy as though it were a temporary disability, which means that pregnant women are entitled to the same insurance benefits, leave policies or modified course requirements that temporarily disabled students are entitled to. The last requirement - and this is the big one - is that schools are required to allow a pregnant student to take temporary leave, and when she returns, she must be reinstated to her prior status, regardless of whether the school allows temporary leave for other conditions. The length of a pregnant woman's leave is to be determined by her doctor."

We cannot ensure that a pregnant student will not be exposed to chemicals that might be unhealthy for her or her fetus. NO LIST OF CHEMICALS IS COMPLETE. In addition, we cannot know the level of exposure, the length of exposure or the number of encounters that might occur with any chemical during a semester.

By maintaining the safety rules, we expect that all students, including a pregnant student, should be able to carry out lab procedures safely. **However, it is the Department's professional advice that pregnant students should be advised NOT to take a lab course unless they are willing to understand and assume the risks.** She should certainly be seeking and following proper medical advice from her physician.

The following are statements from other universities on this issue:

From Purdue University: Pregnant students in undergraduate chemistry labs -- As regards air quality as well as all other laboratory hygiene and protective safety measures, the teaching labs are as good or better than any workplace -- i.e. they are as good as or better than OSHA requires for employees' work environments even though students in teaching labs are not employees and OSHA regulations do not apply to student safety.

However, for most chemicals, very little is known about how a developing fetus will be affected by

exposure of its mother to small quantities of the chemical -- air exposure, skin exposure, ingestion (for example a person touching his/her lips after having touched a surface that contained invisible traces of chemical).

Medical doctors often write recommendations or statements for pregnant students, to the effect that the student may take part in the laboratory exercises "if work with volatile and toxic substances is performed in a fume hood, and standard safety and personal protective equipment are used, so that the student not at risk for coming into contact with possibly injurious substances." This is bogus; this is a CYA phrase. The lab is full of students wielding numerous possibly injurious substances, and there is no way that the University can guarantee that the student is not at risk.

Pregnant lab students who do not wish to risk any possibility of exposure to chemicals in the lab are encouraged to consider withdrawing or taking an incomplete, because the only way to come anywhere close to avoiding that risk is to not be in the lab.

On the other hand, many students recognize that there is no such risk-free environment anywhere, and that the world as a whole, e.g. food additives, hair dye, air pollution.... offers many risks for contact with possibly harmful substances whose effects on the fetus are not known. Pregnant students are encouraged to continue in the lab, focusing on excellent lab hygiene and safety practices, if they are comfortable with the idea that the risk is minimal and acceptable and that standard PPE and safety practices, properly employed, will afford adequate protection.

From Idaho University: If you are pregnant and you want to take the lab, please obtain a written letter from your doctor. We do not know the effect of some of the chemicals that are used in the labs on the fetus or the baby. However, we strongly advise you to take the lab another time when you are not pregnant.

From Texas A&M: Pregnancy introduces an entirely new set of variables in considerations of hazards. Some chemicals that generate no adverse effects in adults can be highly teratogenic (cause abnormalities in embryo or fetus). Although, we will not be working with compounds known to be highly teratogenic, it is considered prudent for pregnant women to limit exposure to all potentially teratogenic chemicals (alcohol, coffee, etc.). It is not known what level of exposure to many chemicals might affect your unborn child. You should assume that these chemicals can represent a real threat to your unborn child. We consider that exposure of an unborn fetus to an avoidable hazard is unacceptable. If this subject applies to you, we strongly suggest that you seek counsel from your personal physician. Although we cannot prevent any individual from taking this course, we recommend that women who are pregnant should drop this course and take it at a later date. This situation should be one in which your Dean would allow dropping the course with a NG, rather than requiring use of a Q drop.

From Southern Connecticut State University: Health Issues Related to Pregnancy. If a student is pregnant or becomes pregnant and does not inform the instructor, SCSU takes no responsibility for the adverse effects that the chemicals may have on the child or mother. If a student is pregnant and wishes to continue with the lab, they must bring the manual to their obstetrician and have a signed letter acknowledging they are allowed to complete the lab experiments. Labs will not be revised under any circumstances to accommodate a pregnant student because the department in general feels that the student should withdraw in this situation. If a student produces the required letter from a doctor, they can complete the experiments at their own risk.

