

Standard Operating Procedure



ACUTELY TOXIC

This standard operating procedure (SOP) is intended to provide general guidance on how to safely work with acutely toxic materials. This SOP is generic in nature and only addresses safety issues specific to acutely toxic chemicals. In some instances, several general use SOPs may be applicable for a specific chemical. In addition, SOPs exist for some of the more common acutely toxic chemicals used on campus; those chemicals are denoted with an asterisk () in the list below.*

A chemical is considered to be acutely toxic when it falls within any of the following categories:

- A chemical with a median lethal dose (LD50) of 50 mg or less per kg of body weight when administered orally to albino rats weighing between 200 and 300 gm each
- A chemical with a median lethal dose (LD50) of 200 mg or less per kg of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between 2 and 3 Kg each
- A chemical that has a median lethal concentration (LC50) in air of 500 ppm by volume or less of gas, 2.0 mg per liter for vapor, or 0.5 mg per liter or less of dust and mists, when administered by continuous inhalation for 4 hours¹.

Examples of acutely toxic chemicals include:

- Acrolein*
- Bromine
- Cyanide salts (potassium and sodium)*
- Hydrogen cyanide
- Nickel carbonyl
- Organolead compounds
- Organomercury compounds
- Organotin compounds
- Osmium tetroxide*
- Pentaborane
- Phosgene

Potential Hazards/Toxicity

Substances that possess the characteristic of high acute toxicity can cause damage after a single or short-term exposure, the health effects of which can range from illness to even death. **Many of these compounds must not be handled while working alone (i.e., cyanides, organic metals, phosgene).**

As the hazards may vary by compound, users must familiarize themselves with the specific hazards of the compounds they are working with, which can be found on the chemical's Safety Data Sheet (SDS). SDSs are available through the Safety Data Sheet link on Yale's EHS webpage (ehs.yale.edu).

Personal Protective Equipment (PPE)

¹ Inhalation cut-off values in the table are based on 4 hour testing exposures. Conversion of existing inhalation toxicity data which has been generated according to 1 hour exposures should be done by dividing by a factor of 2 for gases and vapors and 4 for dusts and mists.

The University's Personal Protective Equipment Policy can be found on the EHS website (ehs.yale.edu)

Eye Protection

Safety glasses must be worn whenever handling acutely toxic chemicals. When there is the potential for splashes, goggles and/or a faceshield must be worn.

Hand Protection

Gloves must be worn when handling acutely toxic chemicals. It is possible that double exam style nitrile gloves (minimum 4mil thickness) may be adequate for handling very small quantities of some of these compounds in general laboratory settings when skin contact is unlikely; however, in many cases a utility grade glove must be worn over the exam style nitrile. To ensure that the appropriate utility grade glove is selected, refer to the chemical's SDS, use a glove manufacturer's selection guide or contact EHS.

Skin and Body Protection

Long pants or clothing that covers the body to the ankles and closed-toe solid top shoes must be worn when these compounds. Lab coats must be worn. For compounds that are toxic through dermal absorption, additional protective clothing (i.e., apron, oversleeves) is appropriate where chemical contact with the skin is likely.

Engineering Controls

Fume Hood

Fume hoods, or other locally exhausted ventilation, must be used when handling these substances. This includes during transfers or manipulations of small amounts which may generate aerosols and during the weighing of solids.

Storage/Handling

- Demarcate an area where work may be conducted with acutely toxic chemicals. A designated area may be an entire laboratory, a defined area within the laboratory, or a device such as a laboratory hood. Designated areas must be clearly marked with signs that identify the chemical hazard and include an appropriate warning; for example: WARNING! SODIUM CYANIDE WORK AREA – HIGHLY TOXIC. The acutely toxic pictogram on the laboratory door sign also identifies the laboratory as a designated area.
 - Upon leaving the designated area, remove any personal protective equipment worn and wash hands with soap and water.
 - After each use (or day), wipe down the immediate work area and equipment to prevent accumulation of chemical residue. Decontamination procedures vary depending on the material being handled. The toxicity of some materials can be neutralized with other reagents.
 - At the end of each project, thoroughly decontaminate the designated area before resuming normal laboratory work in the area.
- Vacuum pumps used in procedures should be protected from contamination by installing two collection flasks in series along with an in-line hydroscopic filter.
- Analytical instruments or other laboratory equipment generating vapors and/or aerosols during their operation must be locally exhausted or vented in a fume hood.
- Store chemicals which are acutely toxic by inhalation in vented/exhausted chemical cabinets.
- Store acutely toxic liquids at/below eye level (~5 feet).
- Keep segregated from incompatible chemicals.

Waste Disposal

All acutely toxic solutions/stock materials must be collected as hazardous waste. All items contaminated with acutely toxic (P-Listed) compounds must be collected as hazardous waste. This includes empty

reagent bottles, weigh boats, pipette tips, kimwipes, and other similar items that have come into contact with these compounds.

Emergency Procedures

Fire Extinguishers

Both ABC dry powder and carbon dioxide extinguishers are appropriate for most fires involving acutely toxic compounds.

Eyewash/Safety Showers

An ANSI approved eyewash station that can provide quick drenching or flushing of the eyes must be immediately available within 10 seconds travel time for emergency use. An ANSI approved safety drench shower must also be available within 10 seconds travel time from where these compounds are used. Ensure the locations of the eyewashes and safety showers, and how to activate them, are known prior to an emergency.

First Aid Procedures

If inhaled

Remove to fresh air. Call 911 for immediate medical attention.

In case of skin contact

Go to the nearest emergency shower if contaminated. Yell for assistance and rinse for 15 minutes, removing all articles of clothing to ensure contaminate is completely removed. Call 911 for immediate medical attention.

In case of eye contact

Go to the nearest emergency eyewash. Yell for assistance and rinse for 15 minutes. Call 911 for immediate medical attention.

Spills

Small Spill (inside a fume hood)

If a small spill occurs inside a fume hood, lab personnel should be able to safely clean it up by following standard spill clean up procedures:

- Alert people in immediate area of spill
- Wear personal protective equipment, including utility grade gloves
- Confine spill to small area with adsorbent material (pads, vermiculite)
- Collect residue, place in container, label container, and dispose of as hazardous waste
- Clean spill area with soap and water

Larger Spill/Any spill outside a fume hood

- Call EHS for emergency assistance (203-785-3555)
- Evacuate the spill area
- Post someone or mark-off the hazardous area with tape and warning signs to keep other people from entering
- Stay nearby until emergency personnel arrive and provide them with information on the chemicals involved