CHEMICAL HYGIENE PLAN

University Policy Statement:

Creighton University is dedicated to ensuring the safety and well-being of its faculty, staff, students, volunteers, and campus visitors. This plan establishes laboratory procedures, practices and policies that will ensure that all laboratory workers, and others who may enter the laboratory setting, are protected from all potentially hazardous substances associated with laboratory operations. All laboratories using chemicals at Creighton University come under the provisions of this plan. The Chemical Hygiene Plan developed herein establishes overall organization and supervisory responsibilities to provide a safe working environment, and engendering its implementation with the end user to ensure personal and institutional safety.

Scope, Definitions, and Application:

The contents of this document apply to all faculty, staff, agents, volunteers, students, and visitors engaged in the laboratory use of hazardous substances, even in small quantities, and whether for service, academic or research purposes. A laboratory is any facility where hazardous chemicals are used in small quantities not on a production basis and includes photo laboratories, art studios, and other nonconventional laboratory areas.

A toxic chemical is one which damages or interferes with the metabolism of living tissue. A hazardous chemical is one for which there is statistical evidence in at least one study that acute or chronic health effects may occur in exposed individuals (21 CFR 1910.1200). Included are carcinogens, toxins, reproductive toxins, irritants, corrosives, sensitizers, and otherwise damaging agents. Chemicals produced in the laboratory, those of unknown toxicity, or those of unknown composition shall be assumed to be hazardous and toxic; mixtures are assumed to be more toxic than their most toxic component.

Purpose:

This Chemical Hygiene Plan is intended to reduce the significant risks of exposure to hazardous chemicals for employees working in laboratories. General precautions should be adopted rather than multiple specific guidelines, but special provisions shall be made for employee protection for work with particularly hazardous substances, including carcinogens, toxins, and acutely toxic substances. Eye and skin contact with chemicals should be avoided. Adequate ventilation must be provided in all work areas and hoods should be used to prevent airborne dispersal. The Chemical Hygiene Plan, as developed, will minimize exposure and shall be followed as a regular and continuing effort in all laboratories. OSHA Permissible Exposure Limits (PELs), Short Term Exposure Limits (STELs). and Threshold Limit Values (TLVs) of The American Conference of Governmental Industrial Hygienists should not be exceeded.

I. Chemical Hygiene Rights and Responsibilities:

Employees and other personnel who work in laboratories have the right to a safe work environment. To that end, they have the right to be informed about the potential hazards of the chemicals in their work areas and to be properly trained to work safely with these substances.

This includes Facilities Management staff and others that may enter the laboratories. Employees have the right to file a complaint with OSHA if they feel they are being exposed to unsafe or unhealthy work conditions and cannot be discharged, suspended, or otherwise disciplined by their employer for filing a complaint or exercising these rights. All personnel working with potentially hazardous chemicals are encouraged to report any concerns about unsafe work conditions.

All personnel including faculty, staff, and students have a duty to fulfill their responsibility of maintaining a safe work environment. The following sections, based on the user's role within the laboratory, list out specific responsibilities and expectations for contributing to a safe work environment.

Principal Investigator (PI) (including, but not limited to, teaching-research faculty, research faculty, clinician-educator faculty, university professors, resident faculty, affiliate faculty, and a graduate student on dissertation grants)

- Ensures general safety training for laboratory workers has been completed
- Provides chemical-, task- and job-specific training to laboratory workers
- Provides laboratory workers with appropriate engineering controls and personal protective equipment
- Maintains a chemical inventory
- Ensures that hazardous materials are disposed of properly
- Documents specific/standard operating procedures for work with particularly hazardous substances
- Conduct annual Self-Audits of assigned laboratory space
- Develops and maintains a laboratory-specific Chemical Hygiene Plan
- Adheres to all responsibilities associated with the Laboratory Worker role

Laboratory Worker (including, but not limited to, staff, students, visitors, volunteers)

- Completes all required training
- Adheres to all safety and compliance policies and procedures
- Follows procedures and lab practices outlined in this Chemical Hygiene Plan
- Learns and follows lab-specific Standard Operating Procedures (SOPs)
- Uses engineering controls and personal protective equipment when appropriate

- Reports unsafe conditions, accidents, and incidents to the PI, EH&S, or the Risk Manager as appropriate

- Can serve as a designee for the PI, if approved, though the PI will still be held responsible for all liability issues that arise

Environmental Health and Safety (EH&S)

- Acts as the Chemical Hygiene Officer

- Develops and updates policies and procedures working safely with hazardous materials

- Administers and oversees the Chemical Hygiene Plan, including an annual review

- Provides initial, basic laboratory training

- Acts as a technical resource

    - Develops and maintains the EH&S website

    - Conducts laboratory safety audits

    - Provides chemical safety guidelines and technical information

    - Maintain and disseminate knowledge of current legal requirements as they pertain to hazardous and/or regulated substances.