Pregnant students need to be advised that if they choose to enroll in a chemistry laboratory class at UNH, they must participate fully as any other student. They may not take the course in a virtual mode or by watching others. A laboratory course involves full engagement in learning techniques and handling chemicals safely. Students need to be advised that choosing not to take a laboratory course may affect their course of study as such courses may be pre-requisites for other classes.

Appendix C: Laboratory Guidelines for Working with Biosafety Level 1&2 Human Pathogens

Laboratory Guidelines for Working with Biosafety Level 1&2 Human Pathogens

(Created by Dr. Huan Gu on 10/20/2021)

1. Biosafety Level 1 (BSL-1)

BSL-1 labs are used to study infectious agents or toxins not known to consistently cause disease in healthy adult humans or animals. Workers follow basic safety procedures, called [standard microbial practices](#), and require no special equipment or design features. Standard engineering controls in BSL-1 laboratories include easily cleaned surfaces that are able to withstand the basic chemicals used in the laboratory.

Specific considerations for a BSL-1 laboratory include the following:

1.1 Laboratory practices

Standard Microbiological Practices (CDC) (Source: <https://www.vumc.org/safety/bio/biosafety-basics-level-1>)

- Limit access to work areas. Close doors during work with research materials.
- Wash hands after handling biological materials, removing gloves, or before leaving work area.
- Don't eat, drink, etc. in the work area.
- Never mouth pipette.
- Use sharps only when no alternatives (e.g., safety devices or non-sharps) exist.
- Handle and dispose sharps carefully and properly.
- Minimize activities that are likely to create splashes, sprays, or aerosols.
- Don't have to be in a biological safety cabinet, but close to a flame. Work can be performed on an open lab bench or table.
- Decontaminate work surfaces at least daily using 70% ethanol.
- Decontaminate waste materials before disposal using 10-15% bleach for at least 15 min.
- Wear a BUTTONED lab coat to protect street clothes.
- Shorts and open toes are not allowed when working with BSL 1 cells or solutions.
- Wear gloves if your hands have broken skin or a rash.
- Wear eye/face protection if splashes or sprays are anticipated.
- Transport materials outside of the laboratory using secondary containment (e.g., a plastic bucket that is deeper than the height of the container) and a cart.
- Avoid public areas during transport.
- Transfer materials to and from the campus according to federal and international regulations.
- Be familiar with written instructions for laboratory procedures and proper responses to emergencies.

1.2 Safety equipment

- PPE (lab coats, gloves, eye protection) are worn.

1.3 Facility construction

- A sink must be available for hand washing.
- The lab should have doors to separate the working space from the rest of the facility.

2. Biosafety Level 2 (BSL-2)

BSL-2 laboratories are used to study moderate-risk infectious agents or toxins that pose a moderate danger if accidentally inhaled, swallowed, or exposed to the skin. Design requirements for BSL-2 laboratories include hand washing sinks, eye washing stations, and doors that close and lock automatically. BSL-2 laboratories must also have access to equipment that can decontaminate laboratory waste, including an incinerator, an autoclave, and/or another method of decontamination, depending on the biological risk assessment.

In addition to BSL-1 considerations, BSL-2 laboratories have the following containment requirements:

2.1 Laboratory practices

Standard Microbiological Practices (CDC) (Source: <https://www.vumc.org/safety/bio/basics-biosafety-level-2>)

- Limit access to work areas. Close doors during work with research materials.
- Post biohazard warning signs at access points and on equipment containing or contaminated by potentially infectious materials.
- Wash hands after handling biological materials, removing gloves, or before leaving work area.
- Don't eat, drink, etc. in the work area.
- Never mouth pipette.
- Use sharps only when no alternatives (e.g., safety devices or non-sharps) exist.
- Take extreme precautions when sharps must be used. Dispose sharps carefully and properly.
- Conduct procedures likely to create splashes, sprays, or aerosols within a biological safety cabinet that is certified annually.
- Do not open the container except in the biological safety cabinet.
- Decontaminate work surfaces at least daily using 70% ethanol.
- Decontaminate waste materials before disposal with 10-15% bleach for at least 15 min.
- Wear a **BUTTONED** lab coat to protect street clothes.
- Shorts and open toe shoes are not allowed when working with BSL 2 cells or solutions.
- Wear gloves when hands may contact potentially infectious materials, contaminated surfaces, or equipment.
- Wear eye/face protection if splashes or sprays are anticipated during work outside a biological safety cabinet.
- Transport materials outside of the laboratory using secondary containment (e.g., a plastic bucket that is deeper than the height of the container) and a cart. The container should be sealed with a cap or sponge. Avoid public areas during transport.
- Transfer materials to and from the campus according to federal and international regulations.
- Be familiar with written instructions for laboratory procedures and proper responses to emergencies.
- Report spills, exposures, illnesses, and injuries immediately.

