UNIVERSITY OF NEBRASKA MEDICAL CENTER℠
ENVIRONMENTAL HEALTH AND SAFETY

UNMC CHEMICAL HYGIENE PLAN

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UNMC Chemical Hygiene Plan
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1. Introduction

1.1 Purpose

OSHA's Occupational Exposure to Hazardous Chemicals in Laboratories standard (29 CFR 1910.1450), also known as the Laboratory Standard, specifies the mandatory requirements of a Chemical Hygiene Plan (CHP) to protect laboratory workers from harm due to hazardous chemicals. The CHP is a written program that outlines the policies, procedures, and responsibilities for protecting workers from the health hazards associated with hazardous chemicals used in the workplace.

1.2 Scope

All UNMC employees who work with hazardous chemicals must comply with the requirements outlined in this Chemical Hygiene Plan (CHP). Every employee is responsible for following safe work practices to protect themselves and all other lab personnel.

1.3 Specific Requirements

Standard operating procedures are essential for ensuring safety and health considerations for each activity involving the use of hazardous chemicals.

Criteria that the employer will use to determine and implement control measures to reduce exposure to hazardous materials, including engineering controls, the use of personal protective equipment (PPE), and hygiene practices, with particular attention given to selecting control measures for extremely hazardous materials.

A requirement to ensure that fume hoods and other protective equipment are functioning correctly and identify the specific measures the employer will take to ensure proper and adequate performance of such equipment.

Information to be provided to lab personnel working with hazardous substances includes:

- The contents of the laboratory standard and its appendices.
- The location and availability of the employer's CHP.
- The permissible exposure limits (PELs) for OSHA-regulated substances or recommended exposure limits for other hazardous chemicals where no applicable OSHA standard exists.
- The signs and symptoms associated with exposure to hazardous chemicals used in the laboratory.
- The location and availability of known reference materials on the hazards, safe handling, storage, and disposal of hazardous chemicals found in the laboratory, including Safety Data Sheets.

The circumstances under which a particular laboratory operation, procedure, or activity requires prior approval from the employer or the employer's designee before being implemented.

Designation of personnel responsible for implementing the CHP. Provisions for additional worker protection for work with particularly hazardous substances. These include "select carcinogens," reproductive toxins, and substances that have a high degree of acute toxicity. Specific consideration must be given to the following provisions and shall be included where appropriate:

- Establishment of a designated area.
- Use of containment devices such as fume hoods or glove boxes.
- Procedures for safe removal of contaminated waste.
- Decontamination procedures.

The employer must review and evaluate the effectiveness of the CHP at least annually and update it as necessary.

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

The physical and health hazards of chemicals in the work area. The measures workers can take to protect themselves from these hazards include specific procedures that the employer has implemented to protect workers from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and the use of personal protective equipment.

1.4 Responsibilities

Environmental Health and Safety

UNMC Environmental Health and Safety (EHS) serves as the primary health and safety resource to assist laboratories in promoting best practices in safety and environmental performance. It maintains compliance with applicable federal, state, and local regulatory requirements, agreements, and permits, including implementation of each laboratory's specific CHP in compliance with the OSHA Standard 29 CFR 1910.1450. EHS is responsible for:

- Providing technical support and assistance in chemical safety, radiation safety, hazardous waste management, biological safety, industrial hygiene, fire and life safety, and environmental stewardship.
- Developing and implementing the university-wide Laboratory Safety and Chemical Hygiene Plans. EHS reviews the program for regulatory compliance, including federal, state, and local regulations, and represents UNMC to various federal, state, and local regulatory and environmental agencies.
- Developing and implementing training and educational programs to enhance the health and safety of the UNMC community and promote compliance with governmental regulations and professional standards.

- Conducting regular visits to laboratories to assist in compliance with the CHP.
- Implementing policies approved by the University administration.

Principal Investigator

The Principal Investigator (PI) is a faculty member or research scientist appointed by the University to conduct research. The PI has overall responsibility for safety and compliance in their laboratory; however, the duties outlined below can be delegated to a competent designee(s) within the laboratory. The PI is responsible for:

- Ensuring that laboratory personnel have read, understood, and adhere to the Laboratory Safety Manual and Chemical Hygiene Plan.
- Ensuring that new laboratory personnel complete all required UNMC Safety, Laboratory Safety, Chemical Safety, and other applicable safety training at the time of hire or before involvement in laboratory research activities and that refresher training is completed as needed.
- Ensuring that current and new laboratory personnel receive adequate safety training on laboratory processes and/or equipment from the Principal Investigator (PI) before use.
- Ensuring that personnel are advised of applicable safety procedures when introducing new hazardous biological or chemical substances, radioactive materials, compressed gases, equipment, and procedures.
- Ensuring that appropriate personal protective equipment (PPE) is available and used.
- Developing operating procedures to address specific hazards or operations encountered in the laboratory. EHS may be consulted to aid in this effort.
- Ensuring that proper signage is present both inside and outside the laboratory to identify potential hazards and update this information annually or whenever changes occur.
- Ensuring that containers are labeled so that laboratory personnel or emergency responders can readily identify the contents.
- Ensuring that the two contacts are listed on the laboratory sign and that the lab has provided 24/7 cell phone numbers for lab personnel who are available for immediate response in case of an emergency.
- Reviewing the laboratory's operating procedures, plans, and other relevant safety protocols at least annually and whenever changes occur.
- Completing a Lab Closeout Checklist prior to any laboratory closeout, renovation, or relocation.