University Laboratory Safety Committee

- Participates in the annual review of the Chemical Hygiene Plan

- Acts as a liaison between the members' departments and EH&S

- Participates in the development of policies and procedures related to hazardous materials and laboratory safety issues.

II. Laboratory Facilities:

Design

Appropriate general ventilation shall be available for laboratories and storage areas. Adequate hoods, biosafety cabinets, and sinks shall be present as shall eyewash fountains and drench showers. There shall be provisions for hazardous waste disposal.

Maintenance

All laboratory-owned equipment shall be regularly maintained and continually appraised for efficiency. Such maintenance is the responsibility of the laboratory PI.

Ventilation and Hoods

General ventilation should not be relied upon for protection from released toxic substances, which should be limited to hoods. Laboratories should draw air from nonlaboratory areas and exhaust out of the building. Hoods should provide 2.5 linear feet of space per person working primarily with chemicals. Each hood shall have a continuous monitoring device and should provide a face velocity of 60-100 lfm. Exhaust from glove boxes and isolation rooms should be scrubbed or HEPA (high efficiency particulate air) filtered. Special care should be taken not to release toxic substances into rooms without air exchange, and there shall be provisions for rapid escape in case of electrical failure. Ventilation should be regularly monitored, and modification made only after full evaluation of the whole system.

Maintenance and certification of hoods and biosafety cabinets will be conducted by an outside contractor, with the contract managed by Facilities Management.

Hoods and biosafety cabinets shall be certified annually by an outside contractor. An inspection sticker shall be affixed to each hood and biosafety cabinet, indicating whether it has passed inspection, the date it was last inspected, and the date the next inspection is due.

Prior to use, it is the user's responsibility to assess and confirm that the fume hood appears to be operating properly and does not indicate any error or alarm or have any other damage or defect that would prevent the hood from being safely operated.

III. Basic Rules and Procedures for Working with Chemicals:

The following rules should apply to all laboratory work. Each PI shall develop specific standard operating procedures (SOPs) to cover the circumstances specific to each individual laboratory or small group of laboratories beyond those general guidelines which follow.

For the purposes of chemical safety and management, an SOP is a detailed, written set of procedures that explains how to utilize and manage hazardous chemicals, processes, and procedures to minimize health and safety concerns. SOPs should provide sufficient detail and be specific to the institution or the facility where the work is conducted so that someone with limited experience or knowledge of the procedure can successfully and safely follow the procedure.

