

MSU Safety Training



Welcome to MSU Lab Safety Training. This first module on the Laboratory Standard and Hazard Communication includes a information slides/pages followed by 30 quiz questions. It will take you 60 to 90 minutes to finish it.

After you complete the training, please follow the instructions for submitting the certificate of completion.

MSU safety training will be given **annually** to the faculty, and staff who are working in a MSU laboratory or otherwise have potential exposures to hazardous materials. Research students and TAs must receive this training before being allowed to work in laboratories.

MSU Safety Training

Module 1: **Laboratory Standard & Hazard Communication**



Objectives:

- To become familiar with the requirements of the OSHA Laboratory Standard and components of Midwestern State's Chemical Hygiene Plan (CHP)
- To ensure that all individuals at risk are adequately informed about work in the laboratory, its risks, methods to protect themselves, and procedures to follow in the event of an emergency

Laboratory Standard

The topics covered in this training module:

- Background information on the OSHA Laboratory Standard
- MSU Chemical Hygiene Plan (CHP) and where to find it
- Responsibilities of MSU personnel and students under the CHP
- General information regarding hazards from chemicals
- Sources of information regarding hazardous chemicals
 - MSU chemical inventory
 - Safety Data Sheets (SDS)
 - Container labels
- How to minimize exposure to hazardous chemicals
- What to do in an emergency

Laboratory Standard

OSHA Laboratory Standard

29 CFR 1910.1450

OSHA Hazard Communication

29 CFR 1910.1200



Laboratory Standard

- The OSHA “[Occupational Exposures to Hazardous Chemicals in Laboratories](#)” Standard, or Laboratory Standard for short, (**29 CFR 1910.1450**) requires employers to protect laboratory workers from health hazards associated with chemical exposure in the laboratory.



**Occupational Safety
and Health Administration**
www.osha.gov 1-800-321-6742

Laboratory Standard

- Developed out of the Hazard Communication Standard ([29 CFR 1910.1200](#)), also referred to as the "**Right-To-Know Law**". The Hazard Communication Standard requires that information and training (i.e., HazCom training) be provided to any employees who have the potential of being exposed to a hazardous chemical “under normal condition of use or in a foreseeable emergency.”



Laboratory Standard

- The Laboratory Standard was developed because the HazCom Standard applies to chemical production facilities. Environment in laboratories is different in scale.
 - Laboratory - A workplace where relatively small quantities of hazardous chemicals are used on a non-production basis
 - Laboratory Scale – Containers used for reactions, transfers, and handling are small enough to be easily and safely manipulated by one person

Laboratory Standard

- A requirement of the **OSHA Lab Standard** is for all employers that have laboratories to develop a written Chemical Hygiene Plan (CHP).
- This written CHP should cover at least:
 - Labels and other forms of warnings
 - Safety Data Sheets
 - Employee Information and Training

The MSU CHP covers significantly more than these issues

– please read the CHP for further information

- In order to:
 - Educate and protect students, faculty, and staff from health concerns associated with the use of hazardous laboratory chemicals.
 - Assure that chemical exposures are not in excess of the permissible exposure limits adopted by OSHA
 - Protect college visitors and property against potentially dangerous accidents associated with the handling, storage and disposal of hazardous chemicals.

Laboratory Standard

Where can you find the CHP?

- An electronic copy of the CHP is available through:
 - https://msutexas.edu/academics/scienceandmath/safety/chemical_safety/safety-management.php
(MCOSME Chemical Safety Webpage)
- A hardcopy of the CHP is also maintained in the following locations:
 - Office of Chemical Safety Officer (Bolin-316)
 - Office of Biology Lab Supervisor (Bolin-324, 218)
 - Office of the Dean of MCOSME (Bolin-111)
 - Office of Laboratory Technician, Engineering (McCoy-107)
 - Office of Assistant Director, Facilities Services
 - MSU Campus Police Office

