# CHEMICAL HYGIENE PROGRAM

CLARK ATLANTA UNIVERSITY

1st Revision August 2012

2nd Revision: April 2019

3rd Revision: April, 2021

Approva George T. French, Jr.

Date 6/1/2021

**President's Letter**

Clark Atlanta University (CAU) is committed to protecting the welfare of its students, faculty, and staff members, as well as, its research and teaching laboratories from chemical and fire hazards. Recognizing that laboratory workers at CAU can be exposed to a broad spectrum of hazardous chemicals, CAU has developed a Chemical Hygiene Program, which includes the Chemical Hygiene Plan and Right-to-Know Procedures. CAU is fully committed to compliance with federal, state, and other regulatory authorities regarding the use of and exposure to hazardous chemicals. The Chemical Hygiene Program is a required resource that ensures that ALL chemical laboratory personnel are informed about hazardous chemicals at CAU; and will know how to respond to and manage emergencies.

The Chemical Hygiene Program (Program) is developed and will continually be refined as new regulations emerge. With the implementation of this Program, the University is well positioned to effectively respond to emergencies, minimizing the impact while maximizing the effectiveness of university resources. The Program will also set in motion the groundwork for recovery and' return to normal operations.

I require all laboratory workers engaged in "laboratory scale" use of hazardous chemicals embrace the Chemical Hygiene Program (Chemical Hygiene Plan and Chemical Hazard Awareness Procedures), and Occupational Safety and Health Administration (OSHA) Lab Standard (29 CFR 1910.1450), and become personally committed to the ultimate goal of protecting our students, faculty, and staff members should an emergency take place in our chemical laboratories on campus.

Thank you,

Original signed by:

_____

Dr. George T. French Jr., President

06/01/21

_____

Date

CLARK ATLANTA UNIVERSITY

# CHEMICAL HYGIENE PROGRAM

CLARK ATLANTA UNIVERSITY

# A. CHEMICAL HYGIENE PLAN

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CLARK ATLANTA UNIVERSITY

## 1.0 OVERVIEW AND APPLICABILITY

Chemicals are naturally a part of the laboratory environment. Exposure to hazardous chemicals can range from mild, such as skin rashes or nasal irritations, to serious, such as burns or organ damage. Many chemicals also pose physical hazards with the potential to cause accidents resulting in fires and explosions. Because there is often a lack of information available to workers concerning chemicals, OSHA has adopted specific guidelines designed to reduce worker exposure as well as to promote the safe storage, use and disposal of laboratory chemicals.

This Chemical Hygiene Plan (CHP or The Plan) has been developed by Clark Atlanta University (CAU) to assist in the recognition, evaluation and control of hazards associated with laboratory chemical operations. The requirements for this Plan result from a rulemaking and review process, through which OSHA determined that laboratories typically differ from industrial operations in their use and handling of hazardous chemicals. Accordingly, OSHA's response to this determination was the promulgation of an operation-specific Standard, "Occupational Exposure to Hazardous Chemicals in Laboratories" (29 CFR 1910.1450), commonly referred to as the "Laboratory Standard".

The Plan applies to all laboratories and describes the policies, responsibilities, work practices, procedures, equipment and controls that function together to protect CAU employees, students and the environment, and forms the foundation for the safe storage, use and disposal of hazardous chemicals in the laboratory. Although not chemicals by definition, bio hazardous materials present physical hazards to employees if handled incorrectly and are therefore addressed in this Plan.

The Chemical Hygiene Committee (CHC) serves as the primary resource for development and review of laboratory chemical safety policies and procedures included in the Plan. The CHC consists of one representative from the following departments: Research and Sponsored Programs, Chemistry, Physics, Biology, The Center for Cancer Research and Therapeutic Development (CCRTD), Facilities Management and The Compliance Office. The University Director of Emergency Management, the Laboratory Safety Manager and the Chairs of Chemistry and Biology departments are de jure members of the committee. Current members of the committee are listed in Appendix K.

Provisions of the Laboratory Standard require that:

- Employees must have access to the Chemical Hygiene Plan.
- Employees must know the location of and how to access Safety Data Sheets (SDS).
- Employees receive training which must include information about the hazardous chemicals present and the operations in which they are involved, use of personal protective equipment, and emergency procedures.
- Employees should be instructed how to identify the presence or release of a hazardous chemical.
- Chemical and waste containers must be properly labeled.
- Adequate engineering controls (e.g., fume hoods) must be provided.
- Employees are entitled to a medical consultation whenever there is an event such as a spill or leak that increases their risk of hazardous materials exposure.
- Standard operating procedures for routine and "high hazard" operations are established.
- Air monitoring be conducted if there is a suspicion that the airborne concentration of a hazardous chemical may exceed established exposure limits.

Radioactive material sources are licensed and serviced by the Radioactive Coordinator at the Morehouse School of Medicine (MSM). CAU users of radioactive sources shall observe the safe practices and procedures implemented by MSM. The Radioactive Materials Program developed by MSM is included as Volume 9 of the CAU Environmental Files.

## 2.0 AUTHORITY AND RESPONSIBILITIES

### 2.1 Lab Safety Manager / Chemical Hygiene Coordinator (LSM-CHC)

The LSM-CHC has overall responsibility for maintaining and establishing compliance with this plan and providing technical guidance. The LSM-CHC will also serve as a liaison between CAU and regulatory agencies relative to laboratory compliance issues. The responsibilities of the LSM-CHC include:

- Ensuring that the Plan, chemical inventories and SDS are up-to-date and available to laboratory personnel.
- Ensuring that training is provided to new and current laboratory personnel and is properly documented.
- Ensuring that laboratory employees follow recommended Standard Operating Procedures (SOPs), safe work procedures and emergency procedures.
- Ensuring that proper safety equipment and engineering§ controls are provided and utilized.
- Ensure that appropriate personal protective equipment is provided and utilized.
- Ensure that laboratory practices and control equipment inspections are conducted and properly documented.
- Ensure that procedures developed for new or particularly hazardous chemicals or operations are coordinated with input from the Principal Investigator and the Chemical Hygiene Committee (CHC).
- Conduct move in/move out inspections (refer to section 2.3)
- Investigate incidents, accidents other potential exposure conditions involving laboratories and submit an incident report to Management Services and the Chemical Hygiene Committee.
- Ensure actions are taken to correct any unsafe condition.
- Maintain copy of employee's Hepatitis B Vaccine Declination Statement.
- Work with all faculty, staff, and Facilities Department to develop procedures for managing hazardous materials.
- Maintain the master chemical inventory for the Campus and ensure that all chemical lists are updated at least annually.
- Arrange for the transportation of hazardous waste to the Hazardous Waste Storage Room, signing all hazardous waste manifests, and conducting weekly inspections of the Hazardous Waste Storage Room.
- Investigate hazardous materials and wastes incidents and assisting in the development of recommendations based upon the results of an investigation.

### 2.2 Deans, Chairpersons & Directors

Deans, Chairpersons and Directors are responsible for establishing and implementing department information and training materials specific to their respective areas. They are responsible for supporting the LSM-CHC, Principal Investigators and research staff, and with providing all necessary resources to ensure a safe working environment.

### 2.3 Principal Investigators & Laboratory Managers

The Principal Investigator (PI) and the Laboratory Manager (LM) play a critical role in the implementation of this Plan in that they have the primary responsibility for chemical hygiene and controlling hazards in their laboratory. It is the responsibility of each PI/LM to understand the provisions of this Plan and ensure that employees including teaching and research assistants as well as students are aware of the dangers involved in the handling and use of hazardous chemicals. The PI/LM is required to notify the LSM-CHC if there is reason to believe that an employee's exposure level

to a hazardous chemical routinely exceeds an action limit such as the OSHA Permissible Exposure Limit.
When ordering a new chemical, the PI/LM is responsible for obtaining SDS from the vendor and conducting a hazard evaluation prior to introducing it to the CAU environment. A copy of the SDS should also be forwarded to the LSM-CHC for evaluation and approval. The PI/LM is also responsible for informing any visitor, contractor or vendor of the hazards of the chemicals used in the area they are working in or visiting. The PI/LM must ensure that there is a SDS available for all chemicals in their laboratory and that all laboratory personnel are trained in reading and understanding SDS.
Additional PI/LM responsibilities include:

***General***

- Ensuring that staff and students know and observe safety policies and procedures.
- Ensuring that laboratory personnel have adequate knowledge and information to recognize and control chemical hazards and have been trained in safe laboratory practices and emergency procedures.
- Ensuring that laboratory personnel are informed of the signs and symptoms associated with exposures to hazardous chemicals.
- Ensuring that chemical waste in their laboratory is properly managed.
- Ensuring that unsafe conditions or equipment is corrected.
- Taking the necessary steps to minimize the potential reoccurrence of a hazardous chemical incident.
- Ensuring that proper personal protective equipment is available and worn

***Laboratory Registration***

Laboratory registration is the process used to maintain laboratory emergency contacts and information, develop laboratory hazardous chemical inventories, and establish laboratory safety inspections for ensuring compliance with the Plan. The annual registration provides each laboratory the opportunity to perform a self-evaluation of their laboratory safety using the laboratory safety inspection checklist (Appendix B).
The laboratory registration process requires the PI/LM to annually submit a completed and current hazardous chemical inventory and Responsible Party Information (RPI Form included as Appendix B) sheet to the LSM-CHC. The LSM-CHC will issue an updated laboratory registration (Appendix D) upon receipt of the hazardous chemical inventory and RPI. The registration contains the laboratory emergency contact personnel, SDS location; and potential hazards in the laboratory. The updated registration must be posted in the laboratory, typically on the door or on the wall to the right of the door.

***Move In / Move Out Procedure***

Each PI/LM that sets up, moves in or vacates a laboratory must contact the LSM-CHC to ensure proper removal of hazardous materials. An inspection of the laboratory will be conducted by the LSM-CHC and the Chemical Hygiene Committee to ensure:

- Proper decontamination of equipment has been completed.
- Hazardous waste, biological waste or other materials that present a hazardous situation are not left unaccounted in the laboratory.

- Chemicals no longer needed but still useable are offered to other laboratories or maintained in an appropriate location.
- Unused compressed gas cylinders are removed from the laboratory.
- Radioactive waste and unused radioactive materials and radiation producing equipment are removed from the laboratory. These activities must be coordinated through the Radiation Safety Officer at Morehouse School of Medicine (MSM).

***Hazard Evaluation***

A hazard evaluation is a step-by-step review of a laboratory procedure, evaluating each step for potential hazards to personnel, property and the environment to assess the risks and identify control methods to mitigate identified hazards. Each PI/LM is responsible for evaluating the hazards from chemicals, biological materials, energy sources (including radioactive and laser) and equipment that could result in potential exposure or injury. Any new potential hazards associated with any change of procedures, new equipment or new chemical must be assessed and documented prior to use. The evaluation should include:

- Chemical and laboratory use evaluation
- Personal protective equipment
- Pollution prevention analysis
- Obtain prior approval (see below)
- The LSM-CHC should be contacted for assistance in completing a hazard assessment and may be present during the evaluation. The attached "Guidelines for Hazard Assessment and PPE Selection" (Appendix D) will aid in understanding the Hazard Assessment and completing the assessment form.

***Obtaining Prior Approval (Introduction of New Hazardous Chemicals and Procedures)***

Prior Approval by the Chemical Hygiene Committee (CHC) or the Institutional Biosafety Committee (IBC) is required prior to the introduction of any new hazardous chemical or new laboratory procedures or operations. This process involves the identification of hazards, management of risks and evaluation of pollution prevention/waste minimization. Considerations for risk management should include:

- Use of specific containment devices such as fume hoods or glove boxes
- Procedures for safe removal of waste materials
- Decontamination procedures
- Specific training for personnel
- Establishment of a restricted work area. Area must be identified by warning signs to alert persons in the area of the hazards and restricted access.
- Prior approval is accomplished by completing a New Hazardous Chemical or Operations Approval Form (Appendix E). Completed Prior Approval forms are maintained by the LS/CHC.

### 2.4 Chemical Hygiene Committee

The primary function of the Chemical Hygiene Committee shall be to provide peer review of all laboratory procedures, audits, training reviews, accident investigations, and other related actions as deemed necessary. The committee should consist of the LS/CHC, faculty and other department representatives as appropriate. The Chemical Hygiene Committee will establish protocols which at a minimum meet the policies and procedures of this Plan and the

compliance requirements of the Laboratory Standard. The primary responsibilities of the committee include:

- Establish risk management controls for laboratory procedures and monitor safety and accident trends.
- Establish and endorse new policies and procedures related to laboratory health and safety.
- Receive and review accident reports.
- Provide recommendations to mitigate accidents involving hazardous chemicals.
- Annually assess the Plan to identify its adequacy, and areas for improvement.
- Continuously improve the function and compliance goals of this Plan

### 2.5 Institutional Biosafety Committee

The Institutional Biosafety Committee (IBC) shall be responsible for the control of laboratory activities where biohazardous materials are used or stored, and serves as the subject expert for biosafety matters. The committee is responsible for reviewing all proposed policies, procedures and uses of biohazardous materials and all hazard evaluations submitted. The IBC reviews and updates the Biosafety Plan annually.

### 2.6 Laboratory Employees

For the purposes of this Plan laboratory employees are considered to be any paid laboratory personnel which typically includes professors, teaching assistants, and graduate students on stipends. They are individually responsible for understanding the hazards of chemicals they use. All laboratory staff must pre-plan their work to ensure their safety and the safety of those individuals who work around them. Their responsibilities include:

- Wearing appropriate personal protective equipment.
- Knowing the location and contents of the applicable SDS.
- Attending training classes.
- Consulting their PI/LM before initiating unfamiliar, non-standard laboratory procedures.
- Using safety devices and engineering controls as appropriate.
- Immediately reporting any problems, accidents or observations regarding chemical health and safety.

### 2.7 Students

Students, while not regulated by the OSHA Laboratory Standard, must be made aware of health and safety hazards they may encounter while handling hazardous chemicals in the laboratory. The PI/LM should ensure that students follow the established standards and procedures.

### 2.8 Support Services

Other departments will assist in enhancing this program. For example, FACILITIES DEPARTMENT (Facilities) will maintain engineering control systems according to required specifications; maintain current criteria for lab design; and maintain safety showers and eye wash stations.

## 3.0 MANAGEMENT OF LABORATORY CHEMICALS

### 3.1 Procurement of Chemicals

The protocol for introducing a new chemical onto the Campus is as follows:

1. When ordering a new chemical, the PI/LM is responsible for obtaining a SDS from the vendor

prior to introducing it onto the campus.

2. It is the responsibility of the PI/LM to inform the LSM-CHC that a new chemical is being introduced onto the campus and to provide him/her with the SDS.
3. If chemicals are to be transferred from another institution, the receiver of transferred chemicals is responsible for securing appropriate SDS and ensuring that the chemicals are properly labeled.
4. The PI/LM must also ensure that the laboratory in which the chemical will be handled has the adequate engineering controls and that all employees have received proper training and personal protective equipment. This must include employees involved in receiving the chemicals and transportation to the laboratory or storage area.
5. It is standard laboratory practice to order the smallest quantity of the chemical consistent with its intended use.
6. The PI/LM is responsible for updating their laboratory's chemical inventory.
7. The LSM-CHC is responsible for updating the master chemical inventory with the inclusion of the new chemical's SDS.

### 3.2 Chemical Inventory

Each laboratory shall at least annually update its chemical inventory. A complete inventory of chemicals used or stored in the laboratory must be submitted to the LSM-CHC. The campus master inventory of chemicals is maintained by the LSM-CHC at the Thomas W. Cole, Jr., Research Center for Science and Technology (RCST). The inventory should contain the following:

1. An alphabetized list of the complete International Union of Pure and Applied Chemistry (IUPAC) names or trade name
2. Chemical Abstracts Service (CAS#)
3. Hazardous waste code
4. Extremely Hazardous Substance (if yes, Threshold Planning Quantity)
5. Quantity stored

### 3.3 Safety Data Sheets

The PI/LM must ensure that an SDS has been included in the master inventory for every chemical in their laboratory. The location and availability of the SDS must be shared with all laboratory personnel. The SDS collection can either be maintained as an electronic or paper copy. The PI/LM should retain and maintain copies of the SDS in the individual laboratory.

### 3.4 Labeling of Containers

All chemical containers shall be labeled with the full chemical or trade name. The manufacturer's label provides specific physical and health hazard information and must be retained on the original container when in use. All substances transferred from an original container to a secondary container shall be labeled with the trade or chemical name, any dilution of the chemical, the date of the transfer, and appropriate physical and health hazards. No abbreviations or codes of the chemical name are acceptable, unless they are referenced on a placard prominently displayed in the work area. Chemical symbols are allowable only if the compound is a product of research and

referenced in research notebooks or similar documents.

### 3.5 Storage of Hazardous Materials

Before storing any hazardous material, read the label and SDS for more specific instructions on the storage and handling and ensure that the container is in good condition. The following is general guidance relative to storing hazardous chemicals:

- Chemicals must only be stored according to hazard class (e.g. flammables, oxidizers, health hazards/toxins, corrosives, etc.).
- Incompatible groups of chemicals must not be stored in close proximity to one another.
- Chemicals should not be stored on the floor or on tops of shelving units. Shelves should be secure and strong enough to support chemicals stored on them.
- All chemical containers should be properly labeled and dated.
- Chemicals in refrigerators should be stored on containment pans or in boxes.
- Shelves impervious to spills with anti-roll lips should be used.
- Chemicals should not be stored above eye level.
- Commonly recognized toxins/poisons must be stored in a locked cabinet and a "poison control agency" number posted.

While not uniform, there are a variety of color-coded hazard/storage indicators in use on laboratory reagents. This color coding separates materials into hazard classes such as flammable, reactive, contact, health and others. Schematics for suggested shelf storage patterns for compatible organic and inorganic chemicals have been included as Appendix G.
Compatibility families are listed below:

| **Compatibility Families of Inorganic Chemicals** | **Compatibility Families of Organic Chemicals** |
|---|---|
| • Metals, hydrides<br>• Halides, sulfates, sulfites, thiosulfates, phosphates, halogens<br>• Amides, nitrates*, nitrites*, azides*, nitric acid<br>• Hydroxides, oxides, silicates, carbonates<br>• Sulfides, selenides, phosphides, carbides, nitrides<br>• Chlorates, perchlorates*, perchloric acid*, hypochlorites, peroxides*, hydrogen peroxide<br>• Arsenates, cyanides, cyanates | • Acids, anhydrides, peracids<br>• Alcohols, glycols, amines, amides, imines, imides<br>• Hydrocarbons, esters, aldehydes<br>• Ethers*, ketones, ketenes, halogenated hydrocarbons, ethylene oxide<br>• Epoxy compounds, isocyanates<br>• Peroxides*, hydroperoxides*, azides*<br>• Sulfides, nitriles |

| | |
|---|---|
| • Borates, chromates, (per) manganates<br>• Acids (except nitric)<br>• Sulfur, phosphorous, arsenic, phosphorous pentoxide* | • Phenols, cresols |

**These chemicals deserve special attention due to their potential instability.*

## 4.0 STANDARD OPERATING PROCEDURES FOR CHEMICAL MANAGEMENT

Standard Operating Procedures (SOPs) are intended to provide general guidance on how to safely work with a specific class of chemical or hazard. The following SOPs address the use and handling of substances by hazard class. In some instances, multiple SOPs may be applicable for a specific chemical (i.e. both the SOPs for flammable liquids and carcinogens would apply to benzene). SOPs by hazard class are provided below and are included in Exhibit A

### 4.1 Standard Operating Procedure: Acutely Toxic Chemicals

An acutely toxic chemical causes damage in a short lime (i.e., after a single concentrated dose) and may result in irritation, burns, illness, or death. Hydrogen cyanide, hydrogen sulfide, nitrogen dioxide, carbon monoxide, chlorine, and ammonia are examples of acutely toxic gases commonly used in laboratories. Corrosive materials such as acids and bases may cause irritation, burns, and tissue damage.

**Decontamination Procedures**

- Wash hands and arms with soap and water immediately after handling.
- All surfaces should be wiped with the appropriate cleaning agent following dispensing or handling. Waste materials generated may need to be treated as a hazardous waste (Decontamination procedures vary depending on the material being handled).
- Decontaminate equipment (vacuum pumps, glassware) with approved cleaning agent before removing them from the designated area.

**Designated Area**

- All locations within the laboratory where acutely toxic chemicals are handled should be posted with caution signs. This includes all fume hoods and bench tops where the acutely toxic chemicals are handled.
- Where feasible, acutely toxic chemicals should be manipulated over plastic-backed disposable paper work surfaces. These disposable work surfaces minimize work area contamination and simplify clean up.

**Eyewash**

- Where eye exposure may occur, suitable facilities for quick drenching or flushing of the eyes shall be provided within 50 feet.
- Bottle type eyewash stations are not acceptable.

**Personal Protective Equipment**

***Eye Protection***

- Eye protection in the form of safety glasses or goggles must be worn at all times.
- Ordinary prescription glasses do not provide adequate protection. Safety glasses must meet the requirements of the American National Standard Institute (ANSI) Z.87.1 1989 Practice for Occupational and Educational Eye and Face.
- Eye protection must be equipped with side shields.
- When the potential for a splash hazard exists, a safety shield along with protective eyewear should be used

***Gloves***

- The appropriate gloves must be worn. Many chemicals may permeate certain gloves in a short period of time. The selection of the proper glove material should be made according to the SDS and the recommendations of the glove manufacturer.

***Protective Apparel***

- Laboratory coats, enclosed shoes (no open toes) and long sleeved clothing should be worn
- Additional protective clothing shall be worn if the possibility of skin contact is likely

**Safety Shower**

- A safety or drench shower should be available within 55 feet or 10 seconds from where acutely toxic chemicals are used

**Spill Response**

- Anticipate spills by having the appropriate clean up equipment on hand. The appropriate clean up supplies can be determined by consulting the SDS. This should occur prior to the use of any acutely toxic chemical. In the event of a spill, alert personnel in the area that a spill has occurred. Do not attempt to handle a spill of acutely toxic chemicals. Vacate the laboratory immediately and contact the LSM-CHC and Public Safety. Remain at a safe distance to receive and provide information to safety personnel when they arrive.

**Vacuum Protection**

- Evacuated glassware can implode and eject flying glass and splattered chemicals. Vacuum work must be conducted in a fume hood, glove box or isolated in an acceptable manner. Mechanical vacuum pumps must be protected using cold traps and where appropriate, filtered to prevent particulate release. The pump exhaust must be vented into a fume hood.

**Ventilation**

- Acutely toxic chemicals should be handled in a fume hood. Fume hoods provide the best protection against exposure and are the preferred ventilation control device. If the use of a fume hood proves impractical attempt to work in a glove box or in an isolated area on a laboratory bench top equipped with specialized exhaust ventilation.
- Manipulation of acutely toxic chemicals outside of a fume hood may require special ventilation controls in order to minimize exposure to the material.
- Acutely toxic chemicals that are volatile must not be used or stored in a biological safety cabinet unless the cabinet is vented to the outdoors.
- If your research does not permit the handing of acutely toxic chemicals in a fume hood or glove box, this should be noted in the hazard evaluation and appropriate emergency procedures identified

**Waste Disposal**

- All materials contaminated with acutely toxic chemicals should be properly disposed of.
- Wherever possible attempt to design research in a manner that reduces the quantity of waste generated.
- Questions regarding waste should be directed to the LS/CHC.

| **EXAMPLES OF ACUTELY TOXIC CHEMICALS*** | | |
|---|---|---|
| Acrolein | Acrylyl chloride | 2-Aminopyridine |
| Benzyl chloride | Bromine | Chlorine dioxide |
| Chlorine trifluoride | Chloropicrin | Cyanogen chloride |
| Cyanuric fluoride | Decaborane | Dichloroacetylene |
| Dimethyl disulfide | Dimethylsulfate | Dimethylsulfide |
| Ethylene chlorohydrin | Ethylene fluorohydrin | Hexamethylene diisocyanate |
| Hexamethyl phosphoramide | Iodine | Iron pentacarbonyl |
| Isopropyl formate | Methacryloly chloride | Methacryloxyethyl isocyanate |
| Methyl acrylonitrile | Methyl chloroformate | Methylenebisphenyl |
| Methyl fluoroacetate | Methyl fluorosulfate | Methyl hydrazine |
| Methyltrichlorosilane | Methyl vinyl ketone | Nickel carbonyl |
| Nitrogen tetroxide | Nitrogen trioxide | Organo Tin compounds |
| Osmium tetroxide | Oxygen difluoride | Ozone |
| Pentaborane | Perchloromethyl | Phosphorus oxychloride |
| Phosphorus trichloride | Sarin | Sulfur monochloride |
| Sulfur pentafluoride | Sulfuryl chloride | Tellurium hexafluoride |
| Tetramethyl succinonitrile | Tetranitromethane | Thionyl chloride |
| Toluene-2,4-diisocyanate | Trichloro (chloromethyl) | |

** This list is provided as a guide and is not inclusive.*
*Carefully review Safety Data Sheets before working with chemicals*

### 4.2 Standard Operating Procedure: Acutely Toxic Gases

Acutely toxic gases are substances that are immediately dangerous to life or health at low concentrations in air.