2.2 Safety equipment

- Appropriate PPE is worn, including lab coats and gloves, eye protection and face shields.
- All procedures that can cause infection from aerosols or splashes are performed within a [biological safety cabinet \(BSC\)](#).
- An autoclave or an alternative method of decontamination is available.

2.3 Facility construction

- The laboratory has self-closing doors.
- A sink and eyewash are readily available.

3. References and Contacts

1. Biosafety in Microbiological and Biomedical Laboratories (5th ed.). 2007. U.S. Government Printing Office, Washington, D.C. Link:

http://www.cdc.gov/OD/ohs/biosfty/bmb15/BMBL_5th_Edition.pdf

2. NIH Guidelines for Research Involving Recombinant DNA Molecules. 2002. Link:

http://www4.od.nih.gov/oba/rac/guidelines_02/NIH_Gdlnes_lnk_2002z.pdf

3. OSHA Bloodborne Pathogens Standard 29CFR 1910.1030. 2001. U.S. Department of Labor, Occupational Safety and Health Administration. Link:

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10051

4. Biohazardous Waste Basics. University of Tennessee Biosafety Office. Link:

<http://biosafety.utk.edu/pdf/biowastebasics.pdf>

5. Public Health Emergency

<https://www.phe.gov/s3/BioriskManagement/biocontainment/Pages/BSL-Requirements.aspx>

Appendix D: Bleach Disinfection of Biosafety Level 1 and 2 Liquid Waste for Drain Disposal

Bleach Disinfection of Biosafety Level 1 and 2 Liquid Waste for Drain Disposal

Effectiveness: Bleach, a sodium hypochlorite solution (NaOCl), is a broad-spectrum disinfectant that is an effective disinfectant for:

- Enveloped viruses (e.g., HIV, HBV, HSV)
- Vegetative bacteria (e.g., Pseudomonas, Staphylococcus, and Salmonella)
- Fungi (e.g. Candida)
- Mycobacterium (e.g., M. tuberculosis and M. bovis)
- Non-enveloped viruses (e.g., Adenovirus and Parvovirus)

Personal Protective Equipment (PPE) (Refer to the disinfectants Safety Data Sheet (SDS) for additional PPE and safe handling and use information)

- Laboratory coat
- Nitrile gloves
- Safety Goggles

Concentration

- The appropriate concentration of sodium hypochlorite for disinfecting liquid BSL1 and BSL2 waste is 5000 ppm, approximately 0.5%. Household bleach is 5.2 - 6.1 % sodium hypochlorite; therefore, a 1:10 (v/v) dilution of bleach to liquid biological waste is appropriate.

Contact Time

- An appropriate contact time of sodium hypochlorite with liquid waste is 30 minutes.

Drain Disposal Assessment

- Assess and verify chemical constituents meet drain disposal requirements. Refer to specific Drain Disposal Procedure for additional information (See Below).
 - **Acceptable:** If acceptable for drain disposal and after 30 minutes of contact time, disinfected liquid waste is poured down the sink and flushed with copious amounts of water.
 - **Not Acceptable:** If not acceptable, collect and manage waste as chemical waste and provide to EHS for disposal.

Stability and Storage

- Bleach must be stored between 50°F and 70°F. According to Clorox, undiluted household bleach has a shelf life of six months to one year from the date of manufacture. After this time, bleach degrades at a rate of 20% each year, until completely degraded to salt and water. A 1:10 bleach solution has a shelf life of 1 month. Some manufacturers-prepared 1:10 bleach solutions, e.g., Bleach-Rite, contain a stabilizer that increases the shelf life to approximately 18 months. Discount brands of bleach may have lower concentrations of sodium hypochlorite and "colour safe" bleach contains NO sodium hypochlorite (hydrogen peroxide), these products should NOT be used for the disinfection of biological waste.

