Hazardous Materials Management Plan

Environmental Health and Safety

UNIVERSITY OF COLORADO
DENVER | ANSCHUTZ MEDICAL CAMPUS

Contents

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The University of Colorado Denver | Anschutz Medical Campus Environmental Health and Safety department (EHS) website contains links to training courses, various EHS manuals and guidelines, and Safety Data Sheet (SDS) resources.

http://www.research.cuanchutz.edu/ehs

Eye Protection Required Colorado Law requires that appropriate eye protection is provided to all employees, students, and visitors wherever hazardous conditions may exist.

Personal Protective Equipment (PPE) At a minimum a laboratory coat and hand protection must be worn while working with hazardous materials.

NOTE: The nature of the work being performed by each laboratory member dictates any additional training needed, which could include enrollment in the Occupational Health and Respiratory Protection programs if respiratory protection is required as part of assigned duties.

No Eating or Drinking in the Laboratory Eating or drinking is not permitted inside a laboratory where hazardous materials or chemical waste are present.

Children Prohibited in Laboratories Children under the age of 18 are prohibited from entering laboratory areas or other areas where hazardous materials or conditions may be present, unless in the context of a scheduled, approved, and properly supervised departmental activity.

Hepatitis B Exposure Assessment and Vaccination Each unit shall assess the potential for exposure to human blood, body fluids, tissues, and other potentially infectious materials for all employees or students, and offer hepatitis B vaccination at no cost if work involves the potential for exposure.

Flammable Liquid Storage Policy Flammable liquids must be properly stored inside fire rated storage cabinets to comply with fire codes and to protect research laboratories from catastrophic fires.

Each research space within an open laboratory at the Anschutz Medical Campus may store a maximum of 2 gallons of flammable liquids outside of a rated flammable liquid storage cabinet.

Flammable liquids may not be stored inside walk-in coolers, refrigerators, or freezers. Up to 500 ml of alcohol may be stored inside a refrigerator if the container is stored inside a sealed plastic secondary container. Only two containers of alcohol are allowed per refrigerator.

Training Requirements for Researchers

Course	Training Frequency
Chemical Waste Management	Initial and refresher training every year thereafter
Chemical Hygiene Plan	Review when joining a lab and every year thereafter
Radiation Safety Training	Initial and refresher training every year thereafter
Bloodborne Pathogen Training	Initial and refresher training every year thereafter
Laboratory Safety Training	One time training

- **Chemical Waste Management** All personnel who handle chemicals or who supervise personnel that handle or generate chemical waste, must successfully complete the Chemical Waste Management online training within 6 months of the date of hire. The Principal Investigator (PI)/Laboratory Supervisor must provide and document On-The-Job

(OJT) General Safety Training to laboratory personnel using the On-the-Job General Safety Training form. New employees must be under the direct supervision of a trained employee whenever handling chemicals until all of the required training has been successfully completed. All employees who handle chemicals are required to complete the chemical waste management refresher training every year they are working with or handling chemicals. The chemical waste management training also applies to PIs and supervisors that supervise individuals who handle chemicals.

- **Chemical Hygiene Plan (CHP)** PIs/Laboratory Supervisors must ensure that all members of the laboratory are familiar with the contents of the CHP, including the Standard Operating Procedures (SOPs) that address chemical-specific hazards.
- **Radiation Safety Training** All personnel who work with radioactive materials at the university must complete either the Radiation Safety Worker or Radiation Principal Investigator training.
- **Bloodborne Pathogen Training** Training consistent with the Federal Occupational Safety and Health Administration (OSHA) Bloodborne Pathogen Standard is required for all university personnel at risk for exposure to bloodborne pathogens, or who handle biomedical/infectious wastes.

Introduction to Chemical Waste Regulations

The Resource Conservation and Recovery Act (RCRA) chemical waste regulations apply only to waste chemicals. Laboratory chemicals become chemical wastes when the chemicals are: spent, expired, surplus stock, or are unused chemicals without a legitimate use. The chemical waste regulations do not apply to chemical reagents that are actively being used and stored in the laboratory.

In Colorado, the Colorado Department of Public Health and Environment (CDPHE) enforces the RCRA chemical waste regulations. The university must comply with these regulations and is subject to compliance inspections by CDPHE without warning. Non-compliance with chemical waste regulations may result in citations or enforcement actions against the university and researchers along with significant fines and/or criminal penalties.

Researchers are responsible for properly collecting chemical wastes generated from laboratory activities and disposing of them through EHS. In some instances, before any research experiment using hazardous materials is started, chemical specific SOPs may need to be completed as part of the requirements under the CHP.

Overview of Chemical, Biological, and Radioactive Waste Disposal Procedures

NOTE: Do not mix chemical waste with biological and/or radioactive wastes.

Chemical Waste

To manage an experiment's chemical wastes, follow the five-step procedure below:

1. Collect the chemical waste in a chemical reagent bottle that is chemically compatible with the waste to be collected;
2. Close the waste container with its original lid;
3. Complete the Hazardous Waste label and place it over the existing reagent label as soon as the first drop of waste is added to the waste container;
4. Keep the chemical waste container closed at all times except when adding waste to it;
5. Inspect every chemical waste container weekly, and document the inspection findings in the Satellite Accumulation Area (SAA) Inspection Log.

To obtain Hazardous Waste labels, email the Hazardous Materials division with the laboratory's mail stop and the number and size of Hazardous Waste labels required (large 5" x 4", or medium 3" x 4").