Laboratory Standard

- Other electronic files are also available at:
 - https://msutexas.edu/academics/scienceandmath/safety/chemical_safety/safety-management.php
(MCOSME Chemical Safety Webpage- see Documents Tab)
 - **MSU Waste Management Plan (WMP)**
 - **OSHA Laboratory Standard**
 - **OSHA Laboratory Safety Guidance**
 - **Faculty, Staff and Student Responsibilities**
 - **Chemical Inventories (*in progress*)**
 - **SDS (previous MSDS, *in progress*)**
 - **Chemical Safety Policy (*in progress*)**

Responsibilities:

KNOW YOUR ROLE



Responsibilities of the Chemical Safety Officer:

- Determines which part of MSU operations is governed by the OSHA Laboratory Standard, and ensures that such operations comply with the Chemical Hygiene Plan.
- Coordinates all health and safety activities, and monitors CHP practices.
- Evaluates, implements, and updates the CHP on a routine basis.
- Provides administrative support to faculty and staff to ensure the plan is implemented at all levels.
- See also: Section 3.2, page 5-6 on the CHP

Responsibilities of the Faculty and Staff:

- Inform and train students and workers on chemical and operational procedure safety as it applies to activities in their areas.
 - Have a copy of “*Chemical Hygiene Plan (CHP) for Laboratories at MSU Documentation*” (Appendix I in the CHP) signed by each person in each lab (**to be kept in each lab**).
- Be aware of any hazardous properties of chemicals stored and used in the area, and evaluate and limit an experiment’s potential for environmental emissions.

Responsibilities of the Faculty and Staff:(continued)

- Before each lab session, inform students about hazardous substances used in the experiment and ensure that each student is aware of potential dangers (e.g. identifying safety concerns and developing safety procedures for each experiment).
- Implement and enforce rules and standards concerning health and safety for laboratory, classroom and support facilities.

Responsibilities of the Faculty and Staff (continued):

- Ensure student and lab worker compliance with the CHP.
- Ensure that proper protective equipment is available and is in working order, and that individuals in the laboratory have been trained in the proper use of such equipment.

Responsibilities of the Faculty and Staff (continued):

- Ensure that all containers of hazardous waste are properly labeled and stored according to the Waste Management Plan.
- Understand planned experimental activities and the hazardous chemicals used, including special personal protective equipment that may be required for those activities.
- See also: Section 3.3, page 7 of the CHP

Responsibilities of Students and Lab Workers:

- Indicate by signature that they have been notified of the location(s) of the CHP and understand all safety instructions and are willing to abide by them.
- Follow all health and safety standards, SOPs and rules established in the CHP as communicated by staff and faculty.
- Report all hazardous conditions to the supervising faculty or staff member.

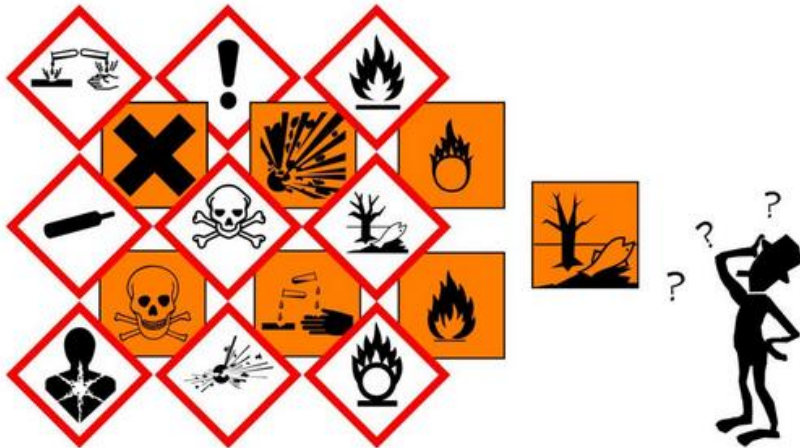
Responsibilities of Students and Lab Workers:

(continued)

- Wear and use prescribed personal protective equipment (**PPE**).
- Report any illness or job-related injuries to the supervising faculty or staff. (See Appendix D of the CHP)
- Request information and training if not sure about proper operational procedures.
- Monitor the workplace to identify EH&S concerns.
(**EH&S = Environment, Health and Safety**)

