Laboratory Safety and Hazardous Waste Management

University Chemical Hygiene Officer
Stefan Wawzyniecki
Overview

OSHA, The Occupational Safety and Health Administration, is responsible for **ALL workers’ SAFETY.**

**29 CFR 1910.1450**, “**Occupational exposure to hazardous chemicals in laboratories**”, addresses the issue of laboratory safety. This section of the law is referred to as OSHA’s “**Laboratory Standard**”. 
OSHA Lab Standard Components

- Scope and application of the law
- Definitions
- Permissible Exposure Limits
- Employee Exposure Determination
- Chemical Hygiene Plan
- Employee Information and Training
- Medical Consultation and Medical Examinations
OSHA Lab Standard Components

- Hazard Identification
- Use of Respirators
- Record keeping
- Date

Can be accessed from the EH&S homepage:

http://www.ehs.uconn.edu
Application and Scope of OSHA Laboratory Standard

Gives guidance to all laboratory workers that are using defined hazardous chemicals which are found under

29 CFR 1910, subpart Z.

in an “investigative” application.
Where OSHA Laboratory Standard Does Not Apply

**DOES NOT** apply to the use of hazardous chemicals that do not meet the requirements of "Laboratory Use". (next slide)

**DOES NOT** apply to the laboratory use of hazardous chemicals which provide no potential for employee exposure.

– Chemically impregnated test media where results are achieved by a colorimetric comparison.

– Commercially prepared test kits where all the reagents needed are contained in the kit.
“Laboratory Use” of a Hazardous Chemical

Use of hazardous chemicals in which all of the following conditions are met:

– Chemical work is carried out on a “Laboratory Scale”
  
  » **Laboratory Scale**: Work with substances in which the containers used in the reactions, transfers, and other handlings can be safely manipulated by **ONE PERSON**.

– The procedures are **NOT** part of a production process.

– Multiple chemical procedures and/or chemicals are used.

– Protective laboratory practices and equipment are available and in common use to minimize the potential for employee chemical exposure.
Employee Exposure Determination within the OSHA Lab Standard

Provisions are described within OSHA’s Laboratory Standard for Monitoring (Initial, Periodic, and Termination) of Employees to Hazardous Chemicals (contact X1110 for more information of when this would be performed) along with means of reporting to affected individuals the monitoring results.
The Chemical Hygiene Plan

A written program developed and implemented by UCONN which includes:

Procedures relevant to safety and health when laboratory work involves hazardous chemicals.

Ways to determine and implement control measures to reduce hazardous chemical exposure.
The Chemical Hygiene Plan

- Requirements of the fume hood and protective equipment used are functioning properly.
- Provision for employer information and training.
- Any circumstances under which a particular laboratory operation, procedure, or activity shall require prior approval from the employer before implementation.
The Chemical Hygiene Plan

- Provisions for Medical consultations and medical examinations
- Designation of personnel responsible for implementation of the Chemical Hygiene Plan including assignment of a Chemical Hygiene Officer, or Committee.
- Provision for additional employee protection for work with particularly hazardous substances.
The Chemical Hygiene Plan can be accessed on UCONN’s EH&S Home Page via the Internet at:

http://www.ehs.uconn.edu
Chemical Hygiene Officer Role and Responsibilities

- A qualified person designated by the employer.
- Provides technical guidance in development and implementation of the provisions of the Chemical Hygiene Plan.

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486-1110
Training and Information under the OSHA Laboratory Standard

- By Training and Information, employees are to be apprised of any hazardous chemical in the work area:
  - At the time of employee’s initial assignment to area
  - Prior to assignments involving new exposures situations

- Frequency of refresher training shall be determined by the employer.
Training and Information under the OSHA Laboratory Standard

- In addition to lecture-based training, and on-site consultative sessions, the University offers CD-ROM based Lab Safety training at the EH & S office, in Chemistry, Life Sciences, IMS, Pharmacy, Nutritional Sciences.

- Should be part of refresher training, or orientation.
Information Availability under The OSHA Laboratory Standard

Employees shall be informed of:

The contents of the OSHA Lab Standard.