Laboratory Manager/Supervisor

The Laboratory Manager/Supervisor is a senior researcher appointed by the Primary Investigator (PI) or who is the PI themselves, responsible for all safety aspects of the laboratory's operations. The Laboratory Safety Manager is responsible for:

- Collaborating with the PI and EHS to ensure that laboratory personnel are informed of and adhere to the Lab Safety Manual, Chemical Hygiene Plan, and all relevant University, school, departmental, and laboratory policies and procedures.
- Ensuring that laboratory personnel conduct activities in accordance with good laboratory practices.
- Ensuring that appropriate PPE is available and used.
- Ensuring that appropriate spill control materials are available and personnel are trained in their use.
- Ensuring that Safety Data Sheets (SDS) are accessible for all hazardous chemicals in use or storage.
- Instructing laboratory personnel on specific procedures and equipment.
- Ensuring that chemical containers are properly labeled and closed.
- Ensuring that chemical inventories are prepared, maintained, and accessible electronically.
- Monitoring the procurement, use, and disposal of hazardous material.
- Advising Facilities personnel of potential hazards that might be encountered when they enter the laboratory.

Laboratory Personnel

Laboratory Personnel are individuals who work in the laboratory, including principal investigators (PIs), research scientists, postdoctoral fellows, technicians, undergraduate and graduate students, visiting scientists, laboratory volunteers, support personnel, and glassware washers. All laboratory personnel are responsible for:

- Reviewing and applying the information in the CHP and all University laboratory policies and procedures.
- Knowing where SDSs are maintained and reviewing them prior to using hazardous materials.
- Taking all Safety, Laboratory Safety, Chemical Safety Training, and other applicable training courses.
- Safely handling and disposing of chemicals.
- Using appropriate engineering controls (e.g., biological safety cabinets, chemical fume hoods, radiation shielding) and personal protective equipment (PPE) when working in the laboratory.
- Reviewing and understanding emergency response procedures.

2. Management of Hazardous Chemicals

2.1 Occupational Safety and Health Services Administration (OSHA)

Enacted in 1970, the purpose of this law is to ensure, as far as possible, "safe working conditions" for every working person in the country. This is accomplished by issuing basic safety and health standards, assigning OSHA employees to inspect workplaces, and requiring the industry to reduce or eliminate job hazards by imposing fines for identified violations.

OSHA sets standards for worker exposure to hazardous substances and requires that such substances bear warning labels. It also mandates that employees receive training and other information on the dangers posed by chemicals and be provided with instructions on how to use these chemicals safely. OSHA can inspect a workplace to determine whether it is in compliance with these regulations. In current practice, only a worker complaint or high worker injury rates, as shown in company records, will trigger an actual inspection.

Under SARA, the Secretary of Labor was directed to issue a final standard to protect the health and safety of employees engaged in hazardous waste operations. In 1989, OSHA issued the Hazardous Waste Operations and Emergency Response (HAZWOPER) rule, representing the first comprehensive approach to protecting public and private sector employees involved in the handling of hazardous waste materials. Many of the workers affected by this rule are employees of State and local governments.

2.2 General Classes of Hazardous Chemicals

The OSHA Laboratory Standard requires that, as part of the Chemical Hygiene Plan, provisions for additional employee protection be included for work involving particularly hazardous substances. These substances include “select carcinogens,” reproductive toxins, and substances that have a high degree of acute toxicity. The OSHA Laboratory Standard defines particularly hazardous substances as:

Carcinogens: A carcinogen is a substance capable of causing cancer. Carcinogens are chronically toxic substances; that is, they cause damage after repeated or long-duration exposure, and their effects may become evident only after along latency period.

Reproductive Toxins: Reproductive toxins are substances that have adverse effects on various aspects of reproduction, including fertility, gestation, lactation, and general reproductive performance. When a pregnant woman is exposed to a chemical, the fetus may be exposed as well because the placenta is an extremely poor barrier to chemicals. Reproductive toxins can affect both men and women. Male reproductive toxins can, in some cases, lead to sterility.

Substances with a High Acute Toxicity: High acute toxicity includes any chemical that falls within any of the following OSHA-defined categories:

- A chemical with a median lethal dose (LD50) of 50 mg/kg or less when administered orally to specific test populations.
- A chemical with an LD50 of 200 mg/kg body weight when administered by continuous contact for 24 hours to specific 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 specific 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.

