

SUBJECT: Chemical Hygiene Plan (CHP): Research Service

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1. PURPOSE

- a) The Chemical Hygiene Plan (CHP) establishes procedures and responsibilities for the handling and use of hazardous materials in the laboratory.
 - i) This plan includes procedures for all laboratory personnel as well as other workers (office, custodial, maintenance, and contractor personnel) whose duties may require them to enter a laboratory where hazardous materials are used or stored.
 - ii) The purpose of this plan is to:
 - 1) Minimize all chemical exposures.

- 2) Provide information for proper evaluation of risks.
 - 3) Provide information on ventilation systems in laboratories.
 - 4) Provide a plan that complies with the OSHA Laboratory Standard.
 - 5) Ensure that permissible exposure limits (PEL) and threshold limit values (TLV) are observed.
- b) This plan addresses required elements in the OSHA Laboratory Standard.
- i) Assignment of responsibilities
 - ii) Guidelines for the use of hazardous chemicals
 - iii) Evaluation and maintenance of safety equipment
 - iv) Communication of chemical hazards
 - v) Prior approval for hazardous operations
 - vi) Guidelines for emergency situations
 - vii) Procedures for the disposal of hazardous materials
 - viii) Medical surveillance

2. **DEFINITIONS:**

- ACGIH** American Conference of Government Industrial Hygienists
- ACOS/R** Associate Chief of Staff for Research
- AED** Automated External Defibrillator
- AL** Action level: If an employee's exposure to a chemical reaches or exceeds the exposure limit preceded by an "AL", the employee should, depending on type of exposure, be referred to occupational health for evaluation.
- AMMS** Acquisitions and Material Management Service
- AO/R** Administrative Officer for Research
- BSC** Biological Safety Cabinet
- BIS** Biomedical Instrumentation Service
- C** Ceiling Value: An employee's exposure to a chemical in which the exposure is preceded by a "C" shall at no time exceed that exposure limit. If instantaneous monitoring is not feasible, then the ceiling shall be assessed as a 15-minute time-weighted-average exposure, which shall not be exceeded by the employee during the workday.
- CAP** College of American Pathologists (Laboratory inspection agency)
- CFR** Code of the Federal Regulations
- CHO** Chemical Hygiene Officer: These duties have been assigned to the Industrial Hygiene Officer.
- CHP** Chemical Hygiene Plan: A plan that outlines proper procedures and practices for working with hazardous chemicals in a laboratory.
- DOT** Department of Transportation
- ECOMP** Employees' Compensation Operations & Management Portal
- EOCC** Environment of Care Committee (Medical Center Safety Committee)
- EMS** Environmental Management Service
- EPA** Environmental Protection Agency

EPA-regulated Chemical Waste

A chemical or mixture of chemicals or natural products (a) that has any of the following properties: toxic, corrosive, ignitable (combustible or flammable), explosive or reactive; (b) that may cause personal

injury, illness, or significant environmental harm; or (c) that is specifically regulated by the Environmental Protection Agency (EPA) in CFR 40, Part 261.

Fire Extinguisher Definitions

"**ABC**" indicates that the extinguisher is designed to extinguish class A, B, and C fires.

Class A Fires- consist of solid combustible materials that are not metals, e.g., wood, paper, cloth, trash, and/or plastics.

Class B Fires - consist of any non-metal in a liquid state, on fire, e.g., gasoline, oil, grease, acetone.

Class C Fires - consist of any energized electrical equipment. As long as the instrument is "plugged in," it would be considered a class C fire.

Class D Fires - consist of metals (e.g., potassium, sodium, aluminum, magnesium) Class D fires require special extinguishers.

GEMS Green Environmental Management System

General Waste (Non-hazardous): All perishable and non-perishable solid waste materials including animal and vegetable waste resulting from food preparation; combustible waste such as paper, rags, cartons, wood, furniture, rubber, plastics, yard trimmings, leaves, metal cans, glass objects, ashes; and other similar materials.

HEFP Healthcare Environment and Facilities Programs

HM Hazardous Materials

HMT Hazardous Materials Table (CFR 49 part 172)

HW Hazardous Waste

IACUC Institutional Animal Care and Use Committee

IATA International Air Transport Association

IBC Institutional Biosafety Committee

IDLH Immediately Dangerous to Life and Health: The concentration of a chemical that is immediately dangerous to life and health. The area should be evacuated if this concentration is reached.

IRB Institutional Review Board

IHO Industrial Hygiene Officer

JC Joint Commission

LEL Lower Explosion Limit: Lowest concentration or temperature at which a chemical may explode.

LFPM Linear Feet per Minute: Units used to express the Face Velocity of a hood.

Ltd Qty Limited Quantity

NFPA National Fire Protection Association

NRC Nuclear Regulatory Commission

OSHA Occupational Safety & Health Administration

PCA Perchloric Acid

PEL Permissible Exposure Limit: The concentration of a chemical that an employee can be exposed to over an 8-hour workday without harmful effects. An employee's exposure to a chemical during any 8-hour work shift should not exceed the exposure limit mandated by OSHA for that chemical.

PI Principal Investigator

PPE Personal Protective Equipment

PSL Patient Service Line

Radioactive Waste: Liquid, solid, or gaseous waste which contains or is contaminated with a radioactive material. This type of waste is regulated by the U.S. Nuclear Regulatory Commission in CFR 10.

RCRA Resource Conservation and Recovery Act

RDC Research and Development Committee

Regulated Waste (biohazardous, infectious and pathological waste). This includes the following:

Blood - human blood and blood products, including serum, plasma, and other blood components, which are in containers or which drip freely from blood-soaked waste items.

Laboratory waste - cultures and stocks of infectious agents; discarded contaminated items used to inoculate, transfer, or otherwise manipulate cultures or stocks of infectious agents; wastes from the production of biological agents; and discarded live and attenuated vaccines.

Regulated human body fluids - cerebrospinal fluid, synovial fluid, pleural peritoneal fluid, pericardial fluid, and amniotic fluid, which are in containers or which fluid drip freely from body fluid-soaked solid waste items.

Sharps - all discarded items that can induce subdermal inoculation of infectious agents, including items derived from human or animal patient care, blood banks, laboratories, mortuaries, and research facilities. Sharps at least include glass or rigid plastic containers of materials defined as infectious such as, needles, scalpels, and pipettes.

Research animal waste - waste of animals that have been exposed to infectious agents that can produce infection or infectious disease in humans.

RQ Restricted Quantity

RSO Radiation Safety Officer

SDS Safety Data Sheet; previously MSDS for Material Safety Data Sheet

SRS Subcommittee on Research Safety

STEL Short Term Exposure Limit: The concentration of a chemical that an employee can be exposed to for a short time, usually 15 minutes, without harmful effects. An employee's exposure to a chemical during any 15-minute period work shift period should not exceed the exposure limit mandated by OSHA for that chemical.

TCLP Toxic Characterization Leaching Procedure: An assay that determines the amounts of heavy metals that can be leached from a substance or material under specific conditions. Materials that release metal concentrations exceeding the non-toxic range are considered hazardous.

TLV Threshold Limit Values: Recommended exposure limits for chemicals published by the ACGIH.

TWA Time Weighted Average: An "8-hour time-weighted average" is defined as an employee's exposure to any chemical averaged over an 8-hour period.

WOC Without Compensation Employee

3. **RESPONSIBILITIES**

- a) Ensure compliance with the CHP: Chief Executive Officer; ACOS/Research; Safety Department; Industrial Hygiene Officers; Research Compliance Officers; Collateral Duty Safety Officer; Supervisory Staff/Principal Investigators.
- b) Principal Investigators are accountable for all research activities in their assigned areas including scientific, management, and administrative duties.
 - i) Principal Investigators ensure that all research activities performed by their staff are consistent with their approved IACUC, IRB, and SRS approved protocols.
 - ii) As leaders of research teams, Principal Investigators shall ensure that all safety principles and rules of conduct are followed within research laboratory areas. They shall set good examples by establishing safe

- work practices, monitoring compliance, and implementing effective corrective actions. In addition, Principal Investigators shall identify laboratory-specific hazards and provide training on all procedures performed within their area of responsibility, as well as on safety precautions for each research protocol.
- iii) They shall ensure that research laboratory staff is adequately trained, have appropriate scopes of practice, and are competent in the performance of assigned duties. The Principal Investigators are also responsible for the safe use of engineering controls, such as chemical fume hoods and BSCs, and the use of appropriate PPE by research laboratory staff.
 - iv) Principal Investigators shall ensure that a current inventory of all hazardous chemicals is readily available for research laboratory staff. They are responsible for compliance with the Research CHP and for providing access to SDSs.
 - v) Principal Investigators shall notify facility Safety staff and an SRS representative of all occupational injuries or illnesses incurred by staff (VA and non-VA personnel) under their supervision and ensure that all incidents are entered into the facilities accident reporting system (ECOMP). [Note: All injuries that occur on campus, both work-related and non-work related, by VA and non-VA staff as well as contractors and visitors, are required to be documented in ECOMP.]
- c) Responsibilities of laboratory employees and other employees/visitors entering a laboratory:
- i) Visitors may read Hazards in the Research Service document and will sign the Visitor's Log before being escorted into a secure area within the Research Service.
 - ii) Non-research VA employees and contractors who need badge access must complete biosecurity training and read the Hazards in the Research Service document before entry into any secure research area.
 - iii) Employees shall:
 - 1) Be aware of hazards and disposal procedures for each chemical before initial use.
 - 2) Understand the hazards related to their position functions and take proper precautions, i.e., use appropriate PPE when handling hazardous chemicals and follow all safe work practices and the guidelines of this CHP.
 - 3) Know emergency response procedures, and the location of the nearest exits and emergency equipment.
 - 4) Use proper waste disposal procedures.
 - 5) Report any accident, overexposure, chemical spill, chemical-related illness, or observed safety violations to the PI, and a representative of SRS, and possibly to the ACOS/R depending on severity. May need to notify Facilities (ext. 31-2017) to assist with clean-up.
 - 6) Attend all mandatory safety-training sessions.
- d) Technical Assistance: Research Safety Coordinator, and the Facility Safety staff
 - e) Repair/Maintenance of Safety Equipment: Facilities Engineering Service
 - f) Repair/Maintenance of Laboratory Equipment: Biomedical Instrument Service
 - g) Medical Assistance: Occupational Health, and Emergency Department

