Introduction

This training is for all laboratory workers who handle chemicals during the course of their work at UAB. The regulatory agencies require this training as a part of your Right-To-Know.

> "…that employees have both a need and a right to know the hazards and the identities of the chemicals they are exposed to when working. They also need to know what protective measures are available to prevent adverse effects from occurring."
>
> ***OSHA's Hazard Communication Standard***

This PDF file is divided into sections.

1. This section, and the Reality Check that follows, covers what you **MUST KNOW** in order to stay safe and protect your health as well as those who work with you.
2. The material in the Appendix contains general knowledge – regulators, regulations, procedures, etc.

Does this mean the "general knowledge" in the Appendix is not important? Absolutely not! We expect you to know about these policies and procedures - at least where to find the information if you need it.

If you supervise/manage a lab, are a Principal Investigator (PI), or a researcher, we expect you to have a thorough knowledge of the materials covered in the Appendix.

Hazardous Chemicals

> A hazardous chemical is "**any chemical which is a physical or a health hazard**."
>
> ***OSHA's Definition of a Hazardous Chemical***

There are two groups of hazardous chemicals: physical hazards and health hazards.

Physical Hazards	Health Hazards
• Flammable liquids	• Carcinogens
• Combustible liquids	• Reproductive toxins
• Compressed gases	• Irritants
• Explosives	• Corrosives
• Organic peroxides	• Sensitizers
• Reactives	• Hepatotoxins
• Oxidizers	• Nephrotoxins

A PDF file that covers details about both **Physical Hazards and Health Hazards** is available on the OH&S website.

Select Agents

The Centers for Disease Control and Prevention (CDC) designates specific chemicals as Select Agents. The use of Select Agents requires prior registration with the UAB Department of Occupational Health and Safety (OH&S) and requires registration with the CDC. For more information, contact OH&S.

Handling Hazardous Chemicals Safely

Exposure to Hazardous Chemicals

Many chemicals are assigned an exposure level. Exposure levels are only intended to protect **most healthy workers**.

Minimizing Exposure

Minimize exposures to hazardous chemicals whenever possible. Follow the recommendations below to minimize "routine exposures" (i.e., exposures that occur daily or often).

- Substitute less hazardous chemicals whenever possible.
- Post appropriate signs to warn others that hazardous chemicals are used and stored in the area. Work only in that area.
- Wear the appropriate personal protective equipment (PPE). PPE minimizes exposures by all routes. Never underestimate the risk.
- Remove your gloves and wash your hands when leaving the laboratory.
- Do not eat, drink, apply cosmetics, or touch your face in the laboratory.
- Use engineering controls (e.g., dry box, fume hood, etc.). Work in a chemical fume hood when possible.
    - Use Class 2 Biological Safety Cabinets (BSC). These are ducted to the outside to protect the product, personnel, and environment from possible hazardous fumes.
    - Have fume hoods certified annually.
- Separate incompatible chemicals during storage. Do not store acids with bases, oxidizers with flammables or reducing agents. (See the PDF file on **Common Laboratory Chemicals That Should NOT Be Stored Together** on the OH&S website.)
- Store corrosive chemicals ***below*** eye level.
- Label storage areas with the proper hazard type.

Special Handling Required

Peroxides and Peroxide Forming Chemicals

Organic peroxides are a dangerous fire hazard if allowed to react with reducing agents. They are powerful oxidizers and are a severe explosion hazard when shocked, exposed to heat, or if they undergo a spontaneous chemical reaction. Upon contact with some reducing agents, explosions can occur.

Many peroxides commonly handled in laboratories are far more sensitive to shock than most primary explosives (e.g., TNT). Many laboratory chemicals can form peroxides, particularly when exposed to air.

