Chemical Hygiene Plan

PLMS Annual Training

Training Overview

- "The Laboratory Standard"
  - OSHA 29 CFR 1910.1450
- Hazardous Chemicals and GHS Classification
- Safety Data Sheets
- Labels
- Chemical Exposure
- Exposure Monitoring
- Controlling Exposures
- Emergency Procedures
- Spill Cleanup
- Hazardous Waste Management

The Laboratory Standard

The OSHA regulation *Occupational Exposure to Hazardous Chemicals in Laboratories* (29 CFR 1910.1450), more commonly known as the Laboratory Standard, is designed to ensure that laboratory personnel are informed about the hazards of chemicals in their workplace and are protected from chemical exposures exceeding allowable levels.

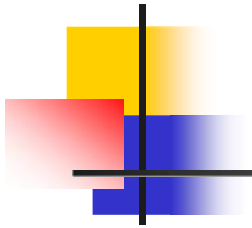
- **A written copy of this standard and its appendices is located in our Safety Data Sheet (SDS) Book, Volume A, just before the Table of Contents.**

PLMS Chemical Hygiene Plan

Located at

→ Sharepoint Sites → Pathology and Laboratory Medicine

→ Lab General → Laboratory General Policy Manual



Hazardous Chemicals and GHS Classification

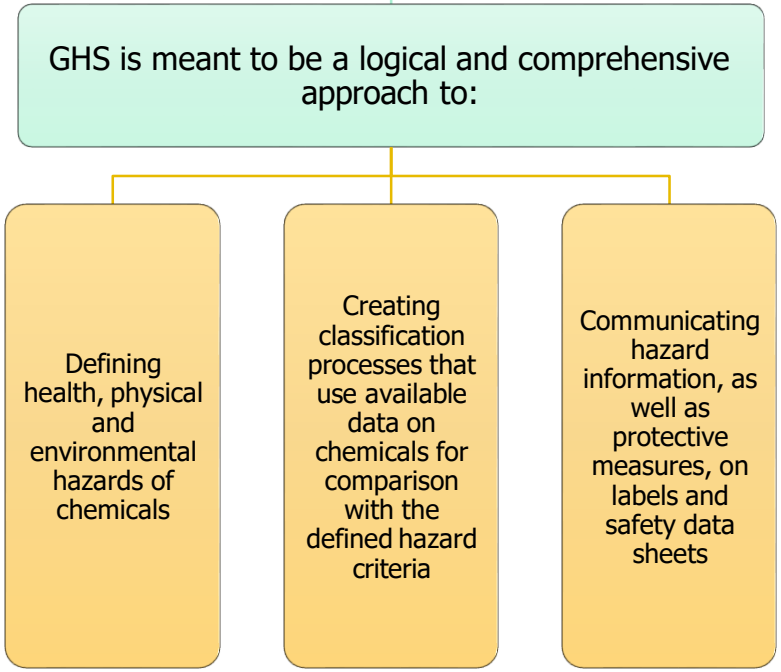
Hazardous Chemical

A **hazardous chemical**, as **defined** by the Hazard Communication Standard (HCS), is any **chemical** which can cause a physical or a health hazard.

Accidents with hazardous chemicals can happen quickly and may be quite severe. **The key to prevention of these accidents is awareness.** Once the hazards are known, the risk of an accident may be reduced significantly by using safe work practices.

GHS Classification

GHS is an acronym for the **Globally Harmonized System of Classification and Labelling of Chemicals**. It is a set of guidelines developed by the United Nations for ensuring the safe production, transport, handling, use and disposal of hazardous materials.



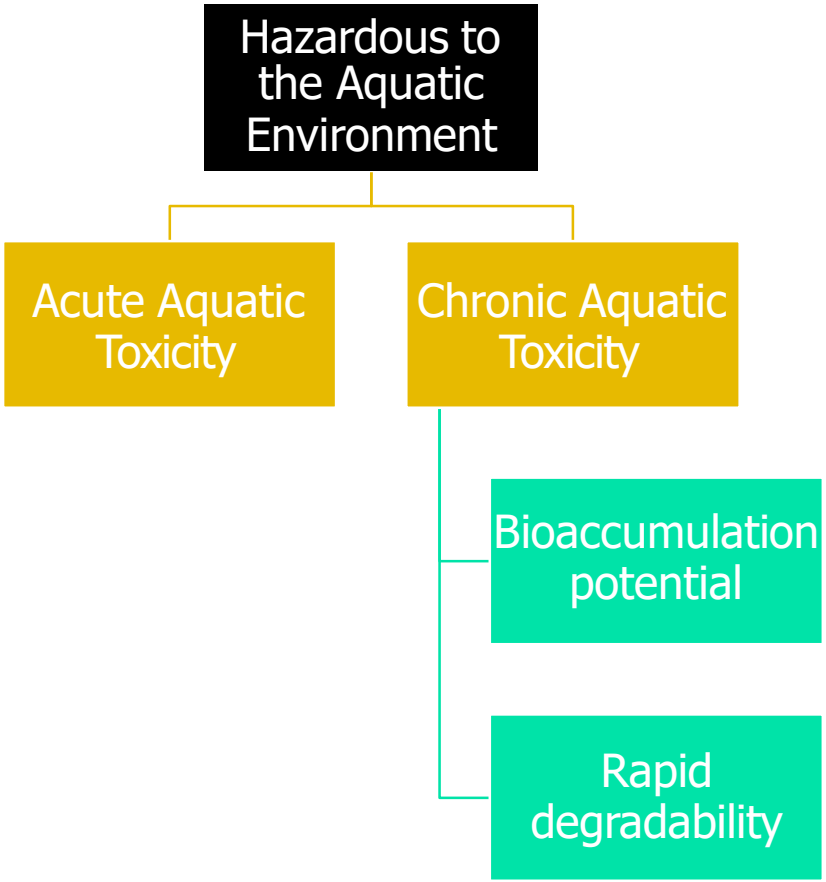
Physical Hazards

Explosives	Flammable Gases	Flammable Aerosols	Oxidizing Gases
Gases Under Pressure	Flammable Liquids	Flammable Solids	Self-Reactive Substances
Pyrophoric Liquids	Pyrophoric Solids	Self-Heating Substances	Substances which, in contact with water, Emit Flammable Gases
Oxidizing Liquids	Oxidizing Solids	Organic Peroxides	Substances Corrosive to Metal

Health Hazards

- Acute Toxicity
- Skin Corrosion/Irritation
- Serious Eye Damage/ Eye Irritation
- Respiratory or Skin Sensitization
- Germ Cell Mutagenicity
- Carcinogenicity
- Reproductive Toxicity
- Target Organ Systemic Toxicity
- Aspiration Toxicity

Environmental Hazards



Hazard Rating Scale

Hazard classification is assessed by manufacturers and suppliers using available data on chemicals for comparison with the defined hazard criteria

GHS scale of 1-5 (1 being the most hazardous and 5 being the least hazardous)

Safety Data Sheets

These are in yellow binders located in the clinical lab, morgue, phlebotomy and at each CBOC.

Safety Data Sheet Standard Format

The SDS should contain 16 headings in a strict ordering.

1. Product and company identification
2. Hazards identification
3. Composition/information on ingredients
4. **First aid measures**
5. Firefighting measures
6. **Accidental release measures**
7. Handling and storage
8. Exposure controls/personal protection
9. Physical and chemical properties
10. Stability and reactivity
11. Toxological information
12. Ecological information
13. Disposal considerations
14. Transport considerations
15. Regulatory information
16. Other information

1. Product Identification

- Identifies the chemical as well as the recommended uses:
  - Product identifier used on the label
  - Other means of identification
  - Recommended use of the chemical and restrictions on use
  - Supplier's details (including name, address, phone number, etc.)
  - Emergency phone number

2. Hazards Identification

- Identifies the hazards of the chemical and the appropriate warning information associated with those hazards:
  - Hazard classification of the chemical
  - Signal word
  - Hazard statement(s)
  - Pictograms
  - Precautionary statement(s)
  - Description of any hazards not otherwise classified
  - For a mixture, a statement describing how much of the mixture consists of ingredient(s) with unknown acute toxicity

3. Composition/Ingredient Info

- Identifies the chemical ingredient(s), information on substances, mixtures and trade secret claims:
  - Chemical name
  - Common name and synonyms
  - Chemical Abstracts Service (CAS) number
  - Impurities and stabilizing additives which are themselves classified and which contribute to the classification of the substance
  - The chemical name and concentration of all ingredients which are classified as health hazards

4. First Aid Measures

- Provides information on what to do in case of an accidental exposure:
  - Necessary first-aid instructions by relevant routes of exposure, i.e., inhalation, skin and eye contact, and ingestion
  - Description of the most important symptoms or effects and any symptoms that are acute or delayed
  - Recommendations for immediate medical care and special treatment needed

5. Fire-Fighting Measures

- Describes how to fight a fire caused by that chemical:
  - Suitable (and unsuitable) extinguishing media
  - Specific chemical hazards arising from fire
  - Special protective equipment and precautions for firefighters