To request a chemical waste pickup from your laboratory, fill out and submit the appropriate form:

Anschutz Campus Denver Campus

Biological/Infectious Waste

Biological waste cannot contain any chemicals or radioactive materials. Laboratory staff should have a written SOP on hand for proper segregation and disposal of any unique waste streams.

Laboratory personnel should collect biological wastes in point-of-use receptacles at the bench. Point-of-use containers should be lined with a red bag and labeled to indicate they are for biomedical wastes only.

Needles, sharps, and empty syringes must be collected in appropriate sharps containers. When full, the sealed sharps containers are disposed of in the appropriate red or yellow biomedical waste tub.

Once a tub is full, the red bag must be secured closed using one of the three methods of closure:

a. Twist the liner closed and tie in a single knot (like tying a balloon);

b. Twist the liner closed, loop the twisted liner and used duct tape to secure;

c. Twist the liner closed, loop the twisted liner and use a zip tie to secure.

After the liner is closed, laboratory personnel must secure the lid on the tub.

Radioactive Waste

Laboratory personnel will collect radioactive waste in special EHS-approved waste containers and clear plastic bags that are prominently marked with radioactive hazard warning labels.

To request a radioactive waste pickup from your laboratory, fill out and submit the appropriate radioactive waste disposal form.

Hazardous Materials Warning Labels

The presence of a hazardous material should be indicated by placing a hazardous material warning label on the outside of the container. Everyone who works in the laboratory must become familiar with these warning labels so that proper safety precautions are taken.

Do not use containers or bags bearing hazardous material warning labels to store non-hazardous materials.

If unfamiliar with a container or a piece of equipment which has a hazardous material warning label, do not use or handle it until properly instructed about the hazards by the PI/Laboratory Supervisor.

Warning Labels OSHA's Globally Harmonized System (GHS) for communicating hazards to users, requires that containers be labeled with the corresponding GHS pictograms used on the containers themselves and on the SDSs. Users should familiarize themselves with these symbols and their meanings before working with chemicals to ensure the correct response is taken in the event of a chemical release or exposure. Information on the GHS symbols, can be found on the GHS Container Labels site.

In addition to GHS markings, chemical containers are sometimes also marked with other warnings such as "Flammable", "Corrosive", "Reactive", "Toxic," or others as appropriate.

Radioactive Material Warning Labels Containers or equipment that have radioactive materials present are marked with a radioactive warning label. The presence of a radioactive warning label does not necessarily indicate that harmful levels of radiation to personnel exist in that area. However, steps should always be taken to prevent contaminating people or equipment with radioactive materials.

Biohazard or Infectious Agent Warning Labels Materials that have the potential to cause disease are marked with a biohazard label. Infectious materials are collected in red bags and placed in red, yellow, or gray tubs, colored buckets, red plastic tubs, or cardboard boxes labeled with the BIOHAZARD symbols.

Identification of Chemical Waste

Generators of chemical waste are required to ensure that wastes are properly identified, segregated, handled, collected, labeled, and stored prior to final disposal. It is useful to understand how chemical wastes are identified so that these wastes can be properly managed and collected for disposal. All chemical wastes are collected by EHS for disposal.

Characteristic Chemical Wastes Chemical wastes which meets one or more of the following characteristics are considered regulated chemical wastes and must be disposed of through EHS. Review the chemical's SDS or the chemical container's label to determine what kind of chemical waste will be generated.

- **Ignitability** A chemical waste meeting any of the definitions below is classified as an ignitable chemical waste:

  a. Any liquid with a flashpoint of less than 140^0 Fahrenheit (F) is considered an ignitable hazardous waste.

  b. Any non-liquid capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture, or spontaneous chemical changes and, when ignited burns so vigorously and persistently that it creates a hazard.

  c. Any ignitable compressed gas.

  d. Any chemical classified by the DOT as an oxidizer.

  Common organic solvents: methanol, ethanol, acetone, xylene, toluene, isopropyl alcohol, and dimethylformamide.

  Common oxidizers: ammonium nitrate, hydrogen peroxide, sodium perchlorate, ammonium persulfate, and sodium nitrate.

  NOTE: Certain peroxide forming chemicals such as ethers, have disposal dates ranging from as little as six months up to 18 months. Check the manufacturer's recommendations to ensure these chemicals are not kept in the lab past their expiration date. Any peroxide forming chemicals that are kept past their expiration date create an explosion hazard, may present danger to lab personnel, and require special disposal methods. To keep track of expiration dates for peroxide formers, it is required that all peroxide forming chemicals have the date received as well as the date opened written on the label of the container. Arrangements need to be made with EHS to pick up and dispose of any peroxide forming chemicals ahead of their expiration date. The expiration dates of these chemicals can also be tracked in EHS Assistant.

- **Corrosivity** Any aqueous wastes which have a pH of less than or equal to 2, or greater than or equal to 12.5, or are capable of corroding steel at a rate of greater than ¼" per year at 130^oF, or a solid or liquid that causes full thickness destruction of human skin at the site of contact within a specified period of time, are classified as corrosive wastes.

Common acids: nitric acid, sulfuric acid, hydrochloric acid, glacial acetic acid, and trichloroacetic acid.

Common bases: sodium hydroxide, potassium hydroxide, and ammonium hydroxide.

- **Reactivity** Any chemical wastes that have at least one of the following characteristics are classified as reactive hazardous wastes: water-reactive, air-reactive, explosive, or capable of generating cyanide or sulfide gases on contact with acids or water.

  Dry picric acid is highly explosive, therefore it would be considered a reactive waste when disposed. Picric acid also forms shock sensitive compounds on contact with heavy metals.