Laboratory Standard

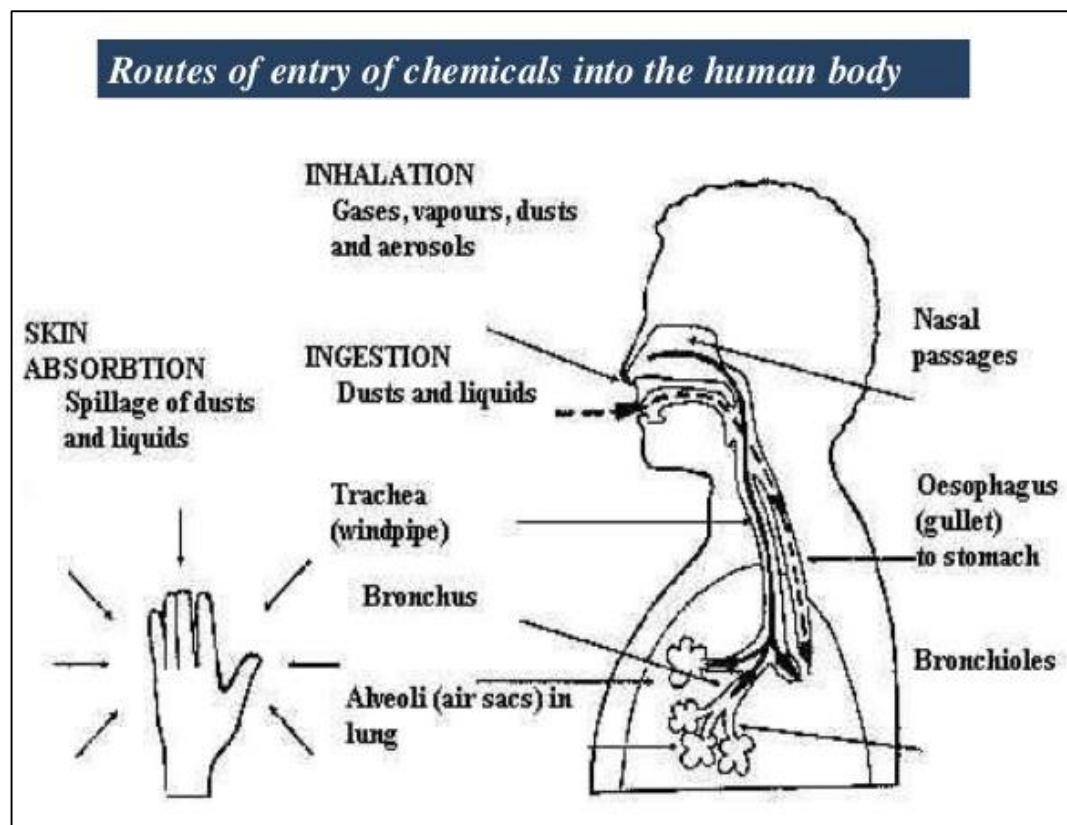
Chemical Hazards:



- **Toxicity** -- the ability of a chemical substance to cause harm
 - The lower the toxicity, the higher the dose that can be tolerated without effect, and vice-versa
 - Everything is toxic at some dose – even water
- **Hazard** -- there is evidence that a material will cause harm under the conditions of use
 - With ***proper*** handling, even highly toxic chemicals can be used safely
 - Less toxic chemicals can be extremely hazardous if handled ***improperly***.

Laboratory Standard

Chemicals can present both physical and health hazards



Physical and Health hazards:

- **Physical Hazards:**
 - What the chemical can do to the area around you
 - (Example: explosive, flammable, corrosive)
- **Health Hazards:**
 - What the chemical can do to you
 - (Example: acute toxicity, carcinogen)

Physical Hazards: Hazards due to physical characteristics of a chemical

- **Flammable** - catches fire easily and burns rapidly
- **Combustible** - will burn under most conditions
- **Corrosive** – will damage / destroy metal
- **Explosive** - will explode / detonate releasing hot gases
- **Oxidizer** - yields oxygen to enhance combustion, may cause ignition of combustibles with no external source
- **Organic peroxide** - uniquely hazardous, potentially explosive
- **Unstable** - tends to decompose during normal handling and storage
- **Water reactive** - reacts with water to release flammable gas, causes fire or presents a health hazard