6. Accidental Release Measures

- Deals with the appropriate response to spills, leaks, or releases, including containment and cleanup practices to prevent or minimize exposure to people, properties or the environment:
  - Personal precautions, protective equipment and emergency procedures
  - Environmental precautions
  - Methods and materials for containment and cleaning up

7. Handling and Storage

- Provides guidance on how to handle a chemical when using it and when storing it:
  - Precautions for safe handling
  - Conditions for safe storage, including any incompatibilities

8. Exposure Control/PPE

- Provides information on how to minimize worker exposure:
  - Control parameters
    - OSHA Permissible Exposure Limits (PELs)
    - Biological Exposure Indices (BEIs)
    - Threshold Limit Values (TLVs)
  - Appropriate engineering controls
  - Individual protection measures
    - Personal Protective Equipment (PPE)

9 -12

9: Physical and Chemical Properties lists the chemical's characteristics

10: Stability and Reactivity lists chemical stability and possibility of hazardous reactions

11: Toxicological Information includes routes of exposure; related symptoms, acute and chronic effects; numerical measures of toxicity

12: Ecological Information lists the chemical's ecotoxicity, persistence, degradability, bioaccumulative potential and other adverse effects

Sections 13 - 16

13: Disposal Considerations describes waste residues and their safe handling and methods of disposal

14: Transport Information lists UN Number, UN Proper shipping name, transport hazard class(es), packing group, any special transport precautions

15: Regulatory Information lists safety, health and environmental regulations specific for the product

16: Other Information including information on preparation and revision of the SDS

Labels

- Manufacturer Container Labels
- Secondary Labels

Container Label

- Keep the manufacturer's label intact. Do not intentionally deface or obscure the label or the hazard warnings.

Manufacturer Container Label Content

All container labels are required to have these elements:

- Pictograms
- Signal Words
- Hazard Statement
- Precautionary Statements
- Product Identifier
- Supplier Identification
- Supplemental Information (as required)
- Expiration Date (CAP COM.30300)

GHS Pictograms

- Nine pictograms will be utilized in identifying hazards of **ALL** chemicals
- Each chemical will have **AT LEAST** one pictogram, often multiple pictograms – to visually convey the hazards associated with it
- Be familiar with the meaning(s) of each pictogram
  - Labels and safety data sheets will not always include that information, understanding these is critical

Health Hazard 	**Flame** 	**Exclamation Mark** 
• Carcinogen • Mutagenicity • Reproductive Toxicity • Respiratory Sensitizer • Target Organ Toxicity • Aspiration Toxicity	• Flammables • Pyrophorics • Self-Heating • Emits Flammable Gas • Self-Reactives • Organic Peroxides	• Irritant (skin and eye) • Skin Sensitizer • Acute Toxicity (harmful) • Narcotic Effects • Respiratory Tract Irritant • Hazardous to Ozone Layer (Non Mandatory)
Gas Cylinder 	**Corrosion** 	**Exploding Bomb** 
• Gases under Pressure	• Skin Corrosion/ burns • Eye Damage • Corrosive to Metals	• Explosives • Self-Reactives • Organic Peroxides
Flame over Circle 	**Environment *(Non Mandatory)** 	**Skull and Crossbones** 
• Oxidizers	• Aquatic Toxicity	• Acute Toxicity (fatal or toxic)

Signal Words

Describe the severity of a hazard

Only 2 signal words will appear:

- **DANGER** (more severe hazard)
- **WARNING** (less severe hazard)

If there is no significant hazard, a signal word won't be used

Hazard Statements

Standard phrases that describe the hazard class (Physical, Health or Environmental)

- Examples:
  - Highly flammable liquid and vapor
  - May cause liver and kidney damage
  - Fatal if swallowed

Precautionary Statements

Measures to minimize or prevent adverse effects, First Aid included

- There are four types of precautionary statements:
  - Prevention (to minimize exposure)
  - Response (in case of accidental spillage or exposure)
  - Storage
  - Disposal

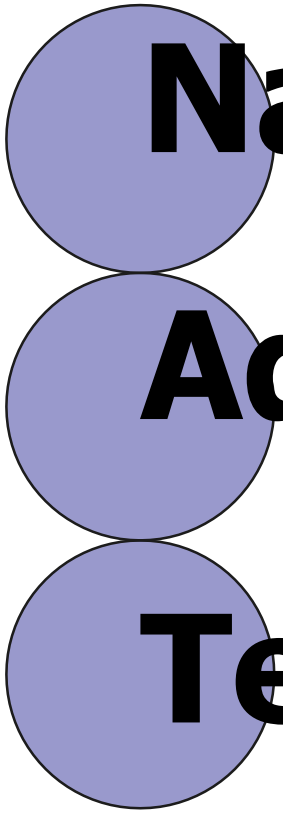
Product Identifier

Ingredient disclosure

Chemical Name,
CAS #, Code

For mixtures, includes the chemical identities of all ingredients that contribute to making it a hazard

Supplier Information



Name

Address

Telephone Number

Supplemental Information

The supplier may provide additional instructions, expiration date, fill date or information that it deems helpful.

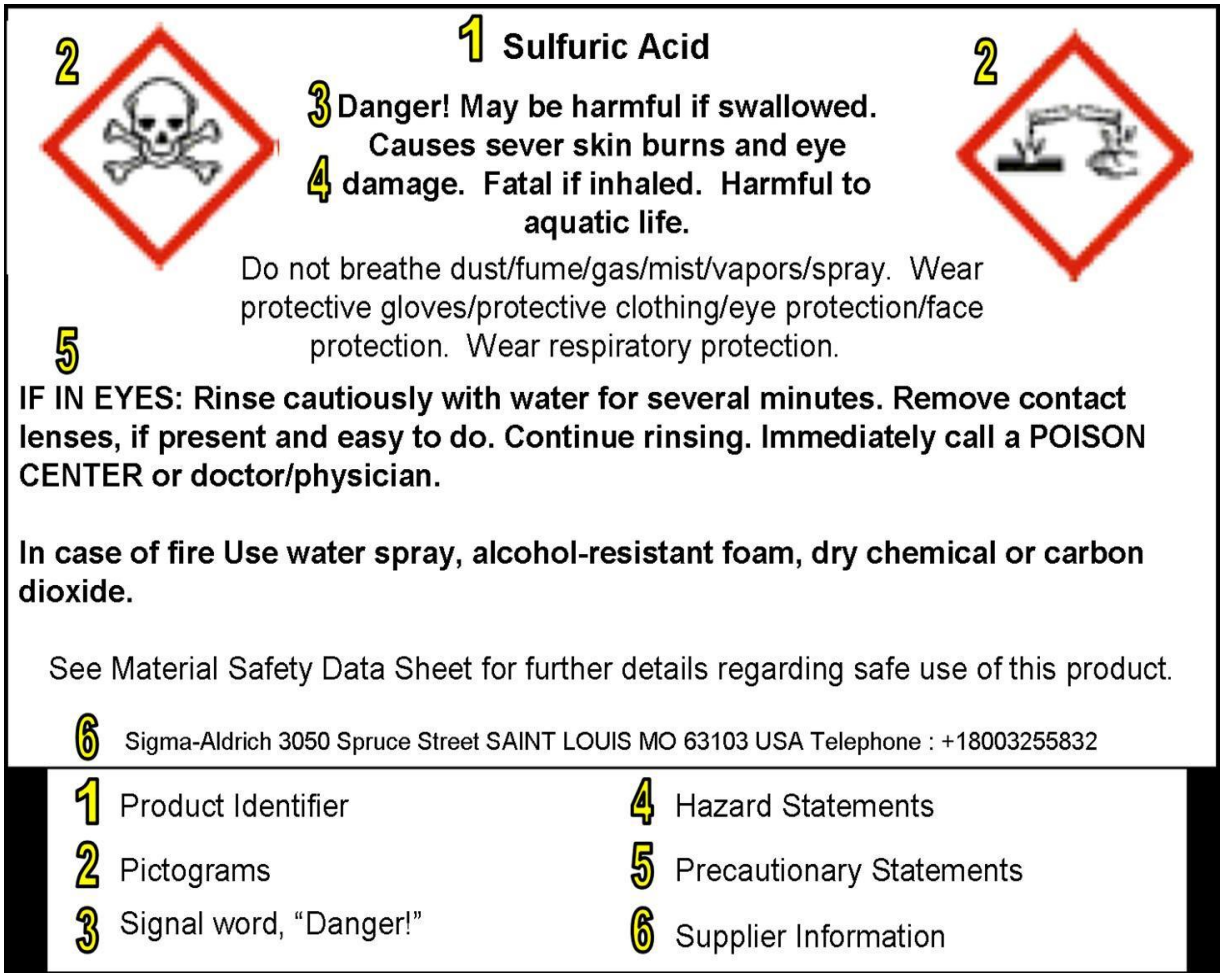
An example is the personal protective equipment (PPE) pictogram indicating what to wear.