2.3 Flammables and Combustible Liquids

Flammable and combustible liquids are classified according to their flash point, with flammable liquids having a flash point of less than 100°F and combustible liquids having a flash point between 100°F and 200°F. Both flammable and combustible liquids are considered fire hazards. Flammable and combustible liquids include alcohols, ketones, xylenes, carboxylic acids, and solvent-contaminated towels or rags. Additional information can be found here: https://www.unmc.edu/ehs/FactSheets/SolventContaminatedTowelsRagsWipers.pdf.

Most organic chemicals are also flammable or combustible.

General rules of handling flammable and combustible liquids include, but are not limited to, the following:

- Keep flammable and combustible materials away from sources of ignition, open flames, hot surfaces, electrical equipment, and static electricity.
- Never heat flammable substances with an open flame.
- Store flammable liquids in National Fire Protection Administration (NFPA) approved cabinets or storage rooms designed for combustible materials.
- Keep containers closed and only transfer chemicals in fume hoods.

2.4 Corrosive Materials

Corrosive chemicals can cause irreversible and visible tissue damage through chemical action at the point of contact. Corrosive chemicals can be liquids, solids, or gases and can cause harm to the skin, eyes, and respiratory tract. Chemicals with a low or high pH are considered corrosive. Therefore, acids and bases are corrosive. Examples are ammonium hydroxide, hydrochloric acid, nitric acid, phenol, sodium hydroxide, and sulfuric acid.

General rules of handling include the following:

- Do not store incompatible acids and bases together.
- Do not mix an acid and base and put the solution into a sealed container.
- Protect your eyes with safety goggles when working with corrosives.
- Hand protection and body protection are also necessary and should be selected based on the volumes used and specific corrosive properties.
- Consult a glove compatibility chart for specific guidance.

2.5 Highly Reactive and Unstable Materials

Highly reactive or unstable materials are those that have the potential to undergo vigorous polymerization, decomposition, condensation, or self-reaction under conditions of shock, pressure, temperature, light, or contact with another material. They can release heat, toxic gases, or flammable gases upon contact with water, air, or moisture in the air. Water-reactive materials react violently in contact with water.

Examples: lithium, sodium, potassium, organometallic compounds, aluminum bromide, calcium oxide, and phosphorus pentachloride. Pyrophoric materials can react with air and ignite spontaneously at or below 113°F (45°C). Pyrophoric materials should be handled and stored in inert environments.

Examples: chlorine trifluoride, phosphine, tert-butyl lithium, silane, white or yellow phosphorus, and many finely divided metals.

The safe handling of these materials depends on the specific material and the conditions under which it's handled. The lab should develop specific Standard Operating Procedures (SOPs) that include hazards, personal protective equipment, and engineering controls.

Persons working with these materials should receive training and approval from the Primary Investigator.

2.6 Compressed Gases and Toxic Gases

Compressed gas is any gas or mixture of gases exerted in a container, a pressure exceeding 40.6 psi (280 kPa, abs) at 68°F (20°C). Generally, the term "compressed gas" also refers to liquefied and dissolved gases that meet these criteria, including cryogenic gases.

The primary hazards associated with compressed gas cylinders are the immense amount of stored energy due to the high pressure, the large volume of gas present, and the properties of the gas itself.

All compressed gases are dangerous and must be handled using basic safety rules. A rupture can result in a powerful release of gas that can propel the heavy steel cylinder in a deadly manner.

Toxic gases pose additional potentially acute health hazards to laboratory personnel and the public; as such, they are considered "Restricted Gases" that require prior approval by the Primary Investigator. This also applies to oxidizing and flammable gases.

The following are general rules for the handling and use of compressed gases:

- Compressed gas cylinders must be secured in an upright position away from excessive heat, highly combustible materials, and areas where they might be damaged or knocked over.
- A chain, bracket, or other restraining device shall be used to prevent cylinders from falling.
- Cylinders of oxygen and other oxidizers must be stored at least 20 feet from fuel gas or other combustible materials unless separated by a noncombustible wall at least 5 feet high with a ½-hour fire-resistance rating.
- Cylinders must always have valve protection caps in place, except when containers are securely attached and connected to dispensing equipment.

Empty gas cylinders must also be stored securely with the valve protection cap in place.

- All hazardous materials must be labeled with the name of the chemical and the primary hazard associated with that chemical (e.g., flammable, oxidizer).
- The cylinder status, indicated as “full,” “in use,” or “empty,” must be clearly marked on the cylinder.
- Flash arrestors should be used to prevent a flashback, should it occur, in a line containing a flammable gas.
- All tubing and fittings should be inspected for integrity before use. If tubing is damaged, cracked, or missing, it should be removed from service until it has been properly repaired or replaced.
- Cylinders must be stored in dry, well-ventilated areas. Closets and lockers are not acceptable storage locations.
- Cylinders must not be stored in hallways, corridors, stairwells, or elevators.
- Unobstructed access must be maintained around the cylinders.
- All compressed gases must be recorded in the lab's chemical inventory.
- All compressed gases must be disposed of properly. Refer to the Pressurized Container/Compressed Gas Cylinder Disposal Fact Sheet.