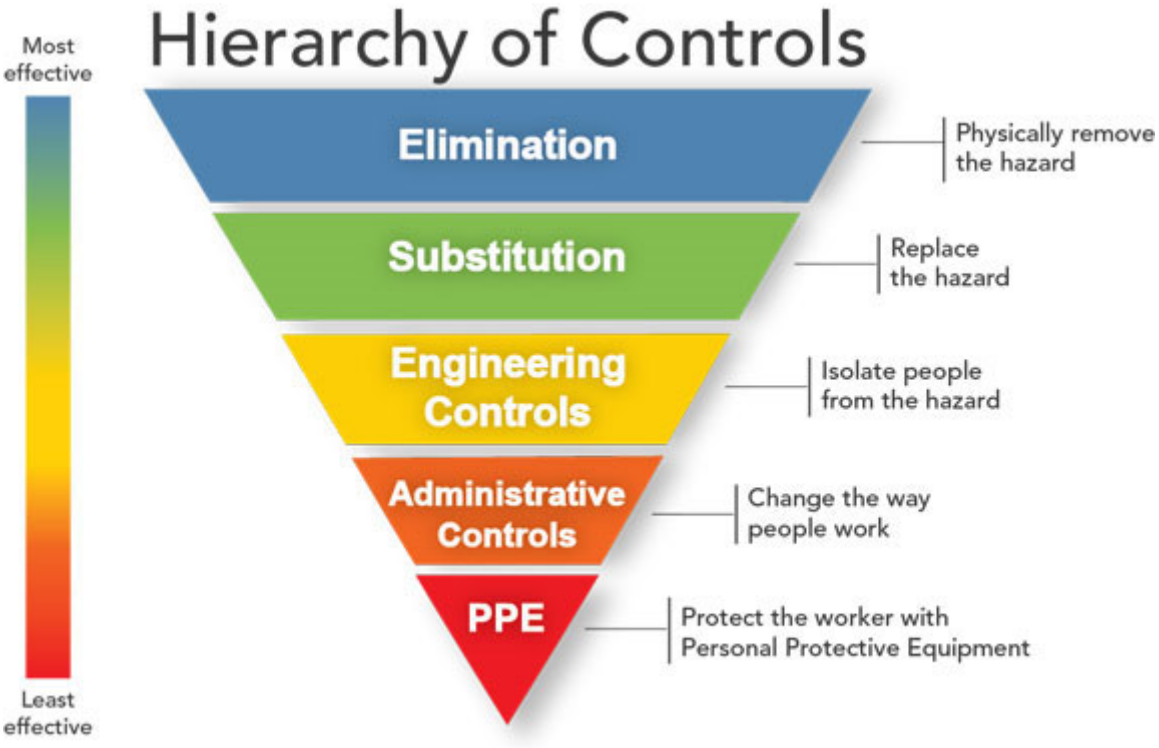
Note that the recommendations below do not address procedures and actions primarily for the prevention of physical injury. Accidents leading to physical injury often will secondarily lead to toxic exposure, so they must be avoided. All areas shall be continually monitored for safety hazards and corrective actions shall be taken.

Chemical exposures occur via four primary routes:

- Inhalation (through nose and mouth)
- Ingestion (eating or drinking)

- Absorption (through skin, eyes, or mucus membranes)
- Injection (skin being punctured or update through an open wound)
- Physical Hazards (explosives, pyrophoric chemicals)

To mitigate the risk of suffering a harmful chemical exposure, carefully considered, multi-tiered system of safety controls should be utilized, frequently referred to as the Hierarchy of Controls, developed by the National Institute for Occupational Health and Safety.



The idea behind this hierarchy is that the control methods at the top of graphic are potentially more effective and protective than those at the bottom. Following this hierarchy normally leads to the implementation of inherently safer systems, where the risk of illness or injury has been substantially reduced.

Elimination and Substitution involves removal of the potential hazard, making it the most effective at reducing hazards. However, these are also the most difficult to implement, especially if they are not considered at the design stages of a process. As such, care should be taken when developing a new protocol to consider the elimination or substitution of potential hazards.

Engineering Controls isolate the worker from the hazard. These are preferred to administrative controls and personal protective equipment because they are less user dependent. A common type of engineering control is local ventilation, such as fume hoods and biosafety cabinets.

Administrative Controls are policies and procedures that are used in conjunction with engineering controls, including things like lab-specific Chemical Hygiene Plans, Standard Operating Procedures, experimental protocols, and more. In order to be effective, users must be fully trained, aware, and adherent to administrative controls in order to benefit from their risk reduction.

Personal Protective Equipment is the last line of defense against a chemical hazard and is designed to protect the user. It includes items such as safety glasses/goggles, gloves, lab coats, and more. As with administrative controls, PPE requires users to properly choose and wear the equipment in order to benefit from risk reduction.

To help reduce exposure in the laboratories, the following guidelines have been implemented:

A. General rules:

1. Use only substances which are necessary and for which adequate facilities are available.

2. All hazards should be identified, and appropriate safety procedures planned and written. Adequate safety equipment must be obtained and appropriately positioned.

3. Avoidance of routine exposures:

    a. Develop and encourage safe habits and avoid exposure to hazardous chemicals.

    b. Vent possible toxic discharges through approved ventilation or hood exhaust systems. Hoods should always be used for known toxic emissions.

    c. Wear appropriate protective equipment and use hoods and well-ventilated areas.