Examples of PPE Pictograms






Label Example



Secondary Labels

Whenever a chemical is transferred from the original labeled container into a secondary container, the secondary label must contain:

- **Product Identifier**
- **Concentration and prep date, if applicable**
- **Primary hazard warnings**
- **What to do if accidental contact occurs (CAP GEN.76200)**
- **Expiration date (CAP COM.30300)**

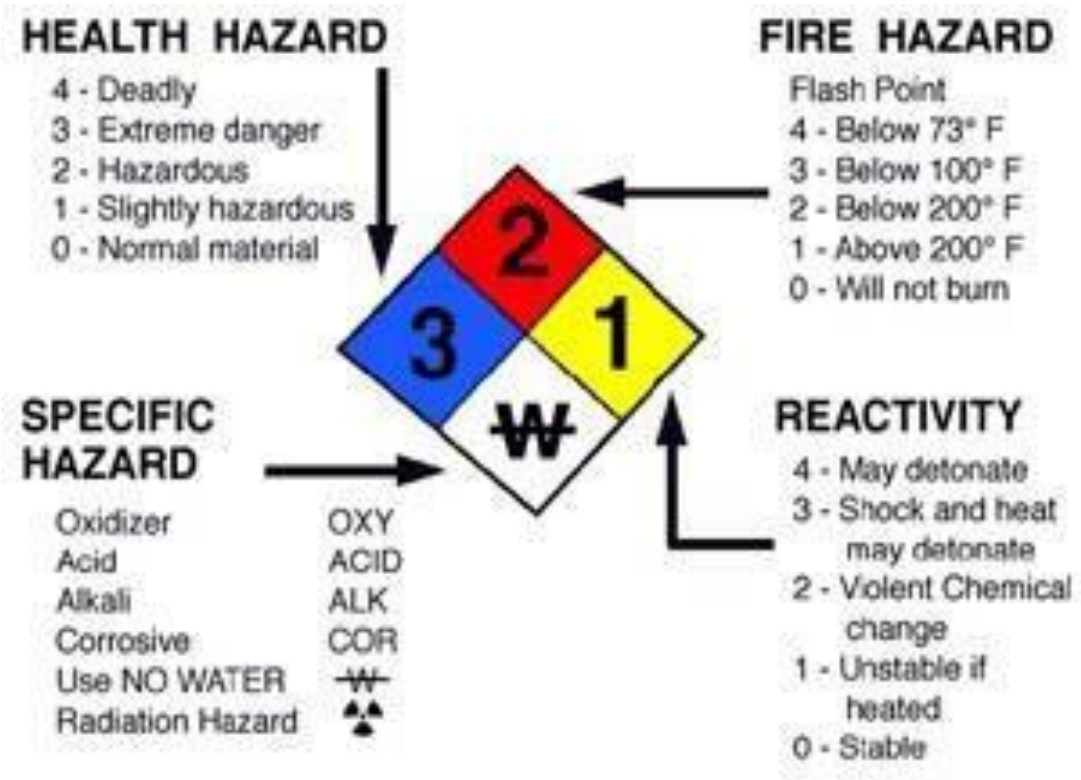
Our laboratory uses the National Fire Protection Association and the Hazardous Materials Identification System labels for **primary hazard warnings.**

- NFPA and HMIS ratings, by themselves, are not sufficient for workplace labels. These systems are intended primarily for emergency response and do not transmit the requisite information.
- **The secondary label must contain all the information listed above.**

More on Secondary Labels

"Batch" labeling can be done where containers are difficult to label because of their size.	• These containers should be clearly grouped together in a drawer, or box and the larger container labeled as described above.
Label information can be displayed in the work area, using signs, placards, process sheets, rather than on individual containers.	• An example of this would be for containers that sit inside an instrument and the label cannot be easily seen. The alternative method must identify the containers to which it is applicable.
Portable, secondary containers for immediate use do not require a label.	• The material is used within the work shift of the individual who made the transfer. • The worker who made the transfer controls the container and is the only person using the hazardous chemical.

NFPA Diamonds



HMIS Labels

- Same color code/numerical rating system as the NFPA diamonds
- 4 – 0, with 4 being the most hazardous
- Caution! This is opposite the GHS scale (1 – 5)

Chemical Exposure

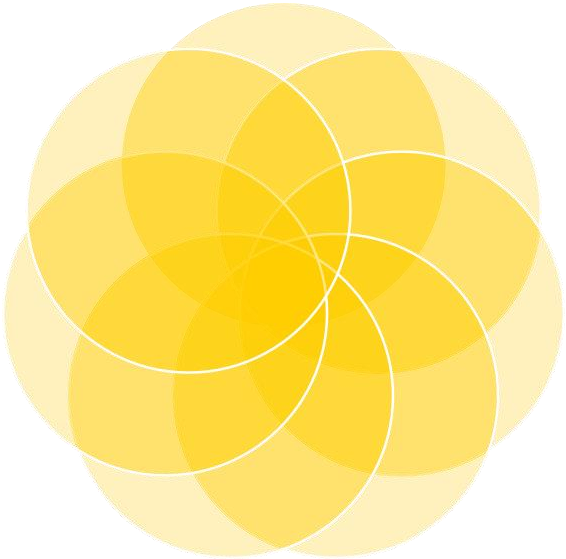
- Routes of entry
- Toxic effects

Basic Toxicology

The health effects of hazardous chemicals are often less clear than the physical hazards.

The actual health risk of a chemical is a function of the toxicity and the actual exposure. No matter how toxic the material may be, there is little risk involved unless it enters the body. An assessment of the toxicity of the chemicals and the possible routes of entry will help determine what protective measures should be taken.

Toxicity is an inherent property of a material, similar to its physical constants. It is the ability of a chemical substance to cause an undesirable effect in a biological system.



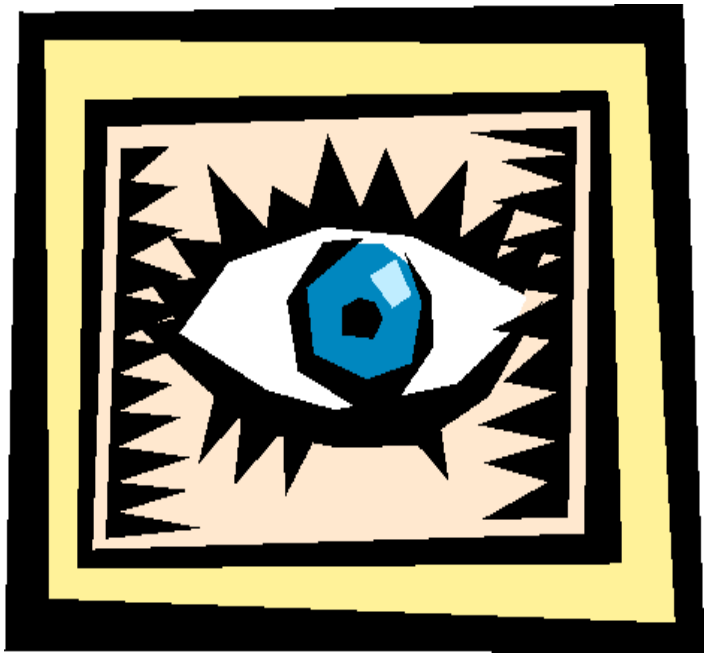
RISK = TOXICITY x EXPOSURE

Hazard is the likelihood that a material will exert its toxic effects *under the conditions of use*.

Conversely, less toxic chemicals can be extremely hazardous if handled improperly.

Highly toxic chemicals can be used safely with proper handling.

Route of Entry: Skin and Eye Contact



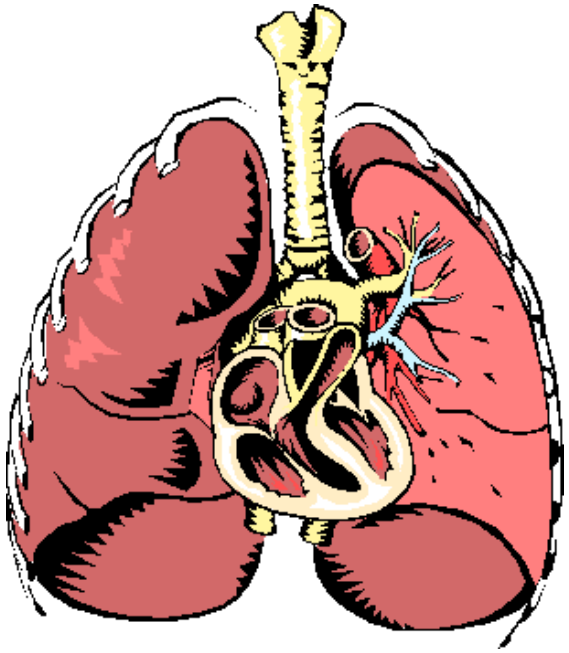
The simplest way for chemicals to enter the body is through direct contact with the skin or eyes. Skin contact with a chemical may result in a local reaction, such as a burn or rash, or absorption into the bloodstream. Absorption into the bloodstream may then allow the chemical to cause toxic effects on other parts of the body. The SDS usually includes information regarding whether or not skin absorption is a significant route of exposure.