Health Hazards: Produce acute or chronic effects in exposed workers

- **Carcinogen** - cause cancer or suspected to cause cancer
- **Toxic Agent** - poisonous / cause acute or chronic effects
- **Reproductive toxin (teratogen)** - could have harmful effect on male or female reproductive system or on developing fetus
- **Irritant** - can cause inflammation of skin or eyes
- **Corrosive** - cause irreversible damage to living tissue
- **Sensitizer** - cause exposed person to develop allergies to the substance
- **Target organ-specific agents** - hazardous to specific organs in body (e.g., lungs, liver, blood, kidneys, nervous system)

How to know what is hazardous?



How do we know what is hazardous?

How do we know which specific hazard is associated with a particular chemical?

- **Chemical Inventory**
- **Safety Data Sheets**
- **Container Labels**

Chemical Inventory:

- Serves as a record of the hazardous chemicals on campus
- MSU is currently developing more centrally accessible inventory records
 - Who has what within and between departments
 - Single source of information regarding specific hazards and handling/storage instructions
 - Facilitates report generation of regulatory bodies
- Inventories are to be maintained and reviewed at least annually.

Safety Data Sheets (SDSs):

- An SDS provides information on safe handling of hazardous materials.
- Formerly known as Material Safety Data Sheets (MSDSs)
- OSHA's hazard communication was updated to the Globally Harmonized System (**GHS**) for HazCom and the Laboratory Standard
- SDS format and container labels are being improved with standard phrases and pictograms
- The new SDS format includes **16 specific sections**, ordered from general use to more technical/specific information

SDS Sections:

- 1) Identification of the substance or mixture and of the supplier
- 2) Hazards identification
- 3) Composition/information on ingredients
- 4) First aid measures
- 5) Firefighting measures
- 6) Accidental release (clean up) measures
- 7) Handling and storage
- 8) Exposure controls/personal protection

Laboratory Standard

SDS Sections:

- 9) Physical and chemical properties
- 10) Stability and reactivity
- 11) Toxicological
- 12) *Ecological information (non mandatory)*
- 13) *Disposal considerations (non mandatory)*
- 14) *Transport information (non mandatory)*
- 15) *Regulatory information (non mandatory)*
- 16) Other information including information on preparation and revision of the SDS

Laboratory Standard

Safety Data Sheets (SDSs):

- An SDS should be provided by the supplier or manufacturer (**avoid just doing a Google search for a generic SDS**)
- Electronic or hard copy SDS must be readily available.
- SDS must be maintained for 30 years.
- One objective of this training module is to familiarize employees with these new SDS format and labels.

<https://www.youtube.com/watch?v=vCI7XXExs7s>

(Free **SDS** Training Tutorial provided by OSHA)

Safety Data Sheets (SDSs):

- Copies of the SDSs for each chemical used in a laboratory are maintained in that laboratory.
- Entire SDS records kept in the Office of the Chemical Safety Manager.
- An electronic copy will also be found at:
 - https://msutexas.edu/academics/scienceandmath/safety/chemical_safety/safety-management.php
(MCOSME Chemical Safety Webpage- SDS Inventory)

Laboratory Standard

Container labels:

ALL Containers Must be Labeled With:

Chemical
Name &
Physical/
Health
Hazards



Name &
Address of
the
Manufacturer
& Emergency
Contact
Numbers

Container labels:

- Globally Harmonized System (GHS) standardizes language and pictograms to facilitate communication
- GHS specifies certain elements that should appear together on chemical labels:
 - Hazard Statements
 - Pictograms
 - Precautionary statements
 - Product identifiers
 - Signal word (Danger or Warning)
 - Supplier identification

Container labels:

- Hazard Statements:
 - Phrase assigned to each hazard category that describes the nature of the hazard.
 - Example: Harmful if swallowed; Highly flammable liquid and vapor
- Precautionary Statements:
 - Phrases that describe recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to a hazardous product, or improper storage or handling of a hazardous product.
 - Example: Avoid breathing dust/fume/gas/mist/vapours/spray; wash skin thoroughly after handling
- Signal word:
 - One word used to indicate the relative severity of hazard and alert the reader to a potential hazard on the label and safety data sheet.
 - **Danger** or **Warning**

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Container labels:

Pictograms: A symbol inside a diamond with a red border, denoting a particular hazard class (e.g., acute toxicity/lethality, skin irritation/corrosion, etc.).