**Decontamination Procedures**

- Wash hands and arms with soap and water immediately.
- When removing used tubing or regulators, conduct these activities in a fume hood to prevent exposure

**Eyewash**

- Where eye exposure to acutely toxic gases may occur, suitable facilities for quick drenching or flushing of the eyes shall be provided within 50 feet.
- Bottle type eyewash stations are not acceptable

**Personal Protective Equipment (PPE)**

**Eye *Protection***

- Eye protection in the form of safety glasses or goggles must be worn at all times.
- Ordinary prescription glasses do not provide adequate protection. Safety glasses must meet the requirements of the American National Standard Institute (ANSI) Z.87.1 1989 Practice for Occupational and Educational Eye and Face.
- Eye protection must be equipped with side shields.

***Gloves***

- Gloves should be worn when handling acutely toxic gases.
- Many chemicals may permeate gloves in a short period of time. The selection of the proper glove material should be made according to the SDS and the recommendations of the glove manufacturer.

***Protective apparel***

- Lab coats enclosed shoes and long sleeved clothing should be worn.
- Additional protective clothing shall be worn if the possibility of skin contact is likely.

**Safety Shielding**

- Safety shielding is required any time there is a risk of explosion, splash hazard or a highly exothermic reaction.
- All manipulations of acutely toxic gases which pose this risk should occur in a fume hood with the sash in the lowest feasible position.
- Portable shields which provide protection to all laboratory occupants are acceptable.

**Safety Shower**

- A safety or drench shower should be available within 55 feet or 10 seconds from where acutely toxic gases are used.

**Securing of Gas Cylinders**

- Cylinders of compressed gases must be handled as high energy sources.
- When storing or moving a cylinder, have the cap securely in place to protect the stem.
- All cylinders are to be stored and used in an upright position.
- Use suitable racks, straps, chains or stands to support cylinders.

**Signs and Labels**

- All acutely toxic gases cylinders must be clearly labeled with the correct chemical name and hazard warnings. Handwritten labels are acceptable; chemical formulas and structural formulas are not acceptable.
- Acutely toxic gases must be stored in a designated area. If special ventilation of the stored cylinders is required, this must be noted on the Hazard Evaluation Form
- Continuous monitoring devices which will alert staff of a release of the acutely toxic gas must be available for such gases.
- The quantity of an acutely toxic gas that may be stored in a laboratory will be determined by the Chemical Hygiene Committee.

**Spill/Emergency Response**

- In the event of a spill or release, alert personnel in the area that a spill has occurred. Do not attempt to handle a spill or release of an acutely toxic gas. Vacate the laboratory immediately and contact the LSM-CHC and Public Safety. Remain on the scene, but at a safe distance, to receive and provide information to safety personnel when they arrive.

**Ventilation**

- Acutely toxic gases should be handled in a fume hood. Manipulation of acutely toxic gases outside of a fume hood may require special ventilation controls in order to minimize employee exposure to the material.
- If the use of a fume hood proves impractical, the PI/LM will determine if the work requires a glovebox.
- All areas where acutely toxic gases are stored or manipulated must be labeled as a restricted area.

**Waste Disposal**

- All empty or partially filled acutely toxic gas cylinders should be returned to the supplier. If the supplier does not accept empty or partially filled cylinders, contact the LSM-CHC concerning disposal.

**EXAMPLES OF ACUTELY TOXIC GASES***

| NAME | CAS# | NAME | CAS# |
|---|---|---|---|
| Arsenic pentafluoride | 7784-36-3 | Oxygen difluoride | 7783-41-7 |
| Arsine | 7784-42-1 | Phosgene | 75-45-5 |
| Boron trifluoride | 7637-07-2 | Phosphine | 1498-40-4 |
| Chlorine | 7782-50-5 | Phosphorous pentafluoride | 7641-19-0 |
| Diazomethane | 334-88-3 | Selenium hexafluoride | 7783-79-1 |
| Diborane | 19287-45-7 | Silicon tetrafluoride | 7783-61-1 |
| Fluorine | 7681-49-4 | Stibine | 10025-91-9 |
| Methyl mercaptan | 74-93-1 | Sulfur tetrafluoride | 7783-60-0 |

***This list is provided as a guide and is not inclusive.***
*Carefully review Safety Data Sheets before working with chemicals*

### 4.3 Standard Operating Procedure: Carcinogens and Toxic Reproductive Agents

A carcinogen describes an agent that can initiate or speed the development of malignant or potentially malignant tumors cells. Because of the potentially serious health consequences presented by reproductive toxins, these agents are to be handled in the same manner as carcinogens. Employees must take every measure possible to prevent exposure to these agents.

**Decontamination Procedures**

- Care must be taken to avoid contaminating the exterior of containers. Any such contamination must be cleaned off within the fume-hood before returning to store and the cleaning material disposed of properly.
- Apparatus must be cleaned within the fume-hood and all materials including solvent, carefully stored as waste.
- Wash hands and arms with soap and water immediately after handling.
- Users must never touch door handles, light switches or telephones with (assumed contaminated) gloves or wear such gloves outside of the laboratory. Gloves should be removed using the proper "surgical" procedure to avoid skin contamination.
- All surfaces should be wiped with the appropriate cleaning agent following dispensing or handling.

- Decontaminate vacuum pumps or other contaminated equipment (glassware) before removing them from the area where carcinogenic material was handled.

**Designated Area**

- All locations within the laboratory where carcinogens are handled shall be a restricted area and identified with caution tape or a posted sign. This includes all fume hoods and bench tops where the carcinogens are handled.
- Where feasible carcinogens should be manipulated over plastic-backed disposable paper work surfaces. These disposable work surfaces minimize work area contamination and simplify clean up.

**Eyewash**

- Where eye exposure may occur, suitable facilities for quick drenching or flushing of the eyes shall be provided within 50 feet.
- Self-contained eyewash stations should not be used in areas where a continuous source of potable water is available. They should be used where installation of a portable water system is remote or not economically feasible. The water in self-contained eyewash stations should be changed weekly.

**Emergency Procedures**

- In the event of a spill, alert personnel in the area that a spill has occurred. Do not attempt to handle a large spill of a carcinogenic material. Vacate the laboratory immediately and contact the LSM-CHC and Public Safety. Remain on the scene, but at a safe distance to receive and provide information to safety personnel when they arrive.

**Hazard Assessment**

- All users of carcinogens must be fully aware of the hazards associated with using the substance and of the routes by which the particular carcinogenic substance can enter the body, be it by inhalation, ingestion or by penetration of the skin, mucosal surfaces or eyes. This will require a thorough reading of the SDS and possibly other sources of information.
- The number of people likely to be exposed to a carcinogenic substance and the duration of their exposure must be kept to a minimum.
- Prior approval and notification is also required for the initial use of carcinogens or significant changes in procedures or the quantity of carcinogenic materials used.

**Personal Protective Equipment (PPE)**

***Eye Protection***

- Eye protection in the form of safety glasses or goggles must be worn at all times.
- Ordinary prescription glasses do not provide adequate protection. Adequate safety glasses must meet the requirements of the American National Standard Institute (ANSI) Z.87.1 1989 Practice for Occupational and Educational Eye and Face.
- Eye protection must be equipped with side shields.

***Hand Protection***

- Gloves must be worn at all times.

Many chemicals may permeate gloves in a short period of time. The selection of the proper glove material should be made according to the SDS and the recommendations of the glove manufacturer.

***Protective Apparel***

- Lab coats, enclosed shoes and long sleeved clothing should be worn.

- Additional protective clothing shall be worn if the possibility of skin contact is likely.

**Safety Shower**

- A safety or drench shower should be available within 55 feet or 10 seconds from where carcinogens are used.

**Signs and Labels**

- Carcinogenic materials must be stored in closed containers that are clearly labeled and marked with the correct chemical name as well as visible hazard and warning signs. Handwritten labels are acceptable; chemical formulas and structural formulas are not acceptable.
- Preferably, all carcinogenic substance containers should be stored in locked, ventilated cupboards fitted with trays to contain spillage and clearly marked with warning and hazard signs.
- All areas where carcinogens are stored or manipulated must be labeled as a designated area

**Spill Response**

- Anticipate spills and have the appropriate clean up equipment on hand. The appropriate' clean up supplies can be determined by consulting the SDS.
- In the event of a spill, alert personnel in the area that a spill has occurred. Contact the LSM-CHC. Remain on the scene, but at a safe distance to receive and provide information to safety personnel when they arrive. Any materials used in the cleanup must be appropriately disposed.

**Vacuum Protection**

- Vacuum work involving carcinogenic materials must be conducted in a fume hood, glove box or isolated in an acceptable manner.
- Mechanical vacuum pumps must be protected using cold traps and where appropriate, filtered to prevent particulate release. The exhaust for the pumps must be vented into an exhaust hood.

**Ventilation**

- All manipulations of carcinogens should occur in a fume hood with the sash in the lowest feasible position. Fume hoods provide the best protection against exposure to carcinogens in the laboratory and are the preferred ventilation control device. Manipulation of carcinogens outside of a fume hood may require special ventilation controls in order to minimize exposure to the material. If the use of a fume hood proves impractical, the work may be conducted in a glove box.

**Waste Disposal**

- All materials contaminated with carcinogens should be disposed of as a hazardous waste. Gloves used must be disposed of as carcinogenic chemical waste.
- Waste material must be securely stored and clearly labeled prior to disposal. Carcinogenic materials must never be disposed of with waste solvent
- Wherever possible, attempt to design research in a manner that reduces the quantity of waste generated. Questions regarding waste pick up should be directed to the LSM-CHC.

**EXAMPLES OF CARCINOGENS**

| NAME | CAS# | NAME | CAS# |
|---|---|---|---|
| Arsenic and arsenic compounds | 7440-38 | Asbestos | 12001-29-5 |
| Azathioprine | 446-86-6 | Benzene | 71-43-2 |
| Benzidine | 92-87-5 | Certain combined | |

| | | | |
|---|---|---|---|
| | | chemotherapy for lymphomas | |
| 1,4-butanediol dimethsulfonate (muleran) | 55-98-1 | Chloromethyl methyl ether | 107-30-2 |
| Chlorambucil | 305-03-3 | Conjugated estrogens | |
| Cyclophosphamides | 50-18-0 | Diethylstibestrol | 56-53-1 |
| Melphalan | 148-82-3 | Methoxalen with ultra-violet A theraphy (PUVA) | 298-81-7 |
| B-Napthlamine | 91-59-8 | Soot, tars, and mineral oils | |
| Thorium dioxide | 1314-20-1 | Vinyl chloride | 75-01-4 |
| N,N-bis(2-chloroethyl)-2-naphthylamine | 494-03-1 | | |
| Bis(chloromethyl)ether | | | |

*This list is provided as a guide and is not inclusive. A list of probable carcinogens and reproductive toxins are provided as Appendix H. Carefully review Safety Data Sheets before working with chemicals.*

### 4.4 Standard Operating Procedure: Compressed Gases

Cylinders of compressed gases represent high-energy sources and should be handled with regard to their potential hazards. Three types of gas products: Compressed gases, liquefied compressed gases, and cryogenic liquefied gases are all generically referred to as compressed gases.

**Securing of Gas Cylinders**

- Cylinders of compressed gases must be handled as high energy sources. When storing or moving a cylinder, ensure that the cap is securely in place to protect the stem

- All cylinders are to be stored and used in an upright position.
- Use suitable racks, straps, chains or stands to support cylinders

**Designated area**

- Compressed gas cylinders which contain acutely toxic gas must be stored in a designated area. Refer to the SOP for acutely toxic gases.

**Eyewash**

- Where eye exposure may occur, suitable facilities for quick drenching or flushing of the eyes shall be provided within 50 feet.
- Self-contained eyewash stations should not be used in areas where a continuous source of potable water is available. They should be used where installation of a portable water system is remote or not economically feasible.

**Hazard assessment**

- Hazard assessment for work with compressed gases should assure that all staff understands proper use and handling precautions.
- All pressurized equipment must be properly shielded.
- Regulators must not be interchanged between different gas types.
- All hose connections must be properly secured and the appropriate pressure set for use.

**Personal Protective Equipment (PPE)**

***Eye Protection***

- Eye protection in the form of safety glasses or goggles must be worn at all times.
- Ordinary prescription glasses do not provide adequate protection. Adequate safety glasses must meet the requirements of the American National Standard Institute (ANSI) Z.87.1 1989 Practice for Occupational and Educational Eye and Face
- Eye protection must be equipped with side shields.

***Gloves***

- If corrosive gases are used, the selection of gloves materials should be made according to the SDS and the recommendations of the glove manufacturer.

***Protective Apparel***

- Lab coats, enclosed shoes and long sleeved clothing should be worn.
- Additional protective clothing shall be worn if the possibility of skin contact is likely.
- All manipulations of compressed gases that pose this risk should occur in a fume hood with the sash in the lowest feasible position. Portable shields, which provide protection to all laboratory occupants, are acceptable.

**Safety Shower**

- Where an employee may be exposed to corrosive gases, suitable facilities for quick drenching or flushing of the body shall be provided within 55 feet or 10 seconds from where the corrosive gas is used.

**Signs and Labels**

- All compressed gas cylinders must be clearly labeled with the correct chemical name and the hazard class warning.
- Handwritten labels are acceptable; chemical formulas and structural formulas are not acceptable.

- Cylinders should be stored in an upright position and secured to a wall or laboratory bench through the use of chains or straps. Cylinder caps should remain on the cylinder at all times unless a regulator is in place.
- Cylinders should be stored in areas where they will not become overheated. Avoid storage near radiators, areas in direct sunlight, steam pipes and heat releasing equipment such as sterilizers.
- Flammable gases should not be stored near exits.
- Transport compressed gas cylinders on equipment designated for this function. Never carry or "walk" cylinders by hand.

**Spill Response**

- In the event of a spill of a compressed gas that is an irritant, oxidizer, asphyxiant, or has other hazardous properties, all personnel in the area should be alerted. Vacate the laboratory immediately and call Public Safety and the LSM-CHC for assistance. Remain on the scene at a safe distance to receive and provide information to safety personnel when they arrive.

**Ventilation**

- Manipulation of compressed gases should be carried out in a fume hood if the compressed gas is an irritant, oxidizer, asphyxiant, or has other hazardous properties.
- Manipulation of a compressed gas that is an irritant, oxidizer, asphyxiant, or has other hazardous properties outside of a fume hood may require special ventilation controls in order to minimize exposure to the material.
- If the use of a fume hood proves impractical, the PI/LM will determine if the work requires a glove box.

**Waste disposal**

- All empty, partially filled compressed gas cylinders and those no longer in use should be returned to the supplier. If the supplier does not accept empty or partially filled cylinders, contact the LSM-CHC concerning disposal.

### 4.5 Standard Operating Procedure: Corrosive Chemicals

Corrosive chemicals are substances that cause visible destruction or permanent changes in human skin tissue at the site of contact, or are highly corrosive to steel. The major classes of corrosives include strong acids, bases, and dehydrating agents.

**Decontamination Procedures**

- Decontamination procedures vary depending on the material being handled. The corrosivity of some materials can be neutralized with other reagents. Special neutralizing agents should be on hand to decontaminate areas. Consult the SDS for special neutralizing agents.
- If a delayed response is noted, seek medical attention immediately. Be prepared to detail what chemicals were involved.
- If the incident involves hydrofluoric acid, seek immediate medical attention
- If there is any doubt about the severity of the injury, seek immediate medical attention.
- Where eye exposure may occur, suitable facilities for quick drenching or flushing of the eyes shall be provided within 50 feet.

**Eyewash**

- Where eye exposure may occur, suitable facilities for quick drenching or flushing of the eyes shall be provided within 50 feet.
- Self-contained eyewash stations should not be used in areas where a continuous source of potable water is

available. They should be used where installation of a portable water system is remote or not' economically feasible.

**Personal Protective Equipment /PPE)**

***Eye Protection***

- At a minimum, safety glasses with permanently attached top and side shields must be worn in the laboratory. .
- These glasses, however, do NOT protect against splash hazards. When performing a hazardous activity, a face shield must be worn in addition to the safety glasses OR switch to chemical splash goggles (with shielded ventilation ports).
- Ordinary prescription glasses do not provide adequate protection. Adequate safety glasses must meet the requirements of the American National Standard Institute (ANSI) Z.87.1 1989 Practice for Occupational and Educational Eye and Face.
- Safety glasses with side shields do not provide adequate protection from splashes; therefore, when the potential for splash hazard exists other eye protection and/or face protection must be worn.

***Gloves***

- Gloves must be worn when handling corrosive chemicals. The selection of glove materials should be made according to the SDS and the recommendations of the glove manufacturer.

***Protective Apparel***

- Lab coats, enclosed shoes and long sleeved clothing should be worn.
- Additional protective clothing shall be worn if the possibility of skin contact is a possibility.

**Safety shielding**

- Safety shielding is required any time there is a risk of explosion, splash hazard or a highly exothermic reaction.
- Portable shields, which provide protection' to all laboratory occupants, are acceptable.

**Safety shower**

- A safety or drench shower should be available within 55 feet or 10 seconds from where the corrosive chemicals are used.

**Signs and Labels**

- All corrosive chemicals must be clearly labeled with the correct chemical name and hazard warning.
- Handwritten labels are acceptable; chemical formulas and structural formulas are not acceptable.
- Segregate the various types of corrosives. Separate acids and bases. Separate organic acids from mineral acids. Liquids and solids should also be separated.
- Specially designed corrosion resistant cabinets should be used for the storage of large quantities of corrosive materials.
- Store corrosives using secondary containment (such as on plastic trays).
- Do not store corrosive materials on high cabinets or shelves (above eye level).

**Ventilation**

- Special ventilation **is** required if these materials are used outside of a fume hood. Fume hoods provide the best protection against exposure to corrosive materials in the laboratory and are the preferred ventilation control device.

- Always attempt to handle large quantities of corrosive materials in a fume hood.
- Perchloric acid digestions or handling large quantities of perchloric acid require the use of a specially designed hood

**Spill Response**

- Anticipate spills by having the appropriate clean up equipment on hand. The appropriate clean up supplies can be determined by consulting the SDS. This should occur prior to the use of any corrosive materials.
- Each laboratory engaged in the use of corrosive chemicals should be equipped with spill kits designed to control and neutralize the liquid portion of the spill. Acids and bases require different types of spill control materials
- Spill kits should not be used on spills of hydrofluoric acid
- Maintaining the spill kit is the responsibility of the PI/LM and the LSM-CHC.
- Never use paper towels on large spills of corrosive liquids.
- In the event of spill alert personnel in the area that a spill has occurred, alert people in the area. Do not attempt to handle a large spill of corrosive materials. Vacate the laboratory immediately and call public safety and the LSM-CHC.
- Contact the LSM-CHC to arrange for waste disposal.

**Waste disposal**

- Most corrosive materials are hazardous waste. Questions regarding waste pick up should be directed to the LSM-CHC.

### 4.6 Standard Operating Procedure: Flammable Liquids

Flammable liquids are chemicals that have a flash point below 100°F (38.7°C) and a vapor pressure that does not exceed 40 psig at 100°F.

**Decontamination procedures**

- Personnel: Wash hands and arms with soap and water immediately following any skin contact.

**Eyewash**

- Where eye exposure may occur, suitable facilities for quick drenching or flushing of the eyes shall be provided within 50 feet.
- Bottle type eyewash stations are not acceptable

**Personal Protective Equipment (PPE)**

**Eye *Protection***

- Eye protection in the form of safety glasses or goggles must be worn at all times.
- Ordinary prescription glasses do not provide adequate protection. Adequate safety glasses must meet the requirements of the American National Standard Institute (ANSI) Z.87.11989 Practice for Occupational and Educational Eye and Face.
- Eye protection in the form of safety glasses or goggles must be worn at all times.
- Eye protection must be equipped with side shields.

***Gloves***

- Gloves should be worn when handling flammable liquids. Many chemicals may permeate gloves in a short

period of time.

- The selection of the proper glove material should be made according to the SDS and the recommendations of the glove manufacturer.

***Protective apparel***

- Lab coats, enclosed shoes and long sleeved clothing should be worn.
- Additional protective clothing shall be worn if the possibility of skin contact is likely.

**Safety shielding**

- Safety shielding is required any time there is a risk of explosion, splash hazard or a highly exothermic reaction. All manipulations of flammable liquids that pose this risk should occur in a fume hood with the sash in the lowest feasible position.
- Portable shields, which provide protection to all laboratory occupants, are acceptable.

**Safety shower**

- A safety or drench shower should be available within 55 feet or 10 seconds away from where flammable liquids are used.
- The selection of the proper glove material should be made according to the SDS and the recommendations of the glove manufacturer.

**Signs and labels**

- All flammable liquids must be clearly labeled with the correct chemical name and hazard warnings.
- Handwritten labels are acceptable; chemical formulas and structural formulas are not acceptable.

**Storage**

- The minimum amount needed for research and/or operations of flammable liquids should be stored in the laboratory.
- If more than **10** gallons of flammable liquids are present outside of safety cans per 100 square foot area, a flammable-liquids storage cabinet is required.
- Flammable-liquids storage cabinets are not designed for the storage of acids, bases, or compressed gases.
- Approved storage cabinets are NOT required to be vented. Ventilation is recommended for the storage of large quantities of Class 1A flammable liquids (such as Diethyl ether or pentane) or malodorous compounds such as mercaptans.
- Some flammable liquids, such as low molecular weight ethers and vinyl compounds and THF, slowly form peroxides upon exposure to air and sunlight. This may necessitate periodic surveillance for peroxide formation. All peroxide forming chemicals containers should bear the date received and the date of first use. The use of test strips is encouraged to ensure continued safety of the material. The LSM-CHC should be informed upon purchasing and delivery of a peroxide forming chemical.
- Store flammable materials away from oxidizers and other incompatible materials.

**Ventilation**

- Fume hoods provide the best protection against exposure to flammable liquids in the laboratory and are the preferred ventilation control device.
- Where possible, experiments involving greater than 500 ml of flammable liquids should be conducted in a fume hood.
- Manipulation of flammable liquids outside of a fume hood may require special ventilation controls in order to minimize exposure to the material.

**Spill response**

- Anticipate spills by having the appropriate clean up equipment on hand. The appropriate clean up supplies can be determined by consulting the SDS.
- This should occur prior to the use of any flammable liquid. Spill supplies for flammable liquids are designed to minimize the production of flammable vapors.
- Never use paper towels on large spills of flammable liquids.
- In the event of a spill alert personnel in the area that a spill has occurred. Do not attempt to handle a large spill of flammable liquid. Vacate the laboratory immediately and call the LSM-CHC and Public Safety for assistance.
- Remain on the scene, but at a safe distance, to receive and provide information to safety personnel when they arrive. Emergency actions and procedures have been prepared for response actions to various scenarios. Please refer to the CAU EAP.

**Vacuum protection**

- Evacuated glassware can implode and eject flying glass, and splattered chemicals. Vacuum work involving flammable liquids must be conducted in a fume hood, glove box or isolated in an acceptable manner.
- Mechanical vacuum pumps must be protected using cold traps and, where appropriate, filtered to prevent particulate release. The exhaust for the pumps must be vented into an exhaust hood.
- Vacuum pumps should be rated for use with flammable liquids.

**Waste disposal**

- Flammable liquids are hazardous waste when disposed of. Wherever possible, attempt to design research in a manner that reduces the quantity of waste generated.
- Questions regarding waste pick up should be directed to the LSM-CHC.

### 4.7 Standard Operating Procedure: Oxidizing Chemicals

Oxidizing chemicals are materials that spontaneously evolve oxygen at room temperature, or with slight heating, or promote combustion. This class of chemicals includes peroxides, chlorates, perchlorates, nitrates, and permanganates. Strong oxidizers are capable of forming explosive mixtures when mixed with combustible, organic or easily oxidized materials.

**Decontamination Procedures**

- Immediately flush contaminated area with copious amounts of water after contact with oxidizing chemicals.
- Remove any jewelry to facilitate removal of chemicals.
- Carefully clean work area after use. Paper towels or similar materials contaminated with strong oxidizing chemicals may pose a fire risk.

**Eyewash**

- Where eye exposure may occur, suitable facilities for, quick drenching or flushing of the eyes shall be provided within 50 feet.
- Bottle type eyewash stations are not acceptable.

**Personal Protective Equipment (PPE)**

**Eye *Protection***

- Eye protection in the form of safety glasses or goggles must be worn at all times.

- Ordinary prescription glasses do not provide adequate protection. Adequate safety glasses must meet the requirements of the American National Standard Institute (ANSI) Z.87.1 1989 Practice for Occupational and Educational Eye and Face.
- Eye protection must be equipped with side shields

***Gloves***

- Gloves should be worn when handling oxidizing chemicals. The selection of glove materials should be made according to the SDS and the recommendations of the glove manufacturers.
- The selection of the proper glove material should be made according to the SDS and the recommendations of the glove manufacturer.