The absorption of a chemical through intact skin is influenced by the health of the skin and the properties of the chemical. Skin that is dry or cracked or has lacerations offers less resistance. Fat-soluble substances, such as many organic solvents, can easily penetrate skin and, in some instances, can alter the skin's ability to resist absorption of other substances.

Wear gloves and other protective clothing to minimize skin exposure. **Symptoms of skin exposure include dry, whitened skin, redness and swelling, rashes or blisters, and itching.**

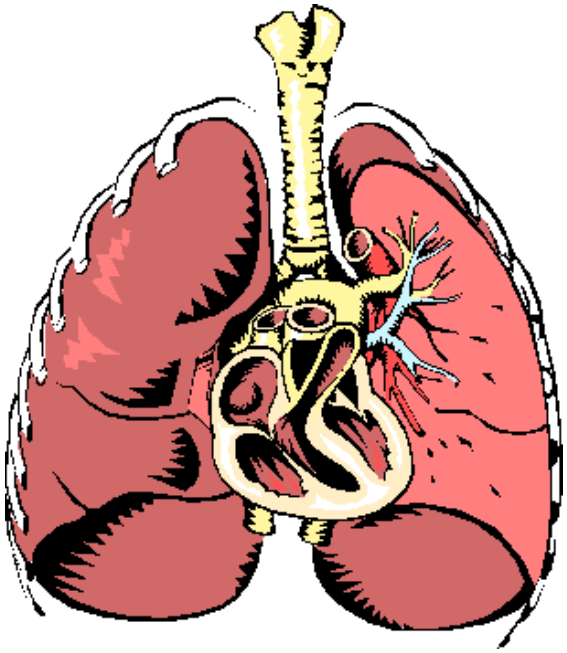
Chemical contact with eyes can be particularly dangerous, resulting in painful injury or loss of sight. Wearing safety goggles or a face shield can reduce the risk of eye contact.

Route of Entry: Inhalation



The respiratory tract is the most common route of entry for gases, vapors, particles, and aerosols (smoke, mists and fumes). These materials may be transported into the lungs and exert localized effects, or be absorbed into the bloodstream. Factors that influence the absorption of these materials may include the vapor pressure of the material, solubility, particle size, its concentration in the inhaled air, and the chemical properties of the material. The vapor pressure is an indicator of how quickly a substance evaporates into the air and how high the concentration in air can become – higher concentrations in air cause greater exposure in the lungs and greater absorption in the bloodstream.

Route of Entry: Inhalation

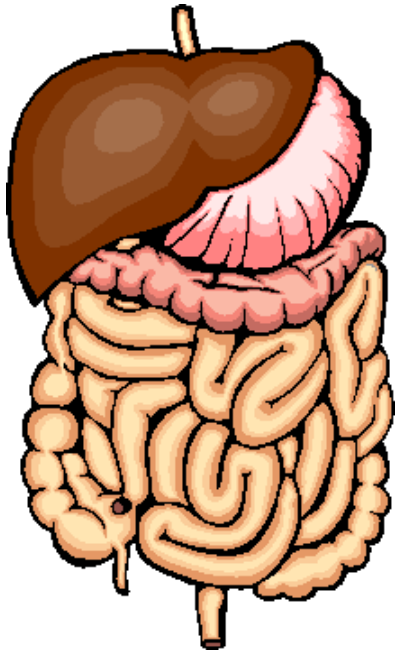


Most chemicals have an odor that is perceptible at a certain concentration, referred to as the odor threshold; however, **there is no relationship between odor and toxicity**. There is considerable individual variability in the perception of odor. Olfactory fatigue may occur when exposed to high concentrations or after prolonged exposure to some substances. This may cause the odor to seem to diminish or disappear, while the danger of overexposure remains.

Symptoms of over-exposure may include headaches, increased mucus production, and eye, nose and throat irritation. Narcotic effects, including confusion, dizziness, drowsiness, or collapse, may result from exposure to some substances, particularly many solvents.

Volatile hazardous materials should be used in a well-ventilated area, preferably a fume hood, to reduce the potential of exposure. Occasionally, ventilation may not be adequate and a fume hood may not be practical, necessitating the use of a respirator.

Route of Entry: Ingestion



The gastrointestinal tract is another possible route of entry for toxic substances. Although direct ingestion of a laboratory chemical is unlikely, exposure may occur as a result of ingesting contaminated food or beverages, touching the mouth with contaminated fingers, or swallowing inhaled particles which have been cleared from the respiratory system. The possibility of exposure by this route may be reduced by **not eating, drinking, smoking, or storing food in the laboratory, and by washing hands** thoroughly after working with chemicals, even when gloves were worn.

Route of Entry: Injection

The final possible route of exposure to chemicals is by injection. Injection effectively bypasses the protection provided by intact skin and provides direct access to the bloodstream, thus, to internal organ systems. Injection may occur through mishaps with syringe needles, or through accidents with pipettes, broken glassware or other sharp objects that have been contaminated with toxic substances.

Cautious use of any sharp object is always important. Wearing gloves may also reduce the possibility of injection.

Toxic Effects of Chemical Exposure

Many factors influence the effects of chemical exposure. The **dose** is the amount of a chemical that actually enters the body. The actual dose that a person receives depends on the concentration of the chemical and the frequency and duration of the exposure. The sum of all routes of exposure must be considered when determining the dose.

In addition to the dose, the outcome of exposure is determined by (1) the way the chemical enters the body, (2) the physical properties of the chemical, and (3) the susceptibility of the individual receiving the dose.

Toxic Effects of Chemicals

The toxic effects of a chemical may be *local* or *systemic*. Local injuries involve the area of the body in contact with the chemical and are typically caused by reactive or corrosive chemicals, such as strong acids, alkalis or oxidizing agents. Systemic injuries involve tissues or organs unrelated to or removed from the contact site when toxins have been transported through the bloodstream. For example, methanol that has been ingested may cause blindness, while a significant skin exposure to nitrobenzene may effect the central nervous system.

Certain chemicals may affect a target organ. For example, lead primarily affects the central nervous system, kidney and red blood cells; isocyanates may induce an allergic reaction (immune system); and chloroform may cause tumors in the liver and kidneys.

It is important to distinguish between acute and chronic exposure and toxicity. *Acute* toxicity results from a single, short exposure. Effects usually appear quickly and are often reversible. *Chronic* toxicity results from repeated exposure over a long period of time. Effects are usually delayed and gradual, and may be irreversible. For example, the acute effect of alcohol exposure (ingestion) is intoxication, while the chronic effect is cirrhosis of the liver. Acute and chronic effects are distinguished in the SDS, usually with more information about acute exposures than chronic.

Relatively few chemicals have been evaluated for chronic effects, given the complexity of that type of study. Chronic exposure may have very different effects than acute exposure. Usually, studies of chronic exposure evaluate its cancer causing potential or other long-term health problems.

Evaluating Toxicity Data

Most estimates of human toxicity are based on animal studies, which may or may not relate to human toxicity. In most animal studies, the effect measured is usually death. This measure of toxicity is often expressed as an LD_{50} (lethal dose 50) – the dose by swallowing required to kill 50% of the test population. The LD_{50} is usually measured in milligrams of the material per kilogram of body weight of the test animal. The concentration in air that kills half of the population exposed by inhalation is the LC_{50}.

To estimate a lethal dose for a human based on animal tests, the LD_{50} must be multiplied by the weight of an average person. Using this method, it is evident that just a few drops of a highly toxic substance, such as dioxin, may be lethal, while much larger quantities of a slightly toxic substance, such as acetone, would be necessary for the same effect.

Susceptibility of Individuals

Factors that influence the susceptibility of an individual to the effects of toxic substances include nutritional habits, physical condition, obesity, medical conditions, drinking and smoking, and pregnancy. Due to individual variation and uncertainties in estimating human health hazards, it is difficult to determine a dose of a chemical that is totally risk-free.

Regular exposure to some substances can lead to the development of an allergic rash, breathing difficulty, or other reactions. This phenomenon is referred to as *sensitization*. Over time, these effects may occur with exposure to smaller and smaller amounts of the chemical, but will disappear soon after the exposure stops. For reasons not fully understood, not everyone exposed to a sensitizer will experience this reaction. Examples of sensitizers include epoxy resins, nickel salts, isocyanates and formaldehyde.

Particularly Hazardous Materials

The OSHA Laboratory Standard defines a particularly hazardous substance as "select carcinogens, reproductive toxins, and substances that have a high degree of acute toxicity."

A reproductive toxin is a chemical "which affects the reproductive capabilities including chromosomal damage (mutagen) and effects on fetuses (teratogen)".

Consult the safety data sheet to determine whether a particular chemical may be considered one of these substances.

Where to Find Toxicity Information

- Toxicity information may be found in Safety Data Sheets, under the "Health Hazard Data" section, on product labels, and in the *Registry of Toxic Effects of Chemical Substances** (RTECS).