1. Limit containers used for storage of peroxidizable compounds or retention of materials that become hazardous upon prolonged storage ***to a maximum of six months after opening***.
2. Dispose of containers in a safe manner.
3. Test all opened containers of such materials every three months for peroxides. Obtain test strips from laboratory and/or safety supply vendors.
4. Label peroxidizable materials upon receipt.
   - Write the ***date of receipt*** and the ***date when the container is opened*** so that it is prominently displayed.

The Chemical Safety and Waste Management manual has a more complete list of peroxide formers. Also, see the PDF file **Suggested Storage Time Limits for Common Peroxidizable Compounds** on the OH&S website.

Compressed Gases

Compressed gases present hazards in addition to their chemical hazards contents. Most compressed gases are under significant pressure. If a cylinder valve were to be broken off, the cylinder would become a dangerous missile.

Even the sudden release of safe gases, such as nitrogen or helium, in an enclosed area can cause suffocation by displacing oxygen.

Minimize risk by doing the following.

1. Keep cylinders properly restrained at all times.
2. Keep the valve protection caps in place while cylinders are not in use.

Transporting Compressed Gases

- Leave the cover cap screwed on hand-tight until the cylinder is in place and ready for actual use.
- **Never roll, drag, or carry a cylinder**. The preferred transport method, even for short distances, is by suitable hand truck with the cylinder strapped in place.
- Handle only one cylinder at a time.
- Restrain the gas cylinder(s) by straps, chains, or a suitable stand to prevent it from falling after a cylinder has been relocated. Contact UAB Maintenance to install wall brackets and chains in laboratories if needed to secure gas cylinders.

Minimize the Risk with PPE

All persons, including visitors, who enter areas where hazardous chemicals are used or stored must wear Personal Protective Equipment (PPE). Know where it is stored and how to properly dispose of, maintain, or clean it.

Skin Protection

- Wear clean, buttoned lab coats for limited protection from chemical splash. Lab coats or disposable gowns give the substance something to react with before it reaches the skin and gives you time to remove the lab coat or disposable gown.
- Wear an impervious apron and sleeves for more protection if needed.
- Wear a closed front, impervious gown with the sleeves tucked into the gloves when working with hazardous drugs or highly toxic substances.
- Never wear lab coats outside the area especially if there is a possibility that it may be contaminated. This includes **never** wearing them home and washing them. A laundering company that provides this service for UAB and its employees.

Hand Protection

- **No one type of glove protects against all types of chemicals**. Gloves have different chemical resistances based on thickness and the materials that they are made from.
- Latex gloves in particular are suitable for most aqueous solutions, but are inappropriate for organic solvents.
- Always check gloves for holes and tears before use.
- Change disposable type gloves as soon as they become contaminated.

Eye Protection

- Use safety glasses whenever there is a chance of solid objects striking the eye. They are not appropriate protection from liquid chemical splash.
- Wear splash goggles when working with liquid chemicals.
- Wear a face shield with splash goggles when the splash hazard is high or the chemicals are particularly dangerous.

  Please note that some newer models protect against both splashes and flying objects. However, before donning the glasses/goggles, make sure that you are wearing the appropriate one for the job.

Respiratory Protection

- Engineering controls (e.g., fume hoods) are preferable to wearing respirators. However, when engineering controls are not able to protect workers adequately, respirators must be used. The selection and use of respirators requires special training.
  - Before wearing a respirator employees must undergo medical screening, training, and fit testing. Anyone who needs to wear a respirator for their work should contact OH&S.