4. LABORATORY FACILITIES, SAFETY AND SAFETY EQUIPMENT

- a) Laboratory Facilities
 - i) Laboratory sizes are generally 250 to 500 square feet
 - ii) Laboratory Design
 - 1) Safety equipment provided to minimize employee exposure to hazardous materials include:
 - a. Chemical fume hoods
 - b. Biological safety cabinets
 - c. Hood certifications are arranged by the facility, BSC certification must be coordinated with the Research Laboratory Coordinator. Both must be certified annually to continue use.
 - 2) Required emergency equipment located in the laboratory or in adjacent hallways are:
 - a. Eyewash stations
 - b. Emergency showers
 - c. Spill control equipment
 - d. Fire alarm pull stations

- e. Fire extinguishers
 - 3) Emergency Communication Modes are via intercom, Outlook, and/or telephone system.
- iii) Laboratory Ventilation
- 1) Laboratories are maintained under negative pressure relative to the hallway with at least 7-8 room air changes per hour and 100% exhaust of laboratory air.
 - 2) Address questions related to laboratory ventilation to Facilities Engineering Service (A/C Shop).
 - 3) Air handlers are excluded from energy saving procedures.
- iv) Laboratory Signage
- 1) Hazard warning signs are posted at the entrance of each laboratory to alert individuals of potential hazards before they enter the laboratory.
 - 2) Signs are posted whenever a procedure involving a highly toxic or a highly contagious material is being used to alert persons entering the area.
 - 3) A sign near a door shows a floor diagram with the location of eyewash stations, emergency showers, fire alarm pull stations, fire extinguishers, and emergency exits.
- b) Laboratory Safety
- i) Best Practices and Good Etiquette for the Laboratory
- 1) Dial 1-911 to report a fire or any other VA emergency.
 - a. Know location of nearest AED, fire extinguisher, fire alarm pulls and how to operate them.
 - b. Remember RACE (**R**escue, **A**larm, **C**ontain, **E**xtinguish) and PASS (**P**ull, **A**im, **S**queeze, **S**pray).
 - 2) Know the location of the nearest eye wash, shower, and chemical spill kit. Flush eye washes weekly and document.
 - 3) Wear appropriate PPE:
 - a. Lab coats are worn for an individual's protection and should be worn only in work areas (including hallways between work areas).
 - b. Chemically resistant gloves should be worn when handling chemicals. Inspect gloves prior to use. Choose appropriate gloves for the chemical handled.
 - c. Gloves shall be removed, and hands washed when leaving the lab to avoid cross contamination. Gloves should not be worn in hallways.
 - d. Eye protection should be worn by laboratory personnel when appropriate. Each operation should be evaluated to ensure that adequate eye protection is achieved (e.g., handling very corrosive chemicals requires more complete eye protection than offered by safety glasses; therefore, a full-face shield should be available and used).
 - 4) It is recommended that contact lenses not be worn in the laboratory. Gases and vapors can concentrate under or within the lens and can cause permanent eye damage. In the event of a splash, it is very difficult to remove contact lenses for rapid irrigation of the eyes.
 - 5) Objects that may come in contact with chemicals or get caught in moving equipment, e.g., long hair, neck ties, and jewelry, should be secured.
 - 6) Always wear your VA picture ID (PIV card). Abide by the VA dress code, including no jeans, open-toed shoes, or sandals. Wear full length pants, or equivalent, when there is a possibility of exposure.
 - 7) Laboratory doors should be closed at all times and shall be locked when the laboratory is unoccupied.
 - 8) Do not allow tailgaters into secure areas and call 1-911 if you suspect unauthorized access. Ask strangers their reason for being in the laboratory area.
 - 9) Do not eat or drink in labs.
 - 10) Do not smoke/chew tobacco, vape, or use any smoking devices, handle contact lenses, or apply cosmetics.
 - 11) Do not store food in laboratory refrigerators or elsewhere in your laboratory.
 - 12) Plants or flowers are not permitted in the labs.
 - 13) All laboratories shall have access to SDS sheets. Be familiar with the SDS before using a chemical; adhere to recommended safety practices. Maintain a current chemical inventory for your laboratory.

- 14) All chemicals shall be stored properly on appropriate shelves, cabinets, and refrigerators. Some chemicals may be stored in the hood but keep this to a minimum. Do not store hazardous liquids above eye level. Use secondary spill containers for hazardous liquid chemicals.
- 15) Do not store boxes or equipment directly on the floor, use pallets available from the warehouse or room 3N-101. Glass containers should never be on the floor.
- 16) Label all containers with contents and hazard type if there is a hazard. If contents are non-hazardous, acronyms are accepted if they are found in the HEFP system, and they should be labeled "non-hazardous." Labeling is not required for containers "in use" and under constant control of the same person for a single workday only. For examples and guidance see R:\All_Staff\Safety\LABELS_Right_to_Know.
- 17) Use a fume hood for tasks that might result in the release of toxic vapors, noxious odors, or dusts. A fume hood is to be used when working with substances with any appreciable volatility (TLV less than 50 ppm). For chemicals used outside the hood, contact IHO for air sampling to determine if a respirator is needed.
- 18) Do not store equipment in fume hoods or BSCs. Use sash at appropriate height and close the sash when not in use. Hoods/BSCs shall be certified annually.
- 19) Do not use a hood or any equipment marked "Out of Service."
- 20) Use bottle carriers or other secondary containers when transporting hazardous chemicals.
- 21) Dispose of sharps (needles, broken glass, slides, pipettes) in red sharps containers. Do not recap needles. Replace sharps containers when $\frac{3}{4}$ full. Full sharps containers should be securely closed and discarded in red, square biohazardous waste bins located in 4Q-127. In Bldg. 49 place your sealed, closed container in the hallway.
- 22) Storage may not be within 18 inches of sprinkler heads or 24 inches of the ceiling.
- 23) Compressed gas cylinders shall be secured, labeled, and used properly. Use a gas specific regulator which does not leak. Store cylinders with protective valve cap in place. Regulators shall be removed, and valve caps must be in place when transporting all cylinders.
- 24) Store and dispose of all hazardous wastes properly. Do not pour hazardous substances into the sink. See *SRS-008 Chemical Disposal SOP* for additional information. Questions about hazardous waste should be directed to the GEMS Program Manager.
- 25) Do not use extension cords or piggy-back power strips. Submit a Maximo Request for frayed electrical cords. Contact the Research Laboratory Coordinator (31-1812) for assistance with requests.
- 26) Help maintain supplies and equipment in working, clean, and usable order. Submit a Maximo Request for equipment repair and label non-functional equipment with "Out of Service" signage.
- 27) Sanitize or wipe down bench surfaces at the end of the day or after use. Sanitize doorknobs, phones, and refrigerator/freezer door handles at least weekly. Disposable sanitary wipes can be obtained in Room 4P-109.
- 28) Use common sense when working with chemicals:
 - a. Always add acid to water (not water to acid).
 - b. Carry out chemical operations carefully.
 - c. Do not centrifuge flammable solvents.
 - d. Take extra precautions if a violent reaction is possible.
 - e. Remove gloves when answering the phone or leaving the laboratory.
 - f. Do not place plastic beakers on hot plates.
 - g. Chipped and cracked glassware should be discarded in the Sharps container.
 - h. Do not work with solutions in over-filled containers.
 - i. Do not sniff or taste any chemical.
 - j. Avoid practical jokes or behavior that might startle, confuse, or distract others while they are working with chemicals.
- 29) Keep emergency contact information current and posted in the lab near the door and by any common service equipment used for storage (ex: on ultra-low freezer doors).
- 30) Be respectful of VA property. Maintain your work area and the common service areas free of clutter. Leave workspace in condition you would expect to find it.
- 31) Keep your training current.
- 32) Provide collegial leadership for colleagues who need direction.

ii) Unattended Laboratory Operations

- 1) All unattended laboratory operations (overnight or on weekends) shall have prior approval from the laboratory supervisor or PI.
 - a. As a general precaution, lights in the area should remain on, and an appropriate sign posted indicating that an unattended procedure is in progress with a name and phone number to call should a problem arise (ex: Samples rocking overnight, call 651-555-1234 if issues).
 - b. Work in a hood and provide secondary containment for toxic substances that may be released or spilled in the event of an accident or failure of a utility service (e.g., power outage).
- 2) The laboratory supervisor or PI shall evaluate the safety aspects of each unattended operation. This should include:
 - a. Consideration of each step for potential accidents and the use of preventive measures to protect against damage or injury resulting from an accidental spill.
 - b. Consideration of time for process completion and safety measures for allowing the process to continue for the duration without an operator present.
 - c. Any other recognizable safety and health considerations in allowing a process to proceed or complete without anyone in immediate attendance.