***http://www.cdc.gov/niosh/docs/97-119/**

Exposure Monitoring

OSHA establishes exposure limits for several hundred substances. Laboratory workers must not be exposed to substances in excess of the permissible exposure limits (PEL) specified in OSHA Subpart Z, *Toxic and Hazardous Substances*. PELs refer to airborne concentrations of substances averaged over an eight-hour day. Some substances also have "action levels" below the PEL requiring certain actions such as medical surveillance or routine air sampling.

Formaldehyde Exposure Monitoring

Currently, formaldehyde is the only exposure monitoring conducted in PLMS. Exposure to any formaldehyde solution, gas or mixture composed of more than 0.1 percent formaldehyde is considered exposure to a potential carcinogen.

Permissible Exposure Limit (inhalation): 0.75 ppm (8 hr. time-weighted average)

Short-term Exposure Limit (inhalation): 2 ppm (15 minutes)

Action Level (inhalation): 0.5 ppm (8 hr. time-weighted average)

Exposure monitoring is conducted annually by an outside contractor according to established industrial hygiene practices. After review of results by the VHSO Safety Office, a copy of the results will be forwarded to PLMS for our files. Results of the monitoring are made available to the individuals monitored within 15 working days of the receipt of analytical results.

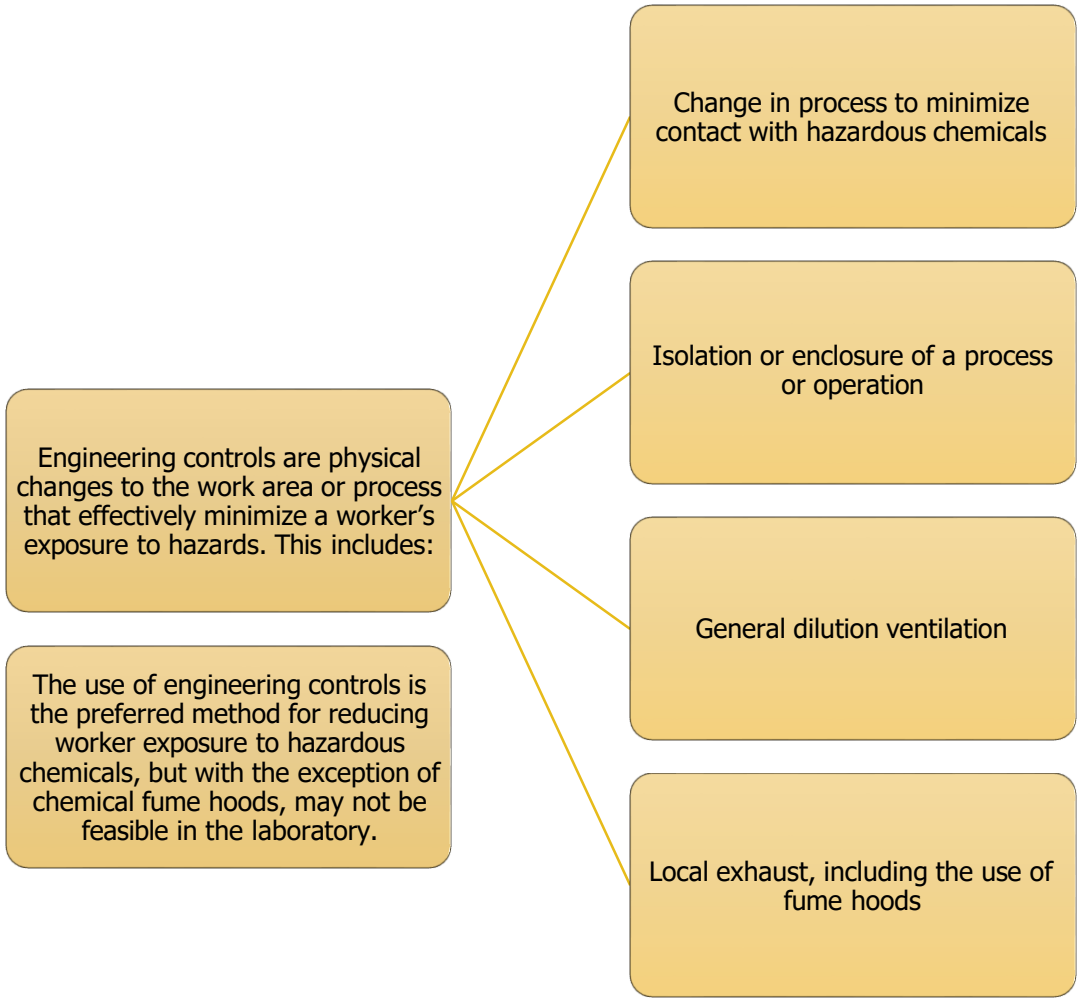
If monitoring reveals that an overexposure has occurred, plans must be implemented to reduce exposure below acceptable limits.

Control Measures

The three main ways to control a hazard are:

- Engineering Controls
- Work Practices & Administrative Controls
- Personal Protective Equipment

Engineering Controls



Chemical Fume Hood

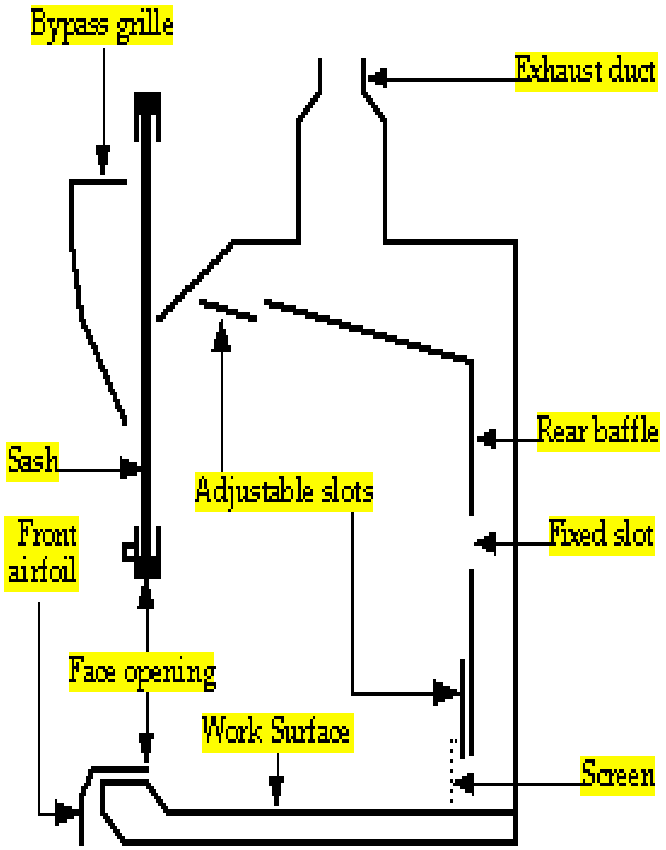
This is a ventilated enclosure in which gases, vapors and fumes are contained. An exhaust fan situated on the top of the laboratory building pulls air and airborne contaminants in the hood through ductwork connected to the hood and exhausts them to the atmosphere.

The front sash moves vertically and provides some protection to the hood user by acting as a physical barrier between the worker and the chemical.

The interior slots and *baffles* direct the air being exhausted. It is important that the baffles are not closed or blocked since this blocks the exhaust path.

The *airfoil* or beveled frame around the hood face allows more even airflow into the hood by avoiding sharp curves that can create turbulence.

The exhaust flowrate or quantity of air pulled through the hood is **constant**. Therefore, when the sash is lowered and the cross-sectional area of the hood opening decreases, the velocity of airflow (face velocity) through the hood increases proportionally. Thus, higher face velocities can be obtained by lowering the sash. The fume is certified for work with hazardous chemicals if the air velocity is between 80 and 120 fpm.



Using Chemical Fume Hoods

To optimize the performance of the fume hood, follow these practices:

Mark a line with tape 6 inches behind the sash and keep all chemicals and equipment behind that line during experiments. This will help to keep materials from escaping the hood when disturbances like air currents from people walking past the hood, etc., interfere with airflow at the face of the hood.

Keep the sash completely lowered any time the hood is not in use; this results in significant **energy conservation**.

Never use a hood to control exposure to hazardous substances without first **verifying that it is operating properly**.

Visually inspect the baffles (openings at the top and rear of the hood) to be sure that the **slots are open and unobstructed**.

Remember:

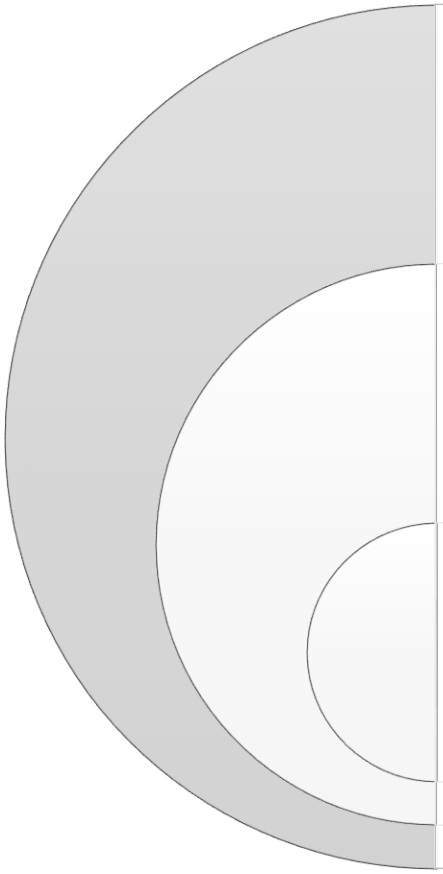
Place large or bulky equipment near the rear of the fume hood. Large items near the face of the hood may cause excessive air turbulence and variations in face velocity.