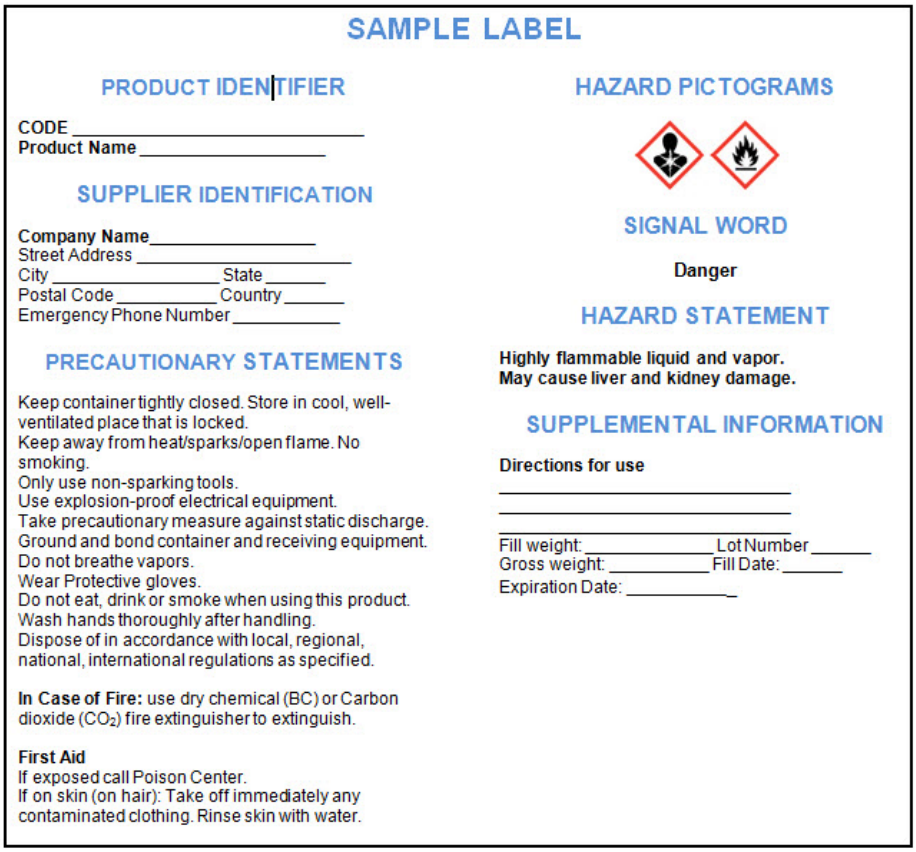
Minimize the Risk by Reading *Before* Use – Not After

Manufacturer Label Requirements

Original labels on the chemicals are the best source of information for obtaining information about the hazards, emergency information, and storage.

By law, **the manufacturer's label must**:

- identify the chemical substance by name
- give the contact information of the manufacturer
- contain any hazard or warning information appropriate for the chemical
    - This includes a hazard pictogram and a signal word. (There are only two signal words – **danger and warning**. Danger is the more hazardous of the two.)



SAMPLE LABEL

PRODUCT IDENTIFIER

CODE _____
Product Name _____

SUPPLIER IDENTIFICATION

Company Name_____
Street Address _____
City _____ State _____
Postal Code _____ Country _____
Emergency Phone Number _____

PRECAUTIONARY STATEMENTS

Keep container tightly closed. Store in cool, well-ventilated place that is locked.
Keep away from heat/sparks/open flame. No smoking.
Only use non-sparking tools.
Use explosion-proof electrical equipment.
Take precautionary measure against static discharge.
Ground and bond container and receiving equipment.
Do not breathe vapors.
Wear Protective gloves.
Do not eat, drink or smoke when using this product.
Wash hands thoroughly after handling.
Dispose of in accordance with local, regional, national, international regulations as specified.

In Case of Fire: use dry chemical (BC) or Carbon dioxide (CO_2) fire extinguisher to extinguish.

First Aid
If exposed call Poison Center.
If on skin (on hair): Take off immediately any contaminated clothing. Rinse skin with water.

HAZARD PICTOGRAMS

SIGNAL WORD

Danger

HAZARD STATEMENT

Highly flammable liquid and vapor.
May cause liver and kidney damage.

SUPPLEMENTAL INFORMATION

Directions for use
_____
_____
_____
Fill weight: _____ Lot Number _____
Gross weight: _____ Fill Date: _____
Expiration Date: _____

Pictograms

Pictograms are a new addition to labels that are a part of the Hazard Communication Standard (HCS). These pictograms are requirement for all chemical labels as of June 1, 2015. Please familiarize yourself with them now.