iii) Electrical Equipment Safety. See "electrical hazard" section in *SRS-003 Laboratory Safety*.

iv) Fire Safety

- 1) Never use flammable liquids in the presence of ignition sources.
 - a. Be aware that flammable vapors alone can produce a fire hazard.
 - b. Materials soaked with a flammable solvent should be discarded in an appropriately labeled hazardous waste container.
 - c. Ensure that all flammable liquids are stored in approved containers appropriate for their volume.
 - d. Do not allow flammable liquids to be stored in direct sunlight or near sources of heat.
 - e. Static electricity during the transfer of solvent from one metal container to another can ignite solvent vapors. Bond (metal strap) metal containers together to equalize the charge between them or ground the container.
- 2) Additional information on fire safety is found in the *SRS-003 Laboratory Safety* and the [Emergency Preparedness General Response Pamphlet](#).

v) Housekeeping and Safety Inspections

- 1) Housekeeping
 - a. EMS is responsible for routinely cleaning all laboratory floors.
 - b. Laboratory personnel are responsible for daily cleaning of all bench tops and other work areas.
 - c. Keep all work areas and aisles clear of clutter and chemicals. Never block access to emergency equipment or exits.
 - d. All chemicals shall be placed in their assigned storage areas at the end of each workday.
 - e. In the laboratory, hazardous waste containers shall be kept closed and labeled: "Hazardous Waste", complete name of chemical(s), and hazard(s). If container is being used for satellite waste collection it should also be labeled as "Satellite Accumulation". When placed in 3N-101 (Bldg. 70) or room 236 (Bldg. 49) for disposal, add PI's name, room number, and date.
- 2) Safety inspections shall be conducted annually by representatives from Research and the Environment of Care Council. Annual laboratory inspections are conducted by a representative of the SRS.

c) Laboratory Safety Equipment

i) Biological Safety Cabinets (BSCs)

- 1) Purpose of a BSC is to protect:
 - a. Personnel from biological hazards inside the cabinet.
 - b. Materials/samples from contamination.
 - c. The environment from biohazards contained within the cabinet.
- 2) The performance of BSCs shall be checked and certified annually, and whenever a BSC is moved, repaired, or returned to service after storage.
 - a. BSCs failing certification must get an "Out of Service" sign.

- b. A record of all facility BSC certifications shall be kept in the Safety Department. The Research Office shall maintain copies of all BSC certifications for Research Service.
- c. BSCs shall NOT be used for chemical work unless attached to an external exhaust.
- d. Employees shall notify their PI or the Laboratory Coordinator whenever a BSC is not functioning properly.
- e. Staff shall not use BSCs unless the certification sticker indicates certification within the past year.

ii) Chemical Fume Hoods

1) Purpose and use of a fume hood:

- a. The fume hood is used to allow the researcher to work with volatile or reactive chemicals inside the hood while minimizing the potential for exposure to airborne chemicals. [Note: In the event a fume hood is not available, the use of a respirator may be required. Consult the IHO for information regarding the use of respirators.]
 - i. Use with chemicals that have airborne concentrations that approach or exceed the OSHA action level or permissible exposure limit (PEL) or threshold limit value (TLV) for the chemical.
 - ii. Use with chemicals that produce airborne concentrations that approach or exceed one-tenth of the lower explosion limit (LEL) for flammables.
 - iii. Use when chemicals of unknown toxicity are used or generated.
 - iv. Use when chemicals with a noxious odor are used or produced.
- b. The fume hood is NOT to be used for intentional evaporation of volatile chemicals as an alternative for proper disposal of chemical waste. An exception to this is the evaporation of solvents from absorbent materials prior to proper disposal of materials.
- c. All work shall be conducted with the hood sash at or below the 100 linear feet per minute (LFPM) mark. All hoods have the proper sash level marked on them with a sticker indicating the 100 LFPM level.
- d. Electrical appliance or other spark sources shall NOT be placed inside the hood when flammable solvents are present.
- e. The fume hood is NOT to be used for general storage of chemicals and/or supplies. Materials placed in hoods shall be kept to a minimum. Any apparatus inside the hood should be at least six inches away from the front edge or sash. Do not block back opening to avoid reduction of air flow.
- f. Close the sash of the hood when not in use so that any vapors resulting from a chemical leak will be contained within the hood.

2) Fume hoods shall be certified (by an outside vendor) at least annually and upon request of the user. A label indicating the last time it was tested, the exhaust fan number, and the hood number shall be placed on the hood. The Research Laboratory Coordinator shall keep records of all performance checks (certifications).

- a. Hoods failing certification shall be signed "Out of Service" and not used until repaired by Engineering Service and recertified by the vendor.
- b. Staff shall not use fume hoods lacking a current certification sticker.
- c. All hoods shall have a "visible" means of checking function by placing a strip capable of fluttering (such as a 5-6 inch long by 1 inch wide Kimwipe piece) on the edge of the sash. This enables users to verify airflow daily.
- d. Employees shall notify their PI or the Laboratory Coordinator whenever a hood is not working properly or if fumes are detected in the laboratory with the hood sash at the 100 LFPM mark. Contact the Research Laboratory Coordinator if there is some uncertainty regarding the functioning of the hood. Submit a Maximo Request to Facilities Engineering Service if you have identified the problem. Place an "Out of Service" sign on the hood until re-certified.
- e. Advanced notice of scheduled interruption of the hood system shall be given by Engineering Service; the notice shall include the date and duration of the shutdown.
- f. In the event of a power failure, emergency procedures shall be followed. Fume hoods are on emergency power. If normal power is down, the fume hoods will still function. This includes the fume hood light and outlets on/in the hood.

iii) Personal Protective Equipment (PPE) and Respirators




- 1) The employee shall be advised of the availability, location, and use of PPE (gloves, gowns or lab coats, eye protection, respirators, etc.) before working with hazardous materials. PPE shall be provided by Research, for questions contact the Research Office. Respirators shall be provided by the Safety Department for fit-testing and by Research thereafter.
 - a. Before the purchase of any PPE, the Facility Safety Department can be consulted to determine whether the PPE is appropriate.
 - b. The PI shall designate specific types of PPE to be used in specific areas or for specific tasks. The Research Safety Coordinator, and facility Safety staff are available for consultation on PPE. These PPE requirements shall be documented on the "Hazard Assessment and Personal Protective Equipment Selection Form" located on the R Drive at R:\All_Staff\Safety\Hazard_Assessment. A form is to be completed for each job description/position where an employee is required to wear PPE and reviewed/updated annually.
 - c. All PPE is to be carefully inspected for defects before each use; only use PPE in good condition.
- 2) Protective eyewear shall be available in all areas where hazardous substances may splash into the eye. The requirements are as follows:
 - a. Eye protection worn when working with chemicals should meet the requirements of the American National Standards Institute (ANSI) Z87.1.
 - b. Chemical splash goggles, face shields, fume hood sash, or safety glasses shall be used when pouring any hazardous chemicals or hazardous waste to protect against splashes.
 - c. When working with more than 10 ml of a concentrated corrosive liquid, protection that covers the chin, neck, ears, and entire face is recommended.
 - d. Eye protection shall be worn when working with any material, e.g., reactive chemical or biohazard, that could cause damage to eyes or internal organs.
 - e. Protective eyewear should be easy to clean and disinfect for reuse.
- 3) Gloves shall be worn when handling all patient specimens, infectious agents, and hazardous chemicals.
 - a. Latex-free or nitrile gloves are recommended for individuals who are latex-sensitive.
 - b. When working with chemicals, wear gloves made of material known to be resistant to permeation by the chemical. See chemical SDS and References 14 and 15 for glove selection guidance.
 - c. Check gloves for integrity before use.
- 4) Respirators should be worn whenever engineering controls or other procedures are not adequate to protect the employee.
 - a. The Safety Office shall set policies for respirator use and distribution, advise employees on the proper selection of a respirator, conduct annual fit-testing, and supervise the respirator program. If a respirator is required, the employee should contact Facility Safety for fit-testing and training on respirator use and care. Air sampling may be required to determine level of respirator protection required.
 - b. OSHA CFR 29: 1910.134 requires the following procedures for the selection and use of respirators.
 - i. An initial medical evaluation is conducted by Occupational Health to determine if the employee can wear a respirator based on the employee's general health. This initial assessment documents the employee's medical profile, i.e., prior exposures, smoking history, and any facial differences that may interfere with proper fitting of the respirator. This initial evaluation may exclude some individuals from participating in the respirator program. Subsequent medical evaluations are conducted at the request of the employee's supervisor or the Safety staff during fit testing.
 - ii. Fit testing involves the use of an odorous chemical or irritating smoke to determine if the respirator has been donned correctly and a tight seal between the respirator and the employee's face is achieved. The proper style and size of the respirator is established during the fit-testing procedure. (Contact Safety Office for fit testing.) This is an annual requirement.
 - iii. Training is required for the proper fit, care, storage, and maintenance of the respirator prior to issuance.
- 5) Other PPE
 - a. Special conditions may require special PPE: e.g., high necked, "rubberized" laboratory aprons (calf or ankle length) or a long-sleeved, calf or ankle length laboratory coat that is resistant to fire and chemicals.




