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### **6.1 Specific Storage Guidelines for Hazardous Materials**

Refer to select incompatible chemical lists before storing different chemicals. Many chemicals can be safely stored together, but others generally should not. The general groupings **NOT TO BE MIXED** are as follows:

Acids	Flammables
Bases	Oxidizers
Cyanides	Organic Acids
Heavy Metals	Organic Bases

Many chemicals if mixed will potentially create heat or other dangerous reactions. Examples of chemical classes include:

- Carcinogens or suspect carcinogens must be stored in a secure area and clearly marked "**CARCINOGEN**" or "**SUSPECT CARCINOGEN**".
- Highly toxic chemicals must be stored in sealed jars clearly marked as "**HIGHLY TOXIC-POISON**" and stored in a clearly marked and separate area from other reagents in laboratory or cold room.
- Acids:  
Store large bottles on low shelves or in acid cabinets. Segregate acids from active metals such as sodium, potassium, or magnesium.  
  
Segregate oxidizing acids from organic acids, flammable and combustible materials.  
  
Segregate acids from chemicals that could generate toxic or flammable gases upon contact, such as sodium cyanide, iron sulfide, and calcium carbide.
- Bases:  
Segregate bases from acids and other reactive compounds.
- Flammables:  
Store in approved safety cans or cabinets. Segregate from oxidizing acids and oxidizers. Keep away from any source of ignition: heat, sparks, or open flames.
- Oxidizers:  
Store in a cool, dry place. Keep away from combustible and flammable materials. Keep away from reducing agents such as zinc, alkaline metals, and formic acid.
- Water Reactive Chemicals:  
These are generally reactive metals, not often used by general laboratories. Store in a cool, dry place away from any water source. Have a Class D fire extinguisher available in case of fire.
- Pyrophoric Substances:  
Materials that will react with air to ignite when exposed, e.g., white phosphorus. Store in a cool, dry place-making provisions for an airtight seal.
- Peroxidizable Chemicals:  
(e.g., ethyl ether, tetrahydrofuran)  
Store in airtight containers with receiving, opening, and disposal dates. Some materials come with metal mesh braid in the chemical to reduce this peroxide formation hazard. If kept for more than three months after opening, the chemical should be tested for peroxide formation.

## 7.0 SPILLS AND ACCIDENTS

**Note: For spills of serious acute nature contact the Department of Environmental Health & Safety (556-4968) and Emergency Dispatch (911).**

Liquid spills should be GENERALLY handled as follows using the **C.L.E.A.N.** plan:

Contain the spill, if possible.

Leave the area, if necessary.

Emergency procedures: utilize available eye wash stations and/or safety shower, and seek medical care.

Access MSDS, for information.

Notify a supervisor.

More specific recommendations:

- Look up Material Safety Data Sheet (MSDS) located in the laboratory or in the Department of Environmental Health & Safety and follow instructions accordingly. MSDS are also located in the Cincinnati Fire Department. MSDS are also available at:

<http://www.enviro-net.com/technical/msds/> or [www.ilpi.com/msds/index.shtml](http://www.ilpi.com/msds/index.shtml)

- Confine or contain the spill to a small area. Do not let it spread.
- For small quantities of inorganic acids or bases, use a neutralizing agent, e.g., sodium carbonate and sodium bisulfide or an absorbent mixture, e.g., soda ash or diatomaceous earth. For small quantities of other materials, absorb the spill with non-reactive material, e.g., vermiculite, dry sand, or absorbent "pillows".
- For larger amounts of inorganic acids and bases, neutralize the spill, then flush with large amounts of water.
- Mop up spill, wringing out the mop in a sink or a pail equipped with rollers.
- Carefully pick up and clean any cartons or bottles that have been splashed or immersed.
- Vacuum the area with a vacuum cleaner approved for the material involved.
- Dispose of all residues according to safe disposal procedures with the help of the Department of Environmental Health & Safety.

## 8.0 DISPOSAL OF HAZARDOUS AND NON-HAZARDOUS CHEMICALS

**(Note: Refer to Environmental Health & Safety Manual Advisories 7.0 - 7.5 Series)**

- Drain Disposal (Guidelines - NFPA #2 or less)  
Note that chemicals classified as RCRA wastes, as defined in 40CFR261, should not be drain-disposed, but instead collected for proper disposal.

Only water-soluble substances should be disposed of in a lab sink.

- A compound is considered water-soluble if it dissolves to the extent of at least 3%, judged by whether 0.2 ml or 0.1 g dissolves in 3 ml of water in a test tube.
- The quantities disposed of to the drain must be limited generally to not more than a few hundred grams or milliliters at one time and should be flushed with at least 100 volumes of excess water.