2.7 Cryogenic Material

A cryogenic liquid is defined as a liquid with a normal boiling point below -150 °C (-240 °F). The most commonly used cryogenic liquid in a laboratory setting is liquid nitrogen. All cryogenic liquids are extremely cold. Cryogenic liquids and their vapors can rapidly freeze human tissue and can also pose an asphyxiation hazard if handled in confined spaces. Additional information on cryogenic materials can be found in the Liquid Nitrogen Dry Shippers Fact Sheet and the Liquid Nitrogen Transportation Fact Sheet.

The following precautions should be taken when handling cryogenic liquids:

- Use and store cryogenic liquids only in well-ventilated areas.
- Wear the appropriate personal protective equipment (PPE) when handling cryogenic liquids. Proper PPE for handling cryogenic liquids includes chemical splash goggles, a face shield, cryogenic-safe gloves, long sleeves, long pants, and closed-toe shoes.
- Cryogenic liquids will vent (boil off) from their storage containers as part of normal operation. Containers are typically designed with a vacuum jacket to minimize heat loss. Excessive venting and/or an isolated ice build-up on the vessel walls may indicate a fault in the vessel’s integrity or a problem in

the process line. A leaky container should be removed from service and taken to a safe, well-ventilated area immediately.

- All systems components, piping, valves, etc., must be designed to withstand extreme temperatures.
- Pressure relief valves must be installed in systems and piping to prevent pressure buildup.
- Additional information can be found in the Dry Ice Handling Fact Sheet.
- All containers containing dry ice should be labeled:
    - Dry Ice Signage Full Size
    - Dry Ice Signage Half Size

2.8 Sensitizers

A sensitizer, also known as an allergen, is a substance that causes exposed individuals to develop an allergic reaction in normal tissue after repeated exposure to the substance. Examples of sensitizers include diazomethane, chromium, nickel, formaldehyde, isocyanates, arylhydrazines, benzylic and allylic halides, and many phenol derivatives. Sensitizer exposure can lead to allergic reaction symptoms or increase an individual's existing allergies.

2.9 Irritants

Irritants are defined as chemicals that cause reversible inflammatory effects on living tissue by chemical action at the site of contact. A wide variety of organic and inorganic compounds, including many chemicals that are in a powder or crystalline form, are irritants. Symptoms of exposure can include reddening or discomfort of the skin and irritation of the respiratory system.

2.10 Restricted Chemicals

What constitutes a restricted chemical is left up to the PI who:

- Assesses the use of certain chemicals that can result in conditions of higher risk for laboratory personnel and facilities.
- Approves the use of Restricted Chemicals when they carry a higher risk due to their inherent hazardous properties.

Typical restricted chemicals:

- Extremely toxic gases
- Reactive metal compounds
- Controlled substances (restricted in terms of licensing requirements)

2.11 Nanomaterials

Nanomaterials are materials with at least one external dimension ranging from 1-100 nanometers. Occupational risks associated with manufacturing and using nanomaterials are not yet clearly defined. Please follow CDC/ NIOSH recommendations for the safe use and production of nanomaterials: http://www.cdc.gov/niosh/topics/nanotech/

2.12 Select Agent Toxins

Select Agents and Toxins are specific biological agents and toxins that are subject to stringent regulatory requirements under 42 CFR 73, 9 CFR 121, and 7 CFR 331 for their potential to pose a severe threat to public health, animal health, plant health, or to animal or plant products. These toxins, along with specified biological agents (viruses, bacteria, and fungi), fall under the oversight of the Federal Select Agents Program (FSAP), which requires registration for the possession, use, and transfer of the listed Select Agents. UNMC's program is managed by the Nebraska Public Health Lab (NPHL). Contact the NPHL at UNMC for additional information.

2.13 Newly Synthesized Chemicals

Principal Investigators will be responsible for ensuring that newly synthesized chemicals are used exclusively within their laboratories and are properly labeled and identified. Suppose the hazards of a chemical synthesized in the laboratory are unknown. In that case, the chemical must be assumed to be hazardous, and the label should indicate that the potential hazards of that substance have not been tested and are unknown.

The Principal Investigator must ensure an SDS is prepared for newly synthesized chemicals if:

- The chemical is hazardous according to the OSHA definition of hazardous (if the hazards are not known, then the chemical must be assumed to be hazardous).

- The newly created chemical or intermediate compound will be stored in the lab on an ongoing basis for use by current and/or future researchers in the same lab where it was initially produced.