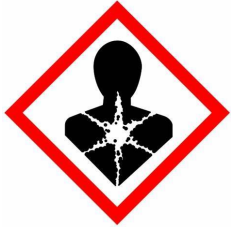


- b. Clothing: Wear clothing that protects skin from hazardous materials.
 - c. Shoes: Always wear shoes that fully cover the foot. Open-toed shoes are prohibited in laboratories.
- iv) Emergency Eyewash Stations and Deluge Showers
- 1) Eyewash stations:
 - a. Are required in all areas where hazardous chemicals used. They shall be located within 10 seconds or 55 feet from an area where the chemicals are used.
 - b. Shall be identified by a highly visible sign.
 - c. Are required to have dust caps in place to prevent debris accumulation inside eyepiece.
 - d. Shall comply with the ANSI standards upon installation. Engineering and Safety shall ensure compliance during annual preventive maintenance.
 - e. Must be flushed weekly and documented by laboratory personnel. Eyewashes in common service areas are flushed weekly by assigned personnel. Maximo requests are submitted to Facilities Engineering when problems with eyewashes are observed. Contact the Research Laboratory Coordinator to turn in a full eyewash tag and get a replacement.
 - 2) Emergency Showers:
 - a. Are required in all areas of high chemical usage.
 - b. Shall be identified by a highly visible sign.
 - c. Shall be flushed monthly for performance and repaired immediately if observed to be malfunctioning.

5. **HAZARD COMMUNICATION**

- a) Hazard Determination and Application: The PI or designee shall conduct a [Hazard Assessment](#) to determine the hazards unique for each job title/description within their laboratory.
 - i) The assessment shall include the identification of hazardous substances, physical hazards, and health hazards. These assessments shall be reviewed and updated on an annual basis by the PI or their designee (see *SRS-003 - Laboratory Safety* or the R drive at [R:\All Staff\Safety\Hazard Assessment](#)).
 - ii) Manufacturers, contractors, importers, and distributors shall be relied upon for providing the appropriate hazard information for the substances they produce, sell, or use on-site.
 - iii) This applies to all hazardous substances that are known to be present in the workplace. Employees may be exposed to these substances under normal working conditions or during an unforeseeable emergency. If employee feels the procedure is unsafe and would like to have a safety assessment performed, contact the IHO, or Research Safety Coordinator.
 - iv) All laboratory personnel are included in the Hazard Communication Program.
- b) Chemical Inventories and Safety Data Sheets (SDS)
 - i) The Occupational Safety and Health Administration's (OSHA) Hazardous Communications Standard (<https://www.osha.gov/hazcom>) requires that employers inform their employees of all chemical hazards they may be exposed to in the workplace and what protective measures are available to prevent adverse events from occurring. This is accomplished through the maintenance of chemical inventories and SDSs for each of the listed chemicals. *SRS-007 Chemical Inventory SOP* document how the Research Service addresses this OSHA Standard. Safety Data Sheet/Chemical Inventory Service | Healthcare Environment and Facilities Programs (HEFP) <http://vaww.hefp.va.gov/occupational-safety-health-gems/safety-data-sheetchemical-inventory-service>.
 - ii) Chemicals developed/synthesized in the laboratory.
 - 1) If a chemical is produced exclusively for the laboratory's own use, the PI shall determine if it is hazardous, create an SDS, and provide appropriate safety training.
 - 2) A chemical shall be treated as hazardous if the health data is not available.
- c) Hazardous Communication and Other Training

- i) Before any individual is permitted to conduct laboratory activities, they are required to complete the following:
 - 1) Biosecurity training
 - 2) OSHA hazardous communication and chemical hygiene training
 - 3) EPA hazardous waste training
 - 4) Annual Mandatory Review (AMR) on Infection Control (bloodborne pathogens)
 - 5) Training that addresses the lab specific hazards listed in the Research Service Safety Training Checklist
 - 6) Review and sign their laboratory's Hazard Assessment
 - ii) Staff involved in research are required to complete the same training as listed above annually, except Biosecurity Training (which is a one-time event).
 - iii) Whenever an employee is transferred to another laboratory, they shall complete the training specific to the hazards of their new position before beginning their new duties.
 - iv) When a new hazardous material is added to the chemical inventory, the PI or designee is responsible for reviewing the SDS for potential health effects. If the product presents a new health hazard (causes health effects unlike those covered in prior training), the PI or designee shall notify all potentially affected employees about the exposure effects related to this hazardous substance and update the Hazard Assessment to reflect this change.
 - v) Upon completion of the training program, each employee is required to sign a form documenting that they have received the training (<R:\All Staff\Training\Training Material\SRS\Research>). Training records are maintained by the SRS Coordinator.
- d) Manufacturer Container Labeling
- i) All manufacturer containers containing solid chemicals, liquids, or gases shall be properly labeled and remain legible. Defacing or removing labels is prohibited.
 - ii) Each label shall be in English and contain the following information as prescribed by the "Global Harmonization System (GHS)" as part of the International Trade and Transport Standardization:
 - 1) Complete name of the substance, i.e., no chemical abbreviations (some original containers use abbreviations, e.g., PBS, these are appropriate and can be used on secondary containers)
 - 2) Signal word
 - 3) Precautionary statement(s)
 - 4) Name and address and telephone number of the manufacturer, importer, or responsible party. If the substance is mixed or created on-site, then the name of the person who produced the substance, Research Service, and Created at Minneapolis VAHCS must also be listed.
 - 5) Hazard warning through appropriate pictogram and/or statement(s)

GHS Pictograms and Hazard Classes		
		
Oxidizers	Flammables Self-Reactives Pyrophorics Self-Heating Emits Flammable Gas Organic Peroxides	Explosives Self-Reactives Organic Peroxides

		
Acute toxicity (severe)	Corrosives	Gases Under Pressure
		
Carcinogen Respiratory Sensitizer Reproductive Toxicity Target Organ Toxicity Mutagenicity Aspiration Toxicity	Environmental Toxicity	Irritant Dermal Sensitizer Acute toxicity (harmful) Narcotic Effects Respiratory Tract Irritation

- e) Inspections to assure compliance with the OSHA Hazardous Communication Standard (29 CFR: 1910.1200)
- i) The facility's Environment of Care (EOC) rounds shall include proper container labeling and chemical storage.
 - ii) A minimum of one comprehensive laboratory inspection is conducted by a representative of the SRS annually. This inspection covers container labeling, chemical storage, and chemical inventories. Refer to the "MVAHCS Lab Safety Audit Checklist" for a complete listing of items addressed during this inspection (See document entitled *SRS-006 Research Laboratory Safety Inspections*.)
 - iii) The SRS reviews the training records for laboratory personnel using the "Safety Training Checklist for Research Laboratory Employees" submitted annually by each research program. Training records are also reviewed during the approval process of new research protocols, continuing reviews of existing protocols, and annually during the SRS review of each laboratory.
 - iv) Refer to *SRS-007 Chemical Inventory SOP* for requirements and practices related to research laboratory chemical inventories.
- f) The Public Relations Officer or the Director's Office is responsible for responding to requests from members of the community on hazardous substances used in the facility. Safety Office needs to be informed and involved in responding to such requests.
- g) When an employee is not following safety and health rules regarding working with a hazardous substance, the employee shall be subject to SRS and MVAHCS disciplinary policies.

6. **PROCUREMENT, TRANSPORT AND STORAGE OF HAZARDOUS MATERIALS (HM)**

- a) Selection of Materials
- i) The purchase of non-hazardous materials is strongly encouraged. Hazardous materials can be identified from the SDS, the container label, or the manufacturer's specifications as an EPA listed hazardous chemical or waste (<https://www.epa.gov/epcra/consolidated-list-lists>).
 - ii) Staff shall determine if an alternate product is available that would satisfy the need but be less hazardous and safer for patients, staff, and the environment.
 - iii) Please "THINK GREEN." The disposal cost of a hazardous material is often greater than any savings seen in bulk purchasing (because material expires before use) or the cost differential between a cheap hazardous chemical that results in odor/exposure complaints versus a more expensive green product.