Nine pictograms are standardized by Globally Harmonized System (**GHS**).



GHS Hazard Symbols



Skull and Crossbones
Acute toxicity via oral, dermal, or inhalation



Flame Over Circle
Oxidising substances



Health Hazard
Aspiratory or respiratory hazard, carcinogenicity, mutagenicity



Environment
Hazardous to the environment



Exploding Bomb
Explosives, self-reactive substances, organic peroxides



Gas Cylinder
Compressed, liquefied, or dissolved gases



Flame
Flammable, pyrophoric, self-heating substances, water reactive



Corrosion
Corrosive, skin damage, eye damage



Exclamation Mark
May cause immediate health effect - eye, skin, respiratory

6 Elements of a GHS-Compliant Label



1 **2-Propanol**

2 **DANGER**

- Highly flammable liquid and vapor.
- Causes mild skin irritation.
- Causes serious eye irritation.
- May cause drowsiness or dizziness.

Keep away from heat/sparks/open flames/hot surfaces. - No Smoking.
Avoid breathing dust/ fume/gas/mist/vapours/spray. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. May be harmful if absorbed through skin. Causes skin irritation. Causes eye irritation. May be harmful if swallowed.

5 Acme Chemical · 101 Main Street · Anywhere · USA

6

1 Product Identifier / Ingredient Disclosure

2 Signal Word

3 Hazard Statement

4 Precautionary Statement

5 Supplier Identification

6 Pictograms

Container labels:

Other Formats:

- NFPA (National Fire Prevention Association)
 - Diamond
 - Used by fire / rescue personnel
- HMIS (Hazardous Materials Identification System)
 - Color coded bars
 - Developed by the American Coatings Association

Laboratory Standard

NFPA Diamond



Health Hazard Blue Diamond

- 4-Deadly
- 3-Extreme Danger
- 2-Hazardous
- 1-Slightly Hazardous
- 0-Normal Material

Fire Hazard Red Diamond

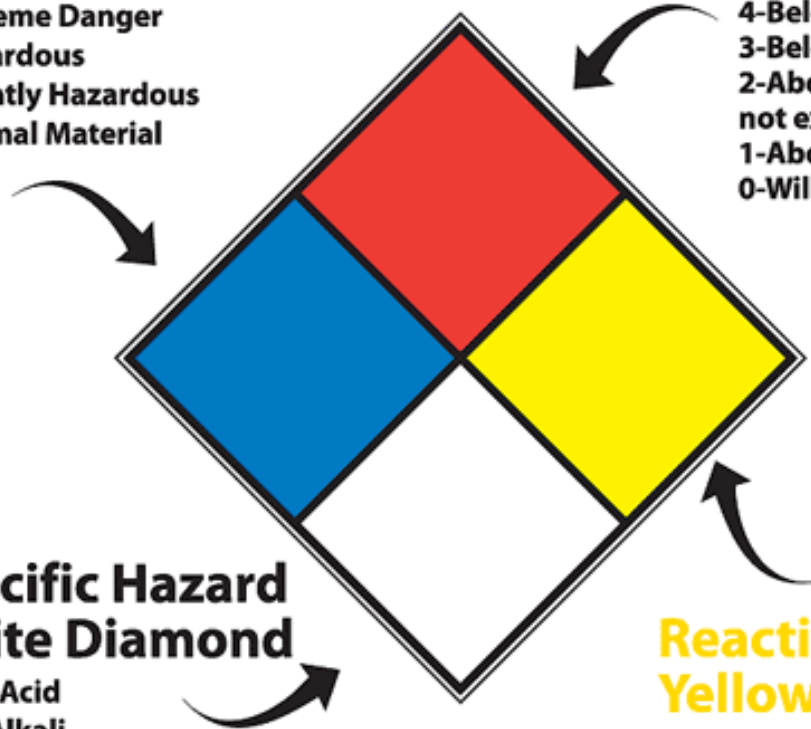
- Flash Points
- 4-Below 73°F
 - 3-Below 100°F
 - 2-Above 100°F not exceeding 200°F
 - 1-Above 200°F
 - 0-Will not burn