3. Minimizing Exposures to Hazardous Chemicals

For the general safety of laboratory personnel, all chemical usage must be conducted in adherence with the general safe laboratory practices below. Methods used to control chemical exposures specifically are categorized as follows:

- Engineering Controls
- Administrative Controls
- Personal Protective Equipment

3.1 Engineering Controls

General lab ventilation cannot be relied upon alone to protect personnel from localized exposures to hazardous levels of airborne chemicals. Engineering controls, such as laboratory fume hoods, glove boxes, and other local exhaust systems (e.g., drop-down flexible ducts), may be necessary to provide additional exposure control.

In general, laboratory fume hoods are recommended whenever using hazardous chemicals that:

- Have a high degree of acute toxicity
- Carcinogens
- Reproductive toxins except where there is a very low risk of exposure (e.g., use of minimal quantities in a closed system).
- Have a permissible exposure limit of less than 50 ppm (or 0.25 mg/m3 for particulate matter).
- They are appreciably volatile (e.g., solvents) or are readily dispersible in the air (e.g., dust).

Additional information can be found in the Laboratory Fume Hood Manual.

3.2 Administrative Controls

Administrative controls are a step in the hierarchy of hazard control and should be used if elimination, substitution, and engineering controls cannot minimize the hazard to individuals. Administrative controls include training, procedures, policy, and changes in work schedules to reduce the amount of time an individual may be at risk. Administrative controls include work practices such as prohibiting mouth pipetting, recapping needles, and posting lab safety signs warning of hazards present in labs, as well as rotating workers in noisy environments to prevent hearing loss.

Administrative controls for minimizing exposures to hazardous chemicals include, but are not limited to:

- Substituting less hazardous chemicals (e.g., using proprietary detergents instead of chromic acid for cleaning glassware or using toluene instead of benzene for liquid-liquid extraction or chromatography).
- Isolating or enclosing an experiment within a closed system (e.g., a glove box or sealed chamber).
- Micro-scaling the experiment to reduce the amount of chemical usage.
- Scale up reactions in small steps and evaluate safety issues after each step to fully understand the reactive properties of the reactants and solvents, which may not have been evident at a smaller scale.

3.3 Personal Protective Equipment

Information on Personal Protective Equipment (PPE) can be found in the UNMC Laboratory Safety Manual. EHS has also developed a Laboratory PPE Selection Guide to assist laboratory personnel in choosing the appropriate PPE.

4. Standard Operating Procedures

4.1 Lab Specific Procedures

Standard Operating Procedures (SOP) are sets of written instructions that describe, in detail, how to perform a laboratory process or experiment safely and effectively.

Laboratories are responsible for establishing and maintaining Standard Operating Procedures (SOPs) for all work conducted in the laboratory that involves the use of hazardous materials (chemical, radioactive, and biological) or physical hazards.

4.2 Prior Approval and Special Precautions for working with Particularly Hazardous Substances

The increased hazard risk associated with Particularly Hazardous Substances (PHS) calls for more strict operating procedures in the laboratory:

Work Habits:

- No eating, drinking, smoking, chewing gum, using tobacco, applying cosmetics, or storing utensils, food, or food containers in laboratory areas where PHS are used or stored.
- Wash your hands and arms immediately after completing any procedure in which a PHS has been used and when you leave the laboratory.
- Conduct each procedure with the minimum amount of the substance, consistent with the work's requirements.
- Keep records of the amounts of each highly hazardous material used, the dates of use, and the names of the individuals who used it.
- Fit work surfaces, including fume hoods, with a chemically compatible removable liner of absorbent plastic-backed paper to help contain spilled materials and simplify subsequent cleanup and disposal.

Personal Protective Equipment:

- PHS may require more stringent use of personal protective equipment. Refer to the SDS for information on the proper use of gloves, lab clothing, and respiratory protection.
- Proper personal protective equipment must be worn when handling PHS.
- Wear lab clothing that protects street clothing, such as a fully fastened lab coat or a disposable jumpsuit, when using PHS. Do not wear laboratory clothing that has been used while manipulating PHS outside the laboratory area.

- Wear disposable protective clothing when methods for decontaminating clothing are unknown or not applicable. Discard disposable gloves after each use and immediately after overt contact with a PHS.

Ventilation/Isolation:

- Perform PHS work in a fume hood, glove box, or other form of ventilation. If the chemical may produce vapors, mists, or fumes, or if the procedure may generate aerosols, the use of a fume hood is required.
- Use a glove box if protection from atmospheric moisture or oxygen is needed or when a fume hood may not provide adequate protection from exposure to the substance; for example, a protection factor of 10,000 or more is required.
- Highly toxic gases must be used and stored in a vented gas cabinet connected to a laboratory exhaust system. Gas feed lines operating at pressures above atmospheric must use coaxial tubing.

Storage and Transportation:

- Store stock quantities of PHS in a designated storage area or cabinet with limited access. Additional storage precautions (e.g., a refrigerator, a hood, and a flammable liquid storage cabinet) may be required for certain compounds based on their other properties.
- Containers must be clearly labeled.
- Consider double containment. Double containment means that the container will be placed inside another container that can hold the contents in the event of a leak and provides a protective outer covering in the event of contamination of the primary container.
- Store containers on trays or pans made of polyethylene or other chemically resistant material.
- Use secondary containment when transporting PHS from one location to another to protect against spills and breakage.