***Protective Apparel***

- Lab coats, enclosed shoes and long sleeved clothing should be worn.
- Additional protective clothing shall be worn if the possibility of skin contact is a possibility.

**Safety Shielding**

- Safety shielding is required any time there is a risk of explosion, splash hazard or a highly exothermic reaction.
- All manipulations of oxidizing chemicals should occur in a fume hood with the sash in the lowest feasible position. Portable shields, which provide protection to all laboratory occupants, are acceptable.

**Safety Shower**

- A safety or drench shower should be available within 55 feet or 10 seconds from where oxidizing chemicals are used.

**Signs and Labels**

- All oxidizing chemicals must be clearly labeled with the correct chemical name and hazard warnings.
- Handwritten labels are acceptable; chemical formulas and structural formulas are not acceptable.

**Storage**

- Oxidizers should be stored in a cool and dry location.
- Keep oxidizers segregated from all other chemicals in the laboratory.
- Minimize the quantities of strong oxidizers• stored in the laboratory.
- Never return excess chemical to the original container. Small amounts of impurities may be introduced into the container that may cause a fire or explosion.
- Do not attempt to open the container when a cap is rusted, stuck or encrusted with scale.
- To minimize the rate of decomposition, store peroxides at the lowest possible temperature consistent with their solubility or freezing point.
- Do not store liquid peroxides or solutions at or lower than the temperature at which the peroxide freezes or precipitates because peroxides in these forms are very sensitive to shock and heat.

**Spill Response**

Anticipate spills by having the appropriate clean up equipment on hand. The appropriate clean up supplies can be determined by consulting the Safety Data Sheet. This should occur prior to the use of any oxidizing chemical. Spill control materials for oxidizers are designed to be inert and will not react with the reagent.

- Never use paper towels or other inappropriate materials that are combustible.
- The waste materials generated during spill cleanup may pose a flammability risk and should not remain in the laboratory overnight, unless it is stored in the appropriate container.
- In the event of a spill alert personnel in the area that a spill has occurred. Do not attempt to handle a spill.

Vacate the laboratory immediately and call the LSM-CHC and Public Safety for assistance.

- Remain on the scene, but at a safe distance, to receive and provide information to safety personnel when they arrive.

**Vacuum Protection**

- Evacuated glassware can implode and eject flying glass and splattered chemicals.
- Vacuum work involving oxidizing chemicals must be conducted in a fume hood, glove box, or isolated in an acceptable manner.
- Mechanical vacuum pumps must be protected using cold traps and, where appropriate, filtered to prevent particulate release. The exhaust for the pumps must be vented into an exhaust hood

**Ventilation**

- Fume hoods provide the best protection against exposure and are the preferred ventilation control device.
- The use of certain concentrations of perchloric acid must be performed in a fume hood equipped with wash down facilities.

**Waste disposal**

- All materials contaminated with oxidizing chemicals pose a fire hazard and should be disposed of as hazardous waste.
- Inform the LSM-CHC if you generate wastes contaminated by oxidizers.
- Do not let wastes remain in the laboratory overnight unless proper containers are provided.
- Questions regarding waste pick up should be directed to the LSM-CHC.

**EXAMPLES OF STRONG OXIDIZERS**

| NAME | CAS# | NAME | CAS# |
|---|---|---|---|
| Ammonium perchlorate | 7790-98-9 | Ammonium permanganate | 13446-10-1 |
| Barium peroxide | 1304-29-6 | Bromine | |
| Calcium chlorate | 10137-74-3 | Calcium hypochlorite | 7778-54-3 |
| Chlorine trifluoride | 7790-91-2 | Chromic anhydride | 7738-94-5 |
| Chromic acid | 1333-82-0 | Dibenzoyl peroxide | 94-36-0 |
| Fluorine | 7792-41-4 | Hydrogen peroxide | 7722-84-1 |
| Magnesium peroxide | 14452-57-4 | Nitrogen trioxide | 10544-73-7 |
| Perchloric acid | 7601-90-3 | Potassium bromate | 7758-01-2 |
| Potassium chlorate | 3811-04-9 | Potassium peroxide | 17014-71-0 |
| Propyl nitrate | 627-13-4 | Sodium perchlorate | 7601-89-0 |
| Sodium chlorite | 7758-19-2 | | |
| Sodium peroxide* | 1313-60-6 | | |

*This list is provided as a guide and is not inclusive. A list of common chemicals with potential reactive concerns is provided as Appendix* I. *Carefully review Safety Data Sheets before working with chemicals*

## 4.8 Standard Operating Procedure: Pyrophoric Chemicals

Pyrophoric chemicals are liquids and solids that will ignite spontaneously in air at about 130 F. Titanium dichloride and phosphorous are examples of pyrophoric solids. Trimethylaluminium and related compounds are examples of pyrophoric liquids.

The LSM-CHC should be informed upon purchasing and delivery of any pyrophoric chemical.

**Decontamination procedures**

- Wash hands and arms with soap and water immediately after handling any chemical. Remove any jewelry to facilitate removal of chemical.
- Carefully clean work area after use. Paper towels or similar materials contaminated with strong oxidizing chemicals may pose a fire risk.

**Eyewash**

- Where eye exposure may occur, suitable facilities for quick drenching or flushing of the eyes shall be provided within 50 feet.
- Bottle type eyewash stations are not acceptable.

**Hazard Assessment**

- Hazard assessment for work involving pyrophoric chemicals should thoroughly address the issue of fire safety (including the need for Class D fire extinguishers), proper use and handling techniques, chemical toxicity, storage, and spill response.

**Personal Protective Equipment (PPE)**

***Eye Protection***

- Eye protection in the form of safety glasses or goggles must be worn at all times.
- Ordinary prescription glasses do not provide adequate protection. Adequate safety glasses must meet the requirements of the American National Standard Institute (ANSI) Z.87.1 1989 Practice for Occupational and Educational Eye and Face.
- Eye protection must be equipped with side shields.

***Gloves***

- Gloves should be worn when handling pyrophoric chemicals. The selection of glove materials should be made according to the SDS and the recommendations of the glove manufacturer.

***Protective Apparel***

- Lab coats, enclosed shoes and long sleeved clothing should be worn.
- Additional protective clothing shall be worn if the possibility of skin contact is likely.

**Safety Shielding**

- Safety shielding is required any time there is a risk of explosion, splash hazard or a highly exothermic reaction.
- All manipulations of pyrophoric chemicals that pose this risk should occur in a fume hood with the sash in the lowest feasible position.
- Portable shields, which provide protection to all laboratory occupants, are acceptable

**Safety Shower**

- A safety or drench shower should be available within 55 feet or 10 seconds from where pyrophoric chemicals are used

**Signs and Labels**

- All pyrophoric chemicals must be clearly labeled with the correct chemical name and hazard warning.
- Handwritten labels are acceptable; chemical formulas and structural formulas are not acceptable.

**Spill Response**

- Anticipate spills by having the appropriate clean up equipment on hand. The appropriate clean up supplies can be determined by consulting the SDS. This should occur prior to the use of any pyrophoric chemical.
- Spill control materials for pyrophoric chemicals or water sensitive chemicals are designed to be inert and will not react with the reagent.
- Do not put water on the spill.
- Specific emergency procedures include as a minimum:

1. Knowing the location and quantity of all water sensitive chemicals in the laboratory
2. Special first aid treatment required by the type of pyrophoric chemicals handled in the laboratory
3. In the event of a spill, alert the LSM/CHC and Public Safety that a spill has occurred. Consult the Chemical Spill Guideline to know if you should / can clean up the spill.
4. Remain on the scene, but at a safe distance to receive and provide information to safety personnel when they arrive

**Storage**

- Pyrophoric chemicals (e.g., phosphorous, metal powders of magnesium, aluminum and zinc) will undergo spontaneous ignition in, contact with air. Store in inert environments and prevent contact with air or water.
- Do not store pyrophoric materials with flammable materials or in a flammable liquids storage cabinet.
- Store these materials away from sources of ignition.
- Never return excess chemical to the original container. Small amounts of impurities may be introduced into the container that may cause a fire or explosion.
- Minimize the quantities of pyrophoric chemicals stored in the laboratory.

**Vacuum Protection**

- Evacuated glassware can implode and eject flying glass and splattered chemicals. Vacuum work involving pyrophoric chemicals must be conducted in a fume hood, glove box, or isolated in an acceptable manner.
- Mechanical vacuum pumps must be protected using cold traps and, where appropriate, filtered to prevent particulate release. The exhaust for the pumps must be vented into an exhaust hood.
- Vacuum pumps should be rated for use with pyrophoric chemicals.

**Ventilation**

- Many pyrophoric chemicals release noxious or flammable gases and should be handled in a hood. With a fume hood, use portable safety shielding and work with the sash as far down as feasible.

**Waste disposal**

- All materials contaminated with pyrophoric chemicals pose a fire hazard and should be disposed of as hazardous waste.
- Inform the LSM-CHC if you generate wastes contaminated by pyrophoric chemicals.
- Wastes must not remain in the laboratory overnight unless proper containers are provided.
- Questions regarding waste pick up should be directed to the LSM-CHC.

## 5.0 BIOLOGICAL SAFETY

According to the Centers for Disease Control and Prevention (CDC) document, *"Biosafety in Microbiological and Biomedical Laboratories (BMBL), 6th edition",* Biosafety Levels 1 (BSL-1) is applicable for undergraduate and secondary educational training and teaching laboratories, and for other laboratories in which work is done with defined and characterized strains of viable microorganisms not known to cause disease in immunocompetent adult humans. Biosafety Level 2 (BSL-2) is applicable to clinical, diagnostic, teaching, and other laboratories in which work is done with the broad spectrum of indigenous moderate-risk agents that are present in the community and associated with human disease of varying severity. BSL-2 is also applicable when work is done with any human-derived blood, body fluids, tissues, or primary human cell lines where the presence of an infectious agent may be unknown. The CAU Research Center conducts work typical of BSL-1 and BSL-2 laboratories.
The BMBL recommendations and OSHA regulations require the establishment of procedures focused on the prevention of percutaneous and mucous membrane exposures when handling clinical material. This biosafety SOP establishes practices and precautions relating to the potential hazards of BSL-1 and BSL-2 laboratory activities. SOPs are provided below and included in Exhibit A.

### 5.1 Standard Operating Procedure: Toxins of Biological Origin

These toxins are defined as any toxic substance of natural origin produced by an animal, plant, or microbe. They are non- volatile, usually not dermally active (mycotoxins are an exception), and tend to be more toxic per weight than many chemical agents.
Note: The possession, use, and transfer of certain toxins of biological origin are regulated by the federal government. These regulated toxins have been deemed by the federal government as a significant risk to the human, livestock, and crop welfare. A complete list of the regulated toxins is maintained by the CDC at
http://www.cdc.gov/od/sap/docs/salist.pdf.
If you possess or anticipate a need for one or more of these toxins, prior approval from the Chemical Hygiene Committee and the Institutional Biosafety Committee is required. Note that the CDC regulates the possession, use, and transfer of select agents and toxins that have the potential to pose a severe threat to public health and safety. The CDC National Select Agent Program oversees these activities and registers all laboratories and other entities that possess, use, or transfer a select agent or toxin. There are also threshold quantities for selected biological toxins.

**General Use of Biological Agents**

The information furnished below is a general guideline that can assist researchers in the use of toxins of biological origin. Additional information for the use, storage, and disposal of these agents is available through the CDC/NIH 6th ed. "Biosafety in Microbiological and Biomedical Laboratories", https://www.cdc.gov/labs/BMBL.html

**Decontamination Procedures**

Decontamination procedures are dependent upon the material being handled. Therefore, each PI/LM must develop specific procedures for the materials being used in their laboratories.

- Standard microbiological methods, e.g., hand washing after removal of gloves and before leaving the work area.
- Describe surface decontamination, cleaning procedures and type of disinfectant Decontamination procedures

vary depending on the material being handled. The toxicity of some materials can be neutralized with other reagents.

- If there is accidental contact, depending on the extent of contact, medical attention should be sought.
- Decontaminate vacuum pumps or other contaminated equipment (glassware) before removing them from the designated area.
- Waste materials generated should be treated as a biohazardous waste.

**Hazard Assessment**

- Hazard assessment should focus on proper use and handling procedures, demarcation of designated areas, and the risk associated with the agents being handled in the laboratory should be described as well as the signs and symptoms of illness and/or disease.
- The type of immunization if needed should be described.
- Routes of transmission such as accidental exposure to sharps, splash exposures, non-intact skin exposures and other exposures such as food, drink, and inanimate objects.
- Non-target effects from exposure to the biohazardous and/or recombinant material such as mutagenesis.
- Medical screening and surveillance (if necessary).
- Health screening and the Hepatitis B vaccination if necessary.
- The availability of an on-campus medical practitioner and facility that can handle emergencies involving toxic biological agents.

**Equipment and Engineering Controls**

- Methods and work practices to minimize personal exposure should be implemented, e.g. use of conveniently located sharps containers, safer needles and sharps and absorbent material on countertops.
- Methods to prevent the release of infectious agents and protect workers from aerosols, splashes, splatters must be implemented. All manipulation of biological toxins shall be carried out in biological safety cabinet or glove box. All centrifuge cups and tubes and equipment shall be fitted with covers.
- Specimen transport and removal of materials from the laboratory shall be conducted in leak proof transport containers.

**Laboratory Access**

Access to laboratories with toxic biological agents shall be controlled in manners such as:

- PI/LM and assistants are the only ones with access to agents.
- Agents must be locked at all times when not in use by lock boxes, locked freezers, double padlocks for storage and locked incubators, locked doors or keycard access.
- Appropriate signage for BSL-1 and BSL-2 laboratory doorway as shown below.

**AUTHORIZED PERSONNEL ONLY**

**BIOSAFETY LEVEL**

| **BSL-1 or BSL-2:** |
|---|
| |

**Principal Investigator:**
**Agent (s):**
**Bldg:** **Room:**

Special Instructions/Precautions for Entry (i.e. personal protective equipment, vaccination):

| **EMERGENCY CONTACT/ ADVICE** | **CONTACT** | **WORK PHONE** | **HOME PHONE OR CELL** |
|---|---|---|---|
| **PRIMARY** | | | |
| **SECONDARY** | | | |
| **LSM-CHC** | | | |

**Personal Protective Equipment (PPE)**

***Eye Protection***

- Eye protection in the form of safety glasses or goggles must be worn at all times when handling biological agents. Ordinary prescription glasses do not provide adequate protection. Adequate safety glasses must meet the requirements of the American National Standard Institute (ANSI) Z.87.1 1989 Practice for Occupational and Educational Eye and Face.
- Eye protection must be equipped with side shields.

***Gloves***

- Gloves should be worn when handling biological agents of any kind. The selection of glove materials should be made according to the SDS and the recommendations of the glove manufacturer.

***Protective Apparel***

- Lab coats, enclosed shoes and long sleeved clothing should be worn when handling biological agents of any kind.
- Additional protective clothing shall be worn if the possibility of skin contact is likely.

**Safety Shower and Eyewash**

- A safety or drench shower should be available within 55 feet or 10 seconds from where biological toxins are used.
- Where eye exposure may occur, suitable facilities for quick drenching or flushing of the eyes shall be provided within 50 feet.
- Bottle type eyewash stations are not acceptable.

**Signs and Labels**

- All locations within the laboratory where biological toxins are handled should be posted with caution signs. This should include all biological safety cabinets, bench tops, equipment, refrigerators and incubators.
- All toxins must be clearly labeled with the correct specie name and hazard warnings. Handwritten labels are acceptable.
- Signs should also include restrictions for food or drink in refrigerators where material is stored and eating in the work area.

**Special Procedures**

- Accidental exposures, such as splash to the face or a sharps injury shall be reported immediately to the LSM-CHC who will in turn report the incident to the Chemical Hygiene Committee. They will contact the University Medical Practitioner who will assess the individual's risk of illness and provide recommendations on post-exposure surveillance.
- All laboratory work shall fully comply with the established biosafety level (BSL-1 or BSL-2) containment as described in the current edition of the CDC/NIH Biosafety in the Microbiological and Biomedical Laboratories.

**Spill Response**

- The appropriate clean up equipment must be available and a written protocol must be established prior to the use of a biological toxin.
- In the event of a spill alert personnel in the area that a spill has occurred. Do not attempt to handle a large spill of a biological toxin. Vacate the laboratory immediately and call Public Safety and the

LSM-CHC from a safe location. Remain on the scene, but at a safe distance, to receive and provide information to safety personnel when they arrive.

**Vacuum Protection**

- Vacuum work involving toxins must be conducted in a fume hood, glove box or isolated in an acceptable manner.
- Mechanical vacuum pumps must be protected using cold traps and, where appropriate, filtered to prevent particulate release. The exhaust for the pumps must be vented into an exhaust hood.

**Ventilation**

- Manipulations of toxins must be conducted in a Biological Safety Cabinet (BSC). The BSC is designed to remove those toxins that are in particulate form before the air is discharged into the environment and are the preferred ventilation control device.
- Manipulation of toxins outside of a BSC may require special ventilation controls in order to minimize exposure to the material. If the use of a BSC proves impractical, a glove box or isolated area of the laboratory should be considered.
- Certain toxins must be handled in a glove box rather than a BSC. The PI/LM or the LSM-CHC will determine if this is required.

**Waste and Disposal**

- All attempts should be made to minimize biological waste.
- When work is completed, all biological toxic agents shall be removed from workbenches and cabinets and stored in a designated refrigerator or freezer. If materials are to be discarded, they will be placed in an appropriate disinfectant, autoclaved, or confined in closed, leak proof, labeled containers (for example, "CONTAMINATED, TO BE AUTOCLAVED").
- Questions regarding the disposal of biological toxins should be directed to the LSM-CHC.

### 5.2 Animal restraint protocol

To ensure safe handling of rodents used in our animal labs, the following protocol has been developed as a guideline. Only those individuals approved by the Institutional Animal Care and Use Committee (IACUC) may be authorized to work with animals in the research laboratories.

Single handed restraint

The tail of the rodent is picked up using thumb and fore finger of one hand then the rodent is placed on the cage lid or other solid surface. The tail is immediately grasped by the palm and middle finger, ring finger and/or little finger, and the thumb and forefinger released. The fold of skin from the scruff of neck down the back is immediately gripped using the thumb and forefinger. The rodent is thereby restrained.

To prevent kicking by the hind legs, the tail is fixed using the palm and forefinger and then the left hind leg is held firmly between the ring and little finger (where the rodent is restrained). All this prevents rodent movement such that the rodent is now restrained in one hand and the other hand is now free to inject cells under the rodent skin.

The rodent is subsequently released back in the cage and the lid placed over the cage. This ensures that the

person injecting stays safe and is not bitten by the rodent.

## 6.0 BLOODBORNE PATHOGENS

### 6.1 General

Employees that may be exposed to human blood, body fluids, or agents potentially infectious to humans, may potentially be at risk of infection or illness. This portion of the Plan has been developed to minimize employee exposure to bloodborne pathogens such as the Hepatitis B virus (HBV) and human immunodeficiency virus (HIV). This section meets the standard of the OSHA Bloodborne Pathogens Standard (29 CFR 1910.1030). This section shall be reviewed and updated by the Institutional Biosafety Committee at least annually and where:

(A) Changes in operating procedures or use in a biological agent introduces a new exposure pathway

(B) Implementations of improvements designed to minimize occupational exposure are documented

The requirements in this section apply to all areas where occupational exposures to blood and bloody components, body fluids and other sources of bloodborne pathogens are anticipated. CAU shall ensure that all potential situations that could result in exposure to bloodborne pathogens are evaluated.

### 6.2 Responsibilities

PI/LM and laboratory and teaching assistants shall ensure compliance with the requirements of this program within their respective areas. Specifically:

- All employees at risk of exposure to HIV and HBV or other infectious diseases in their respective areas shall be identified.
- All employees are trained according to the requirements of this program.
- For work where there is an exposure potential, a procedure specific exposure control plan shall be developed and followed, and proper documentation maintained.

### 6.3 Development of Specific Exposure Control Procedures

The PI/LM conducting work for which there might be an exposure potential to bloodborne pathogens or body fluids shall be responsible for ensuring that procedures used in the laboratory are effective in protecting laboratory personnel. Some considerations to minimizing risks include:

- Through hazard analysis, identify and rank task where there may be a potential for exposure to blood and infectious materials.
- Identify safe work practices, administrative and engineering controls.
- Identify the appropriate PPE and ensure that it is readily available.
- Laboratory personnel involved in any activity with an exposure potential must be educated on how to protect themselves as well as symptoms of exposure.
- The availability of a Hepatitis B Vaccine to all employees at risk in accordance with standard medical practice and provisions for counseling should an employee be exposed to infectious material.
- Documentation of exposure incidences and training records.

### 6.4 Universal Precautions

Universal precautions or the equivalent shall be observed to prevent contact with blood or other potentially

infectious materials. Under circumstances in which differentiation between body fluid types is difficult or impossible, all body fluids shall be considered potentially infectious materials.
Safe work practices are different for each task and are developed based on the severity of the hazards involved. Individuals at risk shall follow the steps outlines in this plan as well as a common sense approach to protecting themselves from exposure. The risk of infection following contact with contaminated equipment or blood varies depending on the type of infectious agent and the extent of the exposure.
The likelihood of an infection occurring from an accidental bloodborne exposure depends on a number of factors, including

- The probability that the material (e.g., blood) was contaminated.
- The health status of the individual.
- The efficiency of the transmission

The individual's health status plays a key factor in how an individual responds to an exposure. Pre-existing diseases, the use of medication, compromised immunity, and pregnancy are factors to consider when determining how the individual may respond to an exposure. The efficiency of the transmission depends upon the type of wound, severity of exposure, infectious dose, exposure route, and the ability of the organism to produce disease.
All blood, body fluids, or potentially infectious material spills shall be handled as biohazardous waste and disposed of in accordance with the procedures outlined in this plan.

## 6.5 Work Practice Controls

### 6.5.1. Administrative Controls

Administrative controls include written procedures, employee training, establishing designated or restricted areas, chemical procurement procedures and preventive maintenance.

***Signs and Labels***

Biohazardous labels or signs shall be affixed to containers of regulated waste, refrigerators and freezers containing potentially infectious materials, containers used to store, transport, or ship potentially infectious materials and contaminated equipment. Labels shall be affixed as close as feasible to the container by string, wire, adhesive, or other methods that prevent loss or unintentional removal.

***Handwashing Facilities***

CAU is equipped with hand washing stations readily accessible to employees. When the provision of hand washing is not feasible, CAU shall provide an appropriate antiseptic hand cleanser and clean cloth, paper towels or antiseptic towelettes.

***Personal Protective Equipment***

If a hazard exists after implementing engineered controls, PPE shall be used. The key element in the selection of effective and appropriate protection is identifying and understanding the hazard and matching the **PPE** that is adequate for the hazard. The type of protection selected shall be based on the degree of anticipated exposure. When gross contamination of the head, body, or feet is anticipated, the use of surgical caps, gowns, face hoods, and shoe covers must be available prior to initiation of task.

***Hepatitis B Immunization Program***

Laboratory personnel who are identified as being at risk for exposure to blood or body fluids shall be offered participation in the Hepatitis B Immunization Program. Medical evaluations and procedures

including the Hepatitis B vaccine or vaccination series, post-exposure evaluation and follow up shall be made available at no cost to the employee. The Hepatitis B vaccination will be made available after the employee has received the required training unless the employee has previously received the complete Hepatitis B vaccination series, or antibody testing has revealed that the employee is immune.
If an employee initially declines the Hepatitis B vaccination but at a later date decides to accept the vaccination, CAU shall make available the Hepatitis vaccination at that time. Employees who decline the offered Hepatitis B vaccination shall be asked to sign the declination statement shown in Exhibit F.

### 6.5.2 Post Exposure

Following a report of an exposure incident, CAU **will** immediately make available to the exposed employee a confidential medical evaluation and follow-up, including at least the following elements:

- Documentation of the routes of exposure and the circumstances under which the exposure incident occurred.
- Identification and documentation of the source individual, unless providing identification is not feasible or prohibited by state or local law.

The source individual's blood will be tested as soon as feasible and after consent is obtained in order to determine HBV and HIV infectivity. If consent is not obtained, CAU shall establish that legally required consent cannot be obtained. When the source individual's consent is not required by law, the source individual's blood, if available, will be tested and the results documented. When the source individual is already known to be infected with HBV or HIV, testing for HBV or HIV status need not be repeated.
Results of the source individual's testing shall be made available to the exposed employee who will be informed of applicable laws and regulations concerning disclosure of the identity and infectious status of a source individual.
The healthcare professional evaluating an employee after an exposure incident shall be provided the following information by CAU:

- A copy of 29 CFR 1910.1030.
- A description of the exposed employee's duties as they relate to the exposure incident.
- Documentation of the route of exposure and circumstances under which exposure occurred.
- Results of the source individual's blood testing, if available
- All medical records relevant to the appropriate treatment of the employee.
- CAU will obtain and provide the employee with a copy of the evaluating healthcare professional's written opinion within 15 days of the completion of the evaluation. The healthcare professional's written opinion for Hepatitis B vaccination will be limited to whether Hepatitis B vaccination is indicated for the employee and if the employee has received such vaccination. The healthcare professional's written opinion for post-exposure evaluation and follow-up will be limited to the following information:
    - That the employee has been informed of the results of the evaluation.
    - That the employee has been told about any medical conditions resulting from exposure from blood or other potentially infectious materials which require further evaluation or treatment.
    - All other findings or diagnosis will remain confidential and will not be

included in the written report.