4. Practical jokes and horseplay are prohibited in laboratories.

5. All contaminated items must be removed prior to exiting, and all exposed skin thoroughly washed. Laboratory coats shall not be worn outside the laboratory. When in hallways, only one glove should be worn to prevent contamination.

6. Do not use damaged equipment or glassware. Use equipment only for its designated purposes. Inoperative equipment should be clearly labelled to prevent use.

7. Avoid working alone in the building. Best Practices and supported by the Prudent Practices in the Laboratory book, a second person must be present when conducting

hazardous procedures. If hazardous procedures must be performed at times when a second person is not available to be present, the PI must be informed and contacted at a specific time when the procedures are completed as to ensure the hazardous procedure has been completed without incident.

8. When unattended operations are in progress leave the lights on, place an appropriate sign on the door, and provide for containment of an unforeseen accident, such as due to utility failure.

9. All operations involving chemicals shall include plans and training for waste disposal. Waste shall be deposited in appropriately labelled receptacles and disposed of in accordance with the established procedures.

10. Eating, drinking, smoking, gum chewing, and the application of cosmetics in areas of laboratories where chemicals are present is prohibited. Hands should be washed prior to these activities. Food and beverages shall not be stored in refrigerators or utensils which are used for laboratory operations.

11. Use of Hoods and Glove Boxes:
    a. Use a hood or glove box for any operation which may generate toxic vapors or dust, especially any volatile substance with a TLV of 50 ppm or less.
    b. Confirm adequate hood performance by a continuous monitoring device, prior to use.
    c. Keep hood sash to the level indicated on the hood to maximize safety.
    d. Only minimal amounts of volatile material should be stored in hoods. Excess volatiles shall not be disposed of in hoods.
    e. Hoods should be left on if toxic substances are stored in them, or if general laboratory ventilation may not be adequate.

12. Personal Apparel and Protective Equipment:
    a. Long hair and loose clothing must be confined.
    b. Shoes that cover the entire foot shall be worn; sandals and perforated shoes are not permitted.
    c. Work areas shall be kept clean and uncluttered.
    d. Appropriate eye protection, skin protection (e.g. gloves), and protective clothing shall be worn.
    e. Gloves and safety glasses or goggles should be worn during any hazardous operations, together with a protective coat or apron. A gown or jumpsuit, full face mask, nose mask, head cover, shoe covers, and other outer disposable protection shall be worn when indicated.
    f. Appropriate respiratory equipment shall be used when chemicals are not properly contained by hoods or ventilation. Either self-contained or appropriate filter respirator units may be indicated. The Respiratory Protection Program must be followed in cases where personnel are required to wear respiratory protection.

13. Accidents and Spills:

a. Eye contact: Promptly flush with water in eyewash for at least 15 minutes and then seek medical attention.
b. Skin contact: Promptly flush with water, remove any contaminated clothing, and seek medical attention.
c. Ingestion: Drink a large amount of water and seek medical attention.
d. Clean-up in case of spills:
    i. The spill shall be promptly confined.
    ii. All nonessential and unprotected personnel shall leave or be removed from the area, undergo decontamination by washing or showering if necessary, and discard any contaminated clothing as needed.
    iii. If the spill is flammable, turn off electrical and flame sources, but maintain ventilation if possible.
    iv. Clean-up personnel should don appropriate protective equipment, including a respirator if indicated. Clean-up and neutralization procedures for the specific spill (see SDS) shall be reviewed. If a specific predefined cleanup SOP for the substance is not available, or if there are any questions as to procedure, an appropriate supervisor, the EH&S Office, or an outside expert shall be contacted after initial containment and evacuation prior to proceeding.
    v. At least two protected individuals should be present prior to proceeding so that there is backup available. Use appropriate neutralizing or absorptive agents. Commercial spill kits should be located strategically. Cover solid material with moistened (by water or appropriate solvent) paper towels. DO NOT DRY SWEEP.
    vi. Perform gross clean up. Then neutralize (or disinfect) and clean again to prevent aerosol formation.
    vii. If the spill is infectious, contain and absorb as much as possible and flood with 1:10 bleach or other appropriate disinfectant.
    viii. All spills of hazardous substances shall be reported to the EH&S Office. All contaminated personnel shall be reported to the EH&S Office and referred for medical evaluation.
    ix. Each laboratory shall develop and maintain specific clean-up SOPs for the most likely spill risks.