Vacuum Lines and Services:

- Protect each vacuum service, including water aspirators, with an absorbent or liquid trap to prevent entry of any PHS into the system.
- Use a separate vacuum pump when using volatile PHS. Perform the procedure inside a fume hood.

Decontamination and Disposal:

- Decontaminate contaminated materials using procedures that decompose the PHS to produce a safe product or remove it for subsequent disposal.
- Decontaminate all work surfaces at the end of the procedure or the end of the workday, whichever comes first.

4.3 Laboratory Activity Hazard Assessment Procedure for Particularly Hazardous Substances

It is required that complete plans for the handling and ultimate disposal of contaminated wastes and surplus amounts of the PHS be in place before the start of any laboratory activity involving a PHS. Laboratories can utilize the Laboratory Standard for PHS to assist with completing risk assessments.

The Principal Investigator (PI), Lab Manager, or their designee must complete the PHS Risk Assessment at least once per calendar year. The purpose is to conduct a risk assessment specific to activities in your laboratories. EHS recommends that risk assessments be reviewed annually to ensure they remain appropriate, and training on their use should also be conducted annually, preferably before new laboratory personnel commence work in the affected laboratories. The person conducting the assessment must verify that it is complete and that the necessary training has been completed.

4.4 Chemical Exposure Assessment

For inhalation hazards, an exposure assessment is necessary to determine the level of exposure to hazardous chemicals. Additional information on chemical hazards can be found online in the NIOSH Pocket Guide to Chemical Hazards.

4.5 Personnel Exposure Monitoring

EHS can assist in conducting a risk assessment to determine if chemical exposure monitoring is necessary in the laboratory. For more information on exposure monitoring in the laboratory, please EHS at (402) 559-6356.

5. Chemical Labeling, Storage, and Inventory

5.1 Labeling

To meet EPA regulations for chemical labeling, templates are available on the EHS website for laboratories to print and use within their lab: Chemical Labeling. All chemical products and containers of chemical waste must be properly labeled.

Additional information on labeling requirements can be found in the Chemical Disposal and Chemical Collection Containers and Storage fact sheets. If you have any questions regarding chemical labels, please contact EHS at (402) 559-6356.

5.2 Storage

Due to the diverse individual properties of chemicals located in a chemical use area, proper storage requirements may be complicated. Some general procedures for chemical storage are listed in the Chemical Storage Fact Sheet.

These procedures are not intended to be all-inclusive but rather to serve as the basis for more specific procedures in the workplace. Specific instructions on chemical storage may be obtained from the Safety Data Sheet, container label, or by contacting the EHS Office.

5.3 Inventory

To respond safely to laboratory emergencies, the Omaha Fire/HAZMAT Department has requested that chemical inventories be compiled, including the chemical name, CAS number, location, and quantity for each laboratory room at UNMC/Nebraska Medicine. Additional information can be found on the EHS Website, Chemical Inventories.

6. Hazardous Waste Management

6.1 Introduction

EHS - Chemical Safety is responsible for the “cradle to grave” management of chemicals in accordance with the Occupational Health and Safety Administration (OSHA) and Environmental Protection Agency (EPA) Resource Conservation and Recovery Act (RCRA) regulatory requirements. Chemical Safety is also responsible for managing the ground and air shipping of hazardous materials and dangerous goods in accordance with the Department of Transportation (DOT) and the International Air Transport Association (IATA) regulatory requirements.

Please refer to the UNMC Waste Handling Policy for further information.

6.2 Environmental Protection Agency (EPA)

The primary mission of the Environmental Protection Agency (EPA) is to protect and enhance our environment. EPA is the lead agency responsible for carrying out SARA Title III reporting requirements. Under Superfund and other related laws, it is the agency primarily responsible for hazardous waste site operations and Superfund site cleanup activities. EPA also conducts technical and environmental training programs related to hazardous materials. At the request of community officials, EPA can provide technical expertise on the full range of environmental contamination issues.

The Resource Conservation and Recovery Act of 1976 (RCRA)
This law, administered by EPA, establishes a federal program to provide comprehensive regulation of hazardous waste. This includes certain materials that pose a potential threat to public health and safety when they are discarded. RCRA regulations provide and maintain a hazardous waste management system that covers the generation, transportation, use, and disposal of such waste (sometimes summarized as regulation from "cradle to grave"). Major control mechanisms include a manifest system to track hazardous waste shipments and a permit system requiring waste site owners and operators to comply with specified safety standards. While RCRA primarily regulates safety precautions at hazardous waste facilities in operation today, it also has strong provisions potentially relevant to cleanup if any part of a facility was in operation during the 1980s.