### 6.6 Engineering Controls

Safe work practices controls are the primary means of eliminating or minimizing the risk of occupational exposure when handling blood or other potentially infectious materials. Where occupational exposure remains after institution of these controls PPE may be used in conjunction with engineering controls. Engineering controls for research laboratories include safety syringes, glove boxes, sharps disposal containers, fume hoods and biological safety cabinets. These controls are used to isolate or remove bloodborne hazards from laboratory workplaces thereby minimizing or reducing exposure potential.

***Sharps Disposal Containers***

These containers minimize the potential for accidental skin penetrations from contaminated sharps (i.e., needles, scalpels, used broken glass, broken capillary tubes). The containers shall be:

- Rigid and puncture-resistant that, when sealed, are leak resistant and difficult to open.
- Red in color with an affixed biohazard labels on each side.
- Accessible to laboratory personnel and be located as close as feasible to the immediate area where sharps are used.
- Kept in an upright position throughout use, never overfilled and be replaced if damaged.

Prior to removal from the area of use, containers of contaminated sharps shall be closed immediately or placed in a secondary container to prevent accidental release of the contents. Secondary containers shall be closable and constructed to contain all the contents and prevent leakage during handling, storage, transport, or shipping.

***Biological Safety Cabinets***

Class II biological safety cabinets or other physical containment devices shall be used when procedures with a high potential for creating potentially infectious splashes or aerosols are conducted. Such procedures may include centrifuging, grinding, vortexing, blending, sonic disruption, flaming inoculation loops, transferring liquids, homogenizing, withdrawing liquids under pressure, and opening containers of infectious materials having internal pressures different from ambient pressures. In these cases, strict adherence to protective practices is required which includes face masks and goggles or face shields with eye protection, as well as the use of appropriate gloves and protective coverings.

*Mechanical Pipetting Devices*

Mechanical pipetting devices are to be used for all pipetting activities. Mouth pipetting is strictly prohibited.

### 6.7 Training

Laboratory personnel who may handle blood or other potentially infectious materials shall be trained at the lime of initial assignment to tasks where occupational exposure may take place and annual thereafter. Training may also be required when an employee changes positions and the new tasks or procedure has a specific type of exposure or operating procedures.

## 7.0 REQUIREMENTS FOR ANIMAL TISSUE USE

The potential risk for exposure to zoonotic pathogens as well as cross-contamination between research

sites should not be overlooked. Occupational health and safety principles require that personnel using animal tissues know the hazards associated with their work, understand how these hazards are controlled, implement safe operational practices, and use proper personnel protective equipment and supplies. Accordingly, the following practices shall be implemented:

**7.1 Policies and Practices**

- The PI/LM must have knowledge of all regulations pertaining to the acquisition of animal tissues under study, have obtained all permits necessary for carrying out the proposed studies prior to their initiation, and ensure that studies will be in accordance with all wildlife regulations.
- PI/LM must assure that all research personnel and students using animal tissues are adequately trained and experienced, and supervised to perform the procedures and are aware of general occupational health & safety practices associated with the use of animal tissues used in the research protocol.
- The use of fresh or frozen animal tissue may pose a risk to the health of researchers and technicians through the transfer of disease (zoonosis) such as brucellosis, leptospirosis, and listeriosis. The Pl must ensure that prior to beginning research involving animal tissues, personnel/students are familiar with the health risks associated with the species involved in the work.
- Training classes allowing personnel to become familiar with some of the health hazards associated with the animal species from which the tissue is derived must be implemented by the PI/LM.
- Hazard Evaluation for intended work with specie should include such risk as exposure to fixatives such as formaldehyde and chloroform.
- As prudent practice, the PI/LM should document that appropriate practices of acquisition, use, and disposition of animal tissues are followed with appropriate consideration of occupational health and safety.
- In addition, the shipping and receiving of animal tissues/specimens must be conducted in accordance with federal safety and importation guidelines and regulations. The PI/LM must act in accordance with the Department of Agriculture, Animal and Plant Health Inspection Service regulations regarding the limits on importation of tissues that may have been exposed to an exotic livestock or poultry disease agent.
- Must comply with any applicable Public Health Service Foreign Quarantine Regulations (42 CFR 71.54) which govern the importation and transfer of etiologic agents and vectors of human disease and the U.S. Fish and Wildlife Service.
- Tissues, either fresh or fixed, must be disposed in an appropriate manner. Disposable items must be discarded into the correct waste containers
- Disposal of tissue samples must follow the SOP for disposal of biological agents

*The movement of other non-infectious materials such* as *formalin-fixed tissues, sterile cell cultures, and other preserved tissues or materials where no evidence or indication exists that they contain an infectious agent of animal or public health significance are not governed by these regulations.*

**7.2 General Hygiene Practice for Animal Tissue Handling**

- Familiarize yourself with recommended procedures before carrying out work.

- Report problems with ventilation or PPE to the LSM-CHC.
- Food and drink should not be stored in the refrigerator where tissue samples are stored or consumed in the laboratory.
- Hand washing should be performed after any activity that involves the handling of animals or specimen material.
- Do not apply cosmetics or contact lenses prior to hand washing.
- Gloves and lab coats should not be worn into public areas. Do not touch common use items (i.e. phone, computer keyboard) with gloved hands.
- Disinfect surfaces where specimen materials have been handled or spilled.
- Whenever possible, activities should be carried out in containment (i.e., isolators, safety cabinets and/or a down draft bench).
- When work is completed, all infectious cultures and toxins will be removed from workbenches and cabinets and stored in a designated refrigerator or freezer. If materials are to be discarded, they will be placed in an appropriate disinfectant, autoclaved, or confined in closed, leak proof, labeled containers (for example, "CONTAMINATED, TO BE AUTOCLAVED").
- Dead laboratory animals and animal tissues not saved by the investigator must be placed in a closed, leak proof labeled container, autoclaved or disposed of in the Center for Laboratory Animal Resources (CLAR) incinerator at the Morehouse School of Medicine.
- Long-term, controlled storage of infectious materials must be authorized by the Animal Care Committee at the Morehouse School of Medicine.

## 8.0 MANAGEMENT OF LABORATORY WASTE

### 8.1 Waste Classification

The hazardous wastes generated in the laboratories will be from spent or otherwise unused/discarded reagents or biological waste (section 8.5 below). There are two different ways a waste can be classified as a hazardous waste. It can be a listed hazardous waste or it can be a characteristic hazardous waste.
The four hazardous characteristics are:

- ignitability
- corrosivity
- reactivity
- toxicity

If a waste exhibits any of the above four characteristics, it is a characteristic hazardous waste. Listed wastes may be classified as F, U or P.

- F-listed wastes from operations that are not specific to a particular manufacturing operation. An example would be certain waste paints and solvents.
- U and P listed wastes are acute hazardous commercial chemical products. An example would be certain laboratory chemicals with an expired shelf life.

### 8.2 Waste Handling & Storage

The LSM-CHC is responsible for managing regulated hazardous waste. He/she oversees the collection, handling and arrangement for disposal of hazardous waste. Waste is segregated at the point of origin in appropriately marked containers. The LSM-CHC is responsible for collection of regulated wastes from the point of generation, and moving them to the staging area for packing and disposal.

Two types of hazardous waste accumulation areas are present at the campus:

- Main Hazardous Waste Storage Area.
- Satellite Accumulation Areas

The main hazardous waste storage area is a location on-site at which hazardous waste can be accumulated. The ≤270 days of accumulations starts once 220 pounds (100 kilograms) of hazardous waste has been accumulated.

Each laboratory has a satellite accumulation area (SAA) where discarded chemical containers such as reagents are stored. The SAA is used to accumulate and temporarily store their hazardous waste. In a SAA, up to 55 gallons of hazardous waste or up to one quart of acute hazardous waste may be accumulated indefinitely. The SAA is typically a designated cabinet beneath a laboratory countertop. The location of all SAA shall be clearly marked with the appropriate sign.

Wastes that are accumulated in these areas must be managed in accordance with the procedures specified below. The PI/LM is responsible for ensuring compliance with these procedures for their SAA.

All SAA must meet the following requirements;

- A Hazardous Waste sign must be posted at each location.
- The name and phone number of the Laboratory Director and the LSM-CHC must be posted.
- The area should be used for hazardous waste accumulation only. No raw materials or chemical stock should be stored in the same area (cabinet) with hazardous waste.
- All containers will) be appropriately labeled as "hazardous waste" with the type of hazard, and segregated for compatibility. The US EPA Compatibility Table is included as Exhibit C.
- Each container must be closed and secure when it is not being filled.
- Hazardous waste shall be placed only in approved hazardous waste containers with a material that is compatible with the waste. Empty containers which originally held the primary waste constituent or similar material are acceptable hazardous waste containers. An approved hazardous waste label with the appropriate information shall be affixed to the container.

### 8.3 Waste Storage Containers

Hazardous waste shall be placed only in approved hazardous waste containers. An approved hazardous waste container is made of or lined with a material compatible with the waste. Empty containers, which originally held the primary waste constituent or similar material, are acceptable hazardous waste containers.

The container must be in good condition without holes, rust or dents. The container shall always be closed during storage, except when waste is being added or removed. A hazardous waste container shall not be opened, handled or stored in a manner that may rupture the container or cause it to leak. Consideration should be given to doubly contain certain dangerous chemicals if storage conditions and limitations are not

ideal.

### 8.4 Emergency Equipment

Appropriate emergency response equipment shall be available in each satellite accumulation area. Emergency equipment shall include the following, as deemed necessary:

- Fire extinguisher, 20lb ABC type.
- Absorbent of the proper type and of sufficient amount to absorb the volume present.
- First aid kit.
- Safety shower and eye wash station as applicable

### 8.5 Biological Waste Management

To ensure health and safety, materials from all laboratories handling microbiology, biomedical, biohazardous materials and items potentially contaminated with infectious agents must be decontaminated prior to disposal. An autoclave that uses saturated steam under pressure has over the years become the generally-accepted method for inactivation of all microbes. Sterilization by autoclaving is accomplished through exposure and penetration of the contaminated material by superheated steam for an adequate amount of lime. Since steam will not penetrate a sealed plastic autoclave bag, bags containing dry loads must not be tightly sealed (rubber band closures will allow bags to "breathe") or adequate amounts of water must be added to the load. Consult the manufacturer's instructions for sterilizing materials inside plastic autoclave bags. Liquid waste and fresh animal tissue waste may be autoclaved inside a tightly sealed bag.

Operational standards require that the autoclave reach a temperature of not less than 121° C (250° F) for 30 minutes at 15 pounds per square inch pressure; or in accordance with manufacturer's directions. A variety of factors can affect the efficiency of an autoclave. Therefore, when treating biohazardous wastes, it is recommended that 115°C be reached and maintained for a minimum of 20 minutes within the waste itself. Biohazard waste that has been autoclaved within these standards is considered to be no longer biohazardous and is considered solid waste for disposal purposes.

#### 8.5.1 Responsibilities

It is the responsibility of the PI/LM for each lab that uses an autoclave to develop lab specific procedures for each waste stream for which they are responsible. The procedure must address each of the following:

- Time
- Temperature
- Pressure
- Type of waste
- Type of container
- Closure on container
- Pattern of loading
- Water content
- Maximum load quantity

### 8.5.2 Recommended Standard Practices for Using an Autoclave

- Review the operator's manual for instructions prior to operating the unit. Different makes and models have unique characteristics. Never exceed the maximum operating temperature and pressure of the autoclave.
- Wear the appropriate personal protective equipment (safety glasses, lab coat and heat-resistant gloves) when loading and unloading the autoclave. Be especially careful not to stand too close when opening an autoclave. Often a pulse of hot steam escapes when the hatch is opened.
- Place autoclavable bags containing waste in a secondary containment vessel to retain any leakage that might occur, never place autoclave bags directly on the autoclave chamber floor. The secondary containment vessel must be constructed of material that will not melt or distort during the autoclave process. (Polypropylene is a plastic capable of withstanding autoclaving but is resistant to heat transfer. Materials contained in a polypropylene pan will take longer to autoclave than the same material in a stainless steel pan.)
- Use heat-sensitive tape or other device to visually check that optimal temperatures have been achieved on each container that is processed.
- Select the appropriate cycle: liquid cycle (slow exhaust) for fluids to prevent boiling over, dry cycle (fast exhaust) for glassware, fast and dry cycle for wrapped items. After the cycle is complete, allow liquid materials inside the autoclave to cool down for 15-20 minutes prior to their removal to prevent boiling over.
- Autoclaving items containing solvents, volatile or corrosive chemicals are prohibited.
- Ensure that the pressure of the autoclave chamber is at zero before opening the door. Stand behind the autoclave door and slowly open it to allow the steam to gradually escape from the autoclave chamber after cycle completion.
- Never start a cycle prior to leaving for the evening.

### 8.5.3 Maintenance and Record Keeping

- Autoclaves are pressure vessels, which are regulated under NRS 455C. They must be regularly maintained and repaired by qualified technicians per the manufacturers recommended schedules.
- Test and assure proper operation of the unit.
- Notify the LSM-CHC who will also notify users when an autoclave is not functioning properly.
- A user log (included as Exhibit B) posted in the autoclave room must be completed by operators for each sterilizing cycle. Date, time, temperature, pressure, chemical indicator and operator must be recorded. This log must be kept for a period of not less than one year.
- All users must be trained before · operating an autoclave and written operating procedures must be readily accessible.
- Confirm on a monthly basis that adequate sterilization conditions are being met through the use of ampoules containing heat resistant spores *(Bacillus stearothermophilus)* placed in the

center of an autoclave load. In conjunction with the *B. stearothermophilus* testing, measure and record the maximum temperature achieved during the autoclave cycle through the use of a maximum registering (or "holding") thermometer on the Autoclave QC Log

#### 8.5.4 Monthly Spore Testing Procedure

- Place ampoule of *B. stearothermophilus* spores and holding thermometer in the center of an autoclave load.
- Process the load under normal operating procedures.
- The highest temperature indicated on the holding thermometer is entered on the Autoclave QC Log (Exhibit C). If this temperature is less than 121 'C, the autoclave is not to be used to treat potentially infectious material.

#### 8.5.5 Biohazardous Sharps

Any object likely to be contaminated or may become contaminated with a pathogen through handling or during transportation and also capable of cutting or penetrating skin or a packaging material. Sharps includes, but is not limited to, needles, syringes with needles, scalpels, broken glass, culture slides, culture dishes, broken capillary tubes, broken rigid plastic, Pasteur pipettes, and similar items having a point or sharp edge or that are likely to break during transportation and result in a sharp edge. Sharps are maintained in the sharps container and disposed of *off*site.

#### 8.5.6 "Clean" Broken Glass

Use a broken glass box for clean broken glass disposal. Boxes must be heavy cardboard lined with a heavy plastic liner and marked 'Broken Glass". Once full, boxes are taped shut and put into the dumpster.

## 9.0 LABORATORY SAFETY EQUIPMENT

### 9.1 Chemical Fume Hood User Guide

The chemical fume hood minimizes chemical exposure to laboratory employees. They are considered the primary means of protection from inhalation of hazardous vapors. They are designed to retain vapors and gases released within them, or isolate apparatus or chemicals that may present physical hazards to employees. To adequately do so, several factors including laboratory design, fume hood construction and installation of fume hood ductwork, exhaust fans and sashes must be examined, correctly installed calibrated and periodically maintained. For instance, fume hoods that are inadequately installed (e.g., not designed based on the size of the room, inadequately vented or operating with an open window) may experience turbulence at the face of the hood or recirculation of contaminated air back into the room, both resulting in poor indoor air quality.

The following are guidelines for safe and effective use of the fume hood.

**Avoid creating air currents or cross-drafts across the hood face**

- Foot traffic, local ventilation systems, windows and doors may cause air currentsto

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| form across hood face, which may reduce the hood performance and pull contaminated air out of the hood toward the user.<br>• Restrict foot traffic and rapid arm/body movement around the hood face.<br>• Keep lab doors and windows closed unless lab ventilation design requires them. |
| **Take extra precautions when handling electrical equipment & flammables in a fume hood**<br>• Do not use spark source when flammable liquids or gases are present inside the hood. Permanent electrical receptacles are not permitted in the hood. |
| **Perform work with the sash height at the appropriately marked position**<br>• The appropriate 18-inch closure point should be clearly labeled on the outer frame of the sash. The sash should remain closed and hood exhaust operating when hood unattended.<br>• For horizontal sliding panes, position sash all the way down with as small an opening as practical |
| **Minimize amount of materials & equipment in hood and avoid using as storage**<br>• Equipment placed in the hood may restrict adequate exhaust air-flow. If absolutely necessary to have equipment in hood, position equipment toward back of hood and elevate equipment with blocks to maintain airflow gap below and around equipment to maintain air circulation<br>• Only chemicals necessary to perform the experiment should be left in the hood. |
| **Place chemical sources & equipment at least 6 inches inside the hood**<br>• Placing a line of tape across the work surface at this 6-inch mark inside the fume hood from the hood sash will help as a reminder |
| **Handle perchloric acid only in a designated Perchloric Acid Fume Hood**<br>• Water wash-down fume hoods made of noncombustible material must be used during use of perchloric acid<br>If there is a doubt as to whether the wash-down system is functioning properly, stop all work in the hood. Call Facilities Management and notify the LSM-CHC. |
| **Do not use hood to evaporate hazardous chemicals or as a means of chemical disposal**<br>• Water wash-down fume hoods made of noncombustible material must be used during use of perchloric acid<br>• If there is a doubt as to whether the wash-down system is functioning properly, stop all work in the hood. Call Facilities Management and notify the LSM-CHC. |
| **Wear appropriate Personal Protective Equipment when working with chemicals**<br>• At a minimum wear the eye protection, gloves, and lab coat when working with hazardous chemicals in the hood. Consult the SDS for appropriate PPE |
| **Keep hood exhaust baffles unobstructed and appropriately adjusted**<br>• Keep air exhaust baffles located at hood's back wall unobstructed and adjust them accordingly |
| **Measure the face velocity at least one a day before use and document on the fume hood log.** |

- Once combinations of face velocity and sash height have been established, they are marked on the fume hoods as match arrows. The hoods must be equipped with a manometer or other hood monitor. Hood function should be checked at least once a day prior to use and a fume hood daily log (included as Exhibit DJ must be posted by the hood.
- ANSI/AlHA recommends 80-120 feet per minute (fpm) average airflow at the hood face for an adequately working fume hood.

***Definitions***

*Sash*

Sash is the term used to describe the movable glass panel that covers the face area of a fume hood. Sashes can be vertical, horizontal, or a combination of the two. Many hoods are installed with a sash stop, which stops the sash at approximately a 14-inch work level. Sash stops should never be removed, overridden, or modified. It is recommended that all lab work in a properly functioning fume hood be performed at the approved sash stop level.

*Alarms, Sensors, Controls, and Gauges*

Many of the newer fume hoods are installed with alarms, sensors, controls, and gauges. These features are included to provide lab personnel with a constant reading of fume hood performance. If the face velocity falls below .an acceptable work range the hood sensors will trigger an alarm to notify lab personnel. Hoods usually go into alarm mode either because the sash has been raised to a height at which the hood can no longer exhaust a sufficient amount of air, the building air exhaust system is not working properly, or there has been a power outage. In the event that hoods affixed with control alarm are not properly functioning, chemical work should not be performed in the hood until the exhaust problem has been corrected and documented. Additionally, laboratory personnel should not attempt to stop or disable hood alarms. Facilities management should be notified for adjustment of air handling system exhausts.

*Location*

The location of the fume hood affects its efficiency. Ideally, fume hoods should be located in an area of minimal traffic. When a person walks by a fume hood, turbulence can be created causing contaminants to be drawn outside the hood. Also, if the air diffuser is located directly above the fume hood, air turbulence may be created causing contaminants to escape into the room. The air flow into the room also has an effect on the fume hood. All doors should be closed to maintain the negative pressure of the lab with respect to the corridor. This ensures that any contaminants in the lab will be exhausted through the fume hood and not into the hallway.

*Face Velocity*

Face velocity is a measurement of the average velocity at which air is drawn through the face to the hood exhaust. According to OSHA's National Research Council Recommendations Concerning Chemical Hygiene in Laboratories1910.1450 App A, general air flow should not be turbulent and should be relatively uniform throughout the laboratory, with no high velocity or static areas.

Airflow into and within the hood should not be excessively turbulent; and hood face velocity should be adequate (typically 100-120 fpm, (feet per minute for most operations)). If using a carcinogen, reproductive

toxin, or acutely toxic material, it is recommended that the face velocity range from 125 to150 fpm. At velocities greater than 150 fpm, studies have demonstrated that the creation of turbulence causes contaminants to flow out of the hood and into the user's breathing zone. It is the responsibility of the PI/LM to ensure that hoods in their lab meet this requirement and hoods falling below this requirement should be taken out of service, tagged as such and reported to Facilities Management and the LSM-CHC. Accordingly, all future hood maintenance at the CAU should meet this requirement.

**Inspection of Fume Hoods**

When installed, fume hoods should be inspected at least once every year by Facilities or an external contractor, in accordance with ASHRAE 110 standard. ASHRAE is the American Society of Heating, Refrigerating and Air-Conditioning Engineers. ASHRAE 110 is the industry standard tracer gas mannequin method. Inspections shall include, where possible, leakage and proper capture integrity of the units. Additionally, all Fume hoods must be tested for their face velocity every 6 months by the LSM.
It is the responsibility of the office of Research and Sponsor Programs to arrange for testing and certifying the hoods.
When needed, an air balancing specialist may be hired to ensure that face velocities meet design criteria and that supply and exhaust air flow are in proper proportion to establish a negative pressure differential between the lab and the outside corridor. Exhaust flow must be greater than supply, to create air movement from the hall into the lab to contain airborne contaminants.
The annual inspection and calibration of fume hoods shall include assessing the following:

- Average face velocity of the hood with the sash fully opened.
- Sash height at which the average face velocity is 100 fpm.
- Smoke test to determine air flow patterns and leakage.
- Placement of airflow indicators in hood.
- Survey hood condition for spills, airflow blockage, and disabled sash stops

Each hood must display a current sticker with date of velocity measurement, velocity match arrows and pass/fail status.

### 9.2 Biological Safety Cabinets

Biological safety cabinets must be certified by a qualified person at least annually and before use and after:

- Initial installation
- Change of the HEPA (high efficiency particulate air) filter
- Moving of the unit
- Any repair or maintenance that could affect the seal of the HEPA filter

Certification procedures used for compliance must meet the requirements of the *National Sanitation Foundation (NSF) Standard 49-2002, Class II (Laminar Flow) Biohazard Cabinetry,* and a record of the results must be maintained.

### 9.3 Fire Safety Equipment

Fire protection equipment and safety procedures are as follows:

- Flammable liquid storage cabinets and cans should be used for quantities greater than 1 liter

(about 1 quart).

- Do not overload and do not store with incompatible materials such as oxidizers.
- Flammable liquid storage cabinets must not be modified. Ventilation should be designed by qualified personnel.
- Do not disable spring-loaded closures and ensure that flame arrestor screens are in place and in good condition.
- Each laboratory must be equipped with fire extinguishers that are easily accessible and capable of extinguishing the type of fire that may be generated by the materials used in the lab. Additionally, instructional and research labs must have access to fire blankets and spill kits.
- Fire extinguishers shall be inspected at least monthly by the Safety Coordinator and annually by a qualified professional.

### 9.4 Emergency Showers and Eyewash Stations

Specific requirements for eyewash stations are listed in American National Standard Institute Standard (ANSI) Z358.1-1990, "Standard for Emergency Showers and Eyewash Equipment." The following safety precautions should be followed:

- All passageways to the eyewash and shower should be clear of any obstacles (even a temporarily parked chemical cart).
- Eyewashes should be cheeked routinely by laboratory personnel to ensure water flow. They should be "flushed" for several minutes routinely to clear out the supply lines.
- The shower shall be located in an area that requires no more than 55 feet or 10 seconds to reach. Consult a medical professional to determine the appropriate distance for harsh acids and caustics :). They should be checked routinely to assure that access is not restricted and that the start chain is within reach.
- The flow through the safety showers should be tested periodically to ensure sufficient flow (approximately 30 gallons per minute), 0.4 gallons per minute eye wash stations.
- Eye wash and shower location shall be in a well-lit area and identified with a sign.
- Shower shall be located on the same level as the hazard
- No electrical appliance should be permitted within the spray area of an eyewash/safety station
- All employees who might be exposed to a chemical splash shall be trained in the use of the equipment
- All eyewash and shower equipment shall meet ANSI Z358.1 requirements and inspected annually to ensure performance criteria is met

### 9.5 Personal Protective Equipment

#### 9.5.1 General

PPE may be used to supplement available engineering controls, but should not be viewed as a substitute for them. An exception may be for short term jobs where the implementation of engineering controls is not feasible.

