Particularly Hazardous Substances (PHS)

What are they and why are they important?

The Occupational Safety and Health Administration (OSHA) defines chemicals as Particularly Hazardous Substances if they are: carcinogens, reproductive toxins, or acutely toxic substances. The increased risk of working with these chemicals requires researchers to implement stringent safe operating procedures and safety precautions for lab workers.

If a laboratory uses carcinogens, reproductive toxins (including teratogens and mutagens) or acutely toxic chemicals, it is the Principal Investigator's (PI's) responsibility to ensure the chemicals are properly identified, managed, and used in a way that provides proper protection for laboratory personnel.

Additionally, the laboratory must develop written Standard Operating Procedures and identify designated areas where work will be done for PHS that are present in the laboratory.

Carcinogens:

The OSHA Health Hazard Pictogram is used to communicate a carcinogen hazard.

Carcinogens are substances capable of causing cancer. They are chronically toxic and cause damage after repeated or long duration exposure; their effects often become apparent only after a long latency period. OSHA classifies a chemical as a carcinogen if it meets any of the following conditions:

- It is listed as an OSHA regulated carcinogen in Subpart Z of the OSHA general industry standard: https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1003
- It is included in the category "known to be carcinogens" in the annual Report on Carcinogens published by the National Toxicology Program (NTP): NTP Report on Carcinogens

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

- It is listed as either Group 2A or 2B by IARC or under the category "reasonably anticipated to be carcinogens" by NTP and causes a statistically significant incidence of tumors in experimental animals.

Reproductive Toxins:

The OSHA Hazard Pictogram is used to communicate a reproductive toxin hazard.

Reproductive toxins are chemicals that can have adverse effects on various aspects of reproductive health in both women and men. These include fertility issues, gestation/pregnancy issues, birth defects, lactation, genetic effects, and general reduced reproductive performance.

- Reproductive toxins can cause chromosomal damage (mutations) or have adverse effects on fetal development (teratogens).
- Adverse effects of exposure to a reproductive hazard may only become evident after a period of infertility.
- Many reproductive toxins are also classified as acutely toxic; they may also carry other characteristics as well including flammable, or pyrophoric. Safe use requires assessing all potential hazards in a Risk Assessment.

An alphabetical list of carcinogens and reproductive toxins can be found at https://oehha.ca.gov/proposition-65/proposition-65-list

Acute Toxics:

The OSHA Toxic Pictogram is used to communicate an acutely toxic hazard.

Substances with a high degree of Acute Toxicity are chemicals that pose a high level of immediate health risk to individuals. They can be defined as either:

- A chemical with a median lethal dose (LD_{50}) of 50 mg or less per kg of body weight when administered orally to male albino rats weighing between 200 and 300 g each.
- A chemical with a median lethal dose (LD_{50}) of 200 mg or less per kg of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between 2-3 kg each.
- A chemical that has a median lethal concentration (LC_{50}) in air of 5000 ppm by volume or less of gas or vapor, or 50 mg per liter or less of mist, fume, or dust, when administered by continuous inhalation for 1 hour (or less if death occurs within 1 hour) to male albino rats weighing between 200 and 300 g each.

PHS Standard Operating Procedures

If PHS are present in a laboratory, the PI or lab manager must develop a laboratory-specific PHS Standard Operating Procedure (SOP). At a minimum, the PHS SOP must include the following:

- The hazards associated with the material.

- Critical information from your Risk Assessment.
- The procedures for safe handling and disposal.
- Identify the designated area for working with the substance.
- Required Engineering Controls, Administrative Controls and Personal Protective Equipment (PPE) for working with the material safely.
- Decontamination procedures
- Emergency response procedures

The University provides SOP templates as a resource for PI's and laboratory managers to use to assist in the creation of laboratory specific PHS SOPs. Please request the applicable SOP template from the dropdown menu. Once the SOP has been filled out, submit to EH&S for review and approval.

PHS Designated Areas

In laboratories where PHS are used, PI's must also identify a Designated Area for their use. The designated area must be clearly marked, and signage posted that includes an OSHA pictogram as well as language that communicates the hazard(s) present. A designated area may be an entire laboratory, a defined area within the laboratory, or equipment such as a laboratory fume hood. Contact EH&S for assistance in providing signage for these areas. An example is provided on the following page.

DANGER

DESIGNATED AREA

for select carcinogens, reproductive toxins and high acute toxicity chemicals

AUTHORIZED PERSONNEL ONLY