






# Acute Toxin Fact Sheet

***This fact sheet is for general safety awareness. Individual Standard Operating Procedures for all experiments and processes involving acute toxins must be developed by the laboratory.***

## PROPERTIES & HAZARDS

Acute toxins are especially poisonous, where even a single exposure of short duration could be lethal for some materials. There are five categories that you may see on the safety data sheet (SDS) or bottle, Category 1 through 5, and three target areas, oral, dermal, and inhalation. In Section 2 – Hazard Identification of the SDS, any one, or a combination of the following hazard classifications, pictograms and hazard statement key words will be listed indicating an acute toxicity hazard. More information on material hazards can be found in complete hazard statements listed on an SDS or chemical bottle.

Hazard Classification and Category	Pictogram	Signal Word
Acute Toxicity (Oral, Dermal or Inhalation) – Category 1 and 2		Fatal
Acute Toxicity (Oral, Dermal or Inhalation) – Category 3		Toxic
Acute Toxicity (Oral, Dermal or Inhalation) – Category 4		Harmful
Acute Toxicity (Oral, Dermal or Inhalation) – Category 5	No Pictogram	May be harmful

The severity of a toxin is categorized by concentrations of the LD<sub>50</sub> (lethal dose for 50% of an animal population) of the substance where available testing data is listed in Section 11 - Toxicological Information on the SDS. This is the median lethality, which means that the minimum dose to be lethal can be much less than these concentrations.

### Acute Toxicity LD<sub>50</sub> Category Ranges

Acute Toxicity Type	Category 1	Category 2	Category 3	Category 4	Category 5
Oral (mg/kg)	≤5	>5 - ≤50	>50 - ≤300	>300 - ≤2000	Anticipated oral LD <sub>50</sub> between 2000 and 5000 mg/kg; Indication of significant effect in humans; Any mortality up to Category 4 values; Significant clinical signs up to Category 4 values; Where expert judgment confirms reliable information indicating the potential for significant acute effects from other animal studies.
Dermal (mg/kg)	≤50	>50 - ≤200	>200 - ≤1000	>1000 - ≤2000	
Gases (ppm)	≤100	>100 - ≤500	>500 - ≤2500	>2500 - ≤5000	
Vapors (mg/l)	≤0.5	>0.5 - ≤2.0	>2.0 - ≤10	>10 - ≤20	
Dusts & Mists (mg/l)	≤0.05	>0.05 - ≤0.5	>0.5 - ≤1.0	>1.0 - ≤5	

## PARTICULARLY HAZARDOUS SUBSTANCES

The Occupational Safety and Health Administration (OSHA) defines particularly hazardous substances as select carcinogens, reproductive toxins, and substances which have a high degree of acute toxicity. Work with particularly hazardous substances requires special provisions for employee protection. The following is required when working with chemicals having these designations:

1. Prior approval required from principal investigator before use.
2. Establishment of a designated area
3. Use of containment devices

#### 4. Procedures for safe removal of waste

These items should be addressed in your laboratory's procedure-specific standard operating procedures that require use and handling of Acute Toxicity Category 1 - 3 materials.

### **CONTROLS**

Selection of controls should be made using a risk-based approach that considers the degree of hazard, route of entry, and characteristics of the process that may potentially lead to exposure. If you need help selecting controls for a given procedure, contact ESSR for assistance.

#### **Engineering Controls**

- Chemical fume hood
- Glovebox
- Snorkel

Chemical fume hoods and gloveboxes provide the best protection against exposure in the laboratory. Generally, chemical fume hoods are the preferred ventilation control device in laboratories unless a glovebox is warranted. Handle highly toxic chemicals (Acute Toxicity – Categories 1 - 3) in a fume hood or glovebox. Working with any hazardous chemical outside of a fume hood is not recommended, but if required for lower toxicity materials (Acute Toxicity - Categories 4 and 5), may be done safely using special ventilation controls, like snorkels, in order to minimize the potential for exposure to the material. A risk assessment must be documented to work with acute toxins outside of a chemical fume hood or glovebox. This risk assessment must meet principal investigator approval. Contact ESSR for assistance with a risk assessment, if needed.