B. Particularly Hazardous Substances: (PHS) encompasses select carcinogens, reproductive toxins, and substances that have a high degree of acute toxicity.

1. Explanations of types of PHS

a. **Select Carcinogens.** Carcinogens are substances that are capable of causing cancer; compounds that are known to pose the greatest carcinogenic hazard are *select carcinogens* and must be handled as PHSs according to the OSHA Laboratory Standard. The following criteria determine this status:

- It is regulated by OSHA as a carcinogen

- It is listed as known to be a carcinogen in the latest Annual Report on Carcinogens issued by the National Toxicology Program (NTP).

- It is listed under Group 1 (carcinogenic to humans) by the International Agency for Research on Cancer (IARC).

- It is listed under IARC Group 2A (probably carcinogenic to humans) or 2B (possibly carcinogenic to humans), or under the category "reasonably anticipated to be a carcinogen by the NTP," and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria: (a) after inhalation exposure of 6 to 7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m^3; (b) after repeated skin application of less than 300 mg/kg of body weight per week; or (c) after oral dosages of less than 50 mg/kg of body weight per day.

b. **Reproductive Toxins** are substances that cause chromosomal damage (mutagens) and substances with lethal or teratogenic (malformation) effects on fetuses. These substances have adverse effects on various aspects of reproduction, including fertility, gestation, lactation, and general reproductive performance, and can affect both men and women. Reproductive toxins will typically be indicated in Section 2: Hazard Identification of the Safety Data Sheet with as

    - H360: May damage fertility or the unborn child,

    - H361: Suspected of damaging fertility or the unborn child, or

    - H362: May cause harm to breast-fed children.

c. **Highly Acute Toxins**. Acute toxicity is the ability of a chemical to cause a harmful effect after a single exposure. Acutely toxic agents cause local toxic effects, systemic toxic effects, or both, and this class of toxicants includes corrosive chemicals, irritants, and allergens (sensitizers).

    - A chemical with a median lethal dose (LD50) of 50 mg or less per kg of body weight when administered orally to certain test populations,

    - A chemical with an LD50 of 200 mg or less per kg of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) to certain test populations,

    - A chemical with a median lethal concentration (LC50) in air of 200 parts per million (ppm) by volume or less of gas or vapor, or 2 mg per liter or less of mist, fume, or dust, when administered to certain test populations by continuous inhalation for one hour, provided

such concentration and/or condition are likely to be encountered by humans when the chemical is used in any reasonably foreseeable manner.

2. Rules for working with PHS

    a. Prior to undertaking work with a PHS, specific standard operating procedures shall be developed by the PI

    b. Personnel working with a PHS must have the knowledge, skill, and discipline to carry out safe lab practices consistently.

    c. All transfers and work shall be conducted in a controlled area such as a restricted access hood, a glove box, or a portion of a laboratory designed for use of highly toxic substances, for which all personnel with access are aware of the necessary precautions. The area shall be conspicuously marked with warnings and restricted access signs and all containers shall have similar warning labels. Warnings such as HIGH CHRONIC TOXICITY, CANCER-SUSPECT AGENT, AUTHORIZED PERSONNEL ONLY are appropriate.

    d. Breakable containers shall be stored in chemically resistant trays and such trays or absorbent plastic backed paper shall be placed under working areas. Contingency spill plans shall be developed.

    e. Appropriate PPE shall be worn at all times when handling materials, including gloves that impervious to the chemicals being used and face and eye protection. Respirators may be necessary, depending on the degree of hazard.

    f. Contaminated items and waste materials should be disposed of as hazardous waste by contacting EH&S for pickup and removal. Containers should be transferred in unbreakable secondary containers only by authorized personnel.

    g. As appropriate, a Special Animal Safety Protocol will be used when a PHS is used in animal research.

IV. Chemical Hygiene Support Activities

A. Chemical Procurement, Distribution, and Storage

1. Procurement:

    a. When a hazardous substance is received, information on proper handling, storage and disposal shall be known by those who will be involved with the material, and an SDS shall be on file in the laboratory and in the EH&S Office.

b. No container shall be accepted from the vendor without a proper identification label, and an SDS, if one is not on file.