HCS Pictograms and Hazards

Health Hazard

- Carcinogen
- Mutagenicity
- Reproductive Toxicity
- Respiratory Sensitizer
- Target Organ Toxicity
- Aspiration Toxicity

Flame

- Flammables
- Pyrophorics
- Self-Heating
- Emits Flammable Gas
- Self-Reactives
- Organic Peroxides

Exclamation Mark

- Irritant (skin and eye)
- Skin Sensitizer
- Acute Toxicity
- Narcotic Effects
- Respiratory Tract Irritant
- Hazardous to Ozone Layer (Non-Mandatory)

Gas Cylinder

- Gases Under Pressure

Corrosion

- Skin Corrosion/Burns
- Eye Damage
- Corrosive to Metals

Exploding Bomb

- Explosives
- Self-Reactives
- Organic Peroxides

Flame Over Circle

- Oxidizers

Environment (Non-Mandatory)

- Aquatic Toxicity

Skull and Crossbones

- Acute Toxicity (fatal or toxic)

There is a PDF file named **OSHA Quick Card Hazard Communication Standard Pictogram** from OSHA on the OH&S website.

Transferring Chemicals

Chemicals that are transferred to another container should have the following information.

- The name of the chemical on the new container
  - **You must have the proper name of the substance on the container**. You may use acronyms, abbreviations and formulas for identification, but the proper name must be on the container.
- All warnings and target organ information from the label of the original container on the new container

Safety Data Sheets (SDS)

Federal law requires that Safety Data Sheets (formerly known as Material Data Sheets or MSDS) be sent with, or before, all hazardous chemicals the first time they are ordered by a facility. They must be available to employees whenever at the workplace.

Contact the Department of Occupational Health and Safety if you need assistance in obtaining Safety Data Sheets (SDS).

The Chemical Inventory

Know what hazards are present in your lab or area. To do this, review your chemical inventory. A good thorough chemical inventory should contain:

- a list of all the chemicals used and stored in the area identified by their hazard class
- no unwanted, unused, or out-of-date chemicals should exist (these should be disposed of properly)

- original containers should have the received date and opened date clearly marked
- chemicals that have been transferred to other storage containers should be properly labeled
- chemicals should be properly segregated and stored

To learn more about which chemicals are incompatible, see the PDF file on **Common Laboratory Chemicals That Should NOT Be Stored Together** on the OH&S website.

OH&S is working on a new software program for handling chemical inventories all across campus. At this time, 06/13, it is unknown as to its release date. However, you can start preparing by properly disposing of all unused, unwanted and expired chemicals. For more information, see the PDF **Making Sense Out of Chemical Storage** or **Are You a Chemical Hoarder?** on the OH&S website. If you have

Spills

Hazardous chemical spills are an unfortunate consequence of laboratory work. At UAB spills are classified as small or large based on the volume of the spilled material and the level of the hazard. Spill response and waste disposal is handled through the OH&S Support Facility.

Small Spills

Spills of 500 ml or less are generally considered small.

- Promptly cleanup small spills using appropriate PPE and equipment.
- Read the information on the original label, or contained in the SDS, to see if there are special precautions.
- Use paper towels, spill pillows or vermiculite as absorbent materials for small spills.
- Dispose of absorbent materials as chemical waste.
- Carefully sweep up and contain spills of powdered chemicals.

- Avoid vigorous sweeping or other actions that might generate respirable dust.
- Clean or dispose of contaminated materials properly.

Large Spills

Spills of more than 500 ml are considered large. Spills of less than 500 ml may be considered large spills **if** the material involved is particularly hazardous.

