

Syracuse University

Laboratory Guidance Document

Acutely Toxic Chemicals

This Laboratory Guidance Document was created by Syracuse University Environmental Health & Safety Services (EHSS) to assist researchers in developing laboratory specific standard operating procedures for the storage, handling, and disposal of acutely toxic chemicals.

Potential Hazards:

'Acute toxicity' refers to those adverse effects occurring after oral or dermal administration of a single dose of a chemical or multiple doses within 24 hours, or an inhalation exposure of four hours. These adverse effects, caused by short term exposure, can range from illness to death.

Properties:

- The Occupational Safety and Health Administration (OSHA) states that a chemical is highly toxic if it falls within any of the following lethal dose (as determined by studies in rats) categories:
 1. LD50 - ingestion: < 50 mg/kg
 2. LD50 - contact (24hrs): < 200 mg/kg
 3. LD50 - inhalation: < 200 ppm/1hr
- The manufacturer's Safety Data Sheet (SDS) for the acutely toxic chemical used in the laboratory should be used as a reference for determining if this criteria is met.
- Examples of chemicals with a high level of acute toxicity:
 - Acrolein
 - Arsine
 - Bromine
 - Chlorine
 - Hydrogen cyanide
 - Hydrogen fluoride
 - Hydrogen sulfide
 - Nitrogen dioxide
 - Ozone
 - Sodium cyanide

General Precautions:

1. Training

The Principal Investigator is responsible for ensuring all personnel under their supervision are aware of the hazards of acutely toxic chemicals, have received appropriate hands-on training, adhere to the laboratory standard operating procedures (SOPs), and are provided with the appropriate personal protective equipment.

2. Work under the buddy system

Acutely toxic chemicals should never be handled while working alone. At least one additional person trained in the safe handling of acutely toxic chemicals should be present in the general vicinity of the work area while an acutely toxic chemical is handled.

3. Awareness

As hazards may vary by compound, users must be aware of the specific hazards of the chemicals they are handling and adjust SOPs accordingly.

Personal Protective Equipment (PPE):

- In addition to the standard laboratory attire (i.e., long pants and closed toe shoes), the following PPE is recommended:
 - ANSI certified (Z87.1) chemical splash goggles
 - Knee-length lab coat
 - Chemically compatible gloves
 - Consider double gloving
- Additional PPE may be necessary based on other hazards present.
- Remove PPE immediately upon contamination.

Best Practices for the Safe Handling of Acutely Toxic Chemicals:

Although SOPs will vary according to the material used, the following practices are generally applicable for projects involving acutely toxic chemicals:

1. Demarcate acutely toxic chemical use areas by posting [in-lab primary hazard postings](#).
2. Review the SDS, laboratory SOP, and emergency procedures before starting any work requiring acutely toxic chemicals.
3. Know the location of the nearest eyewash, safety shower, and fire extinguisher before beginning work.
4. Conduct work involving acutely toxic chemicals within a fume hood.
5. Take every effort to avoid contaminating other surfaces and equipment.
 - After use, wipe down the work area and/or equipment to prevent an accumulation of chemical residue. Decontamination procedures may vary depending on the chemical in use. Consult the chemical specific manufacture's SDS.
 - When vacuum pumps are used, protect vacuum system contamination by installing two collection flasks in series with an in-line hydroscopic filter. Decontaminate vacuum pumps with the appropriate cleaning agent before removing them from the demarcated area.
 - Upon leaving a demarcated work area, remove all PPE and wash hands with soap and water.
6. Ensure that storage containers are in good condition and compatible with the chemical.
7. Procure and store only the smallest practical quantities for the experiment performed.

Storage:

1. Demarcate acutely toxic chemical storage areas by posting [in-lab primary hazard postings](#).
2. Keep acutely toxic materials segregated from incompatible chemicals, and away from heat/flame.
3. Store acutely toxic liquids in vented/exhausted chemical storage cabinets, at/below eye level.
4. Store non-flammable acutely toxic chemicals within secondary containment.
5. Store flammable acutely toxic chemicals within flammable storage cabinets.

Disposal & Waste Management:

Acutely toxic must be collected as hazardous waste.

- All items contaminated with acutely toxic (P-listed) chemicals must be collected as hazardous waste. This includes empty chemical containers, pipette tips, wipes, and any other item that has come into contact with the chemical.
- Place the waste container in the satellite accumulation area in secondary containment and notify the EHSS Hazardous Waste Group at 315.443.9132 for disposal.

Spill Response:

Only personnel who understand the hazards of the acutely hazardous chemicals, and are confident in their ability to safely and properly clean the spill, should perform the cleanup.

- EHSS and/or the lab personnel may clean small spills by absorbing the spill with paper towels then decontaminating the spill area with compatible cleanup materials.
- EHSS will oversee and direct the cleanup of large spills. Depending on the location and/or severity of the spill, EHSS may seek assistance from an outside emergency response services provider.
- All cleanup materials which come into contact with the acutely toxic chemical must be disposed of as hazardous waste.

First Aid:

The manufacturer's SDS for the acutely toxic chemical used should be used as a reference for determining appropriate first aid measures.

1. **Skin Contact:** Remove all contaminated clothing and rinse affected area with water for at least 15 minutes.
2. **Eye Contact:** Flush with water at an emergency eyewash station for at least 15 minutes.
3. **Ingestion:** Seek medical attention immediately.
4. **Inhalation:** Move to fresh air and seek medical attention immediately.

Incident Response:

All laboratory emergencies must be reported to the Department of Public Safety (DPS) at 315-443-2224.

Additional Resources:

1. Environmental Protection Agency: [P-list of acute hazardous wastes](#)
2. OSHA: [List of toxic and reactive highly hazardous chemicals](#)
3. SU EHSS: [SOP Template](#)