  Expired solvents such as isopropyl ether, ethyl ether, furan, tetrahydrofuran and p-dioxane may form unstable organic peroxides on exposure to atmospheric oxygen or UV light, and these compounds may then become shock sensitive. If these items are found in the laboratory, contact EHS before disturbing them.

  Certain cyanide or sulfide solutions form highly toxic gases if exposured to acids, and are therefore another example of reactive wastes.

- **Characteristic of Toxicity** At certain concentrations, metals and other chemicals may cause injury or death through inhalation, absorption, ingestion, or injection. The definition of toxic chemicals also includes chemicals that are known or suspected carcinogens, mutagens, reproductive toxins, and various other chemical classes. Some examples of common toxic materials encountered in the lab are listed in the table below.




Metal	Regulatory Level (mg/L)	Metal	Regulatory Level (mg/L)
Arsenic	5.0	Barium	100.0
Cadmium	1.0	Chromium	5.0
Lead	5.0	Mercury	0.2
Selenium	1.0	Silver	5.0

NOTE 1: Mathematical reference: 1% is equal to 10,000 ppm

NOTE 2: For aqueous solutions, milligrams per liter (mg/L) equals ppm. For example: one milligram of arsenic dissolved in one liter (ten-thousand milliliters) of water equals 1.0 ppm.

Listed Chemical Wastes (P and U Lists) EPA developed a list of acutely toxic chemicals, designated as P-listed chemicals, which are listed hazardous wastes. The complete list of P-coded chemicals A laboratory may not store more than a quart of any P-listed chemical waste at

any time. Researchers must review the P-list whenever new experiments or laboratory procedures are being implemented to ensure that the one-quart limit for P-coded chemical wastes is never exceeded. Empty containers of P-listed reagents must be disposed of through EHS.

Depending on how the chemical waste is generated, not every chemical waste will carry a P-code. The Hazardous Materials division can assist in determining whether or not a chemical waste needs to be managed as a P-coded waste.

The U-list contains chronically toxic chemicals found in most laboratories on campus.

NOTE: All chemical wastes will be disposed through EHS regardless of their regulatory status.

Identification of Universal Wastes

Universal wastes are wastes that might not be easily recognized as chemical wastes. Universal wastes must be properly collected and disposed of through EHS, although there are instances where they may also be picked up and disposed of by Facilities Management. The following is a list of universal wastes:

- Batteries;
- Aerosol cans;
- Mercury containing devices;
- Computers and computer peripherals;
- Certain fluorescent lamps;

Drug Enforcement Agency Controlled Substances Management and Disposal

Any researcher holding a Drug Enforcement Administration (DEA) controlled substances registration must submit a copy of the DEA registration to the university's Reverse Distributor Group via email to ehs.hazmat@cuanschutz.edu. When a controlled substance is no longer needed, disposal must be done via the EHS Reverse Distributor Group.

Empty Chemical Reagent Container Disposal Procedure

Empty chemical reagent containers may be placed in the regular trash with the labels defaced and the caps removed. The exception to this statement is for containers that held P-listed materials which must be disposed of through EHS.

Empty aerosol cans may be disposed of in the regular trash.

Satellite Accumulation Area (SAA)

An SAA is defined as any laboratory space or other room where chemical waste containers are stored.

Researchers must register every laboratory space with EHS that belongs to them, whether or not it is used as an SAA location, using the Laboratory Registration Form.

In order to comply with fire codes and other standards, laboratories must not accumulate more than 10 gallons of chemical waste in any SAA before requesting a chemical waste pickup.

The university is subject to inspection by CDPHE on a regular basis to determine whether researchers are complying with the rules for managing their chemical waste containers. Non-compliance with the following chemical waste container rules may result in significant financial penalties for the university and/or laboratory.

General Guidelines for Collecting Chemical Waste

1. Collect waste in an empty chemical reagent bottle which is chemically compatible and is free from cracks, dents, or rust.
2. Seal the container with its original lid. Do not use corks, rubber stoppers, or Parafilm.
3. Complete a Hazardous Waste label and place it over the existing reagent label as soon as the first drop of waste is added to the container.
4. Keep the chemical waste container within eyesight at all times, otherwise the container must be placed inside a locked room or storage cabinet [1].
5. Inspect chemical waste containers weekly and document the results in the Satellite Accumulation Area Inspection Log.

The Five Don'ts Five rules summarize the most important waste management practices:

1. Do not discard hazardous chemicals down the sink or floor drains;
2. Do not discard hazardous chemicals in the regular trash;
3. Do not evaporate organic solvents inside a chemical fume hood;
4. Do not vent toxic, flammable, or corrosive compressed gases inside a chemical fume hood;
5. Do not treat or destroy chemicals in the laboratory without prior approval from EHS.

Every researcher must ensure that chemical waste containers are managed correctly, paying close attention to the following SAA requirements:

- Selection of proper chemical waste containers;
- Label requirements;
- Quantity storage limits;
- Segregation of chemical wastes and reagents;

[1] Chemical waste in Research 1 and 2, School of Pharmacy and Pharmaceutical Sciences building, Bioscience Park 1, 2, and 3, Perinatal Research Facility, the Barbara Davis Center, and the Anschutz Health Sciences Building are exempted from the requirement to lock chemical waste containers within the room or cabinet due to the security system present in the open laboratory designs within these buildings.