Strong acids and bases should be neutralized to between pH 6-8 and diluted prior to sink

disposal. If dilution after neutralization is not possible then the concentrated neutralized mixture may be flushed with excess water at rates not exceeding 50 ml/minute.

- Non-Drain Disposal (Guidelines - NFPA #3 & #4)  
The following are NOT drain disposable (refer to Contractor Disposal Procedures described in section C.)
  - Substances with boiling points less than 50°C generally should not be poured down the drain, regardless of solubility, because excess vapor concentrations may result in fire or explosion in the sewer system.
  - Mixtures and non-soluble compounds should not be put down the drain because they may cause blockage or excess vapor concentrations that may result in fire or explosion in the sewer system.
  - Acutely toxic or malodorous substances should not be put down the drain.
  - Hydrocarbons, halogenated hydrocarbons, and nitro compounds containing more than five carbon atoms.
  - Explosive organic chemicals such as azides and peroxides.
  - Water soluble polymers that could form intractable gels in the sewer system.
  - Organic chemicals that are highly toxic in concentrations greater than unavoidable traces.
- Contractor Disposal Procedures  
Hazardous chemical waste, which cannot be disposed by any of the above options, will be disposed of by a commercial contractor as coordinated by Environmental Health & Safety. These materials will be collected and disposed on a periodic basis providing the following guidelines are met:
  - Segregate waste. Do not create mixtures with following exceptions:  
Organic Solvents not containing halogens may be combined with each other. It is often possible to dispose of these materials by incineration. Organic solvents containing halogens may be combined with each other.
  - All individual containers of hazardous waste must be clearly identified and labeled using the on-line label found at: (<http://ehs2.uc.edu/chemical/>). List only generic chemical names (product names are useless for disposal purposes).
  - Ensure that proper containers are used for the hazards inherent to each chemical waste. Repackage all materials which, are cracked, leaking, corroded, or poorly sealed in a secure secondary container.
- Disposal of Non-hazardous Waste Chemicals
  - If a solid chemical waste is not considered hazardous by the above definition, it may be disposed in the regular trash in SECURE containers. If unsure, call Environmental Health & Safety (556-4968).

## **9.0 MEDICAL PROGRAM**

### **9.1 First Aid**

- First Aid kits are to be available in each laboratory.
- Accidents

- **Eye contact:** promptly flush eyes with water for a prolonged period (15 minutes) and seek medical attention immediately. (Emergency Dept - 558-4571)
- **Ingestion:** encourage the victim to drink large amounts of water. Seek medical attention immediately as noted above.
- **Skin contact:** promptly flush the affected area with water and remove any contaminated clothing; use a safety shower when contact is extensive.  
**Concentrated Acids or Bases:** Remove clothing immediately and get into safety shower/sink with excess flowing water. Seek medical attention immediately.
- Identify the chemical.
- Refer to the MSDS sheet and follow any additional instructions.
- Call Poison Information, if necessary. 558-5111
- Escort the exposed person to the University Hospital Emergency Room.
- If a spill or incident represents a hazard to other building occupants, notify Environmental Health & Safety (556-4968) and 911.
- All incidents or near misses are to be reported to the area supervisor immediately, and Environmental Health & Safety. Accident reporting form is available at: \_\_\_\_\_

## **9.2 Medical Consultation**

All employees needing non-emergency medical attention should use University Health Services: East Campus/558-4457 - 7:00 a.m.-4:00 p.m. or West Campus/556-2564 - 8:00 a.m. - 4:30 p.m., Monday through Friday. After 4:00 p.m., weekends, and holidays, report to the Emergency Department (558-4571).

The Director of University Health Services will provide overall medical direction for the occupational health care of exposed employees covered under this chemical hygiene plan.

All medical examinations and consultations are performed by or under the direct supervision of a licensed physician without cost to the employee, without loss of pay, and at a reasonable time and place. A physician experienced in occupational medicine is used whenever possible.

- The employee is sent for medical evaluation:
  - Whenever signs and symptoms associated with a hazardous chemical develop.
  - When environmental monitoring reveals an exposure level routinely above the action level.
  - Whenever an event takes place in the work area such as a spill, leak, or explosion resulting in hazardous chemical exposure.
- The University workplace or laboratory supervisor provides the following information to the physician:
  - Identity of the hazardous chemical(s) to which the employee may have been exposed.
  - A description of the conditions under which the exposure occurred, including quantitative exposure data (if available).
  - A description of the signs and symptoms of exposure.
  - A copy of the MSDS for the chemical(s) involved.
- The physician provides a written opinion that will not reveal a specific finding of diagnosis



unrelated to the exposure but will include:

- Any recommendations for further medical follow-up.
- Results of the medical examination and any associated tests.
- Any medical conditions that may be revealed in the course of the examination that may place the employee at increased risk as a result of exposure to a hazardous chemical found in the workplace.
- A statement by the physician that the employee has been informed of the consultation/examination results and any medical condition that may require further examination or treatment.

