

**Standard Operating Procedure (SOP)**

**Working with OSHA Particularly Hazardous Substances: Acute Toxins, Reproductive Toxins, and Select Carcinogens**

**BUILDING:**

**ROOM:**

**PREPARED BY:**

**REVISION DATE:**

**Experimental Process** – Brief Description of the Operation/Experiment:

**Specialized Training Instructions:**

**Chemical and Physical Hazards Associate with the Experiment** – Before completing this section, please review the [UIC Chemicals of Concern](#) form to identify significant chemical hazards involved in this experiment. Note: There are many particularly hazardous substances: acute toxins, reproductive toxins and select carcinogens not on this list.

**Particularly Hazardous Chemicals** fall into three major categories: reproductive toxins, acute toxins, and select carcinogens.

**Chemical:**

i.e. Benzene

**Hazard:**

Select Carcinogen

**Definitions:**

**Reproductive Toxins** are chemicals that affect the reproductive capabilities including causing chromosomal damage (mutations) and adverse effects on fetal development (teratogenesis). A list of reproductive toxins is maintained at:

Chemical List

[http://oehha.ca.gov/prop65/prop65\\_list/files/filesprop65single110112.pdf](http://oehha.ca.gov/prop65/prop65_list/files/filesprop65single110112.pdf)

The State of Illinois does not have a comprehensive list of reproductive toxins that are regulated within a laboratory. However, the State of California has developed an extensive list of "Reproductive Toxins Known to the State of California through Prop 65". Please note, this list is being provided as additional information and is not legally mandated by the State of Illinois

**Acute Toxins** are chemicals that pose a high level of immediate health risk to individuals. They can be defined as:

1. 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 g each.

2. 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.
3. A chemical that has a median lethal concentration (LC50) 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 albino rats weighing between 200 and 300 g each.

**Select Carcinogens** are a category of chemicals where the available evidence strongly indicates that the substances cause human carcinogenicity.

A “select carcinogen” meets one of the following criteria.

1. It is regulated by OSHA as a carcinogen.
2. It is listed under the category “known to be carcinogens” in the annual report by the National Toxicology Program (NTP).
3. It is listed under Group 1 – “carcinogenic to humans” – by the International Agency for Research on Cancer (IARC)
4. It is listed in either Group 2A or Group 2B by the IARC or under the category “reasonably anticipated to be carcinogens” by the NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:
  - a) After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m<sup>3</sup>,
  - b) After repeated skin application of less than 300 mg/kg of body weight per week;
  - c) After oral dosages of less than 50 mg/kg of body weight per day.

OSHA Regulated Carcinogens have extensive additional requirements associated with them that are not covered under this procedure. Below is a list from 1910 Subpart Z-1 Toxic and Hazardous Substances. The use of these agents may require personal exposure sampling based on usage. The following chemicals are OSHA regulated carcinogens:

- Asbestos
- 4-Nitrobiphenyl
- alpha-Naphthylamine
- Methyl chloromethyl ether
- 3,3'-Dichlorobenzidine (and its salts)
- bis-Chloromethyl ether
- beta-Naphthylamine
- Benzidine
- 4-Aminodiphenyl
- Ethyleneimine
- beta-Propiolactone
- 2-Acetylaminofluorene
- 4-Dimethylaminoazobenzene
- N-Nitrosodimethylamine
- Vinyl chloride
- Inorganic arsenic
- Cadmium
- Benzene
- Coke oven emissions
- 1,2-dibromo-3-chloropropane
- Acrylonitrile
- Ethylene oxide
- Formaldehyde
- Methylenedianiline
- 1,3-Butadiene
- Methylene Chloride

Users of regulated carcinogens should refer to the UIC Laboratory Safety Plan for the use of regulated carcinogens in laboratories. Contact EHSO if there are any questions about the use of these materials.

### **Chemical Storage**

Particularly hazardous chemicals must be stored in manner that will minimize the risk of accidental release, be capped tightly and be maintained in chemical resistant secondary containment.

Segregate the chemicals from incompatible materials, as described in the UIC Laboratory Safety Plan.

Additional requirements for the safe storage of a specific chemical may be found in the manufacturer's instructions or in the MSDS.

When transporting the chemical, the container should be protected from breakage by using a bottle carrier or other effective containment.

### **DESIGNATED WORK AREA:**

#### **Sign Posting Requirements:**

For chemicals classified as Select Carcinogens, Known Carcinogens, and Acute Toxins a "Designate Area" sign needs to be placed on the work area (fume hood, lab bench, etc.) and outside the laboratory door. Contact EHSO at [labsafety@uic.edu](mailto:labsafety@uic.edu) to obtain a sign.

You should only work within the designated area with Carcinogens and Acute Toxins. This is to minimize over exposure and widespread contamination throughout a laboratory. It's recommend that a designated storage cabinet, fume hood, and lab prep bench be designated for this type of work.

### **ENGINEERING CONTROLS – The following safety equipment or device features must be available.**

Fume Hood

Autoclave

Biological Safety Cabinet

Shielding

Glove Box

Laminar Flow Hood

Clean Bench

Toxic Gas Cabinet

Other (Please Explain below)

#### **Further Instructions:**

Bench top work with particularly hazardous substances should be avoided whenever possible and performed in contained systems (such as fume hoods or glove boxes). Bench top work is not permitted if there is a reasonable likelihood of workers exceeding regulatory exposure limits. Keep containers closed as much as possible. Use the smallest quantity needed for the experiment being performed.

Chemical fume hoods used as containment areas for particularly hazardous chemicals must have a face velocity of 100 cfm, averaged over the face of the hood and must be certified annually. Check for the UIC Fume Hood Certification Sticker on your fume hood.