Procedure for disinfecting and disposing of liquid waste down the drain

1. Work in a well-ventilated area.
2. Label an appropriate container with the type of liquid (Cell Culture, Bacterial, Fungal, Viral, etc.) to be disinfected, your initials, and the date
 - e.g. "Cell Culture Liquid with 10% Bleach - JP - 11/06/2019"
3. Collect the liquid waste so that does not exceed $\frac{3}{4}$ of the container's volume.
4. Add enough bleach to create a 10% solution (1:10v/v).
5. Let waste sit for 30 minutes. An open container of waste **may not** be left unattended.
6. Dispose of all liquid in the container down the sink drain and flush with a volume of water that is 15-20 times the amount of the liquid waste.
7. If the container is used to collect additional waste, the labeled container must be secured with a cap and stored under a Biological Safety hood.

DRAIN DISPOSAL REQUIREMENTS

Disinfected biological liquid to be disposed via a drain must:

1. Meet the following characteristics:

- Contains no radioactive materials.
- Contains no biological hazards
- Contains no hazardous waste ([Hazardous Waste Reference Guide](#))
- Liquid not exceeding 5 gallons (19 liters)
- Contains less than 10% solids or viscous substances which are insoluble in water
- Contains less than 50 mg/L (ppm) oils and greases
- Have a pH greater than 5.0 and less than 11.0 or not have any other corrosive property likely to cause damage to structures or equipment of the sewerage

2. Discharge to the sewer via a laboratory sink drain only

3. Flush with copious amounts of water (15-20 times the original volume)

4. Allow the previous disinfected biological liquid to be completely flushed prior to discharging the next disinfected biological waste container.

Do Not Enter

Hazardous Chemical
Spill in Laboratory

Appendix F: Department of Forensics Student Lab Safety Guidelines and Safety Agreement

University of New Haven Department of Forensic Sciences

LABORATORY SAFETY POLICIES AND PRACTICES

For students/individuals participating in Forensic Department courses.

Failure to comply with these practices will result in your temporary or permanent removal from the lab at the discretion of the lab manager, TA, or instructor.

Mandatory Training Requirements:

1. All students taking a class in a Forensics laboratory classroom or crime house must take the lab safety training and quiz on Canvas each semester. This should be completed before any labs and students must receive $\geq 70\%$.
2. All students working with human biological fluids – directly or stained materials – must take the Bloodborne Pathogen (BBP) training and quiz on Canvas. This should be completed before any labs and students must receive $\geq 70\%$.

COVID-19 Policy:

1. Unvaccinated or partially vaccinated persons must wear a mask at all times in UNH buildings.
2. All students will be required to show their CoVerified green badge when asked by any employee of the university.

General Requirements:

1. **Do not:** smoke, eat, drink, apply cosmetics, touch contact lenses, or bring food items into any lab spaces, including classrooms. Store food and drink in hallway cubbies.
2. Do not store food or drink in lab refrigerators or freezers.
3. Wash hands prior to leaving a lab space, after every lab session.
4. Gloves are to be removed before leaving the lab and may not be worn in non-laboratory areas. Do not handle items (e.g. phones, personal belongings, computers) other than those for the lab with gloves on.
5. At the end of a lab, put away materials and equipment, and dispose of waste as instructed.
6. **Never dump chemical waste down the drain;** the instructor or TA will coordinate disposal.
7. Do not block emergency safety showers or eyewash stations.
8. Do not write or mark on the laboratory bench paper.

Personal Protective Equipment (PPE):

1. ANSI (American National Standards Institute) approved Visorgogs or Flex Seal goggles will be worn over your eyes at all times when performing laboratory work, unless using a microscope.
2. Face shields will be used when working with large volumes of liquid or as otherwise instructed.
3. Avoid wearing contact lenses in the lab if possible.
4. Always wear provided nitrile gloves when handling chemicals or samples of any kind. Inspect gloves for tears or holes; never reuse gloves.
5. **Your arms and legs must be covered during labs.** Lab coats will be worn during labs at all times. **No** skirts, dresses, shorts, capri length pants, or open-toe shoes (e.g. sandals or flip flops) at any time.
6. Tie back shoulder length or longer hair and confine loose clothing.
7. All students working with human biological fluids – directly or stained materials – will be provided with a facemask that must be worn. Instructors will demonstrate how to properly wear facemasks.
8. **Students will not be allowed to participate in lab if they are not wearing proper attire and PPE.**

Hazardous Material Safety:

1. All experiments should be performed exactly as directed by the instructor and lab materials.
2. Students should not remove any chemicals, equipment, or materials from the lab.
3. Review all SDS (Safety Data Sheets) online through UNH's portal before working with or disposing of any chemicals. Take note of hazards, PPE, and incompatible materials.
4. Never taste or smell a chemical. Check odors only if instructed to do so by gently wafting it towards your nose with your hand.
5. Students are not allowed to enter the Chemical Stockrooms. Ask your instructor or TA for assistance.