The SDS for a particular chemical will provide information on recommended PPE for its use, however, it is

recommended that the SDS be used in conjunction with experience, judgment, and possibly assistance from LSM-CHC so that adequate PPE is selected. The following precautions should be followed when using PPE:

- Select PPE according to the greatest degree of hazard expected to be encountered
- The equipment must provide the kind and degree of protection appropriate for the chemical and the task.
- The limitations of PPE must be understood.
- The equipment must fit properly.
- The equipment must be properly maintained.
- Training of those who will use PPE is mandatory. Laboratory workers must be instructed in the correct use and limitations of personal protective equipment. They must know when the equipment is needed and must be able to recognize when it needs to be serviced, cleaned, or replaced.

#### 9.5.2 Protective Clothing

Skin contact is a potential source of exposure to toxic materials, so any unprotected skin surfaces should be covered. For most lab procedures, a specific type of glove will be required since hands are intimately involved in chemical reagent and glassware handling and apparatus manipulations. Even when there is minimal danger of skin contact, good hygiene practice dictates the use of lab coats, coveralls, aprons, or protective suits.

Protective gloves and garments are not equally effective for every hazardous chemical. Eventually, chemicals may penetrate, permeate or degrade the protective clothing. Therefore, it is very important to select garments for the particular chemicals being handled and to periodically assess their condition. Where there is no immediate danger to the skin from contact with a hazardous chemical it is still prudent to select clothing to minimize exposed skin surfaces. Employees should wear long sleeved/long legged clothing. *No open toe shoe, skirt, short or dress above knees will be allowed in active labs. The LSM will strictly enforce this policy*. A laboratory coat should be worn over street clothes and be laundered regularly. Laboratory coats are intended to prevent contact with chemical dusts and minor chemical splashes or spills.

If it becomes contaminated it should be removed immediately and affected skin surface washed thoroughly. Shoes should be worn in the laboratory at all times. Sandals and perforated shoes are not appropriate. In addition, long hair and loose clothing should be confined.

Additional protective clothing may be required for some types of procedures or with specific substances (such as when carcinogens or large quantities of corrosives, oxidizing agents or organic solvents are handled). This clothing may include impermeable chemically resistant aprons and gloves as well as plastic coated coveralls, shoe covers, and arm sleeves. These garments can either be washable or disposable in nature. They should never be worn outside the laboratory. The choice of garment depends on the degree of protection required and the areas of the body, which may become contaminated.

#### 9.5.3 Eye and Face Protection

Laboratory eye and face protection generally includes safety glasses with side shields, chemical splash goggles and face shields. The use of safety glasses must comply with the American National Standards Institute, ANSI Z-87.1-1989, "Practice for Occupational and Educational Eye and Face Protection." Safety

glasses that meet these requirements will be identified with a "Z 87" marked on the temple bar of the glasses. Goggles and face shields will have a similar marking located somewhere on the device. Face shields are always worn over primary protection such as glasses or goggles as they are not designed to withstand impact.

Eye and face protection is required whenever there is the potential for flying particles or splash of a hazardous chemical or infectious material. This rule applies not only to persons who work continuously in the laboratory, but also to persons who may be in the area temporarily, such as maintenance, custodial or administrative personnel. This rule applies to both teaching and research labs.

The level of eye protection required is based upon the chemicals physical state, the quantities involved, the activity in the lab, and the toxicity or corrosivity of the chemical(s) used. For most situations, safety glasses with side shields should be adequate; however additional protective devices must be worn consistent with the hazards posed by either the chemicals or operations involved. Goggles should be worn in situations where bulk quantities of chemicals are handled and chemical splashes to the face are possible. Goggles form a liquid proof seal around the eyes, protecting them from a splash. When handling highly reactive substances or large quantities of hazardous chemicals, corrosives, poisons, and hot chemicals, goggles with face shield should be worn.

Contact lenses can increase the risk of eye injury if worn in the laboratory, particularly if they are of the gas permeable variety. Gases and vapors can be concentrated under such lenses and cause permanent eye damage. Chemical splashes to the eye can get behind all types of lenses. Once behind a lens the chemical is difficult to remove with typical eyewash. For these reasons it is recommended that contact lenses not be worn during laboratory activities.

#### 9.5.4 Respiratory Protection

Respiratory protective equipment may be necessary when ventilation is not adequate, or a procedure cannot be performed in a laboratory fume hood. Any such operation must be performed in an isolated area away from other occupants. There is a variety of respiratory equipment available, but no one device provides protection against all possible hazards. Types available include:

- Particulate removing air-purifying respirators.
- Gas and vapor removing air-purifying respirators.
- Atmosphere-supplying respirators.

Selection of a respirator from these three categories is based on the chemical and process hazard, as well as the protection required. Respirators are not to be used except in conjunction with a comprehensive respiratory protection program, and any proposed use or installation of respirators should be used under the direction of the LSM-CHC following requirements the OSHA Respiratory Protection Standard (29 CFR 1910.134) and ANSI's standard for respiratory protection (Z88.2). If a respiratory protection program is implemented, only those respirators approved by the National Institute for Occupational Safety and Health (NIOSH) and the Mine Safety and Health Administration (MSHA) should be used. Some of the elements in a comprehensive respiratory protection program include: appropriate respirator selection, training on use and care, fit testing, medical surveillance, maintenance and recordkeeping. Additional requirements are applicable to respiratory protection equipment kept on hand for emergency use.

## 9.6 Lab coat policy

### 9.6.1 Statement of purpose

Clark Atlanta University is committed to providing a safe laboratory working environment for all laboratory (lab) users on its campus. This policy is designed to standardize lab coat use and handling on campus to ensure the protection of the health of our lab users.

Clark Atlanta University's employees should be provided with appropriate lab coats when required for their duties and laundering services/disposal should be provided at no expense to them.

### 9.6.2 Scope

This policy applies to all lab users in all science research laboratories at Clark Atlanta University. The document takes into account current safety best practices, standards and regulations, outlining directives for lab coat usage, selection, decontamination, disposal, and laundering. In order to give time to Research and Sponsored Programs to secure funds for implementation of the Lab Coat Program, effective date of the policy is set for Fiscal Year 2022-2023.

### 9.6.3 Definitions

**Hazardous Materials -** For the purposes of this procedure, hazardous materials are chemical or biological materials that present a health or physical hazard as generally accepted or found in applicable Safety Data Sheets. This includes, but is not limited to:

| | |
|---|---|
| Corrosives | Flammables |
| Skin/Eye Irritants | Air/Water Reactive Chemicals |
| Carcinogens | Reproductive Toxins |
| Toxic Chemicals | Oxidizers |
| Radioactive Materials | Biological Materials |

**Laboratory Area -** For the purposes of this procedure, a laboratory area is a space where the use or storage of hazardous materials occurs for research, teaching, or the support thereof. This includes, but is not limited to:

| | |
|---|---|
| Research Laboratories | Storage Rooms |
| Core Laboratories | Prep Rooms |

Animal Care Facilities Cold Rooms

**Laboratory User (lab user) -** For the purposes of this procedure, a lab user includes all CAU faculty, staff, student assistants, graduate assistants, visiting scientists, laboratory personnel, or volunteers conducting research or otherwise working in a laboratory area.

**Laboratory Supervisor –** For the purposes of this procedure, a laboratory supervisor is faculty or staff given charge of a laboratory/related area. This is often referred to as principal investigator.

### 9.6.4 Procedures

#### a) Lab coat use

Knee length, buttoned lab coats are required to be worn by lab users at all times in laboratory areas in addition to long pants or skirts/dresses which fully cover the legs, and closed shoes.

When properly used, lab coats:

- Provide protection of skin and clothes from incidental contact and splashes.
- Prevent the spread of contamination outside the lab (if not worn outside the lab)
- Provide a removable layer in the event of a spill or major splash of hazardous materials

#### b) Lab coat availability

The department/laboratory supervisor where the lab user works is responsible for providing the required lab coat based on all potential hazards.

Each lab user should have access to at least two coats: one to wear and one to place in the laundry if a laundry service is obtained, or one to use if the first coat is disposed of. Lab coats must be appropriately sized for the user, and the sleeves should be of sufficient length to prevent skin exposure while wearing gloves.

#### c) Lab coat selection

##### i. Flame Resistant (FR) Lab Coats

Lab users working with the following substances are required to wear FR lab coats: **pyrophoric materials, potentially explosive materials, or flammable liquids in the presence of open flames/ignition sources**. Nevertheless, it is recommended that all laboratories working with flammable materials use FR lab coats.

#### ii. Basic Lab Coats

Lab users who do not work with the above substances, should wear a 100% cotton, a cotton/polyester blend, or synthetic lab coat such as Novex or Tyvek. Polyester and rayon lab coats are not satisfactory for work with flammable materials.

#### iii. Disposable Lab Coats

Lab users who work with biohazardous materials exclusively (no flammables, toxic chemicals, corrosives etc.) are encouraged to use disposable lab coats/gowns. If a disposable lab coat is to be used with chemicals (toxics, corrosives, etc.) it must be a chemically resistant material that is suitable for the chemicals in use (e.g. Tyvek).

### d) Laundering, decontamination and disposal

#### i. Laundering

Lab coats shall not be laundered at private residences or public laundry facilities. Departments are responsible for ensuring suitable laundry services are provided for lab coats such as contracting with a private laundering/lab coat exchange service.

#### ii. Decontamination and Disposal

Lab coats contaminated with a hazardous material must be properly disposed of or decontaminated prior to laundering. Lab coats contaminated by biological materials should be autoclaved prior to laundering. Lab coats contaminated by radioactive materials should be given to the Lab Safety Manager for disposal, or for decay prior to laundering if the half-life is less than 60 days. Lab coats contaminated with significant amounts of chemical materials (e.g. a spill) should be handled as hazardous waste. Coats with minor contamination of chemical materials from day to day use can be sent for commercial laundering services. A process shall be implemented by the Laboratory Safety Manager and the laundry service provider to allow the laboratory users to drop off their coats in different receptacles based on the estimated level of contamination.

## 10.0 EXPOSURE ASSESSMENT AND MEDICAL SURVEILLANCE

### 10.1 Employee Monitoring and Surveillance

The OSHA Laboratory Standard requires that if an exposure is suspected, an exposure assessment must be conducted. If this assessment indicates that an employee could have been exposed to a hazardous chemical in a manner that may have caused harm, a medical consultation (and possibly a subsequent examination) must be made available at no cost to the employee. The Chemical Hygiene Committee, Department Head or

Chairperson must be immediately notified by the LSM-CHC of any instance where an exposure is suspected. The LSM-CHC, or possibly the University Medical Practitioner will refer employees to an occupational medicine clinic for evaluation of chemical exposures.

### 10.2 Medical Consultation Criteria Provisions

An opportunity to receive medical consultation shall be provided under the following circumstances:

- If an employee develops any symptoms thought to arise from chemical exposure; after an event such as a major spill, leak or explosion which may have resulted in an exposure
- If an exposure is identified as the result of an evaluation.

Exposure assessments are the responsibility of the LSM-CHC. The purpose of the assessment is to determine if there was an exposure that might have caused harm and to identify the chemical(s) involved. Following notification of overexposure, arrangements for an appropriate medical examination must be completed before the exposed individual may return to work. Any medical examination required by this Plan shall be provided without cost to the employee, without loss of pay and at a reasonable time and place. Records of any medical examination will be maintained in the employee's file.

Since the intent of an exposure assessment is to gather facts, it may include any or all of the following:

- interviews with the employee (s) involved
- review of the general ventilation of the work area
- review of chemicals used/stored in the area
- review of symptoms exhibited/reported by the exposed
- assessment of how these symptoms compare to literature citations
- determination as to whether control measures such as personal protective equipment and hoods were used appropriately
- determination as to whether present control measures are adequate
- monitoring or sampling of air in the area for suspect chemicals

Initial monitoring will be performed if there is reason to believe that exposure levels for a substance routinely exceed the action level (or in the absence of an action level, the permissible exposure limit (PEL)). Periodic monitoring will be performed if the initial monitoring discloses employee exposure over the action level or the PEL. Such monitoring will be in compliance with exposure monitoring provisions and recommendations of the relevant OSHA Standard.

## 11.0 Emergency Response Procedures

Responses to emergencies from laboratories housed in (a) Thomas Cole Science and Research Building and (b) McPheeters Dennis Building are covered in Appendix **K** of this document. Additional information can be found in CAU's Emergency Action Plan and Spill Control and Countermeasures Plan.

## 12.0 ACCIDENT REPORTING & RECORDKEEPING

The PI/LM must submit accident reports to the LSM-CHC and the Chemical Hygiene Committee for any accident or near-miss situations. All employees will be free from any reprisals for reporting accidents. Laboratory near-miss reports, corrective actions and suggestions can be helpful in improving laboratory safety.

Required documentation and records are kept to demonstrate compliance with applicable Laboratory Standard mandates. The Chemical Hygiene Committee uses Plan mandates to collect information. This information is used to complete reports, questionnaires and permits to various federal, state and local agencies. Copies of these reports and the associated information collected through inspections and submittals by laboratories are kept on file by the LSM-CHC.

Departments must maintain records required - by this plan. Records should be maintained of inspections conducted including who conducted the inspections, dates, any unsafe conditions found, and any corrective actions taken. The LSM-CHC will document training activities, whether conducted in classes, safety meetings, or one-on-one job safety training sessions. Chemical Hygiene Committees should keep records of who was trained, who did the training, when the training occurred and what was taught.

The LSM-CHC shall maintain records detailing employee exposure monitoring. These records provide an accurate account of measurements taken to monitor employee exposures if the employee is exposed to any chemical contaminant above the action level. These records must be kept for 30 years past the date the employee ceases work at CAU.

The infirmary shall maintain records detailing employee, medical consultations, including an accurate report of examinations, tests, and written opinions by the attending physician. These records must be kept for 30 years past the date the employee ceases work at CAU. Records must be available to employees or their representatives only. The physician's written opinion concerning occupational exposure is available to CAU.

## 13.0 PLAN REVIEW, EVALUATION AND UPDATING

In order to evaluate the effectiveness of the Plan, periodic inspections will be performed. Laboratory personnel should inspect their work area routinely for compliance with this Plan. Use of the inspection checklist contained in Appendix A or an alternative that addresses the same items is strongly recommended to document the results of these inspections.

Every lab shall be inspected by the LSM-CHC at least once a year. The LSM will conduct comprehensive and formal laboratory safety inspections at least once per year in each lab, including inspections of offices and common areas. The comprehensive laboratory inspections are announced and scheduled ahead so that the person in charge of the laboratory can be present during the inspection.

The LSM-CHC will also conduct unannounced random inspections of all laboratories in a way that does not interfere with normal laboratories activities.

Departments should establish a system for communicating health and safety issues to employees. The Chemical Hygiene Committee may determine a need to conduct periodic audits of the work areas to evaluate work practices and identify potential hazards. Any reports generated that identify deficiencies will

be directed to the laboratory PI/LM.
Program evaluation along with any metrics maintained related to the program is to be conducted annually by the LSM-CHC and reviewed with the Chemical Hygiene Committee. This review should be in the form of a systems audit and based upon the effectiveness of the Plan. The results may require the LSM-CHC to propose modifications to the existing Plan or to initiate new policies. Any changes affecting the Plan will result in an update to the existing Plan.

## 14.0 EMPLOYEE TRAINING

### 14.1 Laboratory Employees

All faculty, staff and research students who work with or are potentially exposed to hazardous chemicals must complete the mandatory laboratory safety training on safe handling procedures, health and safety hazards, labeling, SDS and PPE. They will be informed and trained on the details of this Plan. Such training must occur within 2 weeks of hire and prior to any exposure to hazardous chemicals. Employees and students who fail to comply with this requirement will be denied access to any research lab until completion of the training. Any key request submitted for or by such individual must be denied by the Office of Research and Sponsored Programs.
Additional training shall be provided by the PI/LM whenever a new chemical hazard or procedure is introduced into the laboratory. All laboratory users must complete their assigned refresher safety training annually. CAU requires that employees and research students sign a Laboratory Standard Training Roster (Exhibit E) and receive a copy of the safety training checklist (Exhibit G) after their initial lab safety training. This roster will be maintained by the LSM-CHC and the checklist will be progressively filled out after each training is received.
A completed Laboratory Safety Training Checklist is required to obtain RSP approval for key requests.
It is the responsibility of the Principal Investigator to monitor compliance with this provision. Public Safety and Research and Sponsored Programs work together to enforce the present plan.

### 14.2 New Hire Orientation

The New Hire Orientation Program will inform all new laboratory employees of the following:

- Chemical Hygiene Plan
- Hazardous chemicals utilized in their work environment
- A definition of hazardous materials and wastes (e.g. flammable, toxic, corrosive, reactive)
- How to read an SDS and that SDS are readily available to all employees.

Laboratory specific hazardous materials training will be conducted by their PI/LM.

## 15.0 LABORATORY SAFETY INSPECTION PROGRAM

In the interest of employees and community safety, CAU has embarked upon a program of comprehensive safety inspections of its laboratories to ensure proper compliance with all applicable state and federal

regulations.

Each inspection will be composed of an initial inspection and, if necessary, a follow-up. A representative of the department controlling the laboratory must be in attendance. If the laboratory is for research, it is preferred that the principal investigator who has been given charge of the laboratory be present as well. The LSM will conduct the inspection and note any violations observed during the inspection.

After the initial inspection, the LSM will issue a report with copies going to the Principal Investigator (if applicable) and the Department Chair. The person responsible for the laboratory will use the initial inspection report as a guide for abatement of deficiencies and is required to make all necessary arrangements to abate the deficiencies. If the report calls for a written notification of abatement only, an e-mail from the faculty member in charge of the lab stating that the problem has been corrected will suffice. If a follow-up inspection is required, it will be scheduled after the corrective action due date to verify that the deficiencies are corrected or that proper steps have been made to abate the problem.
If proper steps have not been made, a follow-up report is issued and in addition to the above referenced parties, the Dean will be given copies and the CHC will be informed during quarterly meetings.

## 16. ADDITIONAL POLICIES

### 16.1 Eating and Drinking in Labs

Eating and drinking is prohibited in any research lab where chemical, radiological and/or biological materials are stored or used. Food waste, wrappers, containers, etc. must not be placed in laboratory trash cans as this is considered evidence of food or beverage consumption within the laboratory. Such activities are permitted in a designated area (defined as a room with floor to ceiling walls and a closed door) separated from the laboratory space.
Food or beverage containers may not be stored in the laboratory work space and washed drinking cups, food containers or eating utensils may not be dried on laboratory drying racks. Refrigerators used for storing food or beverages must be dedicated to food only and should be located outside of the laboratory work space and clearly labeled with the words “Food Storage Only, No Hazardous Materials Allowed.” Refrigerators used for storage of research materials must not be used for storage of food or beverages.
The LSM is responsible for identifying laboratories where eating, drinking, and similar activities are prohibited, and for notifying individuals of appropriate areas for such activities

### 16.2 Hot Plate Policy

Hot plates should never be left unattended and should be unplugged whenever not in active use.

### 16.3 Particularly Hazardous Substances Policy

Particularly Hazardous Substances (PHS) include select carcinogens, reproductive toxins or acutely toxic

substances. PHS pose a specifically high risk to employees in the workplace and need special consideration as for their use, storage and disposal.

a/ Establishment of a designated area: A "designated area" in the laboratory must be established for working with PHS. The designated area may be the entire laboratory, an area of a laboratory or a device such as a laboratory hood. The designated area shall be identified with a label similar to the following:


Containers may be flagged with a label indicating the presence of a PHS inside.

Avoid storing PHS on open shelves.

Lab users who are pregnant or plan to be pregnant must be made aware of the designated area and the LSM must be formally informed if the user will attend the area.

b/ Use of containment devices: A PHS should be used in a chemical fume hood or in another approved appropriate containment device, such as a glove box

c/ safe removal of contaminated waste: Waste generated from one or more PHS must mention PHS on the waste label.

d/ Decontamination: Work surfaces on which these substances will be handled should be able to be easily decontaminated or protected from contamination with plastic trays or plastic backed paper. Normal laboratory work should not be conducted in a designated area until it has been decontaminated or deemed safe to use by the LSM.

e/ Purchasing: Purchasing of PHS requires formal approval from the LSM

f/ Log: Every use of a PHS must be logged by the user on a form developed by the Office of Lab Safety showing at least the user's name, the date of use and an estimate of the amount used.

### 16.4 Working alone in research labs

Working alone means working when no one else is in direct line of sight or within sound of the person.

Lab users should avoid working alone when dealing with hazardous materials. All students are prohibited from handling acutely toxic and explosive chemicals while working alone. Undergraduates are prohibited from working alone with any hazardous material. When the lab's activities require a student or a new staff to work alone after hours or on weekends, excluding work with acutely toxic and explosive chemicals, a

protocol allowing the Manager to periodically check on the student/staff must be implemented by each Principal Investigator (PI). The protocol shall contain information on how and when the PI will check on the individual and will emphasize the lab's emergency procedures.

Public Safety and the Principal Investigator must be informed anytime a student/staff stays alone in a wet lab after 7 pm. The "Work Alone" tab in Clark Atlanta University's PantherSafe app shall be used by the student/staff to make Public Safety aware that they are working alone after hours. Working alone after 7 pm or on weekends requires prior approval from the Principal Investigator. Public Safety officers will dismiss any student found alone in a wet lab after 7 pm if they have not opened a Work Alone Session in PantherSafe.

No volunteer or minor can be left alone in a wet lab.

# EXHIBIT A

# STANDARD OPERATING PROCEDURES

The Standard Operating Procedures for Chemical Management are located in the Plan as indicated below:

CLARK ATLANTA UNIVERSITY

## EXHIBIT B
## AUTOCLAVE USER LOG

| Date/ Time | Cycle Length of Time | Temp/ Pressure | Biowaste (Yes/No) | If Biowaste Number of Bags | Chemical Indicator Tape Strip (Yes/No) | Phone Extension | Print Your Name And Laboratory Names (No Initials) |
|---|---|---|---|---|---|---|---|
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- There must be a sterilization indicator in each autoclaving to monitor the sterilization procedure. The indicator must indicate exposure to steam at 121ºC (250ºF)
- Pressure must reach at least 15 psi
- Spore tests must be performed every 40 hours of autoclave operation, but not less than quarterly
- The autoclave must be cleaned at the frequency recommended by the manufacturer
- The autoclave must be serviced at the frequency recommended by the manufacturer, at least annually

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## EXHIBIT C
## AUTOCLAVE QC LOG

| Date | Time | Heat Type Dry/Steam | Temp | Spore Type | Results | Do Results Indicate Effective Treatment | Print Name And Sign (No Initials) |
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Monthly Spore Testing Procedure

- Place ampoule of *B. stearothermophilus* spores (or other appropriate spore type) and holding thermometer in the center of an autoclave load
- Process the load under normal operating procedures
- The highest temperature indicated on the holding thermometer is entered on the Autoclave QC Log. If this temperature is less than 121 °C, the autoclave is not to be used to treat potentially infectious material
- Perform spore viability analysis as recommended by spore strip manufacturer and record results. In instances of failure of sterilizer repeat test and assure that overload was not the cause of failure

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## EXHIBIT D
## FUME HOOD DAILY LOG

**BUILDING NAME:**_____

Laboratory Name:_____

Instrument Type:_____

| Date | Time | Hood Face Velocity (Pass/Fail) | Paper Test (Pass/Fail) | User Signature | Correction Action | Technician Signature |
|---|---|---|---|---|---|---|
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**Exhibit E**

**Laboratory Standard Training Roster**

**Date of Training:** _____

**Facilitator:** _____

| Name (Print) | Signature/Date | Department | Supervisor |
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By my signature above, I am stating that I have received training regarding OSHA's Laboratory Standard including responsibilities, standard operating procedures, work and management practices, safety equipment and personal protective equipment capable of protecting employees from hazardous chemicals and potential health hazards in the laboratory.

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## Exhibit F

## HEPATITIS B VACCINE DECLINATION STATEMENT

I understand that due to my occupational exposure to blood or other potentially infectious materials, I may be at risk of acquiring Hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with Hepatitis B vaccine, at no charge to myself. However, I decline Hepatitis vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease. If in the future, I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with Hepatitis B vaccine, I can receive the vaccination series at no charge to me.

| Employee's Printed Name | Employee's Signature | Date |
|---|---|---|
| Witness's Printed Name | Witness's Signature | |

**Exhibit G**

# LABORATORY SAFETY TRAINING CHECKLIST

**Employee/Student name:**_____ **Department** _____

Prior to beginning work with any hazardous materials in CAU laboratories, all lab users must:

1. Complete mandatory Laboratory Safety Training
2. Know lab-specific facility safety equipment
3. Read and understand Clark Atlanta University's Chemical Hygiene Plan
4. Receive training on lab-specific processes and procedures, including SOP review

It is the responsibility of the hiring manager to inform the lab safety manager early enough to schedule lab safety training.