The location and availability of the employer’s Chemical Hygiene Plan.

The PELs for OSHA regulated substances or recommended exposure limits for other hazardous chemicals not covered under OSHA.
Information Availability under The OSHA Laboratory Standard

Employees shall be informed of:

- Signs and symptoms of overexposure to chemicals (from MSDS)
- Location and availability of references material involving hazardous chemicals, but not limited MSDSs.

All this information can be accessed from the EH&S homepage

http://www.ehs.uconn.edu
Medical Examinations and Treatments

The opportunity to receive medical attention, including any follow-up examinations when determined to be necessary, under the following circumstances:

– when an employee develops signs or symptoms of chemical overexposure

– when exposure monitoring reveals levels above the action level, or PEL

– when a spill, leak, explosion, or other occurrence results in the likelihood of a hazardous exposure, the employee shall be provided the opportunity for a medical consultation.
Medical Examinations and Treatments

All examinations and consultations shall be performed or under direct supervision of a licensed physician, at no cost to the employee, without loss of pay, and at a reasonable time and place.
Role and Responsibility of Consulting Physician

If a medical examination is performed, the physician receives from the employer:

- Identity of the hazardous chemical that the employee was exposed to.
- Description of the condition in which the employee was exposed.
- Description of the sign and symptoms
Role and Responsibility of Consulting Physician

After examination, a written opinion from the Physician to the employer including:

- Recommendations for further medical follow-up.
- Results of the medical exams and tests.
- Any medical condition revealed in the testing that may place the employee in an increased risk as a result to a hazardous chemical.
- A statement that the employee has been informed of the results of the tests and any medical condition that may require further examination.
Role and Responsibility of Consulting Physician

The physician’s written opinion shall NOT reveal specific findings of the employee’s diagnosis unrelated to occupational exposures.
Safe Handling Practices
Before performing any work in a laboratory setting, the most important things that a laboratory worker should understand are the properties, characteristics, hazards, and handling precautions associated with the chemical or chemicals to be used.
Although the Chemical Hygiene Officer is responsible for the Chemical Hygiene Plan and insuring all safety measures are in place in the laboratory, it is the responsibility of EVERY LABORATORY WORKER to abide by those measures, and if any questions arise, please contact EH&S at ext. 1110.
HAZARD IDENTIFICATION

It is important to be able to adequately assess all laboratory situations for potential hazards. Being able to identify a chemical’s specific hazards by using reference materials readily available in the laboratory is the first step in preventing a harmful situation.

Material Safety Data Sheets are an important tool in hazard identification.
HAZARD IDENTIFICATION

Material Safety Data Sheets

Required to be supplied by the Chemical Manufacturer, should be updated as new information becomes available, and readily available for all chemicals being used in the lab.
HAZARD IDENTIFICATION

Material Safety Data Sheets

Contain information on the chemical identity; physical, chemical, and health hazards; target organs/health effects; precautionary measures for safe handling (PPE) and use; emergency and first aid measures.

All warning labels placed on chemicals in the laboratory should be based on the MSDS.
## Material Safety Data Sheet

### Section 1: Material Identification and Information

<table>
<thead>
<tr>
<th>COMPONENTS – Chemical Name &amp; Common Names</th>
<th>%</th>
<th>OSHA PEL</th>
<th>ACGIH TLV</th>
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**Non-Hazardous Ingredients**

**TOTAL:** 100

### Section 2: Physical / Chemical Characteristics

- **Boiling Point:**
- **Flash Point:**
- **Vapor Pressure:**
- **Molecular Weight:**
- **Specific Gravity:**
- **Vapor Density:**
- **Solubility in Water:**
- **Appearance and Odor:**

### Section 3: Fire and Explosion Hazard Data

- **Flash Point and Method Used:**
- **Auto-Ignition Temperature:**
- **Flammability Limits In Air:**