Spills, Accidents, and Emergencies:

1. **CAMPUS POLICE EMERGENCY NUMBER: X7070 (203-932-7070)**
2. Learn the locations and operation of eyewashes, fire extinguishers, fire alarms, sinks, first aid kits, emergency showers, and **emergency phone (located next to the elevator, speed dials campus police)**. Emergency services can also be reached manually through classroom or lab phones (dial 7070).
3. Be aware of emergency procedures and how to evacuate the lab and building.
4. Notify the instructor of any spills, including water. Clean up all spills immediately if instructed to do so.
5. Report **ALL** accidents, injuries, and near misses (close calls) to your instructor **immediately**, they will retrieve the relevant SDS in an emergency. Complete accident/near-miss form with the Lab Manager as soon as possible.
6. In case of burns, run the area under cold water for at least 15 minutes. If the burn is mild, report to Health Services for further treatment. If the burn is moderate to severe, emergency services should be called for transportation to medical care. Medical personnel will need the SDS for treatment of chemical burns of any severity.
7. If a chemical is splashed on your skin, body, or eyes, **immediately** remove any contaminated clothing and rinse the affected area for 15 minutes using the eyewash, safety shower, or sink. Seek medical attention as necessary.
8. In case of accidental ingestion, notify instructor immediately and call **campus police X7070 (203-932-7070)**.

Equipment:

1. Use equipment only for its designed purpose.
2. Do not leave equipment (e.g. hot plate, thermocycler, centrifuge, etc.) unattended while it operates.
3. Do not use broken or malfunctioning equipment, report damage to instructor or TA.
4. Do not mouth pipette; use an electric or manual pipette. **Do not force pipettes beyond their volume limit.**
5. Handle glass with care. If glassware is broken or damaged do not use it and discard it in the broken glass bin. Pick up dropped broken glass with a dustpan and brush.

Contacts:

Lindsey Potts: Forensic Dept. Lab Manager; Dodd's 402; 203-479-4587

Tim Palmbach: Forensic Dept. Chair; Dodd's 422; 203-932-7116

Campus Police **Emergency** number: **X7070 or 203-932-7070**

Appendix G: Department of Forensics Faculty Lab Safety Guidelines and Safety Agreement

University of New Haven Department of Forensic Sciences

LABORATORY SAFETY POLICIES AND PRACTICES

For teaching assistants, instructors, and individuals using research labs.

Read carefully the following policies and practices before entering any research lab space or beginning TA duties.

Mandatory Training Requirements:

Please note: Any student or TA who has not completed the safety training as outlined for the semester will be asked to leave the lab until the training is completed.

1. **Students** working in any Forensic lab or classroom space for research or TA duties must take the UNH Canvas lab safety training and quiz every semester. Training must be completed before beginning lab work.
2. **Students** working in any Forensic lab or classroom for research or TA duties that use human body fluids – directly or stained material – must take the UNH Canvas Bloodborne Pathogen (BBP) training and quiz every semester. Training must be completed before beginning lab work.
 - a. **Students** working with human body fluids must also be fitted for a N95 mask annually by Triumvirate and review the safety protocols with the Lab Manger.
3. **Instructors** must complete the UNH lab safety training and quiz, and BBP training and quiz, annually.

COVID-19 Policies:

1. Unvaccinated or partially vaccinated persons must wear a mask in UNH buildings at all times.
2. Students will be required to show their CoVerified green badge when asked by any employee.

General Requirements:

1. The above training requirements must be completed prior to any classes or research work.
2. **Do not:** smoke, eat, drink, apply cosmetics, touch contact lenses, or bring food items into any lab spaces, including classrooms. Store food and drink in hallway cubbies.
3. Do not store food or drink in lab refrigerators or freezers.
4. It is required that your hands be washed before leaving the lab space.
5. Gloves are to be removed before leaving the lab and may not be worn in non-laboratory areas. Do not handle items (e.g. phones, personal belongings, computers) other than those for the lab with gloves on.
6. At the end of your day: clean the benchtop, put away materials and samples, turn off all equipment, dispose of waste appropriately. Research students must wash, dry, and store all glassware used.
7. Experiments that must run while you're gone must have an "Unattended Experiment" sign.
8. Label all stored samples with your advisor's name, your name, and the date the samples were generated.
9. **Never dump chemical waste down the drain.**
10. Undergraduate researchers must always have a graduate student, faculty member, or lab manager on the floor when doing research. Graduate students should avoid working alone if possible.
11. Do not block emergency safety showers or eyewash stations.
12. Report unsafe conditions or situations to your advisor or the lab manager.