- Aisle space requirements;
- Security requirements;
- Weekly inspections;

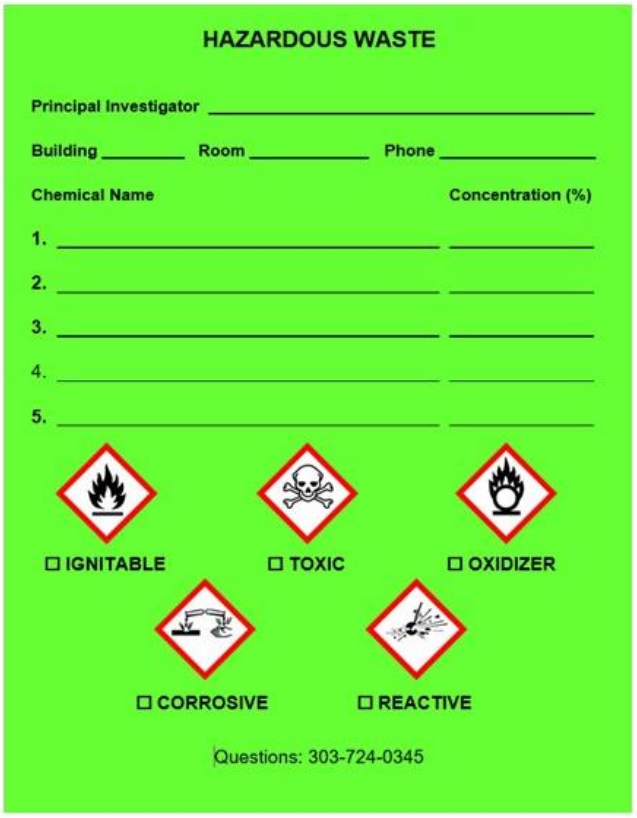
Selecting a Proper Chemical Waste Container Follow these rules when selecting an empty chemical reagent bottle to collect chemical waste:

- Select an empty container in good condition. Containers must not have severe rusting, dents, or other conditions which could cause leaks or other unsafe conditions.
- Select a container that is chemically compatible with the waste to be collected.
- Check the container's lid to make sure it fits properly.
- Keep containers closed at all times, except when adding or removing waste.
- Ensure that the proper university Hazardous Waste Label is applied to the container as soon as the first drop of waste is added.

Labeling Requirements Each chemical waste container must be labeled with a Hazardous Waste label as soon as the first drop of waste has been added to the container. Email the Hazardous Materials division providing your name, mail stop, and the number and size of labels requested (5" x 5" or 3" x 4"). Hazardous waste labels may also be requested directly from Hazardous Materials Specialists during the laboratory's chemical waste pickup.

When labeling empty chemical reagent containers, ensure that the following information is complete and accurate:

- Cross out existing information on the chemical reagent container label.
- Complete all sections of the hazardous waste label:
    1. Name of PI, building name, room number, and phone number;
    2. Spell chemical names completely **- no abbreviations or chemical formulas;**
    3. Include chemical concentrations as a percentage;
    4. Check the appropriate boxes for the hazards associated with the waste to the best of your knowledge. At least one box must be checked.
- Attach the Hazardous Waste label securely, covering the container's original label.



Quantity Storage Limits Only limited quantities of chemical wastes may be stored in the SAA area.

- Do not accumulate more than 1.0 quart of any P-listed waste per SAA.
- Do not accumulate more than 10 gallons combined of all chemical wastes per SAA.

Segregation of Chemical Wastes and Reagents Incompatible chemical wastes must be properly segregated from one another to prevent hazardous chemical reactions. In addition, chemical wastes must be separated from chemical reagents.

- Do not store oxidizers next to flammable liquids;
- Do not store acids next to bases;
- Do not store water-reactive chemicals next to aqueous materials or corrosives;
- Do not store cyanides or sulfides next to strong acids.

NOTE: Incompatible chemical wastes must be stored in separate storage cabinets. If this is not an option due to limited space, ensure the incompatible primary containers are properly sealed, place the sealed incompatible primary containers into separate compatible secondary containers, and lock both secondary containers in the same cabinet.

Dangerous Incompatible Chemical Mixtures to Avoid

Some of the most common incompatible chemical reactions are listed below to help prevent dangerous chemical reactions from occurring:

- Household bleach mixed with a strong acid generates toxic chlorine gas.
- Household bleach mixed with ammonium hydroxide or ammonia generates toxic chlorinated amine gas.
- Acids mixed with any soluble cyanide salt generate toxic hydrogen cyanide gas.
- Acids mixed with any soluble sulfide salt generate toxic hydrogen sulfide gas.
- Oxidizing acids and oxidizers may react with carbon-based chemicals, combustible materials, or reducing agents to cause fires or explosions.
- Alkali metals and hydrides react with water to form flammable hydrogen gas.
- Silver salts mixed with ammonium hydroxide in the presence of a strong base form an explosively unstable nitrite which is very shock sensitive.

Aisle Space Requirements To facilitate the cleanup of chemical spills, always maintain at least 3 feet of aisle space to reach the chemical waste containers stored in the laboratory.

- Do not store laboratory supplies, carts, or equipment in front of the cabinet where chemical waste containers are stored.
- Do not store laboratory supplies, carts, or equipment in front of emergency showers and/or eyewash stations in order to facilitate their use during emergency situations.

Security Requirements Each individual is responsible for their own chemical waste, even if someone else handles it. Chemical waste containers must always be under the individual's control and must be under visual observation at all times. If no one is present, chemical waste containers must be under lock and key[2].

Weekly Inspection of Chemical Waste Containers Chemical waste containers must be inspected weekly for a variety of possible problems. Any issues detected must be resolved immediately.