Do not use the hood as a storage device. Keep only the materials necessary for the experiment inside of the hood.

Keep the hood sash clean and clear.

Clean all chemical residues from the hood chamber after each use.

Pathology Grossing Station



The Shandon Gross-Star workstation uses a downdraft hood:

Downdraft hoods are specially designed work areas with ventilation slots on the sides of the work area. This type of system is useful for chemicals with vapor densities heavier than air.

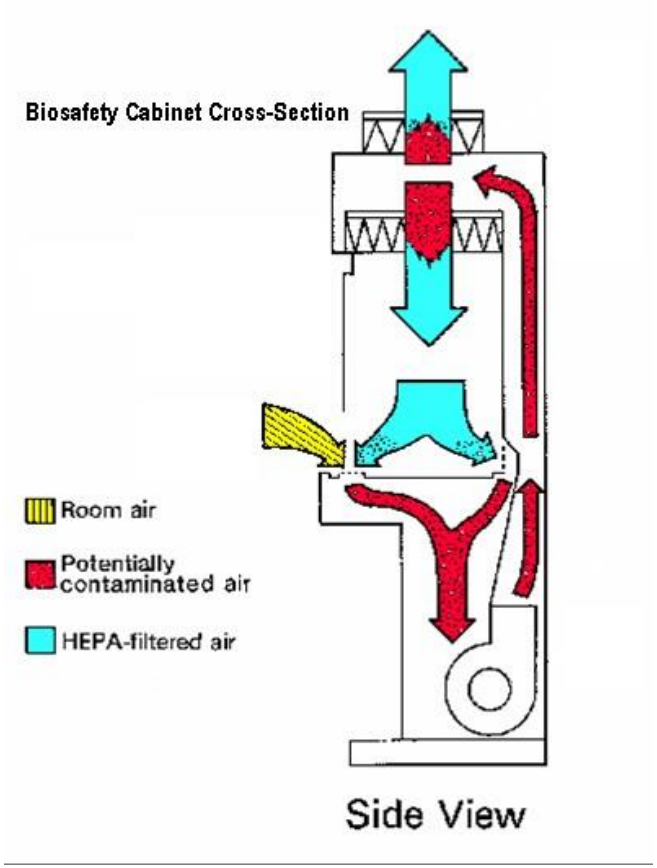
The air is filtered and recirculated back into the lab using an integral blower and filters specific for formaldehyde.

Biological Safety Cabinet

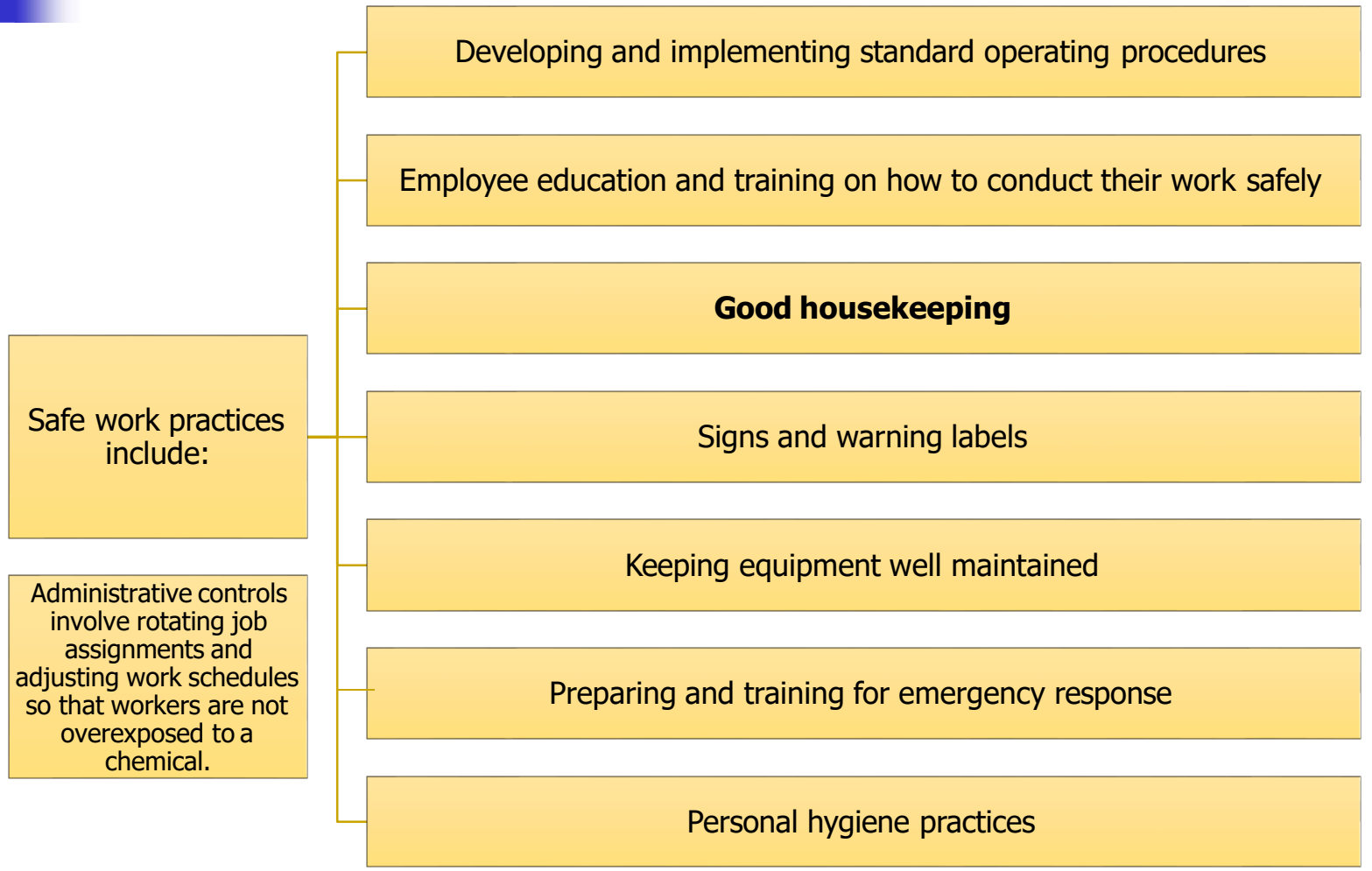
BSCs are located in Microbiology + Cytology

A conventional fume hood should not be used for work with viable biological agents. A biosafety cabinet is specially designed and constructed to offer protection to both the worker and the biological materials.

- Similarly, a biosafety cabinet should **generally not be used for work with hazardous chemicals**. The P&LMS microbiology biosafety cabinet is exhausted to the outside. Even when connected to the building exhaust system, a ducted biosafety cabinet may not achieve a face velocity of 95 - 125 feet per minute, making it inappropriate for use with hazardous chemicals.



Work Practice and Administrative Controls



Personal Protective Equipment

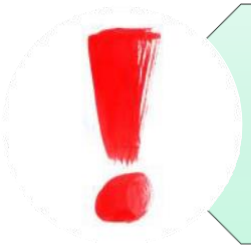
When engineering controls are not sufficient to minimize exposure, personal protective equipment, including gloves, eye protection, respirators and other protective clothing should be used. PPE represents the "last line of defense" against potential exposure.

Eye Protection

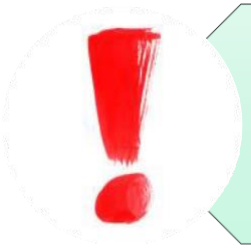
Chemical Splash Goggles should be worn when there is potential for splash from a hazardous material. Like safety glasses, goggles are impact resistant. Chemical splash goggles should have indirect ventilation so hazardous substances cannot drain into the eye area. Some may be worn over prescription glasses.

Face shields are in order when working with large volumes of hazardous materials, either for protection from splash to the face or flying particles. Face shields are not impact resistant.

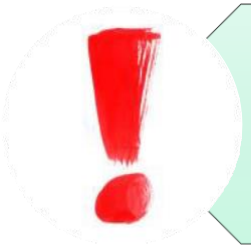
Contact Lenses



Contact lenses may be worn in the laboratory, but do not offer any protection from chemical contact.



If a contact lens becomes contaminated with a hazardous chemical, rinse the eye(s) using an eyewash and remove the lens immediately.



Contact lenses that have been contaminated with a chemical must be discarded.

Protective Clothing

When the possibility of chemical contamination exists, protective clothing that resists physical and chemical hazards should be worn over street clothes. Lab coats are appropriate for minor chemical splashes and solids contamination, while plastic or rubber aprons are best for protection from corrosive or irritating liquids.