- iv) Prior approval shall be obtained from the SRS whenever the proposed use of a new laboratory procedure or chemical represents a serious chemical hazard. Examples of hazardous materials which need prior approval are carcinogens, mutagens, teratogens, chemotherapeutic drugs, toxins, venoms, ether, picric acid, hydrofluoric acid, perchloric acid, nitric oxide, highly volatile mercaptans, highly toxic compounds, highly reactive compounds, cyanide compounds, osmium tetroxide, phosgene gas, hydrogen gas, glutaraldehyde, formaldehyde, methylene chloride, and mercury-containing chemicals.
 - v) It is the goal of this facility to reduce the volume of hazardous waste generated. All personnel can help achieve this goal by:
 - 1) Efficient inventory management. Utilize chemicals before their expiration date.
 - 2) Checking your inventory to ensure that you are nearly out of the chemical before placing an order.
 - 3) Reducing the volume ordered and stored (avoid overstocking).
 - 4) Substituting a less hazardous or non-hazardous product.
 - 5) Refraining from purchasing mercury-containing equipment and chemicals.
 - 6) Contacting the GEMS Program Manager for assistance with hazardous waste stream analysis, green product selection, and waste reduction.
- b) Ordering, Receiving and Transporting HM
- i) For hazardous materials, prior approval of the SRS is required to ensure that safety procedures are in place before the chemical is received.
 - ii) Enter chemical into HEFP system when chemical is ordered.
 - iii) Receive and transport HM with care to avoid breakage. Hazardous and other regulated waste shall be managed to prevent release into the environment. A variety of equipment and personal protective equipment (PPE) are provided to facilitate safe use, transport, and handling. Accidents during movement or transport of these materials can result in serious harm to persons and property.
 - iv) If a shipment is damaged and the contents leaking:
 - 1) If possible, place package in a secondary container and move container to a fume hood.
 - 2) Warn others in the area; evacuate if necessary.
 - 3) Call 1-911 and give the location and identify nature of incident (ex: chemical name(s), spill).
 - 4) Restrict entry.
 - 5) Standby (at a safe distance) to provide information to emergency responders.
 - v) Separate chemicals by hazard class for transportation. Avoid transporting incompatibles together.
 - vi) Use a cart with a sufficiently deep tray (2-3 inch sides) to prevent bottles from falling off or tipping over the side.
 - 1) Don't overload the laboratory carts or stack containers and trays.
 - 2) Move the laboratory cart slowly and carefully over door thresholds and bumps.
 - 3) Use the freight elevator whenever possible.
 - vii) When loading/unloading chemical containers, do not rush. Handle containers deliberately, one at a time. Grasp bottles firmly and use two hands as much as possible. Don't pick them up by the lids; use finger holes or bottle handles when present and carry from bottom when not.
 - viii) Transport individual containers of acids, bases, and flammable solvents in secondary containers to prevent accidental breakage.
 - ix) Gas cylinders shall be moved using a cylinder dolly only. The cylinder shall be secured to the dolly with the regulator removed and the cap in place. The cylinders shall be secured to the wall bracket or rack upon arrival in the lab or gas storage room (Room 4P-106, Bldg. 70; Room 102, Bldg. 49). Locate chains around cylinder tank, not neck.
- c) If you ship a hazardous material, you are responsible for ensuring that you have been trained and the package has been prepared for shipment as specified in Title 49 Code of the Federal Regulations and in the IATA Dangerous Goods Regulations.
- i) Hazardous material (HM) is defined as any substance that could adversely affect the safety of the public, handlers, or carriers during transportation. DOT further defines hazards in the 49 CFR Hazardous Materials

Table. HM are classified into 9 hazard classifications (<https://www.ecfr.gov/current/title-49/subtitle-B/chapter-I/subchapter-C/>).

- ii) Some common HM shipped from this facility include diagnostic specimens, dry ice, and infectious substances. Other common HM includes flammable liquids, flammable solids, corrosives, oxidizers, organic peroxides, toxic substances, and radioactive materials.
 - iii) Approval to ship some HM's, e.g., radioactive materials, requires the approval/participation of one of the facility Safety Officers.
 - iv) Anyone who ships or prepares a HM for shipping is required to complete training at hire and every 2-3 years following initial training. DOT (ground) transportation training must be done every 3 years, and IATA (air) transportation must be done every 2 years.
 - v) Under no circumstance shall HM be transported off campus by staff on public transportation including but not limited to taxi, rideshare, light rail, or bus.
- d) Storage of Hazardous Materials
- i) Incompatible chemicals shall not be stored together. Chemicals shall be segregated by reactive class, e.g., flammables with flammables, oxidizers with oxidizers, etc. Note: Some groups can be stored together, but in their own secondary container. For example, compatible organic acids may be stored on the same shelf as flammable solvents whereas flammable solvents must be stored away from strong inorganic acids such as nitric acid. Consult SDSs for specific chemical incompatibilities and storage requirements.
 - ii) General storage guidelines.
 - 1) Bulk storage areas for flammable liquids must meet the NFPA Standard No. 30 Flammable and Combustible Liquids Code (dedicated external exhaust, diked doorways for spill containment, and no floor drains).
 - 2) Designated hazardous chemical bulk storage rooms are 3N-101 (Bldg. 70) and 239 (Bldg. 49).
 - 3) The labels for chemicals stored in common storage shall include the PI's name, room number, and phone number.
 - 4) Contact the Research Office if you require an explosion proof refrigerator.
 - 5) When storing new chemicals read the label and SDS for any special storage requirements.
 - 6) Store liquids in glass containers no higher than eye level to avoid accidental breakage.
 - iii) Guidelines for Storage of Flammable Liquids
 - 1) Limits on amount of flammable liquids stored:
 - a. Building 70 labs with 1 door: 2 gallons (7.6 L)
 - b. Building 70 labs with 2 doors: 5 gallons (18.9 L)
 - c. Building 49 Labs: 3 gallons (11.4 L)
 - d. Flammable liquids exceeding these limits shall be either stored in an approved safety cabinet or in a designated solvent storage area designed for the safe storage of flammables.
 - e. Conditions to avoid (Check labels, SDSs):
 - i. Flammable liquids shall not be stored with strong inorganic acids like nitric or sulfuric acid.
 - ii. Keep ignition sources away from flammable liquids.
 - iii. Avoid storing combustible materials (paper, cardboard, or packaging materials) close to flammable liquids.
 - iv. Avoid over-loading of shelves in cabinets and storage areas.
 - 2) Working amounts of flammable solvents may be stored on open shelves. However, large amounts of flammable materials should be stored in an approved storage cabinet or in a solvent storage room.
 - 3) Notify Research Safety if using ether.
 - 4) Flammable solvents that need to be stored at low temperatures shall only be stored in "explosion-proof" refrigerators.
 - 5) Flammable liquids shall be stored away from heat sources, e.g., metal cabinet beneath fume hood, or in NFPA approved fire cabinets. Flammable storage cabinets should be properly designed, labeled, and maintained.
 - 6) Keep a solvent spill kit on hand in the event of a spill.
 - iv) Guidelines for Storage of Acid

- 1) Keep large bottles of acids on a low shelf or in acid (corrosion-proof) cabinets.
 - 2) Store organic and inorganic separately.
 - 3) Store inorganic acids away from flammables.
 - 4) Store acids away from caustics (strong bases) and reactive metals such as sodium, magnesium, and potassium.
 - 5) Keep acids away from chemicals that can generate toxic gases on contact, such as sodium cyanide (toxic hydrogen cyanide gas forms) and sulfides (toxic hydrogen sulfide gas forms).
 - 6) Use PPE. Gloves, eye/face protection, and lab coat should always be worn when working with acids. Safety shielding shall be used whenever there is a risk of splashing or an exothermic reaction.
 - 7) Keep an acid spill control kit on hand in the event of an acid spill.
- v) Guidelines for Storage of Caustic Chemicals (concentrated base)
- 1) Store caustics away from concentrated acids.
 - 2) Store solutions of inorganic hydroxides in polyethylene containers.
 - 3) Keep caustic spill control kits on hand in the event of a spill.
- vi) Guidelines for Storage of Peroxide-Forming Chemicals
- 1) Store peroxide-forming chemicals in airtight containers and keep in a dark, cool, and dry place.
 - 2) Inform Research Safety if you'll be using 30% and higher concentrations of perchloric acid.
 - 3) Date the container with expiration date and dispose of one month prior to expiration date.
 - 4) Use safety procedures if peroxide formation is suspected. Contact Safety to test for peroxides. If peroxides are present, contact the IHO for disposal.
- vii) Guidelines for Storage of Water-Reactive Chemicals
- 1) Keep dry. Water-reactive chemicals shall be stored and handled so that they do not contact water or water vapor at any time.
 - 2) Lithium metal reacts with water and shall be kept under mineral oil.
 - 3) Sodium and potassium metal shall be stored under xylene.
- viii) Guidelines for Storage of Oxidizers
- 1) Store oxidizers away from flammables, combustibles, and reducing agents.
 - 2) Strong oxidizers shall be stored and used in glass or other inert containers. Corks and rubber stoppers shall not be used on these containers.
- ix) Guidelines for Storage of Highly Toxic Compounds and/or Select Agents
- 1) Obtain prior approval of the SRS before ordering.
 - 2) Toxic compounds may require security storage if they are of potential use by terrorists.
 - 3) Post "Poison Control Network" number near the phone (800-222-1222).
 - 4) If you experience adverse symptoms related to use of the chemical, go to Occupational Health, and take the SDS with you.
 - 5) See *SRS-008 Chemical Disposal SOP* in the Research Safety Manual for information on disposal of hazardous materials.
- x) Guidelines for Storage of Pyrophoric Compounds
- 1) Pyrophoric compounds are readily oxidized substances that burn when exposed to air. No separate ignition source is needed for combustion.
 - 2) Prior approval by the SRS is required before purchase and use.
 - 3) Store pyrophoric chemicals in tightly closed containers under inert atmosphere and handle these chemicals in an inert atmosphere or liquid.

7. **GUIDELINES FOR WORKING WITH SPECIAL CLASSES OF HAZARDOUS CHEMICALS**

- a) The following are standard operating procedures for the handling of specific classes of hazardous chemicals. Prior Approval for Hazardous Chemicals and/or Procedures is required from the SRS whenever:

- The proposed use of a new laboratory procedure or chemical represents a serious chemical hazard. Examples of hazardous materials which need prior approval are carcinogens, mutagens, teratogens, chemotherapeutic drugs, toxins, venoms, ether, picric acid, hydrofluoric acid, perchloric acid, nitric oxide, highly volatile mercaptans, highly toxic compounds, highly reactive compounds, cyanide salts, glutaraldehyde, formaldehyde, mercury, and mercury salts.
- The toxic limit concentrations for the chemical (e.g., TLV, PEL limits) could be exceeded.
- There is a change in the hazardous procedure.