**LEL** | **UEL**
---|---

**Special Fire Fighting Procedures:**

**Unusual Fire and Explosion Hazards:**

*Optional*
Section 4
Reactivity Hazard Data

Section 5
Health Hazard Data

Section 6
Control and Protective Measures

Section 7
Precautions for Safe Handling and Use / Leak Procedures
MSDS Location at UCONN

MSDSs for most *CHEMICALS* used in laboratories at UCONN can be found on the Internet via the EH&S homepage

*http://www.ehs.uconn.edu*

The *Chemical Hygiene Plan* is also available at this location
If you have trouble interpreting an MSDS, please contact EH&S at 6-1110 for clarification.
TOXICOLOGICAL TERMINOLOGY
FOUND ON A MSDS

Four Routes of Exposure of by which a Chemical can enter the body:

1 - Inhalation
2 - Ingestion
3 - Skin (or eye) Absorption
4 - Injection
Chemical Hazards
Divided up into two categories: Physical or Health

Physical Hazard:
A characteristic of a chemical that necessarily does not manifest itself when that chemical is exposed to an individual.
Chemical Hazards

Physical Hazards:

- Explosive
- Fire
- Pyrophoric
- Combustible
- Reactive
- Water Reactive
- Flammable
- Oxidizer
- Unstable
Chemical Hazards

Health Hazard:
A characteristic of a chemical that exposure to which, may cause an acute or chronic health effect.

Health Hazards:
Irritants
Corrosives
Chemical Hazards

Health Hazard:

**Target Organ Chemicals**

**Sensitizers**

**Reproductive Hazards**

**Mutagens**

**Teratogens**

**Carcinogens**
Parameters that Affect Toxicity:

1) Routes of Entry
2) Physical Condition
3) Dose
4) Duration
5) Frequency
6) Combined Effects
7) Stress
8) Sensitivity
9) Individual Variation
MSDS Signs and Symptoms of Chemical Exposure

- Behavior Change
- Breathing Difficulty
- Change in Complexion / Skin Color
- Coughing
- Drooling
- Fatigue / weakness
- Irritation of eyes / nose / throat / skin
- Headache
- Nausea
- Sweating
- Tightness of chest
- Breathing difficulty
- Coordination difficulty
- Dizziness
- Diarrhea
- Irritability
- Light-headedness
- Sneezing
MSDS Exposure Limits

**PEL (Permissible Exposure Limits):**
Permissible concentration in air of a substance to which workers may be repeatedly exposed eight hours a day, forty hours a week, for a thirty year working lifetime. This limit is enforced by OSHA.

**TWA (Time Weighted Average):**
An allowable concentration for an eight hour day, forty hour week, working lifetime.
MSDS Exposure Limits

**STEL** (Short Term Exposure Limit): A maximum concentration for a continuous fifteen minute period. Allowed four per day, with a minimum of sixty minutes between each fifteen period.

**C** (Ceiling): A maximum concentration that is **NOT** to be instantaneously exceeded.
MSDS Exposure Limits

**IDLH** (Immediately Dangerous to Life and Health):

Atmospheric concentration of any toxic, corrosive, or asphixiant substance that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere with an individual’s ability to escape from a dangerous atmosphere.
MSDS Exposure Limits

**TLV** (Threshold Limit Values):

Not enforced by OSHA, these are TWAs, STELs and Ceilings as recommended by the American Conference of Governmental Hygienists or National Institute for Occupational Safety and Health.
1) Before working in a Laboratory, review and know the Emergency Evacuation Route out of it, and also the building.

2) Know where all the safety equipment (fume hoods, eyewash stations, showers, spill response kits, etc.) is located and it is working properly.

3) Always protect yourself- wear the proper personal protective equipment that is prescribed by the MSDS (safety glasses with side shields, gloves, lab coat)
Laboratory Practices-Chemical Use

1) Before using any new chemicals, review and understand the MSDS for hazards associated with it.

2) Have a plan for using the chemicals, including proper disposal of wastes generated.

3) After opening, record date opened on label.

4) Store chemicals in proper location - *Not Fume Hoods* - with compatible chemicals.
Laboratory Practices - Chemical Use

5) If a hazardous chemical is spilled, tell supervisor, and contact UCFD (911).