**Facility Features**
Know the location and understand the proper use of facility safety equipment.

| Initial or N/A | Date completed | Learning Activity |
|---|---|---|
| _____ | _____ | Fire alarm pull stations and fire extinguishers |
| _____ | _____ | Nearest safety shower and eye wash |
| _____ | _____ | Emergency evacuation routes from lab and assembly point |
| _____ | _____ | Fume hoods, biosafety cabinets and other local exhaust ventilation systems |
| _____ | _____ | Other facility features if applicable |

**Procedures and Documentation**
Read and understand laboratory policies and procedures; know how to access safety-related information.

| Initial or N/A | Date completed | Learning Activity |
|---|---|---|
| _____ | _____ | Complete Laboratory Safety Training (Initial) |
| _____ | _____ | Review the Chemical Hygiene Plan and know how to access the plan from CAU website (Clark Atlanta Chemical-Hygiene-Plan) |
| _____ | _____ | Know where to find the Safety Data Sheets (SDSs) for chemicals in the lab (https://msdsmanagement.msdsonline.com/ClarkAtlantaUniversity) |

| Initial or N/A | Date completed | Learning Activity |
|---|---|---|
| _____ | _____ | Understand the lab policy regarding proper lab attire (long dress and pants, closed-toe shoes) and personal protective equipment (PPE) |
| _____ | _____ | Know the hazards, required PPE and/or engineering controls, signs of exposure, safe handling, storage, disposal etc. of all chemicals and/or processes you work with, including any particularly hazardous substances |
| _____ | _____ | Identify acceptable areas for food storage and consumption |
| _____ | _____ | Know proper storage of hazardous chemicals, including segregation by compatibility, secondary containment, and use of safe storage locations such as flammables and corrosives cabinets. |
| _____ | _____ | Review and discuss SOPs for chemicals and processes used in the lab |
| _____ | _____ | Know proper procedures for collection, storage, and disposal of hazardous waste |
| _____ | _____ | Understand the importance of cleanliness and chemical hygiene in the lab. Recognize that all chemical contamination, regardless of how seemingly insignificant, must be cleaned up immediately. |
| _____ | _____ | Know how to handle spills and emergencies including cleaning small spills if safe to do so and evacuating for large/hazardous spills (see CAU spill cleanup guideline). |

By signing this document, I acknowledge that I have received training regarding each of the above items. If I do not understand something or need further training, I can request it at any time from my supervisor/manager. I understand that it is my responsibility to know the hazards associated with the materials I use and to protect myself and others from those hazards. In addition, I will strive to

maintain awareness of peripheral or adjacent hazards, whether from others in the lab or from other lab groups. I acknowledge that safety is an inherent responsibility to which each member of the lab must commit. I also recognize that unsafe practices in the lab will not be tolerated.

| | |
|---|---|
| Name of Trainee (print) | Name of PI or Manager (print) |
| Title of Trainee (Student, Staff, Faculty) | Title of PI or Manager (PI, Chair, …) |
| Signature of Trainee | Signature of PI or Manager |
| Today's Date | Today's Date |
| Signature of Laboratory Safety Manager | Signature of AVP of Research and Sponsored Programs |

**Appendix A**
**Laboratory Inspection Checklist**
**Safety Management System**

Inspector names_____

Building and Room Number_____Date_____Supervisor_____

**Is the laboratory Registration Information Displayed?_____**

**Emergency Equipment:**

How Many Safety Showers:_____ Last Inspection Dates:_____ Accessible:_____

How Many Eye Wash Units:_____Last Inspection Dates:_____ Accessible:_____Flow:_____

How Many Fire Extinguishers:_____Accessible:_____ Pin in Place:_____Damage:_____

How many Fire Blankets:_____Available and Accessible:_____

How many First Aid Kits:_____Available and Accessible:_____ Adequately Stocked:_____

How many Spill Kits:_____Available and Accessible:_____ Adequately Stocked: _____

Fire Doors: Blocked:_____Left Open:_____

**Fume Hoods:**

Functioning Properly (Use indicator or tissue paper):_____

Are the inspection tags current:_____Improperly used for storage and disposal:_____

**Hazardous Waste**

Any there "unknowns" left in lab:_____Is there a labeled SAA:_____

Is there undisposed "broken glass" or sharps:_____

**Biohazardous Waste**

**Training and Related Issues**

Are carcinogens, reproductive toxins, or other highly toxic materials being used?_____
If yes, is the Designated Area appropriately labeled?_____Is the acrylic door sign accurate?_____

Are there any other unusual hazards? If yes, are there SOP's? _____Have the Post-Docs received training (and is there documentation)? _____Have Post Docs, Visitors, etc. received general safety training?_____

**Miscellaneous:**

Personal Protective Equipment available and being used (gloves, safety glasses, etc.)?_____Gas cylinders secured?_____Evidence of food or drink in the laboratory?_____Chemical Inventory Up-to-Date?_____Chemicals Properly Stored?_____Check the refrigerators Monthly Inspection Forms Filled Out?_____Vacuum Pumps Guarded?_____Comments:

_____

_____

# Appendix A
# Laboratory Inspection Checklist
# Safety Management System

CLARK ATLANTA UNIVERSITY

**Inspection Explanation Sheet**

**Emergency Equipment**

Safety showers and eye wash units should be tagged and the last inspection date should be indicated. Drench hoses should not be used as eye wash units and should not have a tag. If they are the only source of water in the area, however, they should be tagged and inspected. Test the eye wash for adequate flow and run until the water is clear. Each safety shower / eye wash unit area should be free of clutter and thus is accessible. All emergency equipment must be accessible at all times.

Each lab must have at least one $CO_2$ fire extinguisher. Some labs have other types depending on need. Each extinguisher should be inspected for damage, pin in place, and gauge pressure (if it has a gauge). Missing or damaged extinguishers should be reported to the Safety Office. DO NOT "TEST" A FIRE EXTINGUISHER BY "FIRING" IT.

Fire blankets are not required, but if you have one, it must be accessible. Each lab or lab area must have a first-aid kit and it must be stocked. The first-aid kit has an inventory of its contents as well as the re-order numbers. Replacement items are available from Stores/Fisher Scientific. Fire doors (most lab doors leading into hallways) should remain closed. They should not be blocked (preventing egress) or blocked open (potentially spreading fire). Spill-kits, like first-aid kits, must be maintained. See the Safety Office for replacement items. Each lab or lab area must have a spill-kit.

**Fume Hoods**

Fume hoods must be inspected for operation and clutter before each use or daily. A flow indicator and/or a tissue ribbon on the sash indicates flow. The date of inspection should be marked on the inspection tag near the hood face. If you suspect a problem with the fume hood, notify your supervisor and the CHO and indicate the problem on the tag.

**Hazardous Waste**

All containers must be labeled except for those in immediate use.

Refer to the Glassware Disposal policy. Glassware (broken or not) must be placed in cardboard boxes. Contaminated glassware must be disposed of as hazardous waste. Sharps must be placed in the biohazardous sharps container.

**Training and Related Issues**

Refer to the CHP. Work with carcinogen, reproductive toxins and biological toxins require designated areas (Refer to sections 4.0, 5.0 and 6.0 of the CHP). They also require standard operating procedures.

Any unusual hazards (equipment, chemicals, etc.) require that the supervisor provide and document special training. All post-docs, visitors, undergraduate researchers are required to have a minimum of general training.

**Miscellaneous**

Appropriate personal protective equipment (PPE) should be available and in good condition. Compressed gas cylinders, whether in use or in storage, must be secured with a strap or chain. Food or drink must not be consumed in the lab. Evidence of consumption is usually found in the form of wrappers or cups on bench tops or in the trash can. Vacuum pump belts and pulleys must be guarded.

Supervisors should maintain a chemical inventory. The chemicals should be stored according to hazard class. Reactive chemicals should be stored by themselves away from other chemicals.

## Appendix B
## Responsible Party Information (RPI) Sheet –

**Clark Atlanta University**

**Safety Management System**

Date:

**Instructions** – Each lab room must have a separate RPI (even if you are a PI occupying more than one lab). Fill in ONLY the colored areas. The completed form must be submitted to the CHO and Safety Management Services

| General Information | | | | | |
|---|---|---|---|---|---|
| Building | | Room No. | | Campus | |
| Department | | | | | |
| Principal Investigator (PI) | | | | Mail Code | |
| Research / Area Use | | | | | |

| Emergency Contact Information | | | | |
|---|---|---|---|---|
| Emergency Contact Name | Title | Day Phone | Cell Phone | Evening Phone |
| | | | | |
| | | | | |
| | | | | |

| Emergency Information | |
|---|---|
| List types of alarms (i.e. fire, fume hood etc.) | |
| Location of room and building exits | |
| Location of Safety Data Sheets | |
| Location of nearest campus telephone | |
| Location of chemical spill kit | |
| Location of nearest eyewash | |
| Location of nearest safety shower | |
| Location of fire extinguisher(s ) | |
| Location of nearest fire alarm | |
| Location of electrical circuit box | |

| Hazards or Special Concerns (Check all that apply) | | | | | |
|---|---|---|---|---|---|
| ☐ | Vertebrate Animals | ☐ | High Voltage Equipment ( > 600 volts) | | |
| ☐ | Risk Level: 1, 2, 3 | ☐ | Hydrofluoric Acid | | |
| ☐ | Biohazards / Pathogens Biosafety Level: 1, 2, 3 | ☐ | Ionizing Radiation / Radioactive Materials | | |
| ☐ | Carcinogens/Mutagens / Teratogens | ☐ | Oxidizers | | |
| ☐ | Compressed Gases | ☐ | Projects Under Pressure | | |
| ☐ | Continuously Heated Projects | ☐ | Projects Under Vacuum | | |
| ☐ | Corrosive Liquids (Acids or Strong Bases) | ☐ | Pyrophorics | | |
| ☐ | Cryogenics | ☐ | Water Reactive Metals or Compounds | | |
| ☐ | Flammable liquids | ☐ | X-Rays / Lasers / RF | List Highest Laser Class | |
| Describe other hazards or special concerns. (i.e. Inorganic Mercury)<br>Describe any restricted areas in which the Principal Investigator's presence is required for inspection. | | | | | |

| Does this lab contain any amount of the following chemicals? (Check all that apply) | | | | | | | |
|---|---|---|---|---|---|---|---|
| ☐ | Acrylonitrile | ☐ | Ethylene Oxide | ☐ | 2-Acetylaminofluorene | ☐ | 3,3'-Dichlorobenzidine (and its salts) |
| ☐ | Asbestos | ☐ | Formaldehyde | ☐ | alpha-Naphthylamine | ☐ | 4-Dimethylaminoazo-benzene |
| ☐ | Benzene | ☐ | Inorganic Arsenic | ☐ | 4-Aminodiphenyl | ☐ | Ethyleneimine |
| ☐ | 1,3-Butadiene | ☐ | Lead | ☐ | Benzidine | ☐ | Methyl chloromethyl ether |
| ☐ | Cadmium | ☐ | Methylene Chloride | ☐ | beta-Naphthylamine | ☐ | 4-Nitrobiphenyl |
| ☐ | Chromium (VI) | ☐ | Methylenedianiline | ☐ | beta-Propiolactone | ☐ | N-Nitrosodimethylamine |
| ☐ | 1,2-Dibromo-3-Chloropropane | ☐ | Vinyl Chloride | ☐ | bis-Chloromethyl ether | | |

## Appendix C

## Laboratory Registration
## Safety Management System

**Instructions** – Must be posted in Laboratory on the door, in the chemical hygiene plan binder or on the wall to the right of the door for duration of registration. Registration must be renewed annually even if you are occupying the same laboratory.

| General Information | | | | | |
|---|---|---|---|---|---|
| Building | | Room No. | | Campus | |
| Department | | | | | |
| Principal Investigator (PI) | | | | Mail Code | |
| Research / Area Use | | | | | |

| Emergency Contact Information | | | | |
|---|---|---|---|---|
| Emergency Contact Name | Title | Day Phone | Cell Phone | Evening Phone |
| | | | | |
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| Laboratory Information | |
|---|---|
| Does Laboratory have a current Chemical Inventory? | |
| Is inventory in paper or electronic format? | |

| Hazards or Special Concerns) | | | |
|---|---|---|---|
| | **RISK LEVELS** | | **1-4** |
| | **Health** | | |
| | **Flammability** | | |
| | **Reactivity** | | |
| | **Other** | | |
| **Special precautions for First Responders to this Laboratory**: | | | |

By my signature below, I acknowledge receipt of a current Laboratory Responsible Party Information checklist.

_____ _____

Signature of Registrar Date

By my signature below, I acknowledge that the information submitted on the Responsible Party Information checklist is true to the best of my knowledge, and all potential hazards have been evaluated and identified.

_____ _____

Signature of Occupant Date

**Appendix D**

**Clark Atlanta University**

**Safety Management Services**

**Guidelines for Hazard Assessment & Personal Protective Equipment Selection Form**

This form shall be used to document the assessment and identification of safety and health hazards to which a laboratory employee may be exposed and for the selection of appropriate personal protective equipment (PPE) to protect them from the identified hazards.

Instructions:

1) Use this as a guide for your walk-through survey. It will help you identify the hazards and select appropriate PPE.

2) It is the PI/LM responsibility to ensure that the hazard assessment & PPE selection form is completed. As a minimum, one copy should be maintained with laboratory records. You may also forward a copy to the CHO.

Guidance Notes:

Personal Protective Equipment should not be relied on to provide sole protection against hazards. First you must consider and implement proper engineering controls to prevent/minimize hazards. Second, you must consider and implement safe work practices to prevent/minimize hazards.
PPE is to be utilized as a last resort after engineering controls and safe work practices have been attempted.

Conducting the Assessment & Selecting PPE:

Familiarize yourself with the potential hazards to which laboratory personnel may be exposed and the types of PPE that are available.
Identify the hazards associated with the employees work environment.
Select PPE that ensures a greater level of protection than the minimum required to protect workers from the hazards. Fit the worker with the PPE and give appropriate instructions on its use, limitations, and care.
Responsibility for PPE use is the employees; positive reinforcement is the Laboratory manager.

## Hazard Assessment & PPE Selection Guidelines

**Head Hazards:** Tasks that can cause head hazards include: Working below other workers who are using tools and materials which could fall, working on energized electrical equipment, working with hazardous materials, and working under machinery or processes which might cause materials or objects to fall.

Hazards may come from: Burns, Chemical Splash, Electrical Shock, Imp act, etc.

Head PPE Types: Hardhat Type A (impact/penetration resistance plus low-voltage protection),
Hardhat Type B (impact/penetration resistance plus high-voltage protection)
Hardhat Type C (impact/penetration resistance only)
**Hand Hazards:** Tasks that can cause hand hazards include: Sharp edges, splinters, tools, machine parts, cutting instruments, working with hazardous materials, temperature extremes, exposed electrical wires.

Hazards may come from: Biological/Chemical Exposure, Cuts/Abrasions, Punctures, Thermal Extremes, Electrical, etc.

Hand PPE types: Abrasion/ Resistant, Biological/Chemical/Hazardous Materials Resistant, Electrical Resistant, Thermal Resistant, Cut/Puncture Resistant, etc.

**Eye/Face Hazards:** Tasks that can cause eye hazards include: Working with hazardous materials, chipping, grinding, furnace/boiler operations, lasers, metalworking, sanding, welding, and woodworking.

Hazards may come from: Biological agents, Chemicals, Dusts, Heat, Imp acts, Light, Radiations, etc.

Eye/Face PPE Types: Safety Glasses, Safety/Splash Goggles, Face Shield, etc.

**Eye & Face Protection Selection Chart**

| Source | Hazard | Protection |
|---|---|---|
| **IMPACT** - Chipping, grinding, machining, masonry work, woodworking, sawing, drilling, chiseling, powered fastening, riveting, and sanding. | Flying fragments, objects, large chips, particles, sand, dirt, etc. | Spectacles with side protection, goggles, face shields. For severe exposure, use face-shield. |
| **HEAT** - Furnace operations, pouring, casting, hot dipping, and welding. | Hot sparks | Face-shields, goggles, spectacles with side protection. For severe exposure use face-shield. |
| | Splash from molten metals | Face-shields worn over goggles. |
| | High temperature exposure | Screen face shields, reflective face shields. |
| **CHEMICALS** - Acid and chemical handling, use of cleaning products, paint use and clean-up products, pesticide and herbicide use | Splash | Goggles. For severe exposure, use face shield. |
| | Irritating mists | Special-purpose goggles. |
| **DUST** - Woodworking, buffing, general dusty conditions. | Nuisance dust | Goggles, or spectacles with side protection. |
| **LIGHT and/or RADIATION** - Welding: Electric arc | Optical radiation | Welding helmets or welding shields. Typical shades: 10 14. |
| Welding: Gas. | Optical radiation | Welding goggles or welding face shield. Typical shades: gas welding 4 8, cutting 3 6, brazing 3 4. |
| Cutting, Torch brazing, Torch soldering. | Optical radiation | Spectacles or welding face shield. Typical shades: 1.5 3. |
| Glare. | Poor vision | Spectacles with shaded or special purpose lenses, as suitable. |

**Foot Hazards**: Tasks that can cause foot hazards include: Carrying or handling materials that could be dropped, exposed electrical wires, wet or cold conditions, slippery surfaces, sharp edges or points, construction/demolition activities, or working with/exposure to hazardous materials.

Hazards may come from: Chemicals, Impacts, Punctures, Thermal Extremes, Electrical, Compression, etc.

Foot PPE Types: Toe Protection, Metatarsal Protection, Puncture Resistant, Electrical Resistance, Chemical/Hazardous Materials Resistance, Wet/Cold Protection, etc.

**Noise Hazards:** Tasks that can cause hearing hazards include: Mowing, maintenance work, shop activities, printing, machinery, jack-hammering, use of power tools, and working in mechanical or boiler rooms.

Hazards may come from: Impact intermittent noise or constant noise greater than 85db.

Hearing PPE Types: Ear plugs (inserts), Ear muffs, etc.

**NOTE:** *Noise levels greater than 85dB require participation in campus hearing conservation program*
*Noise levels greater than 90dB require some form of hearing protection be utilized. Your CHO can provide more information*

**Respiratory/Inhalation Hazards:** Tasks that can cause inhalation hazards include: Mowing, spraying, welding, chemical fumes, vapors, mists, sawdust, glues and biological agents (like TB), etc.

Hazards may come from: Biological, Chemicals, Dusts, Fumes, Particulates, Vapors, etc.

Respiratory PPE Types: Disposable nuisance-type masks, half mask and full-face mask air purifying respirator, supplied air–airline respirator, self-contained breathing apparatus.

***NOTE****: The use of any air-purifying or supplied air respirators requires prior review and approval CAU Safety Management Services.*

**Radiation Hazards:** Tasks that can cause radiation hazards include: use of radioisotopes, work with radioactive sources or x-rays, working with lasers, work around high strength electrical and/or magnetic fields. Hazards may come from: radioisotopes, radiation sources, x-rays, lasers, EMF devices, etc. Radiation PPE Types: Leaded clothing, gloves, filtered eyewear, etc.

***NOTE****: Potential exposures to radiation and the selection of PPE require prior review and approval by The Radiation Safety officer at Morehouse School of Medicine.*

**Ergonomic Hazards:** Tasks that can cause ergonomic (musculoskeletal) hazards include: keyboarding, lifting, bending, turning, twisting, slipping, pushing, pulling, repetitive motion and other muscle stressors. Hazards may come from: strains, sprains, slips/falls, repetitive motion, etc. Ergonomic PPE types: Gloves, wrist restraints, back belts, etc.

## Appendix D

### Safety Management Services
### Hazard Assessment & Personal Protective Equipment Selection Form

Procedure or Chemical or Biological Agent:_____

Department:_____ PI/LM/ Supervisor:_____

Assessor:_____ Signature:_____

PPE readily available at the inception of project_____ Signature_____Date_____

| Tasks | Potential Hazards | PPE Recommended |
|---|---|---|
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**Notes/Comments:**_____

# Prior Approval Form

**Laboratory Information**

Laboratory Supervisor:_____ Department: _____

Laboratory Location: Building_____Room(s)_____
Chemical Hygiene Officer: _____

**Please Provide a Brief Job or Task Description:** _____

_____

_____

## Hazard Information

**Will there be any work with animals**? _____

**Biohazard Agents:** List all biohazardous agents employees will come in contact with. This includes infectious agents, any activity involving recombinant DNA, any contact with toxins**.**

_____

_____

**Radioactive Agents**: List all radioactive sources employees will come in contact with.

_____

**Chemical Agents:** List all hazardous chemical agents (groups) employees will come in contact with. This includes caustic or dangerous cleaning product.

_____

_____

_____

Identify the materials to be used by:
*1)* The chemical's name and CAS number
*2)* The hazardous group.

a) Maximum projected chemicals use (in the next year, or over the course of the procedure):

____<1 liter or 100gm
____5 liter/1 kg to 20 liters/5 kg

____from 1 liter/l00gm to 5 liters/1 kg
____more than 20 liter/5 kg) Maximum chemical concentration being used:
____Dilute (<5%) ____Intermediate (5-25%) ____Concentrated (>25%)

c) What hazard(s) does the material(s)/procedures listed above present?
____Flammability _____Corrosivity
____Reactivity _____Acute Toxicity

____Chronic Toxicity_____Carcinogenicity/Teratogenicity/Mutagenicity/Sensitization
____Radiation _____Pathogenicity

## How will exposure to the chemicals/procedure be assessed?

The OSHA Lab Standard requires that employee exposure to all hazardous chemicals be assessed before work begins and during lab operations if necessary. Please describe how employee exposure will be assessed.

_____

_____

_____

## Chemical Safety Information and Training

Appropriate safety information contained in Safety Data Sheets or other technical literature provides information necessary to anticipate and provide protection against the hazards associated with materials.
Is safety information for the materials/procedure available?
_____Yes _____No

Are all laboratory employees aware of location of the safety information?
____Yes ____No

Has training in the safe use of the materials or procedure been provided to all users?
____Yes ____No

***Attach safety training documentation form and include the date of training.***

## Indicate the necessary safety equipment to be used with the chemical or procedure listed.

**Engineering Controls**:

___Fume hood Room # of hood____ _____date of last certification:
___Biosafety cabinet Room # of hood____ _____date of last certification

___Safety shields ____Glove box

**Personal Protective Equipment**

____Lab coats _____Hand Protection (List type:_____)
____Eye protection _____Respiratory protection

**Emergency Response Equipment:**

____Safety shower ____Spill response/control equipment
____Eyewash station ____Fire extinguisher
____Fire blanket

## Is medical monitoring required for users of the materials or procedure?

____Yes ____No

*OSHA requires medical monitoring for employees exposed to certain toxic chemicals such as formaldehyde, benzene, cadmium and lead. If yes, please* contact the *CHO for further information.*

## Where will the hazardous materials be stored?

____Flammables cabinet ____Corrosives cabinet

____Household refrigerator ____Spark-proof refrigerator/freezer
____General storage (standard cabinets and drawers)

## Method of disposal

____Hazardous waste pick-up ____Neutralized or consumed during process

As part of your planning effort, please consider ways which you can minimize the amount of hazardous waste generated. Check any of the following methods which will be utilized.

_____Substitution by less hazardous chemicals
_____Reduction in the amount of chemicals used
_____Change in protocol

I accept responsibility for the proper use and disposal of these materials in the laboratory work described above and have assigned chemical hygiene responsibilities within the lab to people with appropriate training and/or experience.