Employee medical records will be maintained at University Health Services. Copies of the physician's written opinion will be provided for the employee's personnel file.

## **10.0 EXPOSURE EVALUATIONS AND MONITORING**

### ▪ Exposure Evaluations:

An exposure evaluation will be conducted for employees who, as a consequence of a laboratory operation, procedure or activity, reasonably suspect or believe they have sustained an overexposure to a toxic substance. The exposure evaluation shall be conducted by Environmental Health & Safety. It is the employee's responsibility to report the exposure incident immediately to their immediate supervisor for evaluation.

The employer shall also consider whether it is appropriate to provide an exposure evaluation in the case of a possible exposure in excess of an ACGIH TLV for a substance which has no associated OSHA PEL.

### ▪ Environmental Monitoring:

Air monitoring for select chemicals will be provided as needed by the Department of Environmental Health & Safety (556-4968). Requests for routine scheduled monitoring of select chemicals (i.e. formaldehyde), as required by OSHA, should be initiated by the departmental laboratories.

## **11.0 DEFINITIONS**

### **Acute**

An adverse effect with symptoms of high severity coming quickly to a crises.

### **C**

Ceiling value for exposure limits.

### **Carcinogen**

A substance capable of causing cancer and is regulated by OSHA or is identified by IARC or NTP as a carcinogen or potential carcinogen.

### **Chemical Agents**

A wide variety of materials (fluids) that have a high potential for body entry by various means. Some are more toxic than others and require special measures of control for safety and environmental reasons.

### **Chronic**

An adverse effect with symptoms that develop slowly over a long period of time or that frequently recur.

### **Combustible**

Able to catch on fire and burn.

**DOT**

Department of Transportation

**EPA**

Environmental Protection Agency

**Exposure Limits**

The concentration in workplace air of a chemical thought to be acceptable. Most workers can be exposed at these levels or lower without harmful effects. The exposure limit terms in common use are TLV, STEL or C.

**Flammable**

Capable of being easily ignited and of burning with extreme rapidity.

**Infectious Agents**

Sources that cause infections either by inhalation, ingestion, or direct contact with the host material.

**Laboratory Scale**

Work with chemicals that can easily and safely be manipulated by one person excluding the commercial production of chemicals for sale.

**Laboratory Use**

A workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

**LC 50**

The concentration of a substance in air that causes death in 50% of the animals exposed by inhalation. A measure of acute toxicity.

**LD 50**

The dose that causes death in 50% of the animals exposed by swallowing a substance. A measure of acute toxicity.

**MSDS**

Material Safety Data Sheet ([www.ilpi.com/msds/index.shtml](http://www.ilpi.com/msds/index.shtml))

**Mutagen**

Capable of changing cells in such a way that future cell generations are affected. Mutagenic substances are usually considered suspect carcinogens.

**OSHA**

Occupational Safety and Health Administration, the regulatory branch of the Department of Labor concerned with employee safety and health.

**Overexposure**

An employee exposure in excess of the permissible exposure limits (PELs) for an OSHA-regulated substance.

**PEL**

Permissible Exposure Limit. This is the legally allowed concentration in the workplace that is considered a safe level of exposure for an 8-hour shift, 40 hours per week.

**pH**

A measure of how acidic or basic (caustic) a substance is on a scale pH 1 to 14. A pH of less than 7 (1-6) indicates that a substance is acidic; and a pH of greater than 7 (8-14) indicates that substance is basic.

**Physical Agents**

Workplace sources recognized for their potential effects on the body. Heat exposure or excessive noise levels are examples of this risk group.

### **Regulated Area**

A laboratory, an area of a laboratory or device such as a laboratory hood for which access is limited to persons who are aware of the hazards of the substances in use and the precautions that are necessary.

### **Sensitizers**

Agents whose repeated exposure over time creates an allergic reaction at some point in time.

### **STEL**

Short-term exposure limit. (STEV – short-term exposure value sometimes used).

### **Sterility**

Changes made in male or female reproductive systems resulting in inability to reproduce.

### **Teratogens**

A substance that causes a deformity in newborns if a significant exposure exists during pregnancy.