Laboratories and rooms where particularly hazardous chemicals are used shall have general room ventilation that is at negative pressure with respect to the corridors and external environment. The laboratory/room door must be kept closed at all times.

Vacuum lines are to be protected by HEPA (high efficiency particulate air) filters or higher efficiency scrubbers.

Before filling in this section, the [UIC Laboratory Hazard Assessment Tool](#) must be completed. Please refer to this document to select appropriate PPE for the experiment.

**PROTECTIVE EQUIPMENT** – The minimum required PPE for working with Corrosive Liquids is as follows:

Safety Glasses

Flammable Resistant Lab Coat

Lab Coat

Safety Goggles

Face Shield

Nitrile Glove

Butyl Gloves

Chemical Apron

Disposable Gowns

Respirator

Cryogenic Gloves

Autoclave Gloves

Wire Mesh Gloves

Boot Covers

**EMERGENCY EQUIPMENT** – Required for handling these hazardous substances

Safety Shower

Eyewash

Fire Extinguisher

Oxygen Sensors/Alarms

Chemical Antidote

Emergency Shut-off Switch/Valve

**DECONTAMINATION PROCEDURES:**

**Personnel:**

Wash hands and arms with soap and water immediately after handling acutely toxic chemicals, reproductive toxins, and carcinogens.

**Area:**

Decontamination procedures vary depending on the material being handled. All surfaces should be wiped with the appropriate cleaning agent following dispensing or handling. Waste materials generated should be treated as a hazardous waste. Review your MSDS for decontamination instructions. If you need assistance contact EHSO at labsafety@uic.edu

**Equipment:**

Vacuum lines are to be protected by HEPA (high efficiency particulate air) filters or higher efficiency scrubbers.

Decontaminate vacuum pumps or other contaminated equipment (i.e. glassware) before removing them from the designated area.

**WASTE DISPOSAL** – Please follow [EHSO Waste Disposal Guidelines](#) to remove unwanted chemicals after the experiment:

**SPECIAL EMERGENCY PROCEDURES** – Outline any special emergency procedures unique to this experiment.

**GENERAL EMERGENCY PROCEDURES**

**FIRE/EXPLOSION:**

Use **R.A.C.E.** Rescue, Alarm, Contain, and Evacuate for all building fires.

**CHEMICAL SPILL:**

**Large Spills (Greater than 1 L)**

The contaminated area should be blocked off from other researchers and if necessary, the affected area should be evacuated as soon as an emergency is determined.

Call 5-5555 for UIC Police on a campus phone OR (312) 355-5555 from a cell phone as needed.

Report the spill to EHSO 6-SAFE (6-7233) or 312-996-7233 and complete an incident report.

**Small Spills (Less than 1 L)**

Employees in the area should be prepared to clean up minor spills, including most spills confined to the chemical fume hood. Wearing double nitrile gloves, splash goggles, face shield and lab coat (and impermeable apron, if available); use absorbent pads to absorb spilled material. Wipe down the contaminated area with soap and water solution. Lab personnel should avoid direct contact with any particularly hazardous chemical. If glove contact does occur, remove gloves and wash hands immediately. Contaminated PPE and clean-up materials must be placed in a compatible container.

**Note: If there is respiratory irritation associated with the exposure, remove all persons from the contaminated area and contact 6-SAFE or 312-996-7233.**

**OTHER:**

If over exposed to any particular hazardous substance to the skin, the worker shall be required to shower or flush the affected areas for a minimum of 15 minutes. If the emergency is not life threatening report to UIC Health Services for Medical Evaluation.

**Non Life Threatening Emergencies**

University Health Services (MC 684)  
835 South Wolcott Avenue, Room E-144  
Chicago, Illinois 60612-7338  
T 312-996-7420  
F 312-413-8485

**Life Threatening Emergencies:**

Report to University of Illinois Hospital & Health Sciences System  
Emergency Room  
1740 W Taylor Street  
Chicago, IL 60612  
**T: 312-996-8177**

**Approval and Certification – I approve the use of this SOP for my lab group. I agree to modify this SOP to meet the safety needs of my researchers working in my lab.**

PI Signature

Name (Print)

Date

**CERTIFICATION – I have read and understand the above SOP. I agree to contact my PI or Lab Manager if I plan to modify this procedure.**

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## References

1. [OSHA Safety and Health Standards](#) (29CFR1910) - United States Department of Labor, OSHA, Government Printing Office: Washington, DC., (latest edition)
2. [Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards](#), National Research Council, National Academy Press: Washington, D.C., 2011
3. [Safety in Academic Chemistry Laboratories](#)- 3rd ed., Committee on Chemical Safety, American Chemical Society: Washington, D.C., 2003
4. Sittig, M., [Hazardous and Toxic Effects of Industrial Chemicals](#), Noyes Data Corporation: Park Ridge, NJ., 1979
5. Furr, A.K., Ed, CRC [Handbook of Laboratory](#), 4th ed., CRC Press: Boca Raton, FL., 1995
6. Mahn, W. J. [Fundamentals of laboratory safety: physical hazards in the academic laboratory](#), Van Nostrand Reinhold, New York, 1991
7. Walters, C.C., Ed., [Safe Handling of Chemical Carcinogens, Mutagens, Teratogens, and Highly Toxic Substances](#), Ann Arbor Science Publishers, Inc., : Ann Arbor, MI., 1980, Vol. I
8. Mahn, W. J. [Fundamentals of laboratory safety: physical hazards in the academic laboratory](#), Van Nostrand Reinhold, New York, 1999
9. [UC Center for Laboratory Safety](#), University of California at Los Angeles, Los Angeles California, 2012, from [cls.ucla.edu](http://cls.ucla.edu).