#### **Personal Protective Equipment**

- Double Gloves – Generally nitrile or neoprene provide adequate protection against minor splashes for most chemicals. Consult glove manufacturer's chemical compatibility guides for best glove selection, or alternative glove types if needed for specific chemicals that penetrate nitrile or neoprene. SDS recommendations on glove type should be reviewed.
- Splash goggles
- Lab Coat
- Clothing that leaves no exposed skin on legs or feet
- Closed-toe shoes that fully cover the top of the foot
- Chemical Resistant Apron\*
- Face Shield\*

*\*For work with large volumes of toxic materials and/or when pouring.*

#### **Training**

- Laboratory Specific Training must cover all processes using acutely toxic materials and include information on safe use and emergency response.

### **STORAGE**

- Minimize the quantity of acutely toxic chemicals stored in the laboratory when possible.
- Acute toxins should be stored in a secure, designated area. This designated area must be approved by the principal investigator.
- Always store acute toxin Category 1 – 3 in compatible, unbreakable secondary containment.
- Acutely toxic chemicals should be stored in containers with a screw-top lid.
- Storage location must be consistent with storage recommendations on the chemical's Safety Data Sheet.
- Laboratories where acute toxins are stored or used must have a designation of "Toxic Chemicals" on the laboratory signage system.

### **USE**

- The principal investigator must approve any purchase or procedure involving acutely toxic materials in Categories 1 - 3.
- If possible, substitute a less toxic chemical for the acute toxin.
- When possible, minimize the quantity of acute toxin used.

- Individuals using acute toxins must be trained by experienced lab personnel.
- Only use acute toxins in a designated area approved by the principal investigator. Tape off designated area where used and label tape with material hazard. All lab workers should be aware of where the designated area is and that they are used for acutely toxic work.
- Keep containers closed as much as possible.
- When weighing out solid acutely toxic chemicals, use the tare method. In this method, the chemical is added to a pre-weighed container in a chemical fume hood. The container is then sealed and re-weighed outside of the hood. If chemical needs to be added or removed, this manipulation is carried out in the hood.
- Change gloves immediately if they have suspected contact with the acutely toxic chemical.
- Do not work alone when working with acute toxins in Categories 1 – 3.
- All researchers working with acute toxins must be trained to recognize the signs and symptoms of exposure.
- The work area should be thoroughly cleaned and decontaminated after work is complete. Decontamination procedures will vary by chemical and should be included in laboratory SOPs.
- Thoroughly wash hands after handling any amount of an acute toxin.
- All acutely toxic waste should be submitted through the Hazardous Waste system, even if the material has been diluted.
- Any spills of acute toxin chemicals must be cleaned immediately and the area decontaminated. Decontamination procedures will vary by chemical and should be included in laboratory SOPs.

### **WASTE**

- Waste should be managed so that incompatible materials are not mixed.
- Waste containers should be compatible with their contents and should be segregated by hazard class into separate secondary containers.
- For questions regarding waste management contact ESSR, Environmental Affairs at [envaffairs@umd.edu](mailto:envaffairs@umd.edu).

### **SPILL CLEANUP**

- Spill cleanup must follow the items specified in the Emergency Response Guide posted in the laboratory.
- If the laboratory is equipped and personnel are trained, minor spills can be handled by laboratory personnel.
- If a spill is beyond the capacity of the laboratory to address, call (301) 405-3333 from a safe location.

### **REFERENCES AND ADDITIONAL RESOURCES**

1. OSHA [A Guide to the Globally Harmonized System of Classification and Labeling of Chemicals \(GHS\)](#)
2. OSHA [Occupational Exposure to Hazardous Chemicals in Laboratories](#)
3. CDC Agency for Toxic Substances and Disease Registry [Toxic Substance Portal](#)
4. [Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards](#), National Academy Press, Washington, DC, 2011.