Reporting: The SRS is to be notified when either of the following occurs:

- There is a failure of any of the equipment used in a procedure involving a hazardous chemical.
- Members of the laboratory staff become ill, and it is suspected that they may have been exposed to a hazardous chemical.

b) Guidelines for Compressed Gases

i) Procedures for handling compressed gases

- 1) Compressed gas cylinders shall be handled with care and respect to avoid a potentially significant incident. A tremendous amount of energy is stored in a compressed gas cylinder. Should the flow control device be damaged, this energy could propel a gas tank through walls and any object or person in its path. In addition, the gas itself may be flammable, toxic, corrosive, or explosive.
- 2) Prior approval for the use of highly toxic or hazardous gases must be obtained from the SRS before an order is placed to ensure that proper procedures are in place.
- 3) Cylinders (full or empty) shall be securely anchored to a wall or bench top. Cylinders shall be stored in an upright position. Oxidizing gases shall not be stored with flammable gases or other flammable substances. Inert gases are compatible with all other gases and may be stored together.
- 4) A gas tank carrier shall be used to transport tanks. Tanks shall be secured to the carrier prior to transporting. Gas cylinder valve safety caps shall be in place when the cylinder is transported. A gas cylinder should NEVER be transported with a regulator attached.
- 5) Gas cylinders shall be clearly labeled with contents and hazards.
- 6) Use only valves and pressure regulators designated for the specific gas and cylinder.
- 7) Do not repair or use force on damaged or frozen cylinder valves. Consult Research Safety Coordinator for direction.
- 8) If a leak is suspected, check connections for leaks using a leak detecting soap solution.
- 9) Keep flammable and/or toxic substances away from your breathing zone.
- 10) When more than one cylinder of a highly flammable gas is to be used in one laboratory, specific approval by the SRS or the Facility Safety Manager shall be obtained. Standby cylinders of flammable gases (full or empty) are not to be stored in the laboratory. Valves on all flammable gas cylinders shall be fully shut off when the unit is unattended.
- 11) Do not release flammable gases near a flame or an ignition source.
- 12) Large gas cylinders of hydrogen are forbidden at MVAHCS.
- 13) Empty gas cylinders shall be stored separately from full gas cylinders and tagged as "empty."
- 14) Gas cylinders of corrosive gases, e.g., hydrogen chloride and hydrogen fluoride shall be dated and returned after 6 months. Work in a hood and use the smallest practical sized cylinder.
- 15) Exposure to corrosive gas can freeze the needle valve over a six-month period.

ii) Training on Compressed Gas Safety is included on the Safety Training Checklist and must be completed annually (R:\All_Staff\Training\Training_Material\SRS\Research).

c) Guidelines for Cryogenic Liquids (See [Cryogenic Safety training](#) for additional information)

i) Liquid Nitrogen:

- 1) The "boil off" of nitrogen can displace air leading to asphyxiation.
- 2) Area must be properly ventilated when drawing off a large volume of liquid nitrogen
- 3) No sources of ignition are allowed since oxygen is condensed from the air as the liquid nitrogen temperature is below the boiling point of oxygen.

ii) PPE: The employee shall wear a face shield and gloves that are resistant to low temperatures when working with cryogenics. Safety goggles are also recommended.

- iii) Safety precautions: Remove watches, rings, and other jewelry before working with cryogenics.
 - iv) Cryogenic containers shall have a pressure relief valve. Containers and associated piping shall be able to withstand extreme cold without becoming brittle.
- d) Guidelines for Corrosive Chemicals
- i) A corrosive chemical is one that has a pH greater than 12.0 or less than 2.0 in solution and can cause destruction or deterioration of tissues by chemical action, e.g., concentrated sulfuric acid. Corrosive chemicals shall be handled with all proper safety precautions:
 - 1) Avoid skin or eye contact.
 - 2) Wear proper PPE, which includes laboratory coat, safety goggles, and gloves.
 - 3) When large quantities of liquids are handled, work in the hood or use a shield/containment barrier so that accidents and spills can be prevented and/or contained.
 - 4) Use heavy plastic or rubber bottle-carriers to transport bottles of corrosive material.
 - 5) If the chemical splashes on your skin, remove contaminated clothing immediately, rinse area with water for 15 to 20 minutes, then report to Occupational Health or Emergency Department (if after hours) flushing affected area.
 - 6) If the chemical splashes in your eyes, flush with water for 15 to 20 minutes, then report to Occupational Health or Emergency Department (if after hours). If you need help, call 1-911 and state your location and emergency.
- e) Guidelines for Reactive and Explosive Chemicals
- i) Reactive chemicals are substances that under specific conditions can react violently with spontaneous generation of large quantities of heat, light, gases, or toxic substances and can be destructive to life and property.
 - ii) Explosive materials are chemicals that cause a sudden, almost instantaneous release of pressure, gas, and/or heat when subjected to sudden shock, pressure, or high temperatures.
 - iii) Prior approval of the SRS is required before ordering [reactive and/or potentially explosive chemicals](#).
 - iv) Procedures:
 - 1) Reactive chemicals shall be handled with all proper safety precautions including segregation in storage, prohibition on mixing of even the smallest quantities with other chemicals without prior approval, and the use of appropriate PPE (i.e., safety glasses and gloves).
 - 2) Handling and manipulation of chemicals that pose a risk of an exothermic reaction, a splash hazard, or an explosion shall be conducted in a chemical fume hood with the sash pulled down as far as possible.
 - 3) Avoid potential explosive situations such as: mixing nitric acid and acetone; peroxide buildup in chemicals; flammable chemicals with oxidants; or allowing picric acid to dry out.
 - 4) Do not attempt to remove chemicals or wastes that have high explosive or reactive potential from your area. Contact the GEMS Coordinator for assistance with disposal.
 - v) Examples: Picric acid, sodium azide, poly-nitro compounds (e.g., 2,4-dinitrophenylhydrazine), and others.
 - 1) Picric Acid that is dry (crystals have formed) or contains less than 10% water by weight is considered unstable and shall be handled as an explosive chemical. The bomb squad (or equivalent) will be called for disposal.
 - 2) Refer to Section n) 2) below for Use of Perchloric Acid in Research.
 - 3) Sodium azide that has been contaminated by a metal spatula will harden (may form into clumps) making it unstable, at which point it may not be moved.
 - 4) Look for the word explosive, peroxide former, or the explosion icon on the label and/or SDS. Some laboratory chemicals including tetrahydrofuran, collodion, dioxane, some oxidizers, and certain ethers may become explosive when kept beyond their expiration date. If a date is not given, the researcher is required to call the manufacturer for the date and write it on the container label. It is important to turn these chemicals in BEFORE the expiration date.
- f) Guidelines for Radioactivity
- i) See *SRS-010 Guidelines for Radiation* for information related to radioactive materials. If needed, contact the RSC for additional information.

g) Guidelines for Flammable Solvents

i) Definitions

- 1) A flammable solvent is one that has a flash point below 199.4°F (93°C).
- 2) The flash point is the lowest temperature at which the liquid gives off enough vapor to be ignited at the surface of the liquid. Flammable and combustible liquids with flash points lower than 200°F shall be heated in hoods or with special local exhaust ventilation if the amount exceeds 10 mL or if the liquid is to be heated to within 30° of the flash point of the liquid. Flammable or combustible liquids shall be heated by hot water, by steam, or by an electric mantle, depending upon their boiling points.
- 3) Never use an open flame.
- 4) A combustible liquid is one having a flashpoint at or above 100°F. All organic solvents are potentially dangerous because they are flammable, toxic or have acute or chronic health effects.

ii) Procedures

- 1) Keep flammable solvents and vapors away from ignition sources.
- 2) Metal containers shall be grounded before transferring flammable solvents from one metal container to another to avoid a static spark that may ignite flammable solvent vapors.
- 3) Tissue processors and similar automatic equipment that release ignitable vapors into the workspace shall be operated at least 5 feet away from combustible material storage, unless separated by one-hour fire resistant wall (Refer to NFPA 99 and NFPA 45 for laboratory fire protection requirements).
- 4) Keep a solvent spill kit in bulk storage areas along with solvent absorbent pillows or pigs to prevent the spread of a leak or spill.
- 5) First Aid:
 - a. Skin Contact: Remove contaminated clothing and rinse skin for 15-20 min. Report to Occupational Health or the Emergency Department (if after hours).
 - b. Eye Contact: Flush eyes with water for 15-20 minutes. Immediately report to Occupational Health or the Emergency Department (if after hours).
 - c. Inhalation: Immediately remove victim to fresh air and report to the Emergency Department if difficulty with breathing occurs. Otherwise, contact Occupational Health to report the incident.

h) Guidelines for Sensitizing Agents

- i) Contacting HM or sensitizing agents may induce an immunological response in the body at a frequency greater than would be expected in the normal population. An immune response to invading organisms or molecules is the normal response of the body; however, altered reactivity to innocuous substances may occur and produce unpredictable results. Primary irritants, chemical, physical, or biological materials may produce an allergic response at the site of contact or act as sensitizing agents.
- ii) A wide variety of substances can produce skin and lung hypersensitivity, e.g., formaldehyde, diazomethane, squaric acid, nickel etc. Check SDSs for information on known sensitizing agents.
- iii) When possible, substitute “green products” for harmful substances.
- iv) Wear appropriate PPE, i.e., gloves, lab coat, and eye protection, to limit exposure. Make sure suitable gloves are used to prevent skin contact (see References 14 and 15).
- v) Work in a chemical fume hood or request a respirator from Safety.
- vi) If the employee is known to have or develops an allergy, they should inform the laboratory supervisor and/or the Occupational Health Physician for advice on appropriate precautions to minimize exposure.

i) Guidelines for chemicals of moderately chronic or high acute toxicity

- i) Definition: Toxic chemical means any chemical that can cause death, temporary incapacitation, or permanent harm to humans or animals.
- ii) Procedures
 - 1) Restrict access to areas where these chemicals are stored or used.
 - 2) Always use a fume hood or other containment device for procedures which may result in generation of aerosols. If a fume hood is not available, notify Safety to participate in respirator program.
 - 3) Wear proper PPE, which includes laboratory coat, safety goggles, and appropriate gloves. Hands and lower arms shall be washed immediately after working with these chemicals.

