

Particularly Hazardous Substances

Definitions

Carcinogen

Carcinogens are substances and exposures that can lead to cancer. A list of carcinogens is available in the [Annual Report of Carcinogens](#).

The International Agency for Research on Cancer (IARC), classifies carcinogens in [different groups](#):

- Group 1: carcinogenic to humans
- Group 2A or 2B: reasonably anticipated to be carcinogens that cause significant tumor incidence in experimental animals under specified conditions.

Reproductive Toxins

The [OSHA Laboratory Standard](#) defines a reproductive toxin as a chemical, “which affects the reproductive capabilities, including chromosomal damage (mutations) and effects on fetuses (teratogenesis).” They can have adverse effects on various aspects of reproduction, including fertility, gestation, lactation, and general reproductive performance. Reproductive toxins can affect both men and women.

High Acute Toxicity

Chemicals having **high acute toxicity** are those that have oral, inhalation, or dermal LD₅₀ and LC₅₀ values below specified thresholds listed in the OSHA Lab Standard. The threshold values:

- Oral LD₅₀ (albino rats): < 50 mg/kg
- Dermal LD₅₀ (albino rabbits): < 200 mg/kg
- Inhalation LC₅₀ (albino rats): < 200 ppm in air
- Probable Equivalent Lethal Oral Dose in Humans (70 kg): < 3.5 g (@ 1/10 oz. or 1/2 teaspoon)

What are Particularly Hazardous Substances?

For more information on determining whether or not a chemical meets one of these definitions, visit [ChemWatch](#).

Conducting Work

According to OSHA Laboratory Standard, when working with particularly hazardous substances require:

- Establishing a designated area for the work
- Using engineering controls such as fume hoods
- Developing procedures for the safe removal of contaminated waste and decontamination of the area
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- Implementing a policy of no eating, drinking, chewing of gum, removing or putting the contact in, application of cosmetics or storage of utensils, food, or food containers.
- Washing your hands and arms immediately after the completion of work.
- Using the minimum amount of PHS consistent with the intended work.
- Reviewing chemical resources for any special decontamination or deactivation procedures.
- Ensuring you have the appropriate spill cleanup materials and absorbent on hand before working with any particularly hazardous substance.
- Covering work surfaces with a removable liner of plastic-backed paper to help contain spilled materials and to simplify subsequent decontamination and disposal.
- Wearing the appropriate personal protective equipment at all times when handling PHS. The minimal PPE is safety goggles, lab coats, long pants, closed toe shoes, and gloves.
- Reviewing the specific chemical's safety data sheet (SDS) and standard operating procedures (SOP) for additional PPE and glove selection.
- Performing work in a fume hood or glove box.

What are Particularly Hazardous Substances?

- Keeping the laboratory door closed at all times
- Designating an entire laboratory, specific workbench, or a chemical fume hood and only conduct work in that area.
- Decontaminating at the end of the procedure or workday.
- Contacting EH&S at (204) 934-2487 for the disposal of contaminated wastes and surplus amounts.
- Obtaining prior approval from PI
- Using secondary containment for experiments and storage
- Labeling the containers clearly to indicate the associated hazard.
- Purchasing made up solutions to avoid weighing dry powders

Designated Areas

All laboratories working with particularly hazardous substances must establish a “designated area.” This area could be an entire room, part of a room, or it could be just a fume hood. Mark the area with signage or wording similar to “Designated Area for PHSs” or CAUTION – HIGHLY TOXIC CHEMICAL (OR SELECT CARCINOGEN), Authorized Personnel Only.

Using Engineering Controls

Work involving particularly hazardous substances must be carried out inside a working fume hood. The exhaust air from the work area must discharge directly to the outdoors, clear of occupied buildings, and air intakes. Exhaust air from the work area must not recirculate. The exhaust air from glove boxes must filter through the high-efficiency particulate air (HEPA) and charcoal filters. The annual certification of the fume hood must be within date. To learn more about how to use fume hood safely, please take the online course [Biosafety Cabinets & Fume Hoods \(BIO304\)](#).

What are Particularly Hazardous Substances?

Personal Protective Equipment (PPE)

Wear a full-fastened, clean laboratory coat or a disposable Tyvek suit in any area where highly toxic chemicals or select carcinogens are in use. The Principal Investigator is to provide clean clothing, and you cannot wear it outside of the work area. Wear appropriate gloves when handling. Double gloving is recommended. Discard disposable gloves after each use and immediately after known contact with a highly toxic chemical or select carcinogen. Wear appropriate eye protection while working with PHSs.

Laboratory Transport

Place storage vessels containing highly toxic chemicals or select carcinogens in a tight outer container before transporting them from storage areas to laboratory work areas. Place contaminated materials to transfer from work areas to disposal areas in a closed plastic bag or other suitable impermeable and sealed the primary container, and place the primary container in a durable outer container before transporting. Label the outer container with both the name of the substance and warning.

Waste Management and Decontamination

Following an apparent exposure, decontaminate or dispose immediately of all clothing contaminated by highly toxic chemicals. Do not send contaminated clothing to the laundry until decontaminated. Treat unused chemicals, and any item (wipes, gloves, etc.) coming in contact with PHSs as hazardous waste. EHS can help you to develop proper disposal guidelines. Make sure to decontaminate the workbench and equipment used for experiments involving PHSs at the end of the workday. Using disposable bench top covers could be an option for working with hazardous materials. Waste Management and Decontamination should always be part of the experiment-specific SOP.

Pre-Approvals

Prior approval ensures that laboratory workers have received the proper training on the hazards, that safety considerations have been taken into account before a new experiment begins, and also eliminates the chances of performing unauthorized experiments in laboratories. EH&S can guide in identifying experiments, equipment, and situations that require pre-approvals.

What are Particularly Hazardous Substances?

Experiments that use PHSs, a situation where a worker is alone working with hazardous materials, a scale-up of an experiment that involves the use of highly hazardous materials, and use of new or dangerous equipment require pre-approval of the PI/supervisor.

Storage Requirements

- Segregate PHSs in a designated location.
- Store tightly capped and in a secure location.
- Use secondary containment.
- Label chemical bottles, work areas, and storage areas.