2. Distribution: When chemicals are hand carried, the container shall be placed in an outside container or cart. When possible, freight-only elevators shall be used. Moving chemicals in personal vehicles is prohibited.

3. Laboratory Storage of Chemicals:

   a. Amounts of storage permitted in laboratories shall be as small as practical, and in no instance shall exceed those amounts permitted by pertinent government regulations. Storage on bench tops is not recommended. Storage in fume hoods shall be minimized to toxic volatiles because of crowding and disruption of air flow patterns.

   b. Flammable substances shall be stored in the laboratory only in minimal quantities, in metal safety cans or flammable cabinets, and in no instance shall exceed those amounts permitted by pertinent government regulations. Non-safety containers should be one liter or less. Flammables may not be stored in any refrigerator except those certified as explosion proof. Larger amounts must be kept in approved flammable storage cabinets, not exceeding five gallons per 400 square feet. Bulk storage and all drums must be stored in a central approved flammable storage room, preferably outside the building, but with at least one vented outside wall. When transferring flammable liquids from bulk the containers shall be grounded.

   c. Compressed gas cylinders shall always be transported using a hand truck and with the valve cap in place. All cylinders in laboratories shall be strapped or chained in place at bench top level.

   d. Exposure of compressed gas cylinders to excessive heat or direct sunlight shall be avoided.

   e. Annual inventories of chemicals shall be conducted by each PI, with unneeded items being re-homed or disposed of properly.

4. Stockrooms/Storerooms or any central storage area for chemicals supplying several laboratories.

   a. Toxic substances shall be segregated in a well-identified area with local exhaust ventilation.

   b. Chemicals which are highly toxic shall be placed in unbreakable secondary containers.

   c. Chemicals whose containers have been opened shall be stored in an area with local exhaust ventilation and shall be kept in unbreakable outer storage containers or spill trays.

d. Stored chemicals shall be examined annually for replacement, deterioration and container integrity.

e. Storerooms/stockrooms shall not be used as preparation or repackaging areas, except in a specifically designated area not posing hazards with other stored materials and shall be under control of one person.

B. Laboratory Signs: Each PI shall assure that each laboratory shall prominently post signs as follows:

1. Post emergency telephone numbers of Public Safety, the EH&S Office, Facilities Management, PI, and key laboratory workers. A sign template is available from EH&S.

2. Post location signs for safety showers, eyewash stations, first aid equipment, fire extinguishers, and exits.

3. Post warnings at areas or equipment where special or unusual hazards exist.

4. Post restricted areas or containers for especially hazardous substances.

C. Chemical labels: All chemicals must be labeled in accordance with current standards, including the Globally Harmonized System.

1. The manufacturer's original labeling on incoming containers shall be preserved.

2. Secondary containers must be labeled with the identity of the substance and appropriate hazard warnings.

3. Prepared mixtures must be labeled with appropriate hazard warnings based on knowledge of the physical properties of the substance

4. Labels must be in English, with words and not chemical symbols or formulas.

5. Labels must contain the full name of the chemical. Abbreviations are permitted if an abbreviation guide (or "cheat sheet") is posted prominently within the lab.

6. Labels must contain the appropriate signal word, Danger or Warning, as found on the SDS.
7. Labels must contain all applicable Danger hazard statements and should contain all applicable Warning labels.

D. A Safety Data Sheet (SDS, formerly known as an MSDS) must be available in hard copy form for each hazardous chemical present in the lab.

1. The PI is responsible for maintaining the SDSs and ensuring that they are available to laboratory workers.

2. The SDSs must be available in a central location that can be accessed immediately by all laboratory workers in case of an emergency. The SDSs can not be behind a lock or a computer that requires a password.

3. The EH&S Office maintains hard copies of SDSs, and they are also available in the UNHCEMS Chemical Inventory System.

E. Inspections:

The EH&S Office inspects research laboratories on a rotating basis, with each lab being audited approximately every 2 years.

1. Labs with previous history of serious non-compliance issues and/or extremely hazardous chemicals will be inspected more often.

2. Labs with non-compliance related to hazardous waste storage and labeling will be inspected 30 days following the initial visit and again 6 months after that.