- 4) If airborne exposure can occur, work shall be performed in a chemical fume hood.
 - 5) When larger quantities are handled, use a shield and containment so that accidents and spills can be easily cleaned up. Store breakable containers in chemically resistant trays; work and mount apparatus above such trays or cover work and storage surfaces with removable, absorbent plastic backed paper.
 - 6) Decontaminate clothing and equipment as appropriate (see SDS). Consult the RSC for assistance.
- j) Guidelines for chemicals of high chronic toxicity --- carcinogens
- i) Procedures for working with chemical carcinogens must follow the written and SRS approved protocol specific for the carcinogen in use.
 - ii) All transfer work, e.g., weighing of chemical, shall be conducted in designated laboratory space.
 - iii) Controlled areas shall be conspicuously marked with warning and restricted access signs.
 - iv) A plan must be prepared prior to using equipment that will be exposed to carcinogens.
 - v) Any contaminated equipment or glassware must be decontaminated prior to removal from the designated area.
 - vi) The SRS reviews carcinogen protocols prior to use and evaluates whether regular medical surveillance and an antidote are needed. If the chemical is on the NIOSH Hazardous Drugs List, personnel should be offered enrollment in the Hazardous Drug Medical Surveillance Program.
- k) Guidelines for animal work with chemicals of high chronic toxicity in the common service Carcinogen Facility
- i) Note: This space (Bldg. 49, second floor) is currently not being used as a dedicated Carcinogen Facility. Contact VMO and SRS if study is proposed that will require use of the Carcinogen Facility.
 - ii) These studies must be reviewed and approved by the IACUC, SRS, IBC (if required), RDC, and ACOS/R.
- l) Guidelines for reproductive toxins
- i) Definitions
 - 1) Reproductive toxins act as reproductive hazards (substances that can cause adverse effects on sexual function and fertility, as well as on the fertilized egg, the embryo, or the fetus), this can manifest as fetal abnormalities, retarded growth, and postnatal functional defects.
 - 2) Mutagens induce mutations in DNA and living cells. Examples of mutagens are arsenic, ethidium bromide, ionizing radiation, and alkylating agents.
 - 3) Teratogens affect the developing embryo (fetus). Damage is most likely to occur during the first 8-10 weeks of pregnancy. Teratogens may produce congenital deformations without inducing damage to the pregnant person.
 - ii) The use of these chemicals is subject to approval by the SRS.
 - iii) In general, when any of the above are used, the following steps should be employed to reduce exposure.
 - 1) Use a chemical fume hood or glove box. (All hoods, glove boxes and other essential engineering controls shall be inspected for adequate air flow before starting any procedure.)
 - 2) Wear PPE.
 - 3) Establish a designated area for use.
 - 4) Set up procedures for the safe removal of contaminated waste.
 - 5) Have a spill control plan to handle spills before starting any procedure.
 - 6) Create decontamination procedures.
 - iv) Other considerations:
 - 1) Embryotoxins requiring special control should be stored in a well-ventilated area. The container should be labeled in a clear manner, e.g., EMBRYOTOXIN: READ SPECIFIC PROCEDURES FOR USE.
 - 2) If the container is breakable, it must be kept in an impermeable, unbreakable secondary container large enough to hold the material in case the primary container leaks or breaks.
 - 3) Personnel considering pregnancy should take adequate precautions to guard against spills and splashes and may choose to participate in an alternative duty that does not require the handling of embryotoxins.
 - 4) Supervisors should be notified of all exposures or spills of embryotoxins requiring special control.
- m) Guidelines for Chemotherapeutic (Antineoplastic) Drugs

- i) Chemotherapeutic drugs are potential occupational safety hazards because they are designed to kill rapidly dividing cancer cells, can suppress the immune system, and do not differentiate between a healthy or diseased cell. They can be toxic to living organisms by inhalation, skin absorption and/or ingestion.
 - 1) Detection: There are no dependable universal sensory warning indicators for the presence of antineoplastic drugs. Therefore, strict and safe work, transport, and storage procedures must be observed at all times.
 - 2) Preparation: Vented BSCs or fume hoods must be used to mix and prepare chemotherapy drugs, and the BSC or fume hood must be labeled as being used for chemotherapy.
 - 3) Storage: Chemotherapy drugs will be stored separately from regular chemical stock and in secondary containment.
- ii) Handling: A laboratory specific SOP must be written and approved by the SRS and IACUC (if animals are involved) prior to use. The SOP must include how staff will be protected from exposure to carcinogen during preparation and laboratory use, administration to animals, and disposal of waste. Laboratory specific SOP should include guidance on appropriate signage, PPE, and waste disposal requirements for working with chemotherapeutic agents within the VMU.
- iii) Disposal: Chemotherapeutic waste is classified into two different categories, which in turn determine how they are managed. See *SRS-008 Chemical Disposal SOP* for additional information on disposal.
 - 1) Materials Containing Traces of Chemotherapeutic Drug
 - a. Traces of chemotherapeutic drug shall be treated as concentrated chemotherapeutic drug.
 - i. These include empty bulk chemo drug containers, empty IV set ups, and other equipment used in drug administration, and contaminated PPE as well as other contaminated materials.
 - An empty container is one where drug can no longer be removed using normal physical means (pouring, aspiration, decanting).
 - Items considered to contain traces of chemotherapeutic drugs filled/partially filled containers, and/or overtly contaminated garments).
 - These items should be disposed of in properly labeled black chemo-waste containers.
 - ii. Outdated drugs and/or partially filled containers of these drugs are considered hazardous waste. These items shall be turned into the GEMS Coordinator for proper disposal as hazardous waste or disposed of in properly labeled black chemo-waste containers.
- iv) Labeling: Syringes and IV bags containing antineoplastic drugs shall be properly identified with drug name, dose, and solution. In addition, the label or bag should include: "CAUTION – CHEMOTHERAPY, HAZARDOUS, DISPOSE OF PROPERLY" prominently displayed.
 All employees handling chemotherapy drugs shall receive training on:
 - 1) Proper handling procedures and PPE
 - 2) Chemotherapy spill procedures
 - 3) Location of SDS
 - 4) What to do in case of accidental exposure
- v) Accidental Exposure: Any employee exposed to chemotherapy drugs should immediately wash area with warm soap and water. A non-germicidal soap is recommended and is available in 4 oz. bottles in 3N-101. If eye exposure occurs, flush for a minimum of 15 minutes prior to reporting to Occupational Health. If needle stick occurs with a chemotherapy drug:
 - 1) Notify your supervisor.
 - 2) Report to Occupational Health.
 - 3) Both you and your supervisor must file reports in the ECOMP.
- vi) Chemotherapeutic Spills:
 - 1) SDSs shall be available and reviewed in the event of a spill.
 - 2) A chemotherapy spill kit shall be available where these drugs are used.
 - 3) The user is responsible for cleanup. If assistance is needed, the IHO, Research Safety Coordinator, or GEMS Program Manager is to be contacted immediately to coordinate or oversee the cleanup.

- vii) Spill Clean Up Procedures: The procedure for spill cleanup requires the use of supplies provided in the chemotherapy drug spill kit.
- 1) Isolate area to prevent further contamination and use the sign in the spill kit to mark the spill area.
 - 2) The person cleaning up the spill puts on the gown, eye protection, booties, and gloves in the spill kit before beginning.
 - 3) Use the absorbent towels and/or the scoop to clean up the spill and place the used towels and/or scoop in the bag provided.
 - 4) If there is broken glass, place in the black chemotherapeutic waste container, then label container as containing sharps.
 - 5) After the spill is cleaned up, the spill area is decontaminated with 10% bleach or appropriate material as designated in the SDS sheet.
 - 6) All materials used in the cleanup are to be placed in the bag provided.
 - 7) Place all PPE in the bag provided, close with a tie, and place the bag in the second bag provided and close it with the tie provided.

n) Guidelines for Compounds of Special Interest

- i) Formaldehyde, Formalin – see [11A Formaldehyde Exposure Control Program and 11B Formaldehyde Fact Sheet](#) (R:\All_Staff\Training\Training Material\SRS\Research). It covers health hazard data, monitoring, occupational exposure limits, exposure control, medical surveillance, chemical disposal, spill cleanup, employee information and training.