The Clean Air Act (CAA)
This act, passed in 1970, is the fundamental Federal law for controlling air pollution. It requires the EPA to maintain an up-to-date list of industrial pollutants that are hazardous to human health and to set an emission standard for each, with

an ample margin of safety. Under the law, EPA prepares minimum pollution standards, and States prepare implementation plans showing how these standards will be attained. States issue permits for the release of listed pollutants into the atmosphere and take samples to evaluate the State's air quality.

The Clean Water Act (CWA)

Initially enacted in 1972, this act aimed to achieve swimmable waters by 1983 and halt pollution discharges by 1985. These goals were not accomplished. The law continues to promote clean water by supporting the construction of sewage treatment facilities (which are currently bearing a heavy burden in processing pollutants), supporting the preparation of water quality plans encompassing the entire Nation, and setting up a permit system restricting the amount and type of pollutants that can be discharged into the Nation's waterways. The law is primarily designed to address point sources of pollution, although nonpoint sources, such as agricultural runoff, are also being addressed.

The Safe Drinking Water Act (SDWA)

This act is specifically designed to protect public water supplies from contamination by mandating water testing, denying Federal funds to projects that threaten critical water supplies, and requiring States to submit plans to protect public wells from contamination.

Pesticides Legislation

Both the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) and the Federal Food, Drug and Cosmetic Act (FFDCA) regulate pesticides. Initially requiring only the registration of pesticides, FIFRA was amended in 1972 to require testing for short-term and long-term toxic effects before registration. For pesticides used on food crops, EPA establishes an upper limit on the amount of residue that can remain on food based on human tolerance levels. The FFDCA requires the Food and Drug Administration (FDA) to enforce these residue limits by monitoring and seizing foods whose residues exceed these standards.

The Toxic Substances Control Act (TSCA)

This legislation was passed in 1976 to reduce the threat from new chemicals that "present or will present an unreasonable risk of injury to health or the environment." As a result, chemical producers must research the effects of new chemicals and notify EPA before they are manufactured. The EPA has the authority to ban or restrict the use of chemicals if there is sufficient evidence that the substance poses an "unreasonable risk." The Act also regulates polychlorinated biphenyls (PCBs) and asbestos.

Comprehensive Emergency Response, Compensation, and Liability Act (CERCLA)

In 1980, Congress passed the Comprehensive Emergency Response, Compensation, and Liability Act, or CERCLA. This is commonly known as Superfund. The bill's purpose was to fund cleanups and emergency response actions for some of the worst inactive or abandoned hazardous waste sites scattered across the country. A billion-dollar revolving trust fund — financed primarily by a tax on specific chemical and petroleum products — was created to pay for Federal and State response actions when releases of hazardous substances pose an existing or potential threat to human health or the environment.

In 1986, this bill was revised and expanded in the Superfund Amendments and Reauthorization Act of 1986 (SARA). The third part of SARA, Title III, is known as the Emergency Planning and Community Right-to-Know Act of 1986. This portion of the legislation makes over three hundred "extremely hazardous substances" subject to routine and detailed reporting to designated local, State, and Federal government agencies. It also requires local planning committees to utilize this information, along with other data on local hazards, to develop effective plans for hazardous materials emergencies.

6.3 The Department of Transportation (DOT)

The Department of Transportation (DOT) establishes the Nation's overall transportation policy. It bears the primary responsibility for issuing standards and regulations relating to the transportation of hazardous materials from State to State nationwide. (Hazardous materials that are transported only within a state's borders are regulated by State law.) The DOT is involved in identifying safer modes of transporting hazardous materials and has significant regulatory, research, and development, as well as training functions, in this area. DOT trains and inspects carriers and shippers of hazardous materials to ensure they comply with regulatory guidelines.

Hazardous Materials Transportation Act of 1974 (HMTA)

This Act improves the regulation and authority of the Secretary of Transportation to protect the nation adequately against risks to life and property inherent in the transportation of hazardous materials in commerce.

The Department of Transportation (DOT) was responsible for issuing the HMTA regulations, as outlined in 49 CFR 171-177. These regulations govern the packaging, marking, labeling, and acceptable conditions of hazardous materials offered for transportation within or across state lines. It also covers the actual transportation procedures and specifications for motor vehicles, aircraft, rail car, and vessels carrying hazardous materials. HMTA as amended by the Hazardous Materials Transportation Uniform Safety Act of 1990 (HMTUSA).

Some key provisions are:

- Shipping Papers: The person offering hazardous materials for transportation must provide a shipping paper with the required information and, in the event of an emergency, immediately disclose this information to the appropriate emergency response authorities.

- Training Requirements: Regulations have been issued specifying the requirements for training of "HazMat employees" (individuals who are involved in the transportation of hazardous materials, including those who handle, prepare, package, or operate a vehicle to transport hazardous materials).

These requirements are in addition to the Hazardous Waste Operations and Emergency Response (HAZWOPER) training requirements established by OSHA and the EPA.