**Principal Investigator Signature:**_____**Date**:_____

CLARK ATLANTA UNIVERSITY

# Appendix F

## Chemical Compatibility Table

*This list is not a substitute for the manufacturers SDS*

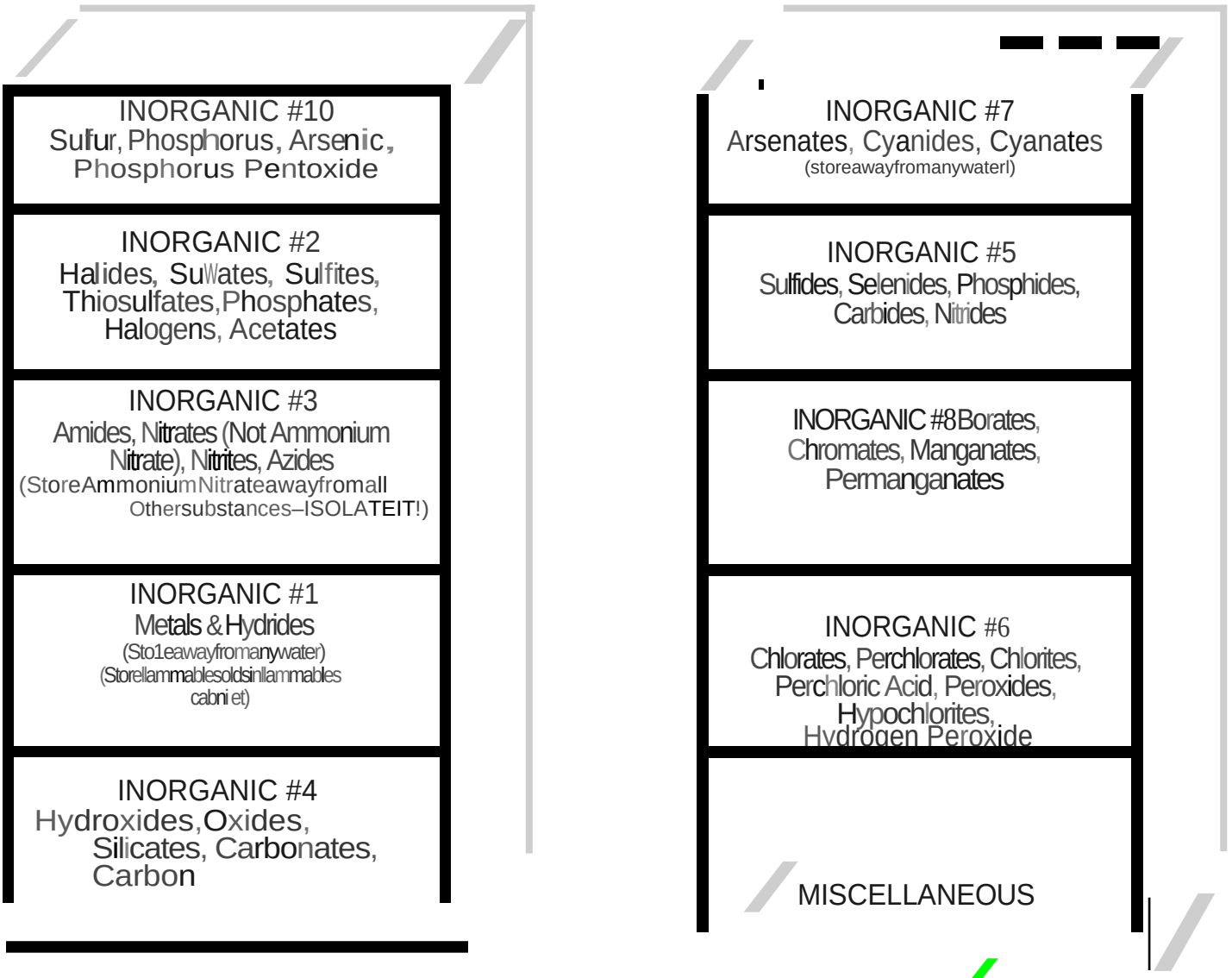
| CHEMICAL | IS NOT COMPATIBLE WITH |
|---|---|
| Acetic Acid | Chromic acid, nitric acid, hydroxyl compounds, ethylene Glycol, perchloric acid, peroxides, permanganates |
| Acetylene | Chlorine, bromine, copper, fluorine, silver, mercury |
| Alkali & alkaline earth metals | Water, carbon tetrachloride or other chlorinated, hydrocarbons, carbon dioxide, halogens |
| Ammonia (anhydrous) | Mercury (in manometers, for example), chlorine, calcium hypochlorite, iodine, bromine, Hydrofluoric acid (anhydrous) |
| Ammonium nitrate | Acids, powdered metals, flammable liquids, chlorates, nitrites, sulfur, finely divided organic or combustible materials |
| Aniline | Aniline, nitric acid, hydrogen peroxide |
| Arsenic materials | Any reducing agent |
| Azides | Acids |
| Bromine | See Chlorine |
| Calcium Oxide | Water |
| Carbon (activated) | Calcium hypochlorite, all oxidizing agents |
| Carbon tetrachloride | Sodium |
| Chromic Acid | Acetic acid, naphthalene, camphor, glycerol, alcohol chromium trioxide flammable liquids in general |
| Chlorine | Ammonia, acetylene, butadiene, butane, methane, propane(or other petroleum gases), hydrogen, sodium carbide, benzene, finely divided metals, turpentine |
| Chlorine Dioxide | Ammonia, methane, phosphine, hydrogen sulfide |
| Copper | Acetylene, hydrogen peroxide |
| Cumene Hydroperoxide | Acids (organic or inorganic) |
| Cyanides | Acids |
| Flammable Liquids | Ammonium nitrate, chromic acid, hydrogen peroxide, halogens |
| Fluorine | Everything |
| Hydrocarbons (such as butane, benzene) | Fluorine, chlorine, bromine, chromic acid , sodium peroxide |
| Hydrocyanic Acid | Nitric acid, alkali |
| Hydrofluoric acid(anhydrous) | Ammonia (aqueous or anhydrous) |
| Hydrogen Peroxide | Copper, chromium, iron, most metals or their salts, alcohols, acetone, organic materials, aniline, nitromethane, combustible materials |
| Hydrogen Sulfide | Fuming nitric acid, oxidizing gases |

# Appendix F

| CHEMICAL | IS NOT COMPATIBLE WITH |
|---|---|
| Hypochlorites | Acids, activated carbon |
| Iodine | Acetylene, ammonia (aqueous or anhydrous), hydrogen |
| Mercury | Acetylene, fulminic acid, ammonia |
| Nitrates | Sulfuric acid |
| Nitric acid | Acetic acid, aniline, chromic acid, hydrocyanic acid (concentrated) hydrogen sulfide, flammable liquids, flammable gases, copper, brass, any heavy metals |
| Nitrites | Acids |
| Nitroparaffins | Inorganic bases, amines |
| Oxalic acid | Silver, mercury |
| Oxygen | Oils, grease, hydrogen, flammable liquids, solids, gases |
| Perchloric acid | Acetic anhydride, bismuth and its alloys, alcohol, paper, wood, grease, oils |
| Peroxides, organic | Acids (organic or mineral), avoid friction, store cold |
| Phosphorus (white) | Air, oxygen, alkalis, reducing agents |
| Potassium | Carbon tetrachloride, carbon dioxide, water |
| Potassium Chlorate | Sulfuric and other acids |
| Potassium perchlorate | (see Sulfuric and other acids also chlorates) |
| Potassium Permanganate | Glycerol, ethylene glycol, benzaldehyde, sulfuric acid |
| Selenides | Reducing agents |
| Silver | Acetylene, oxalic acid, tartaric acid, ammonium compounds, fulminic acid |
| Sodium | Carbon tetrachloride, carbon dioxide, water |
| Sodium Nitrite | Ammonium nitrate and other ammonium salts |
| Sodium Peroxide | Ethyl or methyl alcohol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerin, ethylene glycol, ethyl acetate, methyl acetate, furfural |
| Sulfides | Acids |
| Sulfuric Acid | Potassium chlorate, potassium perchlorate, potassium permanganate (similar compounds of light metals, such as sodium, lithium) |
| Tellurides | Reducing agents |

# Appendix G

## SUGGESTED SHELF STORAGE PATTERN - INORGANIC




Shelf Storage Patterns are shown for segregation purposes only. You may choose to store some categories on the same shelf but segregated in different secondary containers (ie Plastic Nalgene or Glass Trays). Try to keep the groups in order so that more distance is put between groups that are less compatible. Secondary Containment should be used for all liquids in any case.

INORGANIC #9

ACIDS (except nitric Acid)

(acids are best stored in dedicated cabinets)

Store Nitric acid away from other acids unless your acid cabinet provides a separate compartment or secondary containment for Nitric Acid.

### INORGANIC KEY

1. Metals, hydrides
2. Halides, sulfates, sulfites, thiosulfates, phosphates, halogens.
3. Amides, nitrates (except ammonium nitrate), nitrites, azides, nitric acid.
4. Hydroxides, oxides, silicates, carbonates carbon.
5. Sulfides, selenides, phosphides, carbides. nitrides.
6. Chlorates, perchlorates». Perchloric acid", chlorites, Hypochlorites, peroxides», hydrogen peroxide.
7. Arsenates, cyanides, cyanates.
8. Borates, chromates, manganates, permanganates.
9. Acids (except nitric)
10. Sulfur, phosphorus, arsenic, phosphorus pentoxide".

# Appendix H

## Substances Listed in the Fourteenth Report on Carcinogens

https://ntp.niehs.nih.gov/ntp/roc/content/listed_substances_508.pdf

**Bold entries** indicate new or changed listings in the Thirteenth Report on Carcinogens.

### Known To Be Human Carcinogens

Aflatoxins
Alcoholic Beverage Consumption
4-Aminobiphenyl
Analgesic Mixtures Containing Phenacetin (see Phenacetin and Analgesic Mixtures Containing Phenacetin)
Aristolochic Acids
Arsenic and Inorganic Arsenic Compounds
Asbestos
Azathioprine
Benzene
Benzidine (see Benzidine and Dyes Metabolized to Benzidine)
Beryllium and Beryllium Compounds
Bis(chloromethyl) Ether and Technical-Grade Chloromethyl Methyl Ether
1,3-Butadiene
1,4-Butanediol Dimethanesulfonate
Cadmium and Cadmium Compounds
Chlorambucil
1-(2-Chloroethyl)-3-(4-methylcyclohexyl)-1-nitrosourea (see Nitrosourea Chemotherapeutic Agents)
Chromium Hexavalent Compounds
Coal Tars and Coal-Tar Pitches
Coke-Oven Emissions
Cyclophosphamide
Cyclosporin A
Diethylstilbestrol
Dyes Metabolized to Benzidine (Benzidine Dye Class) (see Benzidine and Dyes Metabolized to Benzidine)
**Epstein-Barr Virus** (see Viruses: Eight Listings)
Erionite
Estrogens, Steroidal
Ethylene Oxide
Formaldehyde
Hepatitis B Virus (see Viruses: Eight Listings)
Hepatitis C Virus (see Viruses: Eight Listings)
**Human Immunodeficiency Virus Type 1** (see Viruses: Eight Listings)
Human Papillomaviruses: Some Genital-Mucosal Types (see Viruses: Eight Listings)
**Human T-Cell Lymphotrophic Virus Type 1** (see Viruses: Eight Listings)
**Kaposi Sarcoma–Associated Herpesvirus** (see Viruses: Eight Listings)
Melphalan
**Merkel Cell Polyomavirus** (see Viruses: Eight Listings)
Methoxsalen with Ultraviolet A Therapy
Mineral Oils: Untreated and Mildly Treated
Mustard Gas
2-Naphthylamine
Neutrons (see Ionizing Radiation)
Nickel Compounds (see Nickel Compounds and Metallic Nickel)
Radon (see Ionizing Radiation)
Silica, Crystalline (Respirable Size)
Solar Radiation (see Ultraviolet Radiation Related Exposures)
Soots

Strong Inorganic Acid Mists Containing Sulfuric Acid
Sunlamps or Sunbeds, Exposure to (see Ultraviolet Radiation Related Exposures)
Tamoxifen
2,3,7,8-Tetrachlorodibenzo-p-dioxin
Thiotepa
Thorium Dioxide (see Ionizing Radiation)
Tobacco Smoke, Environmental (see Tobacco-Related Exposures)
Tobacco Smoking (see Tobacco-Related Exposures)
Tobacco, Smokeless (see Tobacco-Related Exposures)
o-Toluidine
**Trichloroethylene**
Ultraviolet Radiation, Broad-Spectrum (see Ultraviolet Radiation Related Exposures)
Vinyl Chloride (see Vinyl Halides [selected])
Wood Dust
X-Radiation and Gamma Radiation (see Ionizing Radiation)

## Reasonably Anticipated To Be Human Carcinogens

Acetaldehyde
2-Acetylaminofluorene
Acrylamide
Acrylonitrile
Adriamycin
2-Aminoanthraquinone
o-Aminoazotoluene
1-Amino-2,4-dibromoanthraquinone
2-Amino-3,4-dimethylimidazo[4,5-f] quinoline (see Heterocyclic Amines [Selected])
2-Amino-3,8-dimethylimidazo[4,5-f] quinoxaline (see Heterocyclic Amines [Selected])
1-Amino-2-methylanthraquinone
2-Amino-3-methylimidazo[4,5-f] quinoline (see Heterocyclic Amines [Selected])
2-Amino-1-methyl-6-phenylimidazo[4,5-b] pyridine (see Heterocyclic Amines [Selected])
Amitrole
o-Anisidine and Its Hydrochloride
Azacitidine
Basic Red 9 Monohydrochloride
Benz[a]anthracene (see Polycyclic Aromatic Hydrocarbons: 15 Listings)
Benzo[b]fluoranthene (see Polycyclic Aromatic Hydrocarbons: 15 Listings)
Benzo[j]fluoranthene (see Polycyclic Aromatic Hydrocarbons: 15 Listings)
Benzo[k]fluoranthene (see Polycyclic Aromatic Hydrocarbons: 15 Listings)
Benzo[a]pyrene (see Polycyclic Aromatic Hydrocarbons: 15 Listings)
Benzotrichloride
2,2-Bis(bromomethyl)-1,3-propanediol (Technical Grade)
Bis(chloroethyl) Nitrosourea (see Nitrosourea Chemotherapeutic Agents)
Bromodichloromethane
1-Bromopropane
Butylated Hydroxyanisole
Captafol
Carbon Tetrachloride
Ceramic Fibers (Respirable Size)
Chloramphenicol
Chlorendic Acid
Chlorinated Paraffins (C12, 60% Chlorine)
Chloroform
1-(2-Chloroethyl)-3-cyclohexyl-1-nitrosourea (see Nitrosourea Chemotherapeutic Agents)
3-Chloro-2-methylpropene
4-Chloro-o-phenylenediamine
Chloroprene
p-Chloro-o-toluidine and Its Hydrochloride
Chlorozotocin (see Nitrosourea Chemotherapeutic Agents)
Cisplatin
**Cobalt and Cobalt Compounds That Release Cobalt Ions In Vivo** (see Cobalt-Related Exposures)
Cobalt–Tungsten Carbide: Powders and Hard Metals (see Cobalt-Related Exposures)

p-Cresidine
Cumene
Cupferron
Dacarbazine
Danthron
2,4-Diaminoanisole Sulfate
2,4-Diaminotoluene
Diazoaminobenzene
Dibenz[a,h]acridine (see Polycyclic Aromatic Hydrocarbons: 15 Listings)
Dibenz[a,j]acridine (see Polycyclic Aromatic Hydrocarbons: 15 Listings)
Dibenz[a,h]anthracene (see Polycyclic Aromatic Hydrocarbons: 15 Listings)
7H-Dibenzo[c,g]carbazole (see Polycyclic Aromatic Hydrocarbons: 15 Listings)
Dibenzo[a,e]pyrene (see Polycyclic Aromatic Hydrocarbons: 15 Listings)
Dibenzo[a,h]pyrene (see Polycyclic Aromatic Hydrocarbons: 15 Listings)
Dibenzo[a,i]pyrene (see Polycyclic Aromatic Hydrocarbons: 15 Listings)
Dibenzo[a,l]pyrene (see Polycyclic Aromatic Hydrocarbons: 15 Listings)
1,2-Dibromo-3-chloropropane
1,2-Dibromoethane
2,3-Dibromo-1-propanol
1,4-Dichlorobenzene
3,3′-Dichlorobenzidine and Its Dihydrochloride
Dichlorodiphenyltrichloroethane
1,2-Dichloroethane
Dichloromethane
1,3-Dichloropropene (Technical Grade)
Diepoxybutane
Diesel Exhaust Particulates
Di(2-ethylhexyl) Phthalate
Diethyl Sulfate
Diglycidyl Resorcinol Ether
3,3′-Dimethoxybenzidine (see 3,3′-Dimethoxybenzidine and Dyes Metabolized to 3,3′-Dimethoxybenzidine)
4-Dimethylaminoazobenzene
3,3′-Dimethylbenzidine (see 3,3′-Dimethylbenzidine and Dyes Metabolized to 3,3′-Dimethylbenzidine)
Dimethylcarbamoyl Chloride
1,1-Dimethylhydrazine
Dimethyl Sulfate
Dimethylvinyl Chloride
1,6-Dinitropyrene (see Nitroarenes [Selected])
1,8-Dinitropyrene (see Nitroarenes [Selected])
1,4-Dioxane
Disperse Blue 1
Dyes Metabolized to 3,3′-Dimethoxybenzidine (3,3′-Dimethoxybenzidine Dye Class)
(see 3,3′-Dimethoxybenzidine and Dyes Metabolized to 3,3′-Dimethoxybenzidine)
Dyes Metabolized to 3,3′-Dimethylbenzidine (3,3′-Dimethylbenzidine Dye Class)
(see 3,3′-Dimethylbenzidine and Dyes Metabolized to 3,3′-Dimethylbenzidine)
Epichlorohydrin
Ethylene Thiourea
Ethyl Methanesulfonate
Furan
Glass Wool Fibers (Inhalable), Certain
Glycidol
Hexachlorobenzene
Hexachloroethane
Hexamethylphosphoramide
Hydrazine and Hydrazine Sulfate
Hydrazobenzene
Indeno[1,2,3-cd]pyrene (see Polycyclic Aromatic Hydrocarbons: 15 Listings)
Iron Dextran Complex
Isoprene
Kepone
Lead and Lead Compounds
Lindane, Hexachlorocyclohexane (Technical Grade), and Other Hexachlorocyclohexane Isomers
2-Methylaziridine

5-Methylchrysene (see Polycyclic Aromatic Hydrocarbons: 15 Listings)
4,4′-Methylenebis(2-chloroaniline)
4,4′-Methylenebis(N,N-dimethyl)benzenamine
4,4′-Methylenedianiline and Its Dihydrochloride
Methyleugenol
Methyl Methanesulfonate
N-Methyl-N′-Nitro-N-Nitrosoguanidine (see N-Nitrosamines: 15 Listings)
Metronidazole
Michler's Ketone
Mirex
Naphthalene
Nickel, Metallic (see Nickel Compounds and Metallic Nickel)
Nitrilotriacetic Acid
o-Nitroanisole
Nitrobenzene
6-Nitrochrysene (see Nitroarenes [Selected])
Nitrofen
Nitrogen Mustard Hydrochloride
Nitromethane
2-Nitropropane
1-Nitropyrene (see Nitroarenes [Selected])
4-Nitropyrene (see Nitroarenes [Selected])
N-Nitrosodi-n-butylamine (see N-Nitrosamines: 15 Listings)
N-Nitrosodiethanolamine (see N-Nitrosamines: 15 Listings)
N-Nitrosodiethylamine (see N-Nitrosamines: 15 Listings)
N-Nitrosodimethylamine (see N-Nitrosamines: 15 Listings)
N-Nitrosodi-n-propylamine (see N-Nitrosamines: 15 Listings)
N-Nitroso-N-ethylurea (see N-Nitrosamines: 15 Listings)
4-(N-Nitrosomethylamino)-1-(3-pyridyl)-1-butanone (see N-Nitrosamines: 15 Listings)
N-Nitroso-N-methylurea (see N-Nitrosamines: 15 Listings)
N-Nitrosomethylvinylamine (see N-Nitrosamines: 15 Listings)
N-Nitrosomorpholine (see N-Nitrosamines: 15 Listings)
N-Nitrosonornicotine (see N-Nitrosamines: 15 Listings)
N-Nitrosopiperidine (see N-Nitrosamines: 15 Listings)
N-Nitrosopyrrolidine (see N-Nitrosamines: 15 Listings)
N-Nitrososarcosine (see N-Nitrosamines: 15 Listings)
o-Nitrotoluene
Norethisterone
Ochratoxin A
4,4′-Oxydianiline
Oxymetholone
Pentachlorophenol and By-products of Its Synthesis
Phenacetin (see Phenacetin and Analgesic Mixtures Containing Phenacetin)
Phenazopyridine Hydrochloride
Phenolphthalein
Phenoxybenzamine Hydrochloride
Phenytoin and Phenytoin Sodium
Polybrominated Biphenyls
Polychlorinated Biphenyls
Procarbazine and Its Hydrochloride
Progesterone
1,3-Propane Sultone
β-Propiolactone
Propylene Oxide
Propylthiouracil
Reserpine
Riddelliine
Safrole
Selenium Sulfide
Streptozotocin (see Nitrosourea Chemotherapeutic Agents)
Styrene
Styrene-7,8-oxide
Sulfallate

Tetrachloroethylene
Tetrafluoroethylene
Tetranitromethane
Thioacetamide
4,4′-Thiodianiline
Thiourea
Toluene Diisocyanates
Toxaphene
2,4,6-Trichlorophenol
1,2,3-Trichloropropane
Tris(2,3-dibromopropyl) Phosphate
Ultraviolet Radiation A (see Ultraviolet Radiation Related Exposures)
Ultraviolet Radiation B (see Ultraviolet Radiation Related Exposures)
Ultraviolet Radiation C (see Ultraviolet Radiation Related Exposures)
Urethane
Vinyl Bromide (see Vinyl Halides [Selected])
4-Vinyl-1-cyclohexene Diepoxide
Vinyl Fluoride (see Vinyl Halides [Selected])

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# Appendix I
# Reproductive Toxins

| CHEMICAL NAME | CAS NUMBER |
|---|---|
| Acetohydroxamic acid | 546-88-3 |
| Actinomycin D | 50-76-0 |
| All-trans retinoic acid | 302-79-4 |
| Alprazolamm | 8981-97-7 |
| Amikacin sulfate | 3983-55-5 |
| Aminoglutethimide | 125-84-8 |
| Aminoglyosides | |
| Aminopterin | 54-62-6 |
| Angiotensin converting enzyme (ACE inhibitors) | |
| Anisindione | 117-37-3 |
| Aspirin | 50-78-2 |
| Barbiturates | |
| Benomyl | 17804-35-2 |
| Benzphetamine hydorchloride | 5411-22-3 |
| Benzodiazepines | |
| Bischloroethyl nitrosurea (BCNU) (carmustine) | 154-93-8 |
| Bromoxynil | 1689-84-5 |
| Butabarbital sodium | 143-81-7 |
| 1,4-Butanediol dimethylsulfonate (busulfan) | 55-98-1 |
| Carbon disulfide | 75-15-0 |
| Carbon monoxide | 630-08-0 |
| Carboplatin | 41575-94-4 |
| Chenodiol | 474-25-9 |
| Chlorcyclizine hydrochloride | 1620-21-9 |
| Clorambucil | 305-03-3 |
| Chlordecone (kepone) | 143-50-0 |
| Chlordiazepoxide | 58-25-3 |
| Chlordiazepoxide hydorchloride | 438-41-5 |
| 1-(2-Chloroethyl)-3-cyclohexyl-1-nitrosourea (CCNU) | 13010-47-4 |
| Clomiphene citrate | 50-41-9 |
| Chlorazepate dipotassium | 57109-90-7 |
| Cocaine | 50-36-2 |
| Colchicine | 64-86-8 |
| Conjugated estrogens | |
| Cyanazine | 21715-46-2 |
| Cycloheximide | 66-81-9 |
| Cyclophosphamide (anhydrous) | 50-18-0 |
| Cyclophosphamide (hydrated) | 6055-19-2 |
| Cyhexatin | 13121-70-5 |
| Cytarabine | 147-94-4 |
| Danazol | 17230-88-5 |
| Daunorubicin hydrochloride | 23541-50-6 |
| Demeclocycline hydrochloride (internal use) | 64-73-3 |
| Diazepam | 439-14-5 |

| | |
|---|---|
| Dicumarol | 66-76-2 |
| Diethylstilbestrol (DES) | 56-53-1 |
| Dinocap | 39300-45-3 |
| Dinoseb | 88-85-7 |
| Diphenylhydantoin (phenytoin) | 57-41-0 |
| Doxycycline (internal use) | 564-25-0 |
| Doxycycline calcium (internal use) | 94088-85-4 |
| Doxycycline hyclate (internal use) | 24390-14-5 |
| Doxycycline monohydrate (internal use) | 17086-28-1 |
| Ergotamine tartrate | 379-79-3 |
| Ethylene glycol monoethyl ether | 110-80-5 |
| Ethylene glycol monomethyl ether | 109-86-4 |
| Ethylene glycol monoethyl ether acetate | 111-15-9 |
| Ethylene glycol monomethyl ether acetate | 110-49-6 |
| Ethylene thiourea | 96-45-7 |
| Etoposide | 33419-42-0 |
| Etratinate | 54350-48-0 |
| Fluorouracil | 51-21-8 |
| Fluoxymesterone | 76-43-7 |
| Flurazepam hydorchloride | 1172-18-5 |
| Flutamide | 13311-84-7 |
| Halazepam | 23093-17-3 |
| Hexachlorobenzene | 118-74-1 |
| Ifosfamide | 3778-73-2 |
| Iodine-131 | 24267-56-9 |
| Isotretinoin | 4759-48-2 |
| Lead | |
| Lithium carbonate | 554-13-2 |
| Lithium citrate | 919-16-4 |
| Lorazapam | 846-49-1 |
| Lovastatin | 75330-75-5 |
| Medroxyprogesterone acetate | 71-58-9 |
| Megestrol acetate | 595-33-5 |
| Melphalan | 148-82-3 |
| Menotropins | 9002-68-0 |
| Meprobamate | 57-53-4 |
| Mercaptopurine | 6112-76-1 |
| Methacycline hydorchloride | 6112-76-1 |
| Methimazole | 60-56-0 |
| Methotrexate | 59-05-2 |
| Tethotrexate sodium | 15475-56-6 |
| Methyl bromide | 74-83-9 |
| Methyl mercury | 22967-92-6 |
| Methyltestosterone | 58-18-4 |
| Midazolam hydrochloride | 59467-96-8 |
| Minocycline hydrochloride (internal use) | 13614-98-7 |
| Misoprostol | 62015-39-8 |
| Mitoxantrone hydrochloride | 70476-82-3 |
| Nafgarelin acetate | 86220-42-0 |
| Neomycon sulfate (internal use) | 1405-10-3 |
| Netilmicin sulfate | 56391-57-2 |
| Nicotine | 54-11-5 |

| | |
|---|---|
| Nitrogen mustard (mechlorethamine) | 51-75-2 |
| Nitrogen mustard hydorchloride | 55-86-7 |
| Norethisterone (norethindrone) | 68-22-4 |
| Norethisterone acetate (norethindrone acetate) | 51-98-9 |
| Norethisterone (norethindrone)/ethinyl estradiol | 68-22-4/57-63-6 |
| Norethisterone (norethindrone)/mestranol | 68-22-4/72-33-3 |
| Norgrestrel | 6533-00-2 |
| Oxazepam | 604-75-1 |
| Oxytetracycline (internal use) | 79-57-2 |
| Oxytetracycline hydrochloride (internal use) | 2058-46-0 |
| Paramethadione | 115-67-1 |
| Penicillamine | 52-67-5 |
| Phenacemide | 63-98-9 |
| Phenprocoumon | 435-97-2 |
| Pipobroman | 54-91-1 |
| Plicamycin | 18378-89-7 |
| Polychlorinated biphenyls | |
| Procarbazine hydrochloride | 366-70-1 |
| Propylthiouracil | 51-52-5 |
| Ribarvirin | 36791-04-5 |
| Secobarbital sodium | 309-43-3 |
| Streptomycin sulfate | 3810-74-0 |
| Tamoxifen citrate | 54965-24-1 |
| Temazepam | 846-50-4 |
| Testosterone cyoionate | 846-50-4 |
| Testosterone enanthate | 315-37-7 |
| 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) | 1746-01-6 |
| Tetracycline (internal use) | |
| Thalidomide | 50-35-1 |
| Thioguanine | 154-42-7 |
| Tobacco smoke (primary) | |
| Tobramycin sulfate | 49842-07-1 |
| Toluene | 108-88-3 |
| Triazolam | 28911-01-5 |
| Trilostane | 13647-35-3 |
| Uracil mustard | 66-75-1 |
| Urofollitropin | 26995-91-5 |
| Valproate (valproic acid) | 99-66-1 |