Inspect every chemical waste container for the following points:

- Waste container is in good condition with no leaks;
- Waste container is closed with a proper lid;
- Hazardous waste labels are properly completed and securely attached;
- No incompatible chemical wastes are stored together;
- No excessive accumulation (limit 1 quart of P-coded waste).

Inspection results must be documented weekly on the SAA Inspection Log, and be made available during inspections. Retain inspection log records for 3 years.

[2] Chemical waste in Research 1 and 2, School of Pharmacy and Pharmaceutical Sciences building, Bioscience Park 1, 2, and 3, Perinatal Research Facility, the Barbara Davis Center, and the Anschutz Health Sciences Buidling are exempted from the requirement to lock chemical waste containers within the room or cabinet, due to the security system present in the open laboratory designs within these buildings.

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NOTE: When the laboratory does not have any chemical waste containers present, write a comment to this effect on the SAA Log.

Chemical Waste Pickup Request

To request a chemical waste pickup, a laboratory member who is current on the chemical waste management training must fill out and submit a Chemical Waste Disposal Form.

Chemical waste containers will be picked up by Hazardous Materials division personnel within 2 weeks after the Chemical Waste Disposal forms are received at the Anschutz Medical Campus, and monthly for the Denver Campus.

> **Labs moving offsite** For a large chemical cleanout when a lab is moving off campus **do not complete a Chemical Waste Disposal Form**. Instead contact the Hazardous Materials division to arrange to have the chemicals picked up for disposal.

Sink Disposal Guidelines for Chemical Waste

The university does not hold a pretreatment permit which would be required by the Federal Clean Water Act for the discharge of contaminated wastewater into the sanitary sewer. As a result, laboratories must not pour chemical waste into sinks or floor drains unless granted pre-approval by EHS in writing.

The following guidelines must be followed whenever chemical wastes are poured down sinks and drains at the university:

- The sanitary sewer may be used only for limited quantities of aqueous non-toxic buffer solutions and other common non-hazardous chemicals **only when approved by EHS**.
- Waste must be water soluble.
- Flammable, toxic, halogenated, corrosive, heavy metal containing, or highly concentrated dyes may not be discarded into the sanitary sewer.
- Biohazardous or infectious wastes may not be disposed into sinks or drains.
- Radioactive wastes, with the exception of deregulated quantities of tritium (H-3), must never be disposed into sinks or drains.

Emergency Response Procedures

Every person handling hazardous materials or chemical waste must know the proper emergency response procedures for spills of hazardous materials. Many hazardous substance spills cannot be safely cleaned up by laboratory personnel, who may lack the appropriate comfort level, PPE or specialized training. For chemical spills that cannot be cleaned up safely, researchers must follow procedures to evacuate the affected area and notify EHS immediately at (303) 724-4444.

Planning for Spills and Emergencies PIs or Laboratory Supervisors are required to provide and document on-the-job training to employees who handle or work with hazardous materials. Examples of the information that should be provided to employees include:

- Location of shutoff switches for laboratory equipment.
- Location of the nearest eyewash, safety shower, fire pull station, and type and location of the nearest fire extinguisher.
- Evacuation routes from the laboratory. Every laboratory must have a written evacuation plan designating both a primary and secondary evacuation route from the laboratory to the outside of the building. Pre-designated muster locations must be established where lab personnel will congregate and be accounted for during an emergency.
- Elevators must not be used in cases of fire or catastrophic chemical releases.
- Laboratory personnel may clean up incidental chemical spills only if the spill is small, and they possess the knowledge, comfort level, and PPE required to do so safely.

Incidental Chemical Spills An incidental chemical spill may be handled by a laboratory member alone or with the help of a coworker, if they have received the required training, possess appropriate PPE, and possess the level of confidence needed to control the situation. Incidental chemical spills are small and are usually 500 ml or less although, the nature of the chemical will change what spilled quantity will qualify as an incidental spill and involve less-hazardous common chemical reagents. If these criteria are not met, contact EHS for assistance with the spill, (303) 724-0345.

Emergency Response to Chemical Spills Contact EHS, (303) 724-0345, or University Police (303) 724-4444 at the Anschutz Medical Campus or (303) 556-5000 at the Denver Campus for assistance if a chemical spill involves any of these criteria:

- The chemical involved has unfamiliar properties or hazards
- Appropriate cleanup supplies or equipment are unavailable
- The spill involves 500 ml or more of a flammable liquid
- A compressed gas cylinder is leaking flammable or toxic gas
- Any amount of chemical has been spilled on a person
- An environmental release (ground, air, water) is possible

Follow these procedures during an emergency response spill:

- Warn others and evacuate the immediate area.
- Close the door behind you and post an employee by door to warn others of the spill.
- For open space laboratories at the Anschutz Medical Campus, cordon off the spill area with barrier tape and close the smoke doors on opposite sides of the spill.
- For fires or large scale toxic, flammable, or toxic gas releases pull the fire alarm.
- From a safe location call:
    - (303) 724-4444 for assistance on the Anschutz Medical Campus

    - (303) 556-5000 for assistance on the Denver Campus
- Provide your name, call back number, building name and location, name of chemical spilled and quantity released.
- Wait for the emergency responders to show up and provide them with details of the incident.

Personnel Decontamination and Injury Procedures Ask a nearby person to immediately call University Police if the incident occurs after regular working hours.