In case of a large spill of a known hazardous chemical:

1. Contain the spill if possible
2. Warn others
3. Restrict access
4. Evacuate the area
5. Contact the OH&S Support Facility Manager at 934-3797 immediately
    a. Give your name
    b. Extension
    c. Location of spill
    d. Quantity and name of the chemical spilled
6. Decontaminate personnel that may have been splashed with the chemical and contact physicians at The Workplace (933-5300) if necessary

Contact with corrosive chemicals requires immediate attention. Know the location of safety showers and eyewashes in your area.

The OH&S Support Facility Manager and the Spill Response Team

The OH&S Support Facility Manager will contact the Spill Response Team, which will have full authority over the clean-up operation. The Spill Response Team has been specially trained to handle hazardous chemical spills. Anyone deliberately breaching the authority of the Spill

Response Team at the site of a spill, thereby jeopardizing the health and safety of other UAB employees, may be subject to disciplinary action.

The OH&S Support Facility Manager or his designee will be responsible for calling any additional personnel needed at the site of the spill.

Spill Kits

Purchase or create your own spill kit if the laboratory or area does not have one. However, when purchasing a spill kit, make sure that you get one that is best suited for your lab and the hazards in it. There are chemical spill kits as well as biosafety spill kits and others available from most vendors.

A basic chemical spill kit should include:

- chemical resistant gloves
- safety glasses or goggles
- disposable lab coats
- aprons or gowns
- paper towels
- spill booms or pillows
- vermiculite
- a small disposable plastic broom and dust pan
- Zip-loc bags
- plastic garbage bags
- small bottle of detergent cleaning solution

Spill kit supplies may be stored in a bucket that can be used to contain the waste generated in the cleanup.

For more information on spills, spill kits, and cleanup, review the Spill Response Safety Short on the OH&S website.

Emergencies

Emergencies Procedures

When an emergency occurs:

In Hospital Locations
1. Dial 4-0001
2. Give your name
3. A telephone number where you are located
4. Your building and room number
In a Non-Hospital Area
1. Call UAB Police – 911 on campus phones or 934-3535 on a cell phone.
2. Report the nature of the emergency.
3. Give the location of the emergency
4. State where you will meet the emergency vehicle.
5. State how many persons are involved.
6. Tell them the type and severity of any observed injuries.
7. Notify others in the area about the nature of the emergency.
8. Meet the ambulance or fire crews at the place you indicated. Send someone else if you cannot go.
9. Do not move any injured persons unless they are in danger.
10. Keep them warm. Unnecessary movement can severely complicate neck injuries and fractures.

If Chemicals Have Been Spilled

If chemicals have been spilled on someone:

1. Get the individual under a shower or spigot to wash the affected area thoroughly
2. If they have chemicals in their eyes:

a. irrigate with plenty of water for at least 15 minutes
b. check for and remove contact lenses before irrigation

Contact lenses may be difficult to remove, and the irrigation must not be delayed.

If Hazardous Chemicals Have Been Ingested

If hazardous chemicals are ingested:

1. try to identify the substances involved
2. notify medical staff or the local poison control center at 4-4606
3. never attempt to give anything by mouth to an unconscious person

An Accident/Injury Report Form should be completed and a copy forwarded to the Department of Risk Management.

Injuries

Non-Life Threatening Injuries

During regular work hours:

- have the supervisor or lab manager fill out a the Initial Medical Evaluation Authorization
- send the injured employee to The Workplace, (205) 933-5300, 2151 Highland Avenue, Birmingham, AL 35205.
- complete an Accident Report as soon as possible after the incident occurred

Life-Threatening Injuries

- Call emergency services
- Have the victim transported to the University Hospital emergency department.
- When calling for emergency assistance, stay on the line until the emergency operator tells you to hang up.
    - Tell them which entrance to use and have someone meet the emergency response crew at that entrance to guide them to the injured person.
    - Also notify the emergency responders about any special hazards that may be involved (ex. radioactive materials, chemicals, etc.).