Personal Protective Equipment (PPE):

1. ANSI (American National Standards Institute) approved Visorgogs or Flex Seal goggles must be worn over your eyes when performing lab work, unless using a microscope.
2. Face shields should be used when working with larger volumes of liquid chemicals.
3. Avoid wearing contact lenses in the lab if possible.
4. Always wear provided nitrile gloves when handling chemicals or samples of any kind. Inspect gloves for tears or holes; never reuse gloves.
5. **Your arms and legs must be covered.** Lab coats must be worn when performing research. **No** skirts, dresses, shorts, capri length pants, or open-toe shoes (e.g. sandals or flip flops) at any time.
6. Tie back shoulder length or longer hair and confine loose clothing.
7. If you are not wearing the proper/approved PPE, you may be denied entrance into the lab.

Hazardous Material Safety:

1. Unauthorized experiments are prohibited. Perform the experiments as directed by your instructor.
2. Avoid moving chemicals, supplies, or equipment between labs unless otherwise deemed necessary.
3. Hazardous chemicals should always be transferred between rooms in a secondary container, which can be found in Room 412.
4. Review all SDS (Safety Data Sheets) online through UNH's portal before working with or disposing of any chemicals. Take note of hazards, PPE, and incompatible materials.
5. Never taste or smell a chemical. Check odors only if instructed to do so by gently wafting some of the vapor towards your nose with your hand.
6. Use a biosafety cabinet or a fume hood when necessary; do not use a biosafety cabinet as a fume hood.
7. When working with chemical fume hoods, work with the sash at the lowest possible position and work at least eight inches back from the front opening.
8. Read the chemical labels very carefully. Read them 3 times: when you pick it up, before you use it, and after you are finished. Always consult your instructor and review the online SDS if you are unsure.
9. Never return unused chemicals to the stock bottle; dispose of or store excess in a secondary container.
10. Review proper chemical handling before working with any chemicals. Ask if you are unsure.
11. All secondary containers must be labeled with the full chemical composition name, the course/instructor, name or initials of the person who prepared the reagent, and the date of preparation.

Spills, Accidents, and Emergencies:

1. **CAMPUS POLICE EMERGENCY NUMBER: X7070 (203-932-7070)**
2. Learn the locations and operation of eyewashes, fire extinguishers, fire alarms, sinks, first aid kits, emergency showers, and **emergency phone (located next to the elevator, speed dials campus police)**. Emergency services can also be reached manually through classroom or lab phones (dial 7070).
3. Be aware of emergency procedures and how to evacuate the lab and building.
4. Report **ALL** accidents, injuries, and near misses (close calls) to your instructor or advisor **immediately**. Complete accident/near-miss form with the Lab Manager as soon as possible.
5. The instructor, advisor, or lab manager will retrieve SDS in case of emergency, it is important you know or can indicate what you were working with if an accident occurs.
6. For any large or acutely hazardous spills, remove all individuals from the affected areas. Immediately call **campus police X7070 (203-932-7070)** to report the spill. Contact the lab manager.
7. In case of burns, run the area under cold water for at least 15 minutes. Notify the instructor, advisor, or lab manager. If the burn is mild, report to Health Services for further treatment. If the burn is moderate to severe, emergency services should be called for transportation to medical care. Medical personnel will need the SDS for treatment of chemical burns of any severity.
8. If a chemical is splashed on your skin, body, or eyes, **immediately** remove any contaminated clothing and rinse the affected area for 15 minutes using the eyewash, safety shower, or sink. Notify instructor, advisor, or lab manager. Seek medical attention as necessary.
9. In case of accidental ingestion, notify instructor, advisor, or lab manager immediately and call **campus police X7070 (203-932-7070)** who will call and coordinate emergency medical services (911). The nearest available supervisor must ready the SDS for emergency personnel on arrival.

Equipment:

1. Use equipment only for its designed purpose.
2. Do not leave equipment (e.g. hot plate, thermocycler, centrifuge, etc.) unattended while it operates.
3. Do not use broken or malfunctioning equipment, report damage to advisor or lab manager.
4. Do not mouth pipette; use an electric or manual pipette.
5. Handle glass with care. If glassware is broken or damaged do not use it and discard it in the broken glass bin. Pick up dropped broken glass with a dustpan and brush.