- Chemical contact with skin requires immediate flushing of the affected area with water for 20 minutes. Use a safety shower for large areas, an eyewash for the eyes, or a laboratory sink for small areas of the body.
- Do not use chemical or mechanical methods of removal that may damage the skin and worsen the exposure. Use only mild soap or detergent and warm water.
- For injuries which require immediate medical attention, seek care at the nearest emergency department.
- For routine job-related injuries or exposures that do not require immediate medical attention, seek care at one of the designated medical providers.

Appendix A: P-Listed Chemical Reference List

Code	CAS No.	Substance
P023	107–20–0	Acetaldehyde, chloro-
P002	591–08–2	Acetamide, N-(aminothioxomethyl)-
P057	640–19–7	Acetamide, 2-fluoro-
P058	62–74–8	Acetic acid, fluoro-, sodium salt
P002	591–08–2	1-Acetyl-2-thiourea
P003	107–02–8	Acrolein
P070	116–06–3	Aldicarb
P203	1646–88–4	Aldicarb sulfone.
P004	309–00–2	Aldrin
P005	107–18–6	Allyl alcohol
P006	20859–73–8	Aluminum phosphide (R,T)
P007	2763–96–4	5-(Aminomethyl)-3-isoxazolol
P008	504–24–5	4-Aminopyridine
P009	131–74–8	Ammonium picrate (R)
P119	7803–55–6	Ammonium vanadate
P099	506–61–6	Argentate(1-), bis(cyano-C)-, potassium
P010	7778–39–4	Arsenic acid H_3AsO_4
P012	1327–53–3	Arsenic oxide As_2O_3
P011	1303–28–2	Arsenic oxide As_2O_5
P011	1303–28–2	Arsenic pentoxide
P012	1327–53–3	Arsenic trioxide
P038	692–42–2	Arsine, diethyl-
P036	696–28–6	Arsonous dichloride, phenyl-
P054	151–56–4	Aziridine
P067	75–55–8	Aziridine, 2-methyl-
P013	542–62–1	Barium cyanide
P024	106–47–8	Benzenamine, 4-chloro-
P077	100–01–6	Benzenamine, 4-nitro-
P028	100–44–7	Benzene, (chloromethyl)-
P042	51–43–4	1,2-Benzenediol, 4-[1-hydroxy-2-(methylamino)ethyl]-, (R)-
P046	122–09–8	Benzeneethanamine, alpha,alpha-dimethyl-
P014	108–98–5	Benzenethiol
P127	1563–66–2	7-Benzofuranol, 2,3-dihydro-2,2-dimethyl-, methylcarbamate.
P188	57–64–7	Benzoic acid, 2-hydroxy-, compd. with (3aS-cis)-1,2,3,3a,8,8a-hexahydro-1,3a,8-trimethylpyrrolo[2,3-b]indol-5-yl methylcarbamate ester (1:1).
P001	81–81–2	2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenylbutyl)-, & salts, when present at concentrations greater than 0.3%

Code	CAS No.	Substance
P028	100–44–7	Benzyl chloride
P015	7440–41–7	Beryllium powder
P017	598–31–2	Bromoacetone
P018	357–57–3	Brucine
P045	39196–18–4	2-Butanone, 3,3-dimethyl-1-(methylthio)-, O-[(methylamino)carbonyl] oxime
P021	592–01–8	Calcium cyanide
P021	592–01–8	Calcium cyanide $Ca(CN)_2$
P189	55285–14–8	Carbamic acid, [(dibutylamino)- thio]methyl-, 2,3-dihydro-2,2-dimethyl- 7-benzofuranyl ester.
P191	644–64–4	Carbamic acid, dimethyl-, 1-[(dimethyl-amino)carbonyl]- 5-methyl-1H- pyrazol-3-yl ester.
P192	119–38–0	Carbamic acid, dimethyl-, 3-methyl-1- (1-methylethyl)-1H- pyrazol-5-yl ester.
P190	1129–41–5	Carbamic acid, methyl-, 3-methylphenyl ester.
P127	1563–66–2	Carbofuran.
P022	75–15–0	Carbon disulfide
P095	75–44–5	Carbonic dichloride
P189	55285–14–8	Carbosulfan.
P023	107–20–0	Chloroacetaldehyde
P024	106–47–8	p-Chloroaniline
P026	5344–82–1	1-(o-Chlorophenyl)thiourea
P027	542–76–7	3-Chloropropionitrile
P029	544–92–3	Copper cyanide
P029	544–92–3	Copper cyanide Cu(CN)
P202	64–00–6	m-Cumenyl methylcarbamate.
P030		Cyanides (soluble cyanide salts), not otherwise specified
P031	460–19–5	Cyanogen
P033	506–77–4	Cyanogen chloride
P033	506–77–4	Cyanogen chloride (CN)Cl
P034	131–89–5	2-Cyclohexyl-4,6-dinitrophenol
P016	542–88–1	Dichloromethyl ether
P036	696–28–6	Dichlorophenylarsine
P037	60–57–1	Dieldrin
P038	692–42–2	Diethylarsine
P041	311–45–5	Diethyl-p-nitrophenyl phosphate
P040	297–97–2	O,O-Diethyl O-pyrazinyl phosphorothioate
P043	55–91–4	Diisopropylfluorophosphate (DFP)