6) For particularly hazardous chemicals -
   - establish a designated work area
   - use a containment device
   - wear double gloves.
   - if a spill, fire, explosion, or injury occurs, contact the UCFD.

7) Orientation - Periodic Safety meetings - Training
EPA (RCRA)
Hazardous Waste Regulations

- EPA ID #
- LQG
- < 90 day Facility
- Waste Profiles
- Waste Minimization
- Waste Determination
Mercury Spills

EH&S (x3115 D. Shannon) has a vacuum pump to clean up (major) Mercury Spills.

Close off room where spill occurred, post NO ENTRY, and Call EH&S immediately. (Evenings, weekends, call UCFD 911)
Hazardous Waste Containers must:

1) Be labeled "Hazardous Waste" with the respective hazard warning word. (Toxic, Corrosive, Ignitable, Reactive)

2) Have the contents itemized by % composition. Use complete names, not formulae, structures, nor abbrevs.

3) Have tightly fitting cap which are only removed to make additions.
Hazardous Waste Containers must:

4) hold compatible chemicals.

5) be stored by hazard category, and segregated from incompatible chemicals.

6) be stored off the floor and in a secure designated location.
Hazardous Chemicals are NOT to be poured down Storm or Sink Drains. This is a violation of Connecticut DEP laws.
There are Chemicals that can be disposed of in regular trash or the sanitary sewer system. These are identified in UCONN’s Chemical Hygiene Plan. located at: http://www.ehs.uconn.edu
REMEMBER!

It is illegal to intentionally dispose of Hazardous Wastes down drains, or into dumpsters.
If unsure of the proper disposal method for a Chemical or Waste, *first* contact EH&S (ext. 1110/3115) for assistance.
Chemical Waste Pick-ups

- Call x3613 (office) or x3115 (Denis Shannon)
- Visit Web Page
Chemical Inventory

- Electronic or Paper
- Containers labeled, & in good shape
- For chemicals with limited shelf life, include dates of receipt, opening, and expiration
- Review at least annually- document!
- Storage by classification
1) Test plumbed eyewashes weekly, and keep a log.

2) Remove Chemical reagents bottles from work area of Facilities personnel who might be working in the Laboratory.
3) Stock first aid kits with Band-Aids, 4x4 gauzes, rolled bandages and ace bandages. No creams, ointments, etc... Report to Student Health Services after first aid.

4) For serious injuries and true emergencies call 911
5) For bleeding and wound care:
   a) Wear clean gloves
   b) Cover area with gauze
   c) Apply pressure to bleeding - have person sit or lie down
   d) Call 911 if wound is large, or if the person is dizzy or weak
Laboratory Accident and First Aid

Information

7) Burns
   a) Heat - cool water for 5 minutes
      report to SHS, or if large burn area
      call 911

   b) Chemical - cool water 15 minutes,
      report to SHS, or if large area
      call 911
8) Eye splash - Chemical
Flush with luke warm running water for at least 15 minutes before going to Emergency Room or SHS.

9) Eye- dust, metal, paint or wood chips
Cover or close eye - report to SHS
Chemical Health & Safety Consultation

◆ E-Mail Addresses:
  – Stefan.W @uconn.edu
  – Denis.Shannon@uconn.edu
Chemical Health & Safety Consultation

- Electronic Mailing List
  - LISTSERV@UCONNVMM.UCONN.EDU
  - SUBSCRIBE LABSAF-L
  - LABSAF-L@UCONNVMM.UCONN.EDU
The University’s Lab Safety & HazWaste programs are part of the

A. Chemical Hygiene Plan
B. Student Handbook
C. Hazard Communication Program
If you generate H.W., you must do ALL except which of the following:

- A. *Label it “Hazardous Waste”*
- B. *Keep it capped & in a designated area*
- C. *Place on floor for pick-up by EH & S*
- D. *Label with chemical name(s)*
QUIZ

In the event of a chemical spill, a fire, or a major injury in your lab, you should first

- A. Call the Chancellor’s office
- B. Call 911
- C. Call Environmental Health & Safety