### **Toxic Substance**

Any substance which is: 1) Regulated by OSHA in 29 CFR Part 1910, Subpart Z ([www.osha.gov/comp-links.html](http://www.osha.gov/comp-links.html)) or (2) is found to be a carcinogen or potential carcinogen as defined in this paragraph.

### **TLV**

Threshold Limit Value. The amount of exposure allowable for an employee in an 8-hour day. Sometimes expressed as TLV-TWA or threshold limit value - time weighted average.

## **12.0 RECORD KEEPING**

The laboratory has established and maintained an accurate record for each employee of environmental monitoring, medical consultations, and examinations, including test or written opinion required. **All records are kept, transferred, and made available in accordance with 29CFR1910.20, which is length of employment plus thirty years.**

- The following records are maintained by the Department of Environmental Health & Safety.
  - Inventory and amount records for acutely hazardous substances. (Individual laboratories keep these lists as well.)
  - Environmental monitoring.
  - Laboratory safety audits.
  - Training documentation and attendance.
- University Health Services maintains employee medical records.
- Accident records are retained by:
  - Environmental Health & Safety
  - Employee Labor Relations (Workers Compensation)
- Departmental records are kept of:
  - Inventory and amount records for acutely hazardous substances.
  - Environmental monitoring.
  - Laboratory safety audits.
  - Training documentation and attendance requests for MSDS.

### **13.0 REFERENCES**

The CHP was written in accordance with National Research Council recommendations, as well as federal and state standards.

U.S. Department of Labor, final rule part II. Federal Register, 29 CFR Part 1910.1450 Occupational Exposure to Hazardous Chemicals in Laboratories, Wednesday, January 31, 1990 ([www.osha.gov/comp-links.html](http://www.osha.gov/comp-links.html)).

National Research Council. Prudent Practices for Handling Hazardous Chemicals in Laboratories, National Academy Press, 1981.

National Research Council. Prudent Practices for Disposal of Chemicals from Laboratories, National Academy Press, 1983.

CRC Handbook of Laboratory Safety, 3rd Ed., CRC Press, 1990.

Threshold Limit Values and Biological Exposure Indices for 1990-1991, American Conference of Governmental Industrial Hygienists, Cincinnati, OH, 1990.

Terry Jo Gile, A Model Chemical Hygiene Plan for Laboratories, Clinical Laboratory Management Association, Inc., 1990.

Stricoff, R. S. and Walters D. B., Laboratory Health and Safety Handbook, John Wiley & Sons, Inc., 1990.

Laboratory Safety and Right to Know Compliance Source book, Pathfinder Associates, Inc., 1990.

OSHA Instruction CPL 2-2.38C, U.S. Department of Labor, Office of Health Compliance Assistance, Oct. 22, 1990.

**14.0 APPENDIX A**

Laboratories must not only have MSD sheets on all chemicals and from all suppliers, but they must verify that MSD sheets contain the information cited below.

**Material Safety Data Sheet Checklist**

You must ensure that each MSDS contains the following information:

- √ Product or chemical identity used on the label.
- √ Manufacturer's name and address.
- √ Chemical and common names of each hazardous ingredient.
- √ Name, address, and phone number of hazard and emergency information.
- √ Preparation or revision date.
- √ The hazardous chemical's physical and chemical characteristics, such as vapor pressure and flashpoint.
- √ Physical hazards, including the potential for fire, explosion, and reactivity.
- √ Known health hazards.
- √ OSHA permissible exposure limit (PEL), ACGIH threshold limit value (TLV) or other exposure limits.
- √ Emergency and first aid procedures.
- √ Whether OSHA, NTP or IARC lists the compound as a carcinogen.
- √ Precautions for safe handling and use.
- √ Control measures such as engineering controls, work practices, hygienic practices or personal protective equipment required.
- √ Primary routes of entry.
- √ Procedures for spills, leaks, and clean up.

**14.0 APPENDIX B**

Sample letter requesting additional MSDS information:

Date

ANY Chemical Co.  
123 First Street  
City, ST 12345

We are seeking additional information, in order to comply with the OSHA Hazard Communication Standard (29 CFR 1910.1200). Our MSDS on your product \_\_\_\_\_ stock number \_\_\_\_\_, dated / / appears to be missing the following:

Please send an updated MSDS sheet to:

Dr. William Johnson  
University of Cincinnati  
P.O. Box 670900  
Cincinnati, OH 45267-0900

Thank you for your cooperation. If you have any questions concerning this request, please contact, Dr. Johnson at (513) 558-0000.

Yours truly,

William Johnson, Ph.D.  
Director of Chemistry