Chemical Waste:

1. **Never dump chemical waste of any kind down the drain.**
2. Appropriate empty containers are available for disposal of chemicals in the Room 412
3. You may reuse an empty chemical stock bottle as a waste bottle:
 - a. If the original chemical was *non-hazardous*
 - i. Triple rinse the container
 - ii. Wait until completely dry
 - iii. Remove original label and replace with the appropriate waste label or write “Empty Bottle”
 - b. If the original chemical was *hazardous*
 - i. Do not rinse the container
 - ii. Fill only with waste that is compatible with the original chemical (ask if you are unsure)
 - iii. Remove original label and replace with the appropriate waste label, include the name of the original chemical on the label.
4. Waste containers should be inspected for damage before use and caps should fit tightly.
5. Do not use laboratory bottles with ground glass stoppers.
6. **Never mix waste types – keep acids, bases, flammables, and oxidizers separate!**
7. Waste containers must be completely closed during storage.
8. Follow the below instructions for labeling waste:
 - a. Place a “Hazardous Waste” or general waste label on the bottle– Ask if unsure which.
 - b. List all components of the waste including water and % concentrations.
 - c. Do not use chemical formulas or abbreviations. (Write “Water” not “H₂O”)
 - d. Name of lab course or room generated.
 - e. Do not date the label, this is done only by Triumvirate.
9. Waste should be stored in the laboratory Satellite Accumulation Area (SAA) in secondary containment.
10. Do not overfill waste containers, only fill up to the “shoulder” of the bottle.

Chemical Storage:

Chemicals must be stored according to the requirements outlined in its SDS.

Remember flammables should be stored in approved flammable cabinets; acids and bases stored in cabinets and separately. Do NOT store chemicals randomly in plastic tubs on shelves or with your other research materials.

In addition:

1. Each container should be labeled as to the date it was received AND opened.
2. Chemicals that are dispensed into secondary containers should be labeled with full chemical name, date chemical was dispensed, your initials, instructor/advisor name, catalog number and chemical hazards.
3. When preparing reagents/disinfectants, label the bottles with solution name, date prepared and the person’s initials.
4. Once a chemical container is empty: rinse the bottle (only if the chemical is non-hazardous), deface the label and write ‘empty’ with a sharpie, throw non-hazardous waste containers away or dispose of in SAA if hazardous.
5. For research students: dispose of excess reagents or solutions you have dispensed into secondary containers before you finish your thesis, unless otherwise instructed by your advisor. Place chemical stocks in an area where they can be found to be used by future students.

Contacts:

Lindsey Potts: Forensic Dept. Lab Manager, Dodd’s 402, 203-479-4587

Tim Palmbach: Forensic Dept. Chair, Dodd’s 422, 203-932-7116

Campus Police **Emergency** number: **X7070 or 203-932-7070**

Appendix H: Chemical Procurement, Receiving and Inventory

Chemical Procurement, Receiving and Inventory Program

This section of the CHP describes standard operating procedures for procuring, receiving, and inventorying chemicals. An important program goal is to establish a centralized chemical stockroom in each department from which chemicals are procured, received, inventoried and distributed to laboratories. Centralizing these activities would:

- allow better monitoring of chemicals stored and used and their location within the facility;
- reduce the waste involved in duplicate purchases;
- reduce waste disposal costs;
- facilitate compliance with regulations.