For more information about handling emergencies and/or injuries, visit the On-The-Job Injury/Illness Program website. There is also a PDF file on **Emergencies** on the OH&S website.

Conclusion

This concludes this portion of the Chemical Safety (CS 101) Training Course.

Reality Checks

In the next section of this course, you will be asked to respond to real life situations. This is ***NOT*** the assessment, but the assessment will be based on these scenarios. Answer carefully and quickly. Some of the scenarios will be timed.

The Assessment

Take the assessment after you have completed the reality check. You must score 80% or higher to pass. You are allowed to take the assessment three (3) times. If you fail all three (3) attempts, it will be recorded on your transcript as a failed course and will not be removed. You will then have to re-enroll in the course.

APPENDIX

SECTION 1: Regulatory Overview

This training is based on regulations from the Federal and State government as well as local entities. Chemicals and the disposal of them are highly regulated by the following agencies.

United States Department of Transportation (U.S. D.O.T)
• Governs what may be transported and how it must be packaged and marked • Regulates the transportation of hazardous materials on public roadways • Sets standards for shipping labels and containers as well as standards for carriers
United States Environmental Protection Agency (U.S. E.P.A)
• Regulates the way hazardous materials and wastes are disposed of under the Resource Conservation and Recovery Act (RCRA) • Has requirements covering the storage of certain hazardous materials under the Emergency Planning and Community Right-To-Know Act (EPCRA)
Occupational Safety and Health Administration (OSHA)
• UAB follows, **but is not regulated by**, the Occupational Safety and Health Administration (OSHA) guidelines for hazard communication, laboratory and chemical safety.
Alabama Department of Environmental Management (ADEM)
• Regulates the way hazardous materials and wastes are disposed of under the Resource Conservation and Recovery Act (RCRA)
Jefferson Community Commission (JeffCo)
• Regulates the disposal of wastes through the sewer system

SECTION 2: UAB's Occupational Health and Safety (OH&S) Program

Audits

The Department of Occupational Health and Safety (OH&S), conducts random and required audits based on regulatory requirements and the potential for exposure.

Audits are to check:

- general safety and housekeeping problems
- environmental and personnel monitoring for exposure to hazardous chemicals
- proper chemical and waste handling

SECTION 3: The Lab Standard and Lab Requirements

The Lab Standard

While the UAB OH&S Program is **not regulated** by OSHA, they do require that each laboratory follow **The Lab Standard**. As a part of The Lab Standard, each lab must have the following.

1. Its own **Chemical Hygiene Plan (CHP)**

   Each lab must have a written Chemical Hygiene Plan (CHP) available to all employees working in the area. It should be specific to the individual lab or research group and address certain areas such as chemical inventories. The CHP should:

   - include standard operating procedures for handling highly hazardous substances
   - address emergency response procedures
   - include standard operating procedures for handling hazardous chemicals safely

- include criteria for the use of personal protective equipment and other control measures as well as methods to ensure their proper functioning.
- contain provisions for employee training, medical consultation, or evaluation
- provide information for additional protection for working with particularly hazardous substances

For a sample CHP, visit the OH&S website.

2. An appointed **Chemical Hygiene Officer (CHO), also known as a Lab Coordinator**

   Department heads or Principal Investigators (PIs) appoint Lab Coordinators (CHOs). They are responsible for:

   - implementing and updating the Chemical Hygiene Plans
   - ensuring that the laboratories they oversee have accurate and up-to-date chemical inventories
   - conducting, arranging, and keeping up-to-date training records
   - ensuring compliance with the Chemical Hygiene Plan (CHP)
   - serving as the liaison with OH&S
   - administering the Chemical Hygiene Plan (CHP)
     - This includes provisions for obtaining prior approval of especially dangerous procedures.

Occupational Exposure to Hazardous Chemicals in Laboratories, or OSHA's Lab Standard was written specifically to address chemical handling in the research setting. UAB follows the OSHA Lab Standard, but OSHA has **no regulatory authority** over UAB.