- Identify and safeguard: Improvement of the placarding system, development of a central reporting system, and establishment of a computerized telecommunications data center.

The Federal Aviation Administration (FAA)

FAA is a department of the U.S. Department of Transportation (DOT). It is responsible for enforcing the United States' Air Transportation and Dangerous Goods Regulations.

The International Air Transport Association (IATA)

IATA is made up of airlines from around the world. The member airlines of IATA recognize the need to transport by air, articles and substances having properties which, if uncontrolled, could adversely affect the safety of the passengers, crew and/or aircraft on which they are carried. In response to this concern IATA developed The Dangerous Goods Regulations based on The International Civil Aviation Organization (ICAO) Technical Instructions. The regulations list the types of materials suitable for air transport and provide packaging, labeling and documentation instructions for them. They also spell out the training requirement for people involved with handling of dangerous goods and the notifications required in the event of a spill.

For information on transporting chemicals, please see the Chemical Transportation Fact Sheet & Hazardous Materials/Dangerous Goods Shipping Plan.

6.4 Hazardous Material Fact Sheets

The variety of chemicals generated at UNMC prohibits the development of guidelines specific to each chemical. However, guidelines for the disposal of some chemical wastes are presented and must be subsequently tailored to accommodate different types of chemicals.

Environmental Health and Safety has developed Hazardous Material Fact Sheets for certain chemical/chemical products. Please use these as a quick reference to guide you as you generate and dispose of these items.

Some common chemical waste streams, including compressed gas containers, water reactive compounds, shock-sensitive compounds, pyrophoric chemicals, peroxide-forming chemicals, biohazardous/infectious waste, chemotherapy, mixed (radioactive and hazardous) waste, dioxin, battery collection, commercial (trade name) products, spent photo fixer, spent Cidex (glutaraldehyde), formalin and unknown chemicals, are addressed in this section for easy reference.

If questions arise concerning the appropriate disposal procedures for these chemicals or chemicals not listed in this section, contact EHS at 402-559-6356.

6.5 Accumulation Limits

Tag all full chemical waste containers or unwanted chemical containers. Do not exceed 30 gallons of chemical waste. Please see Chemical Disposal Factsheet for additional information.

7. Hazard Information

Effective controls protect workers from workplace hazards; help avoid injuries, illnesses, and incidents; minimize or eliminate safety and health risks; and help employers provide workers with safe and healthful working conditions. The processes described in this section will help employers prevent and control hazards.

The following are examples of different hazard types: physical, noise, vibration, lighting, electrical, heat and cold, nuisance dust, fire/explosion, machine grinding, ergonomic, chemical, radiation, psychological, and biological.

7.1 Hazard Identification

To effectively control and prevent hazards, employers should:

- Involve workers, who often have the best understanding of the conditions that create hazards and insights into how they can be controlled.
- Identify and evaluate options for controlling hazards, using a "hierarchy of controls."
- Use a hazard control plan to guide the selection and implementation of controls, and implement controls according to the plan.
- Develop plans with measures to protect workers during emergencies and non-routine activities.
- Evaluate the effectiveness of existing controls to determine whether they continue to provide protection or whether different controls may be more effective. Reviewing new technologies for their potential to be more protective, more reliable, or less costly.

8. Emergency Response

Information on emergency procedures can be found online:
https://www.unmc.edu/emergency-management/index.html

8.1 Laboratory Safety Signs

To provide information to emergency response personnel about hazards present in laboratories, each laboratory on campus should have a current lab sign posted at the corridor door leading into the laboratory room/space.

For more information on lab signs, visit the Laboratory Signs webpage.

8.2 Chemical Spills

The goal is to minimize the potential for spills and to prepare for chemical spills. Chemical spill kits should be available in laboratory areas where chemicals are used. Please review the UNMC Chemical Spill Plan. Chemical Spill procedures are available in the Emergency Preparedness Guides & can also can be found here: https://www.unmc.edu/ehs/FactSheets/ChemicalSpillResponse.pdf

8.3 Chemical Exposures

Contact Public Safety at 402-559-5555 or go to the Emergency Department.

8.4 Incident Reporting

An incident is defined as an occurrence, condition, or situation that arises in the course of work that results or could result in injury, illness, damage to health, or fatality. Additional information on incident reporting can be found here: https://www.unmc.edu/ehs/safety/incident-reporting.html

8.5 Medical Surveillance

The purpose of the medical surveillance program is to evaluate the health of employees related to their potential occupational exposures to hazardous agents. This program will also assure compliance with various regulations which require medical monitoring when employees use certain materials, are exposed to certain biological or physical hazards or are members of certain regulated occupational groups. The Medical Surveillance Policy does not include ergonomic-related illnesses and work-related injuries/illnesses (worker's compensation claims) covered under the University Workers Compensation Program. Those working with animals should refer to the IACUC Policy for Occupational Health and Safety for Personnel with Animal Contact.