Chemical Purchasing and Procurement Responsibilities

- Only Lab Managers are responsible for ordering chemicals.
- Lab faculty and staff should send all chemical purchase requests through their respective Lab managers before purchase.
- Students should never be permitted to order chemicals or reagents on their own, all chemical requests should be submitted to their respective department Lab Manager beforehand.
- The SURF program (Summer Undergraduate Research Fund) should follow all procedures according to their department on ordering lab supplies and/or chemicals.
- Existing chemical inventories as well as other department chemical inventories must always be double checked for requested chemicals before making new purchases to prevent duplicate chemicals from being ordered.
- The lower unit cost for bulk purchases is usually outweighed by the cost of additional storage/disposal that it requires; therefore, efforts must be made to purchase smaller quantities whenever possible.
- Lab Managers should always follow department guidelines for purchasing to ensure purchasing limits are not exceeded and budgets are maintained.
- Efforts must be made to ensure adequate facilities and equipment in the labs that will receive the chemicals/reagents in order to safely store and work with extremely hazardous substances before ordering these materials.
- Lab Managers should consider using or substituting less hazardous chemicals whenever possible.
- Lab managers must upload a copy of the SDS to the MSDS Online chemical inventory program for any chemical that is not already in the system.
- Safety Data Sheets should be regularly checked to make sure the most recent manufacturers' copy is used.
- Before purchasing biological materials, lab managers shall review the Bio Safety Level to ensure the materials meet the biosafety levels for the laboratory it will be stored and utilized in. BSL-2 materials can only be stored in BSL-2 certified laboratories. Only BSL-2 Materials or below are allowed on campus.
- No chemicals should be brought to campus without being reviewed

Appendix I: Peroxide Forming Chemicals Information Sheet

Potential Peroxide-Forming Chemicals

This policy refers to the proper use, storage, and disposal of peroxide-forming chemicals in order to minimize risks to personnel, university facilities and the environment.

Lists of Peroxide forming chemicals and the associated hazards

Peroxide-forming materials are materials that can react with molecular oxygen over time under normal use and storage conditions to form organic peroxides. Peroxides formed in this way can be potentially shock sensitive and even explosive, especially when dry. There are many different materials that are capable of peroxide formation, and certain molecular structures are known to exhibit this behavior. These peroxide formers are typically categorized in lists by their hazard level and also by the type of peroxide that can form.

List A materials:

Known to form dangerous peroxides in hazardous levels under normal conditions of storage. Discard or test for peroxides every 3 months after the opening date.

Butadiene (gas)	Potassium metal
Chloroprene	Sodium amide
Divinylacetylene	Tetrafluoroethylene (gas)
Isopropyl ether	Vinylidene chloride
Potassium amide	

List B Materials:

Known to form dangerous peroxides at potentially hazardous levels when the material is used or stored in a way that the peroxides could increase in concentration. Many common laboratory solvents fall into this category. Discard or test for peroxides at least every 6 months after the opening date.

1,4-dioxane	Furan
Cyclohexanol	Glyme
Decalin	Isopropyl benzene
Diethyl ether	Tetrahydrofuran (THF)
Diglyme	Tetralin

List C Materials:

Vinyl compounds that form peroxides that are capable of initiating free radical polymerization in the neat vinyl monomer. Polymerization processes that occur in this way can be very dangerous. Discard or test for peroxides at least every 6 months after the opening date.

Acrylonitrile	Vinyl acetate
Methyl methacrylate	Vinyl chloride
Styrene	Vinyl pyridine

The listed material above is not all inclusive. Categorization of materials known to form peroxides led to the understanding that certain molecular structures are prone to peroxide formation. Known structures include the following functional groups of possible peroxide forming chemicals:

Aldehydes	Benzylic compounds
Allylic compounds	Ethers
Amides	Vinyl compounds, particularly vinyl halides

Safe Storage and Use of Peroxide-Forming Chemicals

Maintenance of peroxide-forming chemicals requires implementation of the following procedures:

- Identify potential peroxide-forming chemicals in lab spaces and label each container with the date it has been received as well as the date it is opened.
 - Lab managers are responsible for labeling these chemicals.
- Lab managers should minimize their inventory of peroxide-forming chemicals when possible.
- Store peroxide-forming chemicals in tightly sealed containers to minimize introduction of air.
 - Lab managers may add a blanket of Argon to opened containers
- Light can initiate the peroxide-forming process, so containers should be stored either in containers that exclude light, or cabinets that do not allow light to enter (i.e. flammable storage cabinet, or under fume hood)
- Test for peroxides at least as often as recommended for opened containers. (Every 3 months for List A chemicals, and every 6 months for List B and C)
- Any unopened chemicals from the manufacturer must be tested upon reaching the manufacturer's expiration date.
- Inspect containers of peroxide-forming chemicals frequently, looking for signs of precipitation, stratification of liquid, crystal formation, or other irregularities.
 - If peroxide-forming chemical containers present any of these signs, DO NOT move or disturb the container and contact Lab Manager or and Public Safety as soon as possible.
 - Before distilling any peroxide forming chemicals, always test the chemical first with peroxide test strips to ensure there are no peroxides present. Never distill peroxide forming chemicals to dryness. Leave at least 10-20% still bottoms to help prevent possible explosions.