3. New labs will be added to the list of inspections as needed.

4. Efforts will be made to inspect all labs belonging to one PI at the same time.

5. Results of the inspection, including the inspection checklist, will be provided to the PI.

F. Maintenance of Safety Equipment

1. Eyewashes must be inspected weekly by Laboratory Workers and this information documented on a lab-specific inspection sheet.

2. Eyewashes and emergency showers must be inspected twice a year by EH&S personnel and documented on the green-and-white tag near the equipment

3. Fire extinguishers must be maintained by the EH&S Office in accordance with regulations.

G. Medical program:

1. Compliance with Regulations: Medical surveillance shall be in accordance with 29 CFR 1910.1450. The employer shall maintain for each employee a record of any monitoring of employee exposures and any medical examinations or consultations, including written opinions. The Medical Surveillance Program shall be the responsibility of the University Chemical Hygiene Officer.

2. Medical Surveillance:

a. Laboratory employees whose work involves regular and frequent handling of toxicologically significant qualities of a chemical should consult a qualified

physician to determine, on an individual basis, whether a regular schedule of medical surveillance is desirable.

b. When an employee develops signs or symptoms associated with a hazardous chemical the employee shall be provided an opportunity for a medical examination.

c. When exposure monitoring reveals a level above the action level (or PEL if none), or STEL, for an OSHA regulated substance, medical surveillance shall be established.

d. When a spill occurs with possible personnel exposure, the affected employees shall be provided with an opportunity for medical examination.

e. Medical surveillance shall be arranged through the Risk Manager. All medical examinations and consultations shall be performed by a licensed physician without cost to the employee or loss of pay.

f. The physician shall be provided:

- The identity of the chemical.
- A description of the circumstances.
- The signs and symptoms of the employee.

g. The physician shall provide the employer a written opinion to include:

- Recommendations for further medical follow-up.
- The results of the examination and testing.
- Any medical condition found which may place the employee at increased risk.
- A statement that the employee has been fully informed.
- The opinion shall not reveal unrelated diagnoses.

3. Work Related Injury or Illness: Should laboratory personnel suffer an "on the job" injury or illness, treatment can be sought as follows:

a. Emergencies: It is recommended that personnel go to the closest Emergency Department, which is the CHI Creighton University Medical Center – University Campus, located at 2412 Cuming Street, then follow up with their primary care provider.

b. Non-emergencies: Personnel may go to their primary care physician or to the Concentra Urgent Care located at 2700 F Street.

c. All work-related injuries or illnesses shall be reported on Creighton Form HR-24 to Risk Management. Accidents and occupationally related illnesses are covered under Workers' Compensation.

H. Protective Apparel and Equipment: Each PI, working with EH&S, shall assure that each laboratory or small group of laboratories handling or storing hazardous chemicals shall have the following personal protective equipment and equipment easily accessible:

1. Protective apparel in adequate amounts compatible with the required degree of protection for substances being handled. This includes glasses, goggles, masks, gloves, aprons, gowns, shoe and head covers, and any other appropriate protective equipment.

2. An eye wash within 100 feet that is kept free of obstructions.

3. An emergency shower in close proximity that is kept free of obstructions

4. An ABC-type fire extinguisher within each laboratory room.

5. Fire alarm in close proximity.

6. Telephone for emergency use.

7. Other equipment designated by the EH&S Office or PI

I. Records:

1. Chemical Hygiene Plan records shall show documentation that facilities and precautions are compatible with current knowledge and regulations.

2. Inventory and usage records for high risk substances shall reflect the amount of material on hand and the names of workers involved with the handling and storage of the material.

3. Medical records shall be retained by the University in accordance with current statutes, generally 30 years after termination of the employee.

J. Emergencies, Spills and Accidents:

1. A written Emergency Plan shall be developed by the PI for each laboratory or small group of laboratories. This Emergency Plan may cite the Chemical Hygiene Plan but must extend those portions specific to the laboratory or specific high-risk substances.

a. The written Emergency Plan shall be communicated to all laboratory personnel.

b. The Plan shall include, but not be limited to:

- Procedures for ventilation failure, including the presence of hazardous chemicals and marked temperature changes.
- Fire emergency procedures, including specific evacuation routes.
- Medical emergency procedures beyond those herein.
- Utility failures of all types.
- SOP's for all specific laboratory operations beyond these guidelines.
- SOP's for all particularly high-risk substances (defined in III. B. above) handled.
- Contamination and spill procedures specific for the laboratory.