Code	CAS No.	Substance
P004	309–00–2	1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexa- chloro-1,4,4a,5,8,8a,-hexahydro-, (1alpha,4alpha,4abeta,5alpha,8alpha,8abeta)-
P060	465–73–6	1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexa- chloro-1,4,4a,5,8,8a-hexahydro-, (1alpha,4alpha,4abeta,5beta,8beta,8abeta)-
P037	60–57–1	2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1aalpha,2beta,2aalpha,3beta,6beta,6aalpha,7beta, 7aalpha)-
P051	72–20–8	2,7:3,6-Dimethanonaphth [2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1aalpha,2beta,2abeta,3alpha,6alpha,6abeta,7beta, 7aalpha)-, & metabolites
P044	60–51–5	Dimethoate
P046	122–09–8	alpha,alpha-Dimethylphenethylamine
P191	644–64–4	Dimetilan.
P047	534–52–1	4,6-Dinitro-o-cresol, & salts
P048	51–28–5	2,4-Dinitrophenol
P020	88–85–7	Dinoseb
P085	152–16–9	Diphosphoramide, octamethyl-
P111	107–49–3	Diphosphoric acid, tetraethyl ester
P039	298–04–4	Disulfoton
P049	541–53–7	Dithiobiuret
P185	26419–73–8	1,3-Dithiolane-2-carboxaldehyde, 2,4-dimethyl-, O-[(methylamino)- carbonyl]oxime.
P050	115–29–7	Endosulfan
P088	145–73–3	Endothall
P051	72–20–8	Endrin
P051	72–20–8	Endrin, & metabolites
P042	51–43–4	Epinephrine
P031	460–19–5	Ethanedinitrile
P194	23135–22–0	Ethanimidothioic acid, 2-(dimethylamino)-N-[[(methylamino) carbonyl]oxy]-2-oxo-, methyl ester.
P066	16752–77–5	Ethanimidothioic acid, N-[[(methylamino)carbonyl]oxy]-, methyl ester
P101	107–12–0	Ethyl cyanide
P054	151–56–4	Ethyleneimine
P097	52–85–7	Famphur
P056	7782–41–4	Fluorine

Code	CAS No.	Substance
P057	640–19–7	Fluoroacetamide
P058	62–74–8	Fluoroacetic acid, sodium salt
P198	23422–53–9	Formetanate hydrochloride.
P197	17702–57–7	Formparanate.
P065	628–86–4	Fulminic acid, mercury(2+) salt (R,T)
P059	76–44–8	Heptachlor
P062	757–58–4	Hexaethyl tetraphosphate
P116	79–19–6	Hydrazinecarbothioamide
P068	60–34–4	Hydrazine, methyl-
P063	74–90–8	Hydrocyanic acid
P063	74–90–8	Hydrogen cyanide
P096	7803–51–2	Hydrogen phosphide
P060	465–73–6	Isodrin
P192	119–38–0	Isolan.
P202	64–00–6	3-Isopropylphenyl N-methylcarbamate.
P007	2763–96–4	3(2H)-Isoxazolone, 5-(aminomethyl)-
P196	15339–36–3	Manganese, bis(dimethylcarbamodithioato-S,S′)-,
P196	15339–36–3	Manganese dimethyldithiocarbamate.
P092	62–38–4	Mercury, (acetato-O)phenyl-
P065	628–86–4	Mercury fulminate (R,T)
P082	62–75–9	Methanamine, N-methyl-N-nitroso-
P064	624–83–9	Methane, isocyanato-
P016	542–88–1	Methane, oxybis[chloro-
P112	509–14–8	Methane, tetranitro- (R)
P118	75–70–7	Methanethiol, trichloro-
P198	23422–53–9	Methanimidamide, N,N-dimethyl-N′-[3-[[(methylamino)-carbonyl]oxy]phenyl]-, monohydrochloride.
P197	17702–57–7	Methanimidamide, N,N-dimethyl-N′-[2-methyl-4-[[(methylamino)carbonyl]oxy]phenyl]-
P050	115–29–7	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide
P059	76–44–8	4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-
P199	2032–65–7	Methiocarb.
P066	16752–77–5	Methomyl
P068	60–34–4	Methyl hydrazine
P064	624–83–9	Methyl isocyanate
P069	75–86–5	2-Methyllactonitrile
P071	298–00–0	Methyl parathion
P190	1129–41–5	Metolcarb.

Code	CAS No.	Substance
P128	315–8–4	Mexacarbate.
P072	86–88–4	alpha-Naphthylthiourea
P073	13463–39–3	Nickel carbonyl
P073	13463–39–3	Nickel carbonyl $Ni(CO)_4$, (T-4)-
P074	557–19–7	Nickel cyanide
P074	557–19–7	Nickel cyanide $Ni(CN)_2$
P075	54–11–5	Nicotine, & salts
P076	10102–43–9	Nitric oxide
P077	100–01–6	p-Nitroaniline
P078	10102–44–0	Nitrogen dioxide
P076	10102–43–9	Nitrogen oxide NO
P078	10102–44–0	Nitrogen oxide NO_2
P081	55–63–0	Nitroglycerine (R)
P082	62–75–9	N-Nitrosodimethylamine
P084	4549–40–0	N-Nitrosomethylvinylamine
P085	152–16–9	Octamethylpyrophosphoramide
P087	20816–12–0	Osmium oxide OsO_4, (T-4)-
P087	20816–12–0	Osmium tetroxide
P088	145–73–3	7-Oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid
P194	23135–22–0	Oxamyl.
P089	56–38–2	Parathion
P034	131–89–5	Phenol, 2-cyclohexyl-4,6-dinitro-
P048	51–28–5	Phenol, 2,4-dinitro-
P047	534–52–1	Phenol, 2-methyl-4,6-dinitro-, & salts
P020	88–85–7	Phenol, 2-(1-methylpropyl)-4,6-dinitro-
P009	131–74–8	Phenol, 2,4,6-trinitro-, ammonium salt (R)
P128	315–18–4	Phenol, 4-(dimethylamino)-3,5-dimethyl-, methylcarbamate (ester).
P199	2032–65–7	Phenol, (3,5-dimethyl-4-(methylthio)-, methylcarbamate
P202	64–00–6	Phenol, 3-(1-methylethyl)-, methyl carbamate.
P201	2631–37–0	Phenol, 3-methyl-5-(1-methylethyl)-, methyl carbamate.
P092	62–38–4	Phenylmercury acetate
P093	103–85–5	Phenylthiourea
P094	298–02–2	Phorate
P095	75–44–5	Phosgene
P096	7803–51–2	Phosphine
P041	311–45–5	Phosphoric acid, diethyl 4-nitrophenyl ester
P039	298–04–4	Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)ethyl] ester
P094	298–02–2	Phosphorodithioic acid, O,O-diethyl S-[(ethylthio)methyl] ester

