2020
UMCES
REUs

Hazard Communication/ Right to Know

OSHA 29 CFR 1910.1200/COMAR 09.12.33

You have a Right to Know about the hazards that you might encounter on the job.

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University of Maryland
CENTER FOR ENVIRONMENTAL SCIENCE

Introduction

The **University of Maryland Center for Environmental Science (UMCES)** recognizes the responsibility of protecting the safety and welfare of our campus communities and visitors. **Hazard Communication (HC)** is also termed the Employee **Right to Know Law (RTK)**. You have a Right to Know about the hazards that you might encounter on the job. Employees who work with or around hazardous material must have some knowledge of the materials and have a right to understand how the materials can hurt them and how to protect themselves from such harm. Hazard Communication is a requirement of Federal and State laws:

- **Occupational Safety and Health Administration (OSHA) Code of Federal Regulations (CFR)29 CFR 1910.1200**
- **Code of Maryland Regulations (COMAR)**
  - **COMAR 09.12.33** and
  - Title 5, Subtitle 4, §5-401 thru 410 of the Annotated Code of Maryland – Labor and Employment Article (Access to Information about Hazardous and Toxic Substances).

In order to ensure chemical safety in the workplace, information about the identities and hazards of the chemicals must be available and understandable to workers. The transmittal of information is to be accomplished by means of a comprehensive hazard communication program. Although the Hazard Communication Standard applies mainly to employers, hazard communication is not effective unless you also do your part in working safely with materials. As an REU, you must be able to identify the possible hazards of using a chemical before you start to use it. Do not wait until you have already been exposed to find out that you have put yourself in danger. Read chemical labels and Safety Data Sheets (SDSs) and understand the information they contain. You can search the web using the name of the chemical and the manufacturer and "SDS". Always follow instructions and warnings about how to use hazardous materials safely. These include written instructions on labels, Safety Data Sheets (SDSs), verbal instructions, and safety information you may receive from supervisors.

To view a Safety Data Sheet for any chemical go to: https://login.ehs.com/ and login with ID: **SViewer** and your Password is **UMCESchemicals$2**. Type in the name of the chemical and hit search. Click on view pdf (it is the adobe pic to the left of the chemical name). The Safety Data Sheet will come up and you can review all the precautions you need to work with it safely.

All the safety information in the world will not help protect you if you don't apply the information you are given. Remember, you should never hesitate to ask questions so that you clearly understand what it takes to protect yourself from hazards of potentially dangerous materials. Ask your supervisor or your Safety Officer.

What is a Hazardous Material?

DOT Definition of Hazardous Material: "Any substance which may pose an unreasonable risk to health and safety of operating or emergency personnel, the public, and/or the environment if not properly controlled during handling, storage, manufacture, processing, packaging, use, disposal, or transportation.

There are nine classes of hazardous materials.

Class 1 Explosives
Class 2 Compressed Gases
Class 3 Flammable Liquids
Class 4 Flammable solids
Class 5 Oxidizing Materials
Class 6 Poisonous Materials
Class 7 Radioactive Materials
Class 8 Corrosives
Class 9 Miscellaneous

A combination of these different classes of these materials can be found in laboratory refrigerators, freezers, cabinets, and bench tops, maintenance shops, housekeeping closets and storage areas, and even in the business offices. **Never eat or store your lunch and snacks in areas where hazardous materials are used or stored (laboratories, maintenance shops, or storage areas containing hazardous materials)**. Surfaces, appliances, machines and equipment in these areas have all had hazardous materials in or on them at some time and you do not want to contaminate what you will be eating. **Do not throw food wrappers or containers in the laboratory trash cans** – this is a state and federal regulation and could incur a fine if OSHA were to visit. No food/beverage or their containers in the lab or lab trashcans. Why? Because if food and beverage containers and wrappers appear in a lab or lab trashcan you cannot prove you did not consume that product in the lab. You may have casually tossed it there as you passed by. You cannot prove that to the inspectors! Keep the labs free of consumables.

RISKS

The risks associated with the possession and use of a hazardous chemical are dependent upon a multitude of factors, all of which must be considered before acquiring and using a hazardous chemical. Important elements to examine and address include:

- the knowledge of and commitment to safe chemical use practices of all who handle the chemical;
- its physical, chemical, and biological properties and those of its derivatives;
- the quantity received and the manner in which it is stored and distributed;
- the manner in which it is used;
- the manner of disposal of the substance and its derivatives;
- the length of time it is on the premises, and
- the number of persons who work in the area and have open access to the substance.

Handle hazardous materials responsibly.

HAZARDS

There are <u>two types</u> of harmful hazardous materials:

- those that cause **health hazards** and
- those that cause **physical hazards** or **both**.

Health Hazards

A "health hazard" is a product for which there is statistically significant evidence that acute or chronic health effects may occur in exposed employees. The goal of defining precisely, in measurable terms, every possible health effect that may occur in the workplace because of chemical exposures cannot realistically be accomplished. This does not negate the need for employees to be informed of such effects and protected from them.