Source: https://www.chemistry.ucla.edu/sites/default/files/safety/doc/REPRODUCTIVE_TOXINS.pdf

# Female and Male Reproductive Toxins

| CHEMICAL NAME | CAS NUMBER |
|---|---|
| **FEMALE REPRODUCTIVE TOXINS** | |
| Anabolic steroids | |
| Carbon disulfide | 75-15-0 |
| Cocaine | 50-36-2 |
| Cyclophosphamide (anhydrous) | 50-18-0 |
| Cyclophosphamide (hydrated) | 6055-19-2 |
| Ethylene oxide | 75-21-8 |
| Lead | |
| Tobacco smoke (primary) | |
| Uracil mustard | 66-75-1 |
| **MALE REPRODUCTIVE TOXINS** | |
| Benomyl | 17804-35-2 |
| Carbon disulfide | 75-15-0 |
| Colchicine | 64-86-8 |
| Cyclophosphamide (anyhdrous) | 50-18-0 |
| Cyclophosphamide (hydrated) | 6055-19-2 |
| 1,2-Dibromo-3-chloropropane (DBCP) | 96-12-8 |
| m-Dintrobenzene | 99-65-0 |
| o-Dintrobenzene | 528-29-0 |
| p-Dintrobenzene | 100-25-4 |
| Dinoseb | 88-85-7 |
| Ethylene glycol monoethyl ether | 110-80-5 |
| Ethylene glycol monomethyl ether | 109-86-4 |
| Lead | |
| Nitrofurantoin | 67-20-9 |
| Tobacco smoke (primary) | |
| Uracil mustard | 66-75-1 |

Lists taken from:
http://www.hawaii.edu/ehso/lab/list.htm

Source: https://www.chemistry.ucla.edu/sites/default/files/safety/doc/REPRODUCTIVE_TOXINS.pdf

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# Appendix J

## Common Chemicals with Potential Reactive Concerns

**A. COMMON EXPLOSIVES**

1. **Acetylenic Compounds**
   a. Copper(I) Acetylide
   b. Ethoxyacetylene
   c. Propyne
   d. Propyne Peroxide
   e. Disilver Acetylide
2. **Azides**
   a. Benzenesulphonyl Azide
   b. Carbonyl Diazide
   c. Silver Azide
   d. Lead(II) Azide
3. **Azo Compounds**
   a. Diazinine
   b. Azomethane
   c. Diazomethane
4. **Chlorite/Chlorate/Perchlorate Compounds**
   a. Silver Chlorite
   b. Silver Chlorate
   c. Potassium Chlorite
   d. Lead Tetrachloride
5. **Fulminates**
   a. Silver Fulminate
   b. Mercury(II) Fulminate
   c. Sodium Fulminate
   d. Copper(II) Fulminate
6. **Nitro Compounds and Nitrate Esters**
   a. Nitromethane
   b. Nitroglycerine
   c. Nitrocellulose
   d. Trinitrotoluent
7. **Other Nitrogen Containing (Diazonium Salts, Nitroso Compounds, Amides, Nitrides)**
   a. Silver Amide
   b. Silver Nitride
   c. Nitrosylcyanide
   d. Disulfur Dinitride

8. Picrates
    a. Picric Acid
    b. Lead Picrate
9. Peroxides
    a. Diacetyl Peroxide
    b. Zinc Peroxide
    c. Dimethyl Peroxide
10. Strained Ring Compounds
    a. Benzvalene
    b. Prismane
11. Polymerizable Compounds
    a. Acrylic Acid
    b. Ethylene
    c. Butadiene
    d. Styrene
    e. Vinyl Chloride
    f. Cyclopentadiene

B. WATER REACTIVE CHEMICALS
1. Alkali Metals (e.g., lithium, sodium)
2. Organometallic Compounds (e.g., tetramethylaluminum)
3. Halides (e.g., acetyl chloride, titanium tetrachloride)
4. Hydrides (e.g., diborane, sodium hydride)
5. Peroxides (e.g., sodium peroxide)
6. Carbides (e.g., calcium carbide)
7. Oxides (e.g., sodium oxide)
8. Phosphides (e.g., aluminum phosphide)
9. Antydrides (e.g., acetic anhydride)
10. Other Hydrolyzable Compounds (e.g, chlorosulfonic acid, aluminum tribromide)

C. STRONG OXIDIZERS
1. Fluorine
2. Ozone
3. Chlorine
4. Persulfates
5. Peroxides
6. Peroxy Acids
7. Perchlorates
8. Dichromates
9. Chromates
10. Permanganates
11. Hypochlorites
12. Nitrates
13. Nitrites
14. Nitrous Oxide
15. Liquid Oxygen

16. Liquid Air
17. Chlorosulfonic Acid
18. Nitromethane
19. Hypochlorites
20. Chlorates

D. STRONG REDUCERS
1. Finely Divided Metals
2. Hydrazine
3. Hydrides
4. Hydrogen
5. Aniline
6. Sodium
7. Lithium
8. Potassium
9. Butadiene
10. Acetylides

E. COMMON REACTIVE CHEMICALS
1. Ammonium Nitrate
2. Ammonium Perchlorate
3. Benzoyl Peroxide
4. 2Butanone Peroxide
5. tertButyl Hydroperoxide
6. tertButyl Peroxide
7. Calcium Hydride
8. Cesium
9. Chromium Nitrate
10. Chromium Trioxide
11. Diborane
12. Diethylaluminum Hydride
13. Dimethyl Phosphine
14. mDinitrobenzene
15. pDinitrobenzene
16. Divinylbenzene
17. Germane
18. Hydrazine
19. Hydrazine Hydrate
20. Hydrazinium Chlorate
21. Hydrazinium Chlorite
22. Hydrogen Peroxide (concentrated)
23. Hydroxylammonium Nitrate
24. Lauroyl Peroxide
25. Lithium Acetylide
26. Magnesium Perchlorate
27. Mercury (I) Perchlorate
28. Nitroethane

29. **Nitromethane**
30. **Nitropropane**
31. **oNitrotoluene**
32. **pNitrotoluene**
33. **Peroxides**
34. **Phosphorus (red)**
35. **Picric Acid**
36. **Potassium**
37. **Trinitrotoluene**

**This appendix does not represent a comprehensive list of reactive chemicals. Users should always consult information furnished by the chemical manufacturer or supplier as well as other standard references outlined in the Chemical Hygiene Plan.**

# Appendix K

**RESEARCH EMERGENCY RESPONSE PLAN**

This section provides general information on (a) fire-related, (b) water, and (c) spill emergency response procedures in the Thomas Cole Science and Research Center and McPheeters Dennis Building.

The following individuals comprise the Chemical Hygiene Committee (CHC) as of the date of the current revision. The CHC is also the Emergency Response Team for all research buildings.

| Title | Name | Contacts |
|---|---|---|
| Laboratory Safety Manager | K. Emmanuel Fangman | kfangman@cau.edu x6974 |
| Research and Sponsored Programs Representative | Carol Johnson | cjohnson@cau.edu x6992 |
| Director of Emergency Management, Chief of Police | Chief Debra Williams | dwilliams@cau.edu x6412 |
| Chair of Chemistry Department | Dr. Conrad Ingram | cingram@cau.edu x6898 |
| Chair of Biology Department | Dr. Winfred Harris | wharris@cau.edu x8138 |
| Physics Department Representative | Terry Harrington | tharrington@cau.edu X8400 |
| Center for Cancer Research and Therapeutic Development (CCRTD) Representative | Tony Griffin | tgriffin@cau.edu x6826 |
| Compliance Office Representative | Dr. Gayle Watts | gwatts@cau.edu x6643 |
| Director of Facilities | Morry Alls | malls@cau.edu x6670 |
| Researcher or Admin from Chemistry Department | Dr. Ishrat Khan | ikhan@cau.edu x6847 |
| Researcher or Admin from Biology Department | Dr. Akm Hussain | ahussain@cau.edu x8941 |

In the event of an emergency in (or affecting) the Research Center, or involving chemicals on campus, team members should be called.

Responsibilities of the Emergency Response Team

(1) Inform personnel about the location of and training in the use of emergency equipment, including safety showers, eyewashes, and fire extinguishers.

(2) Coordinate with Public Safety and Facilities to ensure emergency equipment is in working order. (3) Work with Public Safety to ensure synergy with the University emergency plan.

(4) Work with Public Safety to ensure proper evacuation protocols are followed.

**Fire and Fire-Related Emergencies**

If there is a fire or fire-related emergency, including a FIRE ALARM, hazardous gas leaks, hazardous material or
LARGE flammable liquid spill, smoke, or odor of burning, immediately follow these procedures:

- √ Do not assume the fire alarm is false.
- √ Use the fire extinguisher if you are trained to do so, and feel comfortable in extinguishing small fires
- √ Otherwise, Call x8911
- √ Evacuate the building using the stairs
- √ Assemble at pre-determined point outside building
- √ Quickly account for colleagues and report any missing
- √ Do not re-enter building until fire/emergency personnel give permission

**Basic Steps for Emergency Response**

High Hazard Emergency

If emergency is:

a. Immediately dangerous to life and health (IDLH)
b. Involves a large area, major injury to personnel
c. Is a threat to personnel and the public
d. Involves radioactive material
e. Involves an infectious agent, or involves large amounts of highly toxic, corrosive, or reactive hazardous material, then proceed with **PLAN A** (High hazard emergencies)
f. Neither a,b,c,d,or e, then proceed with **PLAN B** (Low Hazard Emergencies)

**Plan A (High Hazard Emergencies)**

√ Isolate the area, if possible, and evacuate

√ Keep others out of the area and take action to protect life and limb

√ CALL X8911, identifying the exact location of the emergency, any injuries, and any hazardous materials involved, if known

√ Follow evacuation procedures

**Plan B (Low Hazard Emergencies)**

√ For minor injuries, report to CAU's Health Center, or local emergency room for treatment

√ All injuries which occur on the job must be treated at the Health Center or hospital

√ A small spill (less than one gallon) is the lab worker's responsibility

√ Spill kits (absorbents) are available from the Chemistry and Biology Departments or Mr. Paul Abrahams (x6974)

√ **Report all emergencies** to Public Safety, LS/CHC and the LD/PI

**If Clothing is on Fire**

Stop moving

Drop to the floor

Roll on the floor to extinguish flames

Wash with an emergency shower

Seek medical attention, if necessary

Immediately report incident to Public Safety, LS/CHC and the LD/PI
LM/PI

**If Chemical gets in Eyes or on Skin**

(1) Remove contact lenses (if applicable) and rinse affected area for at least 15 minutes in emergency eyewash or shower

(2) Remove contaminated clothing. Call an ambulance if necessary

(3) Collect SDS for chemicals involved, and provide these to emergency response personnel

**Mercury Spills**

Broken Thermometers or small (5mL) mercury spills

(a) Collect and consolidate all glass pieces, plus visible mercury, using a piece of cardboard or plastic.

(b) Place in a puncture-proof, airtight container (labeled "universal waste mercury"), and temporarily store in the

g. Satellite Accumulation Area (SAA)

h. Have universal waste moved to more storage in Sciences Research Center (SRC)'s hazardous waste room

(c) If powdered sulfur (or a mercury spill-kit) is available cover small mercury droplets with some and place residue in a puncture-proof, airtight container (labeled "universal waste mercury")

(d) Temporarily store in the SAA prior to move to SRC's hazardous waste room

Larger Spills

Or, for any spill for which you believe unrecovered mercury might remain, contact a member of CRC's Emergency Response Team for clean-up instructions, or assistance

**Complete Spill Response Kit**

Work areas that have chemicals should include the following items at a minimum:

(1) Laboratory Coats
(2) Safety glasses
(3) Disposable vinyl gloves
(4) Absorbent (e.g., spill pillows, vermiculite, etc.)

**Water Emergencies**

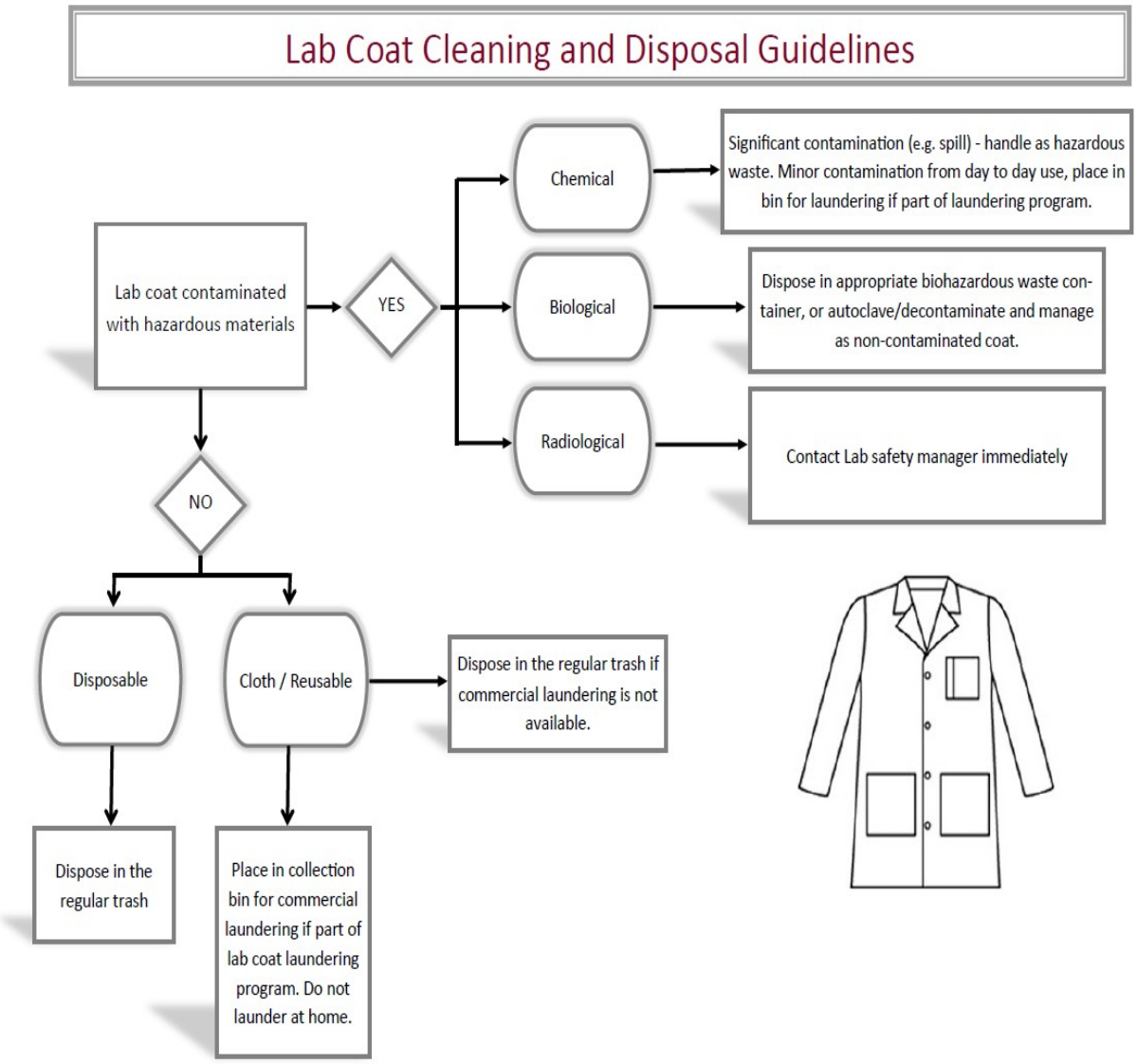
If water, or suspected water, accumulates inside a laboratory during normal working hours, evacuate the lab and contact SRC's Emergency Response Team (SRCERT) and Facilities. The SRCERT member(s) will conduct a hazard assessment of flooded areas prior to entry by Facilities. If necessary and safe to do so, Facilities will de-activate any electrical equipment and outlets in the affected areas, before attempting to stop the flow of water in the laboratory. If the water is not considered hazardous or bio-hazardous, Facilities shall initiate water removal activities.

If water, or suspected water, accumulates inside a laboratory outside of normal working hours, Public Safety will contact a member of SRCERT and Facilities. The SRCERT member(s) will conduct a hazard assessment of flooded areas prior to entry by Facilities. If necessary and safe to do so, Facilities will de-activate any electrical equipment and outlets in the affected areas, before attempting to stop the flow of water in the laboratory. If the water is not considered hazardous or bio-hazardous, Facilities shall initiate water removal activities**.**

If the water is assessed as being hazardous, SRCERT shall attempt to clean it up, using mops, spill control pillows, etc. If SRCERT is unable to safely clean up the hazardous water, Public Safety will be notified to call remediation contractors or other authorities.

SRCERT and Facilities are responsible for assessing areas affected by a flood for re-occupancy. The area shall be assessed to ensure that all wall and floor openings are closed up, tools and equipment have been removed from the area, and building systems (e.g., ventilation, fire alarm, fire suppression) have been restored.

# APPENDIX L


Lab Coat Cleaning and Disposal Guidelines
Lab coat contaminated with hazardous materials
YES
Chemical
Significant contamination (e.g. spill) - handle as hazardous waste. Minor contamination from day to day use, place in bin for laundering if part of laundering program.
Biological
Dispose in appropriate biohazardous waste container, or autoclave/decontaminate and manage as non-contaminated coat.
Radiological
Contact Lab safety manager immediately
NO
Disposable
Cloth / Reusable
Dispose in the regular trash if commercial laundering is not available.
Dispose in the regular trash
Place in collection bin for commercial laundering if part of lab coat laundering program. Do not launder at home.

# APPENDIX M

## Hazardous waste label (Satellite Accumulation Area)

**HAZARDOUS WASTE - SATELLITE ACCUMULATION**

CLARK ATLANTA UNIVERSITY - EPA ID #GAD065325177

Lab Room: Contact Person:

Waste ID/Log #: Container size:

Waste Description/ Chemical Composition:

Hazardous properties (circle all that apply or add): Flammable-Corrosive-Toxic-Reactive-Explosive-Pyrophoric-Irritant-Oxidizer-Carcinogenic-

Contact LAB Safety Manager at x6974 for questions or pickup.

# B. AWARENESS OF Clark Atlanta University's CHEMICAL HAZARDS (Right to Know)

## Awareness of Chemical Hazards at CAU

In 1988, the "Georgia Public Employee Hazardous Chemical Protection and Right to Know Act" was passed. This Right-to-Know (RTK) Law ensures that the hazards of working with and being exposed to chemicals in the workplace are communicated to all employers and employees.

Employees of CAU, through the RTK Law, have the right to know the properties and potential safety and health hazards of substances to which they may be exposed. This knowledge is essential in reducing the risk of occupational illness and injury.

### Goals of the Law

(1) To help employees reduce the risks involved in working with hazardous materials;
(2) To reduce the incidence and cost of illness and injury resulting from hazardous substances;
(3) To transmit vital information to employees about the hazards of substances in the work place; and
(4) To promote public employer's need and right to know

### In Accordance with the Law, CAU Employers and Employees Must be Aware of:

(1) Hazard Determination
(2) Safety Data Sheets (SDS) (3) Labels
(4) Information and Training
(5) The Written Right-to-Know Plan

#### Hazard Determination

A chemical is a physical hazard if there is scientifically valid evidence that it is flammable, a compressed gas, an explosive, etc.

A chemical is a health hazard if there is statistically significant evidence, based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. Classes of health hazards include: (a) carcinogens, (b) reproductive toxins, and (c) neurotoxins.

#### Safety Data Sheets (SDS)

The SDS is probably the most effective way of communicating the hazards of working with chemicals. At a minimum, an SDS contains the following information on a chemical: (1) its full name, (2) its physical characteristics, (3) physical and chemical hazards, (4) exposure limits (if any), (5) safe handling procedures, (6) emergency and first aid procedures, and (7) name and address of its manufacturer.

a) All chemicals should be accompanied by an SDS from the manufacturer.

b) All chemicals must have an SDS.

- All labs with chemicals must have an SDS file readily accessible to all CAU employees.

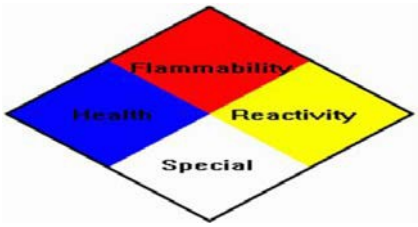
## Labeling

The Label is another vehicle for communicating the hazards of chemicals to CAU employees. All chemicals purchased by CAU must be labeled by the manufacturer. The label should contain (a) the full name of the chemical, (b) appropriate hazard warnings, and (c) the name and address of the manufacturer or vendor.

If a chemical is transferred to another container, the container must be labeled with: (a) the chemical name, (b) hazard warnings, (c) name and address of the chemical manufacturer/vendor.

### National Fire Protection Association (NFPA) Labels

The NFPA color-coded label indicates the following hazards posed by chemicals. The rating is from 0 to 4, with "0" indicating no appreciable hazard; and "4" an extreme hazard.




(a) Flammability (Red), (b) Health (Blue), (c) Reactivity (Yellow), (d) Special Information (White)

### Information and Training

Employers are required to provide employees with information and training on hazardous chemicals in the work area. The training shall include: methods and observations used to detect the release of chemicals, physical and health hazards, SDS, labels, and personal protective equipment to be used when in close proximity to chemicals.

The type of information and training will depend on the level of chemical exposure anticipated for a CAU employee.

Non-Science Workers in Science Buildings: All workers in the science research buildings must receive a mandatory safety awareness training within two weeks of hire. The training should educate them about the location and hazards of chemicals present in the building, ways to protect themselves from chemical exposure, and what to do in the event of science building emergencies.

Public Safety, Facilities, Chemical Receiving Personnel: Information and Training on aspects of *CAU's Chemical Hygiene Plan*, including: the presence of a *Chemical Hygiene Plan*; hazards of chemicals; protection from exposure to chemicals; SDS; NFPA and other labels; potential emergencies and actions taken during emergencies.

All Employees (and students) who use Chemicals on a Regular Basis: Chemical Hygiene Training is offered within two weeks of hire. Refresher training: every year following initial training. Also, on-line Chemical Hygiene Training is offered through the Division of Research and Sponsored Programs.

## Documentation of Training

All employee training (Awareness or Chemical Hygiene), is performed and documented by the Lab Safety/Chemical Hygiene Coordinator (or his designee) and retained for five (5) years.