2. All accidents or near accidents shall be reported to and carefully analyzed by the Chemical Hygiene Officer and the results disseminated to all interested personnel.

K. Information and Training Programs:

1. Supervisory Training: The EH&S Office shall be responsible for acquisition and dissemination of regulatory and technical information on the Chemical Hygiene Program, to provide literature and consultation, and to provide education programs for Laboratory Workers.

2. Right to Know: Each employee has a Right to Know concerning the hazards of working with chemicals in the laboratory workplace. This Hazard Communication Standard is set forth in 29 CFR 1910.1200. This Right to Know applies to any person who comes in contact with any hazard. Each PI shall ensure that each employee shall be informed of the Right to Know prior to commencing work as a part of their initial training.

3. Safety Data Sheets (SDS): Each PI shall obtain and keep on hand in each laboratory or small group of laboratories the SDS for every hazardous chemical used.

4. Training and Education:

a. Each employee shall receive information from the PI at the time of initial assignment concerning the hazards of the work performed in the laboratory and all applicable chemical safety procedures. They shall be informed of the location of the Chemical Hygiene Plan, where the SDS and safety procedures are kept, and how to access the information. They shall be informed of the permissible exposure limits, the signs and symptoms of exposure to hazardous chemicals, and the location of reference materials. Training and education programs shall be a regular and continuing effort, not just annual.

b. Training shall include methods and observations to detect release of hazardous chemicals, the control of physical and health hazards, and measures which may be taken for employee protection.

c. A Chemical Hygiene Program Education and Training form documenting all training and education of each individual, shall be maintained by the PI, and a copy forwarded to the EH&S Office whenever an update occurs.

5. Safety Programs: Each PI shall develop for each laboratory or small group of laboratories a Chemical Hygiene Plan specific to the location and specific operations of that laboratory to supplement this Chemical Hygiene Plan. This program shall include procedures to deal with emergency situations.

6. Emergency Procedures: All employees shall be instructed by the Laboratory Supervisor in applicable emergency procedures and shall know the location and proper operation and use of all emergency equipment and protective apparel. Key full-time personnel shall be trained in the use of specialized emergency equipment.

7. Receiving and Stockroom Personnel: Receiving and Stockroom personnel shall be made aware by the Laboratory Worker ordering the chemicals of hazards in the area, handling procedures, protective apparel, chemical transport, and all relevant regulations.

L. Waste Disposal Programs: To ensure that minimal harm to people, other organisms and the environment will result from the disposal of waste laboratory chemicals, each PI shall develop and implement laboratory waste disposal procedures within the context of the separate University Waste Disposal Plan. The following items are guiding principles regarding hazardous waste disposal which supplement the Disposal Plan:

1. Laboratory waste disposal procedures shall, at a minimum, include:

a. How waste is to be collected.

b. How waste is to be segregated.

c. How waste is to be labeled and stored.

2. Unlabeled containers of chemicals and solutions shall be disposed of promptly. Partially used unlabeled containers shall not be opened.

3. Upon termination of an employee, for whatever reason, all chemicals for which that person has had responsibility shall be accounted for by transfer to another individual, return to stock, disposal, or other transfer of accountability.

4. Laboratory chemical wastes shall be removed from the laboratory to a central storage area at least quarterly, and more frequently as the situation dictates.

5. Other than chemical waste that can be neutralized and disposed of through the laboratory sewage system, all chemicals shall be processed and transported off campus for appropriate disposal.

6. Indiscriminate disposal of chemicals down the drain, or by adding them to mixed refuse for landfill burial is prohibited.

7. Fume hoods shall not be used as a means for disposal for volatile liquids.

8. At the time of a PI's decommissioning of their lab, the PI must make appropriate plans to safely and effectively clean the lab. This means all chemicals must be given to a new lab (with updated chemical inventory), appropriately converted to hazardous waste, and all equipment must be cleaned. Costs associated with the disposal of hazardous laboratory wastes shall be borne by EH&S, except in cases of hoarding or lab cleanouts after the departure of a PI. In that instance, costs will be the responsibility of the generating department.

Reviewed and Updated April 12, 2022
The Laboratory Safety Committee

Thank you to Princeton University EH&S and Prudent Practices in the Laboratory (2011)