Specific Hazard White Diamond

- ACID - Acid
- ALK - Alkali
- COR - Corrosive
- OXY - Oxidizer
-  - Radioactive
-  - Use No Water

Reactivity Yellow Diamond

- 4-May Detonate
- 3-Shock & Heat may detonate
- 2-Violent Chemical change
- 1-Unstable if heated
- 0-Stable



Laboratory Standard

HMIS Diagram

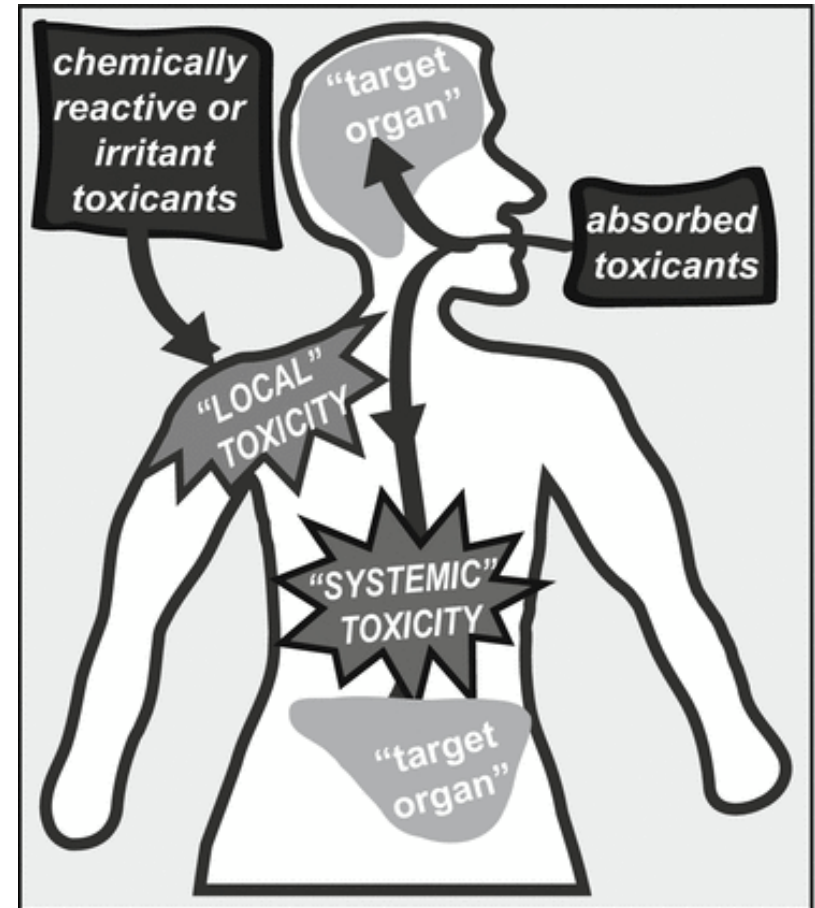


Container labels:

- Newly purchased chemicals stored in original bottles must have the manufacturer's original label identifying potential hazards, the date of purchase, and the date first opened.
- Chemicals transferred to a secondary container must be appropriately labeled:
 - in English
 - with the chemical name
 - formula,
 - concentration (if in solution),
 - solvent (if in solution),
 - hazard warnings,
 - who transferred or created the chemical,
 - and the date that it was transferred/created.

Laboratory Standard

Chemical exposure:



Laboratory Standard

- **Exposure** (dose): Amount of a substance that is ingested, inhaled or contacted through the skin
- Exposure to toxic agents can have severe consequences, including death
- Injuries can occur anywhere toxic chemicals are handled
- Most chemical injuries could have been avoided
 - If these people had had the **proper equipment**, if they had been using the **proper techniques** and if they had had **adequate knowledge**, such as exposures probably would not have occurred.