Code	CAS No.	Substance
P044	60–51–5	Phosphorodithioic acid, O,O-dimethyl S-[2-(methylamino)-2-oxoethyl] ester
P043	55–91–4	Phosphorofluoridic acid, bis(1-methylethyl) ester
P089	56–38–2	Phosphorothioic acid, O,O-diethyl O-(4-nitrophenyl) ester
P040	297–97–2	Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester
P097	52–85–7	Phosphorothioic acid, O-[4-[(dimethylamino)sulfonyl]phenyl] O,O-dimethyl ester
P071	298–00–0	Phosphorothioic acid, O,O,-dimethyl O-(4-nitrophenyl) ester
P204	57–47–6	Physostigmine.
P188	57–64–7	Physostigmine salicylate.
P110	78–00–2	Plumbane, tetraethyl-
P098	151–50–8	Potassium cyanide
P098	151–50–8	Potassium cyanide K(CN)
P099	506–61–6	Potassium silver cyanide
P201	2631–37–0	Promecarb
P070	116–06–3	Propanal, 2-methyl-2-(methylthio)-, O-[(methylamino)carbonyl]oxime
P203	1646–88–4	Propanal, 2-methyl-2-(methyl-sulfonyl)-, O-[(methylamino)carbonyl] oxime.
P101	107–12–0	Propanenitrile
P027	542–76–7	Propanenitrile, 3-chloro-
P069	75–86–5	Propanenitrile, 2-hydroxy-2-methyl-
P081	55–63–0	1,2,3-Propanetriol, trinitrate (R)
P017	598–31–2	2-Propanone, 1-bromo-
P102	107–19–7	Propargyl alcohol
P003	107–02–8	2-Propenal
P005	107–18–6	2-Propen-1-ol
P067	75–55–8	1,2-Propylenimine
P102	107–19–7	2-Propyn-1-ol
P008	504–24–5	4-Pyridinamine
P075	54–11–5	Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)-, & salts
P204	57–47–6	Pyrrolo[2,3-b]indol-5-ol, 1,2,3,3a,8,8a-hexahydro-1,3a,8-trimethyl-, methylcarbamate (ester), (3aS-cis)-.
P114	12039–52–0	Selenious acid, dithallium(1+) salt
P103	630–10–4	Selenourea
P104	506–64–9	Silver cyanide
P104	506–64–9	Silver cyanide Ag(CN)
P105	26628–22–8	Sodium azide
P106	143–33–9	Sodium cyanide
P106	143–33–9	Sodium cyanide Na(CN)

Code	CAS No.	Substance
P108	57–24–9	Strychnidin-10-one, & salts
P018	357–57–3	Strychnidin-10-one, 2,3-dimethoxy-
P108	57–24–9	Strychnine, & salts
P115	7446–18–6	Sulfuric acid, dithallium(1+) salt
P109	3689–24–5	Tetraethyldithiopyrophosphate
P110	78–00–2	Tetraethyl lead
P111	107–49–3	Tetraethyl pyrophosphate
P112	509–14–8	Tetranitromethane (R)
P062	757–58–4	Tetraphosphoric acid, hexaethyl ester
P113	1314–32–5	Thallic oxide
P113	1314–32–5	Thallium oxide Tl_2O_3
P114	12039–52–0	Thallium(I) selenite
P115	7446–18–6	Thallium(I) sulfate
P109	3689–24–5	Thiodiphosphoric acid, tetraethyl ester
P045	39196–18–4	Thiofanox
P049	541–53–7	Thioimidodicarbonic diamide $[(H_2N)C(S)]_2NH$
P014	108–98–5	Thiophenol
P116	79–19–6	Thiosemicarbazide
P026	5344–82–1	Thiourea, (2-chlorophenyl)-
P072	86–88–4	Thiourea, 1-naphthalenyl-
P093	103–85–5	Thiourea, phenyl-
P185	26419–73–8	Tirpate.
P123	8001–35–2	Toxaphene
P118	75–70–7	Trichloromethanethiol
P119	7803–55–6	Vanadic acid, ammonium salt
P120	1314–62–1	Vanadium oxide V_2O_5
P120	1314–62–1	Vanadium pentoxide
P084	4549–40–0	Vinylamine, N-methyl-N-nitroso-
P001	81–81–2	Warfarin, & salts, when present at concentrations greater than 0.3%
P205	137–30–4	Zinc, bis(dimethylcarbamodithioato-S,S′)-,
P121	557–21–1	Zinc cyanide
P121	557–21–1	Zinc cyanide $Zn(CN)_2$
P122	1314–84–7	Zinc phosphide Zn_3P_2, when present at concentrations greater than 10% (R,T)
P205	137–30–4	Ziram