Loose clothing (such as overlarge lab coats), skimpy clothing (such as shorts), torn clothing and unrestrained hair may pose a hazard in the laboratory.

Footwear

Closed-toed shoes should be worn at all times in the laboratory. Perforated shoes, sandals or cloth sneakers should not be worn. Such shoes offer no barrier between the laboratory worker and chemicals or broken glass.

Chemical resistant overshoes or boots may be used to avoid possible exposure to corrosive chemical or large quantities of solvents or water that might penetrate normal footwear (e.g., during spill cleanup). Leather shoes tend to absorb chemicals and may have to be discarded if contaminated with a hazardous material.

Gloves

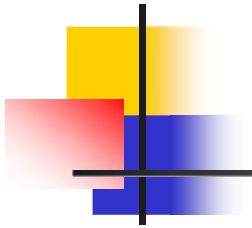
Protective gloves should be worn when handling hazardous materials, chemicals of unknown toxicity, corrosive materials, rough or sharp-edged objects, and very hot or very cold materials. When handling chemicals in a laboratory, disposable vinyl or nitrile examination gloves are usually appropriate for most circumstances. These gloves will offer protection from incidental splashes or contact.

When working with chemicals with high acute toxicity, working with corrosives in high concentrations, handling chemicals for extended periods of time or immersing all or part of a hand into a chemical, the appropriate glove material should be selected, based on chemical compatibility.

Most safety data sheets (SDS) recommend the most protective glove material in their Protective Equipment section.

Respirators

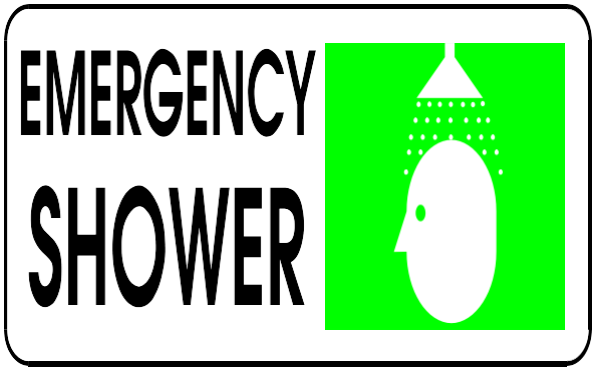
A respirator may only be used when engineering controls, such as general ventilation or a fume hood, do not reduce the exposure of a chemical to acceptable levels (e.g., chemical spills).



Emergency Procedures

Chemicals on skin or clothing

- Immediately flush with water for no less than 15 minutes. For larger spills, the safety shower should be used.
- While rinsing, quickly remove all contaminated clothing or jewelry. Seconds count. Do not waste time because of modesty.
- Use caution when removing pullover shirts or sweaters to prevent contamination of eyes.
- Check SDS to determine if any delayed effects should be expected.
- Discard contaminated clothing or launder them separately from other clothing.
- Do not use solvents to wash skin. They remove the natural protective oils from the skin and can cause irritation and inflammation. In some cases, washing with a solvent may facilitate absorption of a toxic chemical.



Chemicals in Eyes

Immediately flush with water for at least 15 minutes. The eyes must be forcibly held open to wash, and the eyeballs must be rotated so all surface area is rinsed. The use of an eye wash fountain is desirable so hands are free to hold the eyes open.

Remove contact lenses while rinsing. **Do no lose time removing contact lenses before rinsing.** Do not attempt to rinse and reinsert contact lenses.

Seek medical attention regardless of the severity or apparent lack of severity.

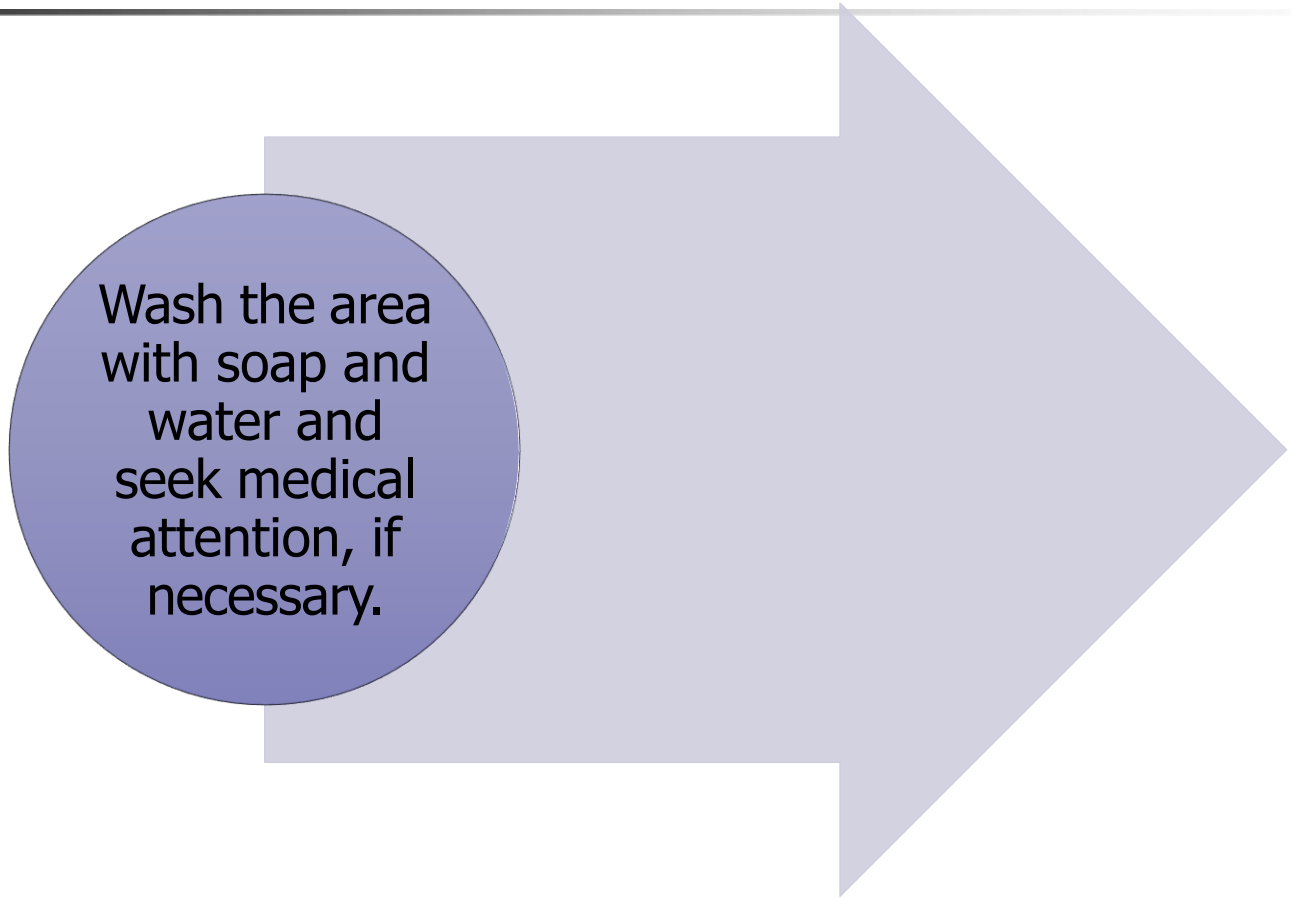
Chemical Inhalation

Close containers, open windows or otherwise increase ventilation, and move to fresh air. If symptoms, such as headaches, nose or throat irritation, dizziness, or drowsiness persist, seek medical attention.

Review the SDS to determines what health effects are expected, including delayed effects.

Accidental Ingestion of Chemicals

Accidental Injection of Chemicals



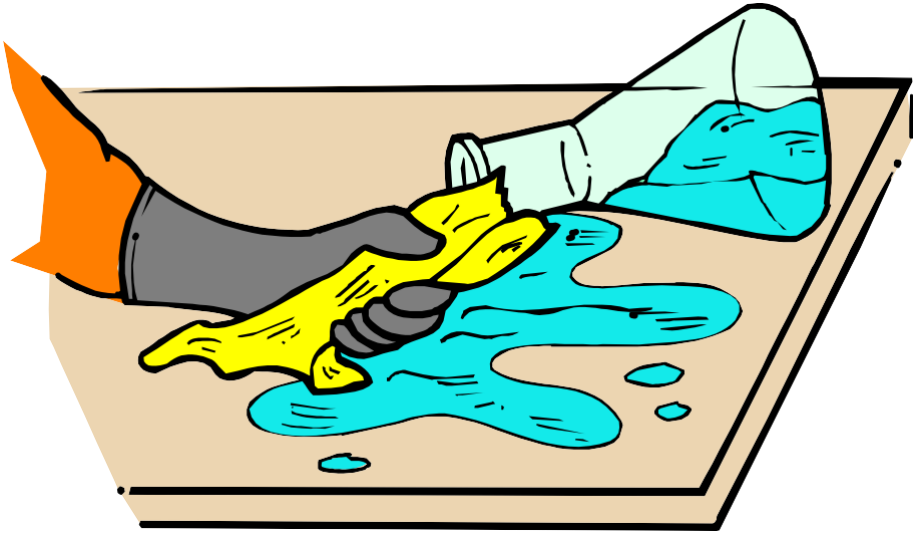
Reporting Accidents and Injuries

All accidents, injuries, or near-misses should be reported to your supervisor and VHSO Safety Office.