Health hazards, depending on the exposure, may cause significant changes in the body. Signs and symptoms may occur in the over-exposed person, such as shortness of breath, skin irritant, headache, feeling ill, or getting cancer. The determination of occupational health hazards is complicated by the fact that many of the effects or signs and symptoms occur commonly in non-occupationally exposed populations, so that effects of exposure are difficult to separate from normally occurring illnesses. Not all people respond to the same degree by the same material. Each individual has different levels of susceptibility depending on a variety of factors: age, inherited characteristics (relating to body chemistry and metabolism), weight, general health, and etcetera. The following list describes most health hazards (it is not all-inclusive):

- **Carcinogens** cause cancer
- **Toxic** or **highly toxic** agents can cause illness, organ damage, and possible death
- Reproductive toxins affect the reproductive capabilities including chromosomal damage.

- **Irritants** cause a temporary or reversible inflammation of living tissue (such as eyes, skin, or respiratory system).
- **Corrosives** burn/destroy skin or eyes on contact.
- **Sensitizers** cause an allergic reaction in normal tissue after repeated exposure to the chemical.
- Target organ effects:
  - **Hepatoxtoxins** cause liver injury.
  - **Nephrotoxins** cause kidney damage.
  - **Neurotoxins** are capable of causing damage to nerves or nerve tissue.
  - **Hematopoietic toxin**s act on the blood or hematopoietic system depriving the body of oxygen.
  - **Lung toxins** irritate or damage pulmonary tissue.
  - **Reproductive toxins** affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

Health Effects

The terms "acute" and "chronic" are used to delineate between effects on the basis of severity or duration.

- "**Acute**" effects usually occur rapidly resulting from short-term exposures, and may be of short duration. The acute effects referred to most often are irritation, corrosion, sensitization, narcosis (light-headedness) and death.
- "**Delayed effects**" appear hours after exposure. Delayed pain and irreversible damage is begun before you are aware of it. Delayed effects may begin from the slow onset of disease after exposure.
- "**Chronic**" effects generally occur from long-term exposure, and may be of long duration.

Toxicology

The science of toxicology is based on the principle that there is a relationship between a toxic reaction (the response) and the amount of poison received (the dose). An important assumption in this relationship a dose has no response or response is so low it is not measurable. A second assumption is that once a maximum response occurs, any further increases in the dose will not result in any increased effect. Knowing the dose/response relationship is a necessary part of understanding the cause and effect relationship between exposure and illness. "The right dose differentiates a poison from a remedy". One of the more commonly used measures of toxicity is the LD50. The LD50 (the lethal dose for 50 percent of the animals tested) of a poison is usually expressed in milligrams of chemical per kilogram of body weight (mg/kg). A chemical with a small LD50 (like 5 mg/kg) is very highly toxic. The more toxic a material, the smaller amount necessary to cause harm. A chemical with a large LD50 (1,000 to 5,000 mg/kg) is practically non-toxic. Recognize that the LD50 says nothing about non-lethal toxic effects though. A chemical may have a large LD50, but may produce illness at very small exposure levels. *Chemicals with small LD50s are more toxic (not more dangerous) than chemicals with large LD50s.* The more toxic a material is, the smaller the amount of it is necessary to be absorbed before harmful effects occur. The lower the toxicity, the greater the quantity is needed for it to be absorbed and be harmful. The danger or risk of adverse effects of chemicals are determined by how they are used, not by the inherent toxicity of the chemical itself.

PHYSICAL HAZARDS

Physical hazard means a material poses one of the following hazardous effects: explosive; flammable (gases, aerosols, liquids, or solids); oxidizer (liquid, solid or gas); self-reactive; pyrophoric (liquid or solid); self-heating; organic peroxide; corrosive to metal; gas under pressure; or in contact with water emits flammable gas (29CFR 1910.1200—Physical Hazard Criteria).

Some chemicals have both health and physical hazards associated with them. Physical hazards are the most common and will be present in most workplaces at one time or another

Definitions

The **auto ignition temperature** or kindling point of a substance is the lowest temperature at which it will spontaneously ignite in a normal atmosphere without an external source of ignition, such as a flame or spark.

Compressed gas causes asphyxiation, fire, explosions, and can penetrate the skin like a needle injection.

The **flash point** of a volatile material is the lowest temperature at which it can vaporize to form an ignitable mixture in air. Measuring a flash point requires an ignition source. The lower the flashpoint the more dangerous it is. Gasoline is more flammable than diesel. Gasoline will ignite from negative 45°F and upwards. Whereas, diesel needs to be at 144°F before it will ignite. Materials that have a flashpoint below 100 degrees Fahrenheit (38^0C) are flammable. Materials with a flashpoint between 100^0F -200^0F are combustible.