- 1) Mixtures and solutions containing 0.1% or more formaldehyde shall state on the label the concentration of formaldehyde, name of PI, and include the words, “Poison, Danger, Cancer Hazard.”
- 2) Areas identified as exceeding permissible exposure limits shall be identified with the following warning sign: DANGER, FORMALDEHYDE, IRRITANT AND CANCER HAZARD, AUTHORIZED PERSONNEL ONLY.
- 3) Labels can be found [R:\All_Staff\Safety\LABELS Right to Know](#) or through [HEFP](#).

ii) Perchloric Acid

- 1) SRS approval is required before purchase and use of perchloric acid.
- 2) Order in small quantities, 500 mL maximum.
- 3) Handling: Mandatory use of safety glasses and PPE.
- 4) Storage: Concentrated perchloric acid (PCA) must be stored in a specially rated hood, and labeled with PI’s name and phone number. Dilutions of perchloric acid shall be prepared in this hood for use in the laboratory.
- 5) Conditions to avoid: No organic materials should be stored with concentrated perchloric acid. Do not allow perchloric acid to contact strong dehydrating agents (e.g., concentrated sulfuric acid, anhydrous phosphorous pentoxide).
- 6) Perchloric acid hood: Heating of perchloric acid above ambient temperatures should be done only in the special PCA laboratory hood, which provides a special water wash down system to remove organic perchlorates (see NFPA 45, 6-12).

iii) Chloroform

- 1) Chloroform generates phosgene during storage which is highly toxic to lung tissue
- 2) Purchase: Chloroform, like all time-sensitive materials, is to be purchased in the smallest quantity practical based on usage, i.e., an amount that can be used within one year.
- 3) Labeling: All chloroform containers shall be dated upon receipt and opening. Labeling must include the expiration date (contact manufacturer with lot number if needed).
- 4) Storage: Chloroform should be stored in a cool, dry, well-ventilated area (less than 86° F) and in tightly sealed, dark colored glass containers as chloroform is photosensitive.
- 5) Only use chloroform in a fume hood to reduce exposure risk.
- 6) Disposal: Chloroform shall be disposed of as a hazardous waste (Room 3N-101). Chloroform should be disposed of one month prior to expiration date. The expiration date for un-stabilized chloroform is one year after receipt, and one year after opening for stabilized chloroform.

8. DISPOSAL OF HAZARDOUS MATERIALS (HM)

See *SRS-013 Chemical Disposal Standard Operating Procedures* for information on disposal. If needed, contact the GEMS Program Manager for additional information.

9. EMERGENCY RESPONSE PROCEDURES FOR HAZARDOUS CHEMICAL

- a) Emergency Response: For all major emergencies call 1-911. This includes fire, chemical spill, employee health event, bomb threat, etc.
 - i) When a hazardous chemical spill occurs, follow these procedures:
 - 1) Small spills: If you know the material that has been spilled and have the proper spill response training, you may clean up the spill yourself. Contact the Facility Safety Department for disposal of spill cleanup materials and, if needed, for technical advice.
 - 2) Large Spills: If the spill involves a large amount of chemical or you do not have the specifically required training, proceed as follows:
 - a. Move all affected people away from the spill to a safe area.
 - b. Call 1-911 or the designated emergency response number in your area.
 - c. Locate the SDS for the hazardous chemical that spilled, if safe to do so. You may need to print the SDS from an adjacent location.
 - d. Remain in a nearby safe area to address emergency responders' questions.
 - 3) Body Fluid Spill: Trained laboratory personnel shall clean up the spill. Refer to "Guidelines for Handling Biological Hazards."
 - 4) Mercury Spill:
 - a. We do not allow mercury thermometers, any known mercury sources in your lab should be disposed of safely.
 - b. In case of spill, contact Facility Safety (or 1-911 if after hours). They have a specialized vacuum for cleaning up mercury spills.
 - 5) Radioactive Spill: Immediately notify the Radiation Safety Officer (RSO) during regular working hours. Call 1-911 after hours, on weekends, and holidays; identify the spill as radioactive. Research personnel may cleanup spills in accordance with the instructions found in "Guidelines for Handling Radioactive Materials and Radiation Protection."
 - 6) Spill of Unknown Material: Call 1-911 or the Facility Safety Department for assistance. Inform the person answering the phone that the identity of the material is unknown and give any information that you do have about the material.
 - 7) For additional information on emergency chemical spill response, see the facilities [Hazardous Materials Spill Response Plan](#).
 - b) Related Research Service Documents:
 - i) SRS-005 Management of Research Spaces
 - ii) SRS-011 Laser Safety Plan
 - iii) SRS-012 Medical and Security Incident Plan
 - iv) SRS-013 Research Evacuation Plan

10. MEDICAL SURVEILLANCE, EXPOSURE MONITORING, AND EMPLOYEE INCIDENTS AND REPORTING

See *SRS-009 Research Safety Occupational Health Policy* for information related to Occupational Health Services. If needed, contact the IHO, or Occupational Health for additional information.

11. REPORTING REQUIREMENTS

- a) From VHA Handbook 1058.01, Research Compliance Reporting Requirements; see also Research Service R&D SOP 005 entitled "[Reporting Research Events](#)," and *SRS-012 Medical and Security Incident Plan*.

- b) Apparent or suspected research safety events that shall be reported include
 - i. Exposures to hazardous chemicals
 - ii. Research-related injuries
 - iii. Safety incidents
 - iv. Program non-compliance.
 - v. See *SRS-012 Medical and Security Incident Plan* for what constitutes an adverse event, procedures for reporting, and reporting timelines.
- c) Note: All injuries and illnesses that occur on campus are required to be entered into the facility's on-line ECOMP by you or designee.

12. REFERENCES

1. Research Laboratory Safety Guidebook. HEFP, St. Louis, December 4, 2019. <http://vaww.hefp.va.gov/guidebooks/research-laboratory-safety-guidebook>
2. Title 29 Code of the Federal Register (CFR) Parts 1910.134, 1200, 1450, 1048. <https://www.ecfr.gov/current/title-29/subtitle-B/chapter-XVII/part-1910>
3. Minnesota Rules, 7045.0454 and 7045.0558. <https://www.revisor.mn.gov/rules/7045/>
4. ANSI Z87.1 entitled Industrial Eyewear Impact Standard. <https://blog.ansi.org/2020/04/ansi-isea-z87-1-2020-safety-glasses-eye-face/>
5. CFR 49 entitled Transportation. <https://www.ecfr.gov/current/title-49>
6. CFR 40 Part 262 entitled Standards Applicable to Generators of Hazardous Waste. <https://www.ecfr.gov/current/title-40/chapter-I/subchapter-I/part-262>
7. NFPA 10 entitled Standard for Portable Fire Extinguishers. <https://blog.ansi.org/2017/12/nfpa-10-2018-standard-portable-fire-extinguisher/>
8. NFPA 30 entitled Flammable and Combustible Liquids Code. <https://www.nfpa.org/News-and-Research/Data-research-and-tools/Hazardous-Materials/The-fire-risk-of-Intermediate-Bulk-Containers/About-NFPA-30>
9. NFPA 99 entitled Health Care Facilities, Chapter 11, Laboratories. <https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=99>
10. The Joint Commission, Environment of Care Essentials for Health Care. <https://store.jcrinc.com/2023-environment-of-care-essentials-for-health-care/>
11. Metropolitan Council Environmental Services Regulations. <https://metro council.org/About-Us/What-We-Do/Departments/Environmental-Services.aspx>
12. VHA Handbook 1058.01, Research Compliance Reporting Requirements dated October 22, 2020. https://www.va.gov/vhapublications/publications.cfm?pub=1&order=asc&orderby=pub_Number
13. NIOSH Hazardous Drug List. <https://www.cdc.gov/niosh/docs/2016-161/default.html>
14. Utah State University Office of Research Glove Compatibility Guide. <https://research.usu.edu/ehs/chemical/glove-compatibility>
15. University of Michigan Environment, Health & Safety. <https://ehs.umich.edu/research-clinical/planning-safe-research/glove-compatibility-chart/>

13. REGULATORY WEBSITES

Contact the Safety Office at ext. 31-5180 if you require a hard copy of any of the regulations mentioned below.

1. VA Standards & Codes Library, and Guidebooks. <http://vaww.hefp.va.gov>
2. Dept. of Labor, Occupational Safety and Health Administration (OSHA) Requirements. <http://www.osha.gov>
3. 29 CFR 1910 (General Industry). <https://www.osha.gov/laws-regs/regulations/standardnumber/1910>
 - a. 1910.1000 Air Contaminants
 - b. 1910.1001 Asbestos
 - c. 1910.1025 Lead
 - d. 1910.1027 Cadmium
 - e. 1910.1028 Benzene
 - f. 1910.1048 Formaldehyde

- g. 1910.1052 Methylene Chloride
 - h. 1910.1200 Hazard Communication
 - i. 1910.1450 Occupational Exposure to Hazardous Chemicals in Laboratories (Chemical Hygiene Plan)
 - j. 1910.151 Medical Services and First Aid
4. National Institute of Occupational Safety and Health (NIOSH) Recommendations. <http://www.cdc.gov/niosh>
 5. American Conference of Governmental Industrial Hygienists Recommendations. <http://www.acgih.org>
 6. Environmental Protection Agency (EPA). <http://www.epa.gov>
 7. Minnesota Pollution Control Agency (MPCA). <http://www.pca.state.mn.us>
 8. Hennepin County. <http://www.co.hennepin.mn.us>

14. SRS APPROVAL: July 26, 2023

15. RECISSIONS: Chemical Hygiene Plan, August 14, 2017

16. FOLLOW-UP RESPONSIBILITY: Subcommittee on Research Safety (SRS)