If an employee believes that he or she has been over-exposed to a chemical, the worker should contact Employee Health, regardless of whether or not signs or symptoms are noted.

VHSO encourages a culture of reporting all incidents and near misses. Incident investigations are conducted to work towards safer working environments and practices. These investigations are not to assign blame or responsibility for an accident.

Spill Cleanup



Preventing Spills

Most spills are preventable. The following are some tips that could help to prevent or minimize the magnitude of a spill:

- Place chemical containers being used in a hood or lab bench area that reduces the possibility of accidentally knocking over a container.
- Keep all unused reagents in their appropriate storage area and keep your work area clean of needless equipment and clutter.
- Plan your movements. Look where you are reaching to ensure you will not cause a spill.
- Transport chemical containers in a chemical carrier or cart.

Chemical Spill Procedure

The following are general guidelines to be followed for a chemical spill.

Immediately alert area occupants and supervisor, and evacuate the area, if necessary.

If there is a fire or medical attention is needed, follow appropriate procedures.

Attend to any people who may be contaminated. Contaminated clothing must be removed immediately and the skin flushed with water for no less than fifteen minutes. Clothing must be laundered before reuse.

If a volatile, flammable material is spilled, immediately warn everyone, control sources of ignition and ventilate the area.

Don personal protective equipment, as appropriate to the hazards. Refer to the Safety Data Sheet or other references for information.

Consider the need for respiratory protection. If respiratory protection is needed, contact VHSO Safety Office.

Major Chemical Spill Procedure

Major spills are those that by the nature or the volume of the spilled chemical require special procedures to clean up.

In general, spills of carcinogenic, reactive, toxic or reproductive hazard chemicals should only be cleaned up by specially trained personnel using specialized equipment, such as a hazmat suit.

In the event of a major spill, evacuate the area and call for assistance. Remain on the scene but at a safe distance to receive and direct hazardous materials responders when they arrive.

Minor Chemical Spill Procedure

Minor spills are small spills of chemicals that do not pose a hazard. These may be cleaned up immediately by laboratory personnel wearing appropriate personal protective equipment.

To clean up a minor spill, follow these steps:
Don protective gear: chemical resistant gloves, face protection and a lab coat
Confine the spill using an absorbent material
If using neutralizer, work from the perimeter of the spill inward
If spill is flammable, maintain hood ventilation and turn off ignition sources including hot plates and centrifuges with brush-type motors
Carefully scoop absorbed material into a disposable bag and discard as hazardous chemical waste
Decontaminate area with soap and water after cleanup
Never use paper towels to absorb large spills of flammable liquids because it increases vapor production. In addition, paper towels contaminated with strong oxidizing chemicals pose a fire risk.

Hazardous Waste Management

Hazardous waste is generally defined as waste that is dangerous or potentially harmful to human health or the environment.

Hazardous Waste Management

Many chemicals are considered **regulated waste**. Regulated waste is any liquid, gaseous, or solid chemical that is ignitable, corrosive, reactive, toxic or persistent.

The US Environmental Protection Agency (EPA) controls the disposal of all non-radioactive regulated chemical wastes.

No chemical waste should be poured down the drain or discarded in the trash unless it is certain that doing so does not violate hazardous waste regulations.

Hazardous Waste Management

The first step in any hazardous waste program is **source reduction**. Source reduction refers to reducing or eliminating chemical waste before it is generated or disposed of.

Techniques for source reduction include:

- Chemical substitution (replacing chemicals with less toxic materials)
- Limiting chemicals purchased to only the amount needed
- Recycling methods that recover usable chemicals from waste materials, such as reclaiming solvents through distillation
- Neutralization or treatment of chemical waste, such as the use of Formalex in histology

Packaging Hazardous Waste

Place hazardous waste in sealable containers. Using the original container is perfectly acceptable. Do not overfill waste containers, but leave at least 1 inch of headroom.

Whenever possible, *wastes from incompatible hazard classes should not be mixed* (e.g. organic solvents with oxidizers).

Containers must be **kept closed** except during actual transfers. **Do not leave a hazardous waste container with a funnel in it.**

Chemical containers that have been triple-rinsed and air-dried in a ventilated area can be placed in the trash or recycled. If the original contents were highly toxic, the container should be rinsed first with an appropriate solvent and the washings disposed of as hazardous waste.

Waste Identification and Labeling

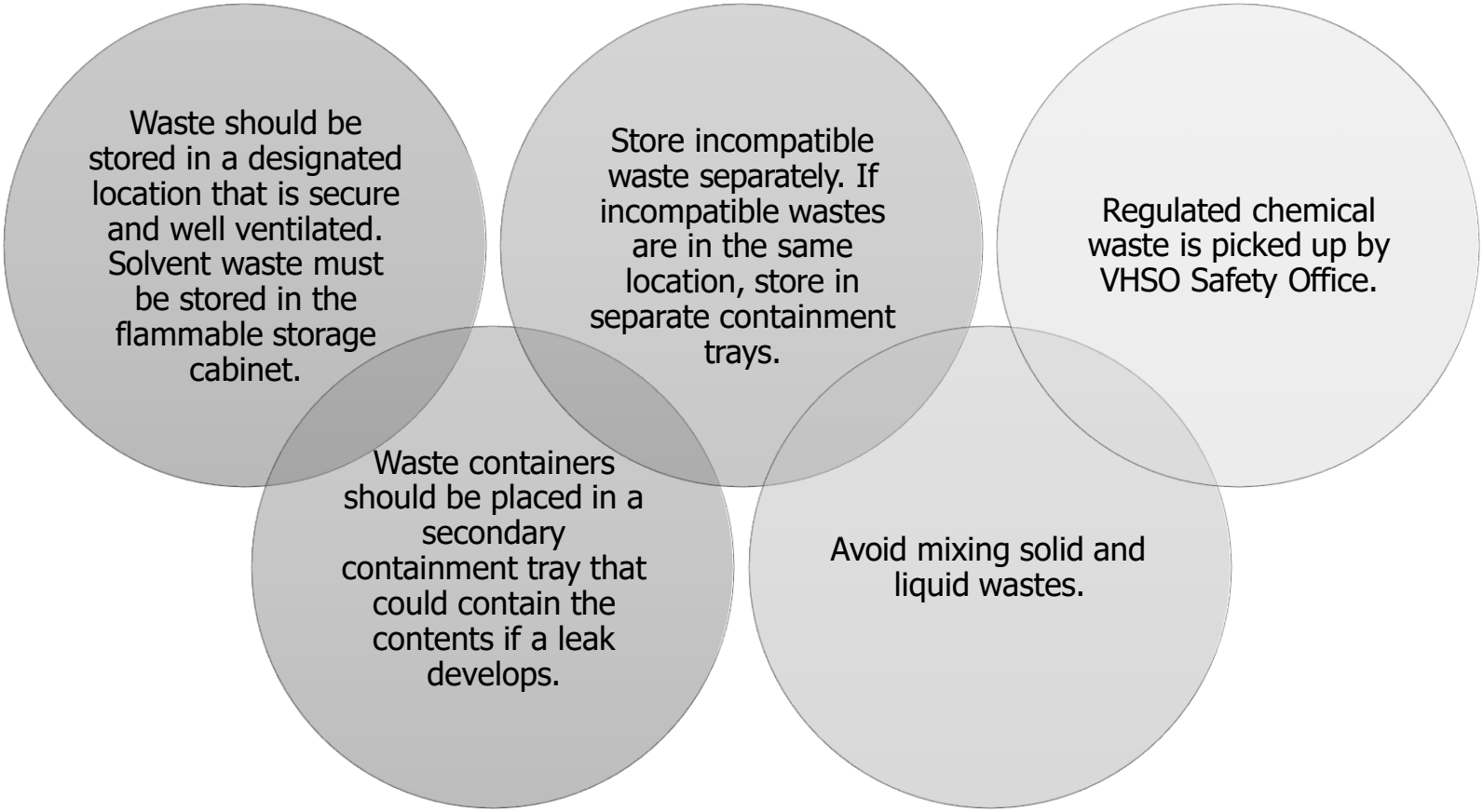
All waste should be properly labeled as soon as the first drop of waste enters a waste container.

Containers must be clearly labeled with the words ***HAZARDOUS WASTE*** along with the names of the principal chemical constituents and the approximate percentage.

Listing accurate percentages is not as important (+5% is acceptable and constituents less than 1% can be listed as "trace") as listing all of the chemicals that makeup the waste.

Write the start date of collection on the container.

Waste Storage Requirements



Congratulations, you are almost finished!

Please take the quiz and sign the training record form.