Exposures to and effects from these hazards can be acute or chronic

- Acute effects usually occur rapidly as a result of short-term exposures, and are of short duration
- Chronic effects generally occur as a result of long-term exposure, and are of long duration

Routes of Exposure:

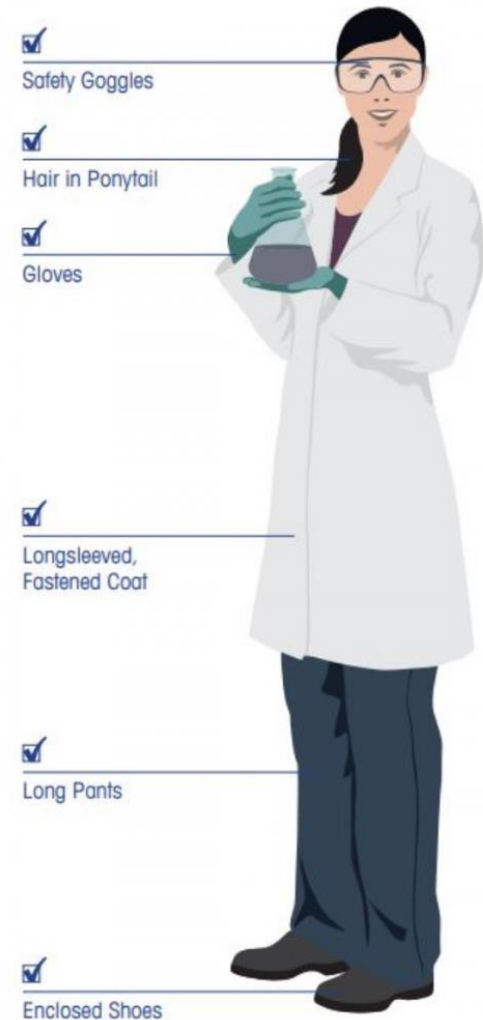
- **Inhalation / breathing** - most common route, gases or vapors can be transported into the blood, solid particles inhaled into lungs
- **Absorption through the skin** - many solids, liquids, vapors and gases can be absorbed through the skin
- **Ingestion / swallowing** - usually not intentional due to failure to wash hands, eating in contaminated lab, etc.
- **Injection** - accidents handling glass, sharps, etc.
- **Eye Contact** - either physical damage or absorption

How will you know if you have been exposed?

- Monitor yourself and work area for signs & symptoms:
 - Odors
 - Skin rash
 - Eye or throat irritation
 - Nausea
 - Dizziness or headache
 - Trouble breathing
- Specific signs & symptoms for each chemical are provided in the SDS for that chemical (Section-11)

Laboratory Standard

How do we control (specifically minimize) exposure to chemical hazards?



Laboratory Standard

- By minimizing exposures we mean:
 - Keep worker's exposure below the Permissible Exposure Limit (PEL)
 - PEL's are regulatory limits set by OSHA on the amount or concentration of a substance in the air
 - **PELs can be found in the SDSs**
- Ways to minimize exposures and risks of exposures:
 - Administrative Controls
 - Engineering Controls
 - Work Practices / Housekeeping Controls
 - Personal Protective Equipment (PPE)

Administrative Controls:

Procedures that Limit Contact with Hazard:

- Safety procedures – in written form and available
- Training of personnel
- Restriction of access to areas with hazardous chemicals
- Provision of medical surveillance of expected exposures
- Maintaining centralized inventory
- Perform/provide inspections of laboratories and equipment

Engineering Controls:

Removes or Separates Hazard from Person:

- Chemical substitution – use the least hazardous reagent
- Ventilation – fume hoods
- Safety showers
- Eye wash stations
- Designated work areas
- Facility design

Laboratory Standard

Work Practices Controls:

- Personnel maintain safe working environment
- Proper laboratory technique and chemical hygiene including:
 - Proper handling
 - Proper storage
 - Proper disposal
- MSU has a separate Waste Management Plan to cover disposal regulation compliance
 - An electronic copy will also be found at:
https://msutexas.edu/academics/scienceandmath/chemical_safety/safety-management.php
(MCOSME Chemical Safety Webpage)

Personal Protective Equipment (PPE):

- Should be considered only after administrative and engineering controls have been applied
- Equipment that is necessary to protect yourself from hazardous and biohazardous materials in the event that engineering controls and work practices do not adequately prevent exposure to chemicals
- Examples: gloves, glasses/goggles, lab coat, face shield
- Must be adequate for the substance being handled

Exposure Control – Shipping/Receiving:

- All incoming shipments must be inspected and should be refused if proper labels are not attached, or containers are not intact and not in good condition.
- If leaking containers are found, the containers must immediately be placed in an appropriate secondary container.
- Chemicals should arrive with expiration dates assigned.
- Where necessary, all areas where shipments of chemicals are received will have appropriate personal protective equipment (PPE) and spill-control materials available. Each chemical receiving area should have an appropriate fire extinguisher.
- Labels on incoming containers shall not be removed or defaced.
- See Section 4.6 of the CHP (p.13)

Exposure Control – Inspections & Monitoring:

- Inspections are performed annually by the Chemical Safety Officer using form in CHP (Appendix B)
- Inspection report identifies problems that need immediate attention as well as those of lower priority
- Facilities Services will be notified of problems with emergency equipment and infrastructure
- Laboratory users are also responsible for monitoring for and reporting any safety concerns

Report any unsafe conditions by contacting the faculty/staff of the area who in turn should notify the **department chair** and should file a written report (Appendix D in the CHP) with the Chemical Safety Officer so that the condition may be corrected. Unsafe conditions that must be reported include the following:

- Nonfunctioning hoods in the science area;
- Unsafe storage conditions;
- Blocked emergency exits;
- Improperly charged fire extinguishers;
- Eyewash stations or safety showers that do not work or are blocked;
- Absence of personal protective equipment.

Exposure Control – Inspections & Monitoring:

Monitoring:

- PELs should not be exceeded during the normal workday
- Exposures may need to be monitored if there is reason to believe that the exposure to hazardous chemicals routinely exceeds the PELs.

Laboratory Standard

Chemical Exposure Response:

What happens if there is a spill or other type of exposure?



Chemical Spills:

Call Campus Police (940) 397-4239 if any of the following occur:

- An accident or spill involving hazardous materials results in a serious injury.
- Hazardous material is released into the sewer system.
- The severity of an incident is unclear.

Chemical Spills:

The following situations represent an immediate hazard. Evacuation is to be absolute, and the area should be isolated until a HAZMAT team arrives:

- If hazardous vapors are present, the area should be isolated.
- If hazardous material cannot be safely neutralized or contained by the personnel on hand.
- If a fire is involved with any chemical spill or accident.
- If individuals are unfamiliar with the hazards of the spilled material.

Chemical Spills:

- If there is no immediate danger (flammability, toxicity, reactivity, corrosivity), a small spill (< 5 gallons) can be cleaned by campus personnel using spill kits
- Use **SDS** as a guide for clean up procedures
- For chemical spills beyond the clean up and response capabilities of MSU, call **Campus Police** who may contact: (a) **Wichita Falls Fire Department**; (b) **Safety Kleen (Waste disposal company)**
- Complete Incident Report form for all spills, near misses, accidents, injuries, exposure, etc. (See the form in Appendix D in the CHP)

Laboratory Standard

Individuals exposed to hazardous chemicals should respond immediately.

- In the case of eye exposure, flush eyes promptly with water for 15 minutes and seek medical evaluation.
- In the case of skin contact, flush the affected area promptly with water and remove any contaminated clothing. Seek medical evaluation as necessary.
- In the case of inhalation, isolate the individual from the fumes (i.e. move the individual to fresh air) and seek medical evaluation.
- A copy of all appropriate **SDSs** should accompany anyone sent for medical evaluation because of injury and potential exposure to hazardous materials.

Lab Safety Team:

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