An **explosive** material causes a sudden almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature. The lower explosion limit (**LEL**) or lower flammable limit (**LFL**) is the lowest concentration of vapor in air, which will burn or explode upon contact with a source of ignition. Below the LEL/LFL, the mixture is too lean (i.e. there is insufficient fuel) to burn or explode. The upper explosion limit (**UEL**) or upper flammable limit (**UFL**) is the highest concentration of vapor in air, which will burn or explode upon contact with a source of ignition. Above the UEL, the mixture is too rich (i.e. there is insufficient oxygen) to burn or explode. The LEL and UEL are the percentage by volume of vapor in air. Example - For diethyl ether, the LEL is 1.9% and the UEL is 36% by volume of air. The range between 1.9% and 36% is the dangerous range of diethyl ether. It is between the LEL/LFL and UEL/UFL that is dangerous.

Oxidizers bring about an oxidation reaction causing a fire of itself or through the release of oxygen or other gases.

Pyrophoric materials will ignite spontaneously in air at 130^0F or below without an ignition source.

Reactive chemicals cause damage by the release of gases that will burn, explode, or produce high pressure that can cause injury to a person. Organic peroxides, unstable materials, and water reactive materials are examples of reactive chemicals.

Specific gravity (SG) is the weight of a liquid compared to the weight of water at the same temperature and pressure, with water being equal to "1". Pressure is nearly always 1 atmosphere (atm) equal to 101.325 kPa. Specific gravity is a simple means of obtaining information about the concentration of solutions of various materials such as brines, hydrocarbons, sugar solutions (syrups, juices, honeys, etc.) and acids. Substances with a specific gravity of 1 are neutrally buoyant in water, those with SG greater than 1 are denser than water, and so (ignoring surface tension effects) will sink. A Specific Gravity of less than one (1) is less dense than water, and will float.

Vapor density is the density of a vapor in relation to the weight of air with air being "1". The vapor density would indicate whether a gas is denser (greater than 1) or less dense (less than 1) than air. The density has implications for container storage and personnel safety—if a container can release a dense gas, its vapor could sink and, if flammable, vapors can collect until it is at a concentration sufficient for ignition. Even if not flammable, it could collect in the lower floor or level of a confined space and displace air, possibly presenting a smothering hazard to individuals entering the lower part of that space. Vapors lighter than air rise, dissipate quicker, and pose less of a hazard.

Exposure Limits

To guard against both acute and chronic health effects, scientists have identified exposure limits for different kinds of materials.

- The **PEL**, or permissible exposure limit, is the quantity of hazardous chemical that an average employee exposed to in an 8-hour workday without ill effects.
- Threshold limit values (**TLV***s*) are air quality standards developed by the American Conference of Governmental Industrial Hygienists. They are the model for many other air quality limits such as OSHA's PELs. TLVs are the amounts of materials in the air that almost all healthy adult workers are predicted to be able to tolerate without adverse effects.
- Time-weighted average (**TWA**) refers to the average time, over a given work period (such as an 8-hour workday) of a person's exposure to a hazardous materials l or agent.
- Short-term exposure limit (**STEL**) is the maximum concentration to which workers can be exposed to a hazardous materials or agent for a short period of time (15 minutes) four times throughout the eight-hour day, with at least one hour between exposures.
- Concentrations of hazardous materials in the environment are expressed as parts per million (**ppm**) and parts per billion (**ppb**). Government tolerance limits for various poisons usually use these abbreviations.

Routes of Entry

In order for a chemical to become hazardous to a person's health, it must first contact or enter the body and the chemical must have some biological effect on the body. There are four major routes of entry:

- **Inhalation** (breathing)
  Breathing of contaminated air (fumes, dusts, mists, vapors) is the most common way that workplace chemicals enter the body. Use the fume hood when opening or using chemicals that produce harmful vapors (i.e. acids; bases; flammable and explosive materials).
- **Absorption** (skin/eye contact)
  Some hazardous materials, when contacted, can be absorbed through the skin into the blood stream,

  especially organic solvents, materials dissolved in the solvents, acids, and bases. The eyes may also be a route of entry.
- **Ingestion** (eating)
  Less commonly, workplace hazardous materials may be swallowed accidentally if food, Chap Stick, lipstick, gum, your hands, or cigarettes are contaminated. For this reason do not drink, eat, or smoke, chew gum, or apply Chap Stick or lipstick in areas you are exposed to toxic chemicals. Never eat or store your lunch and snacks in the lab. Surfaces and appliances have all had hazardous materials in or on them at some time and you do not want to contaminate what you will be eating. Do not throw food wrappers or containers in the laboratory trashcans (an OSHA inspection would fine such a finding). No food/beverage or their containers in the lab.
- **Injection**
  Injection is the fourth way hazardous materials may enter the body. While uncommon in most workplaces, it can occur when a sharp object (e.g., needle, shard of glass or a stream of high-pressure gas) punctures the skin and "injects" a chemical or biohazard directly into the bloodstream. For example: If a beaker contains a chemical solution and it breaks and a piece of the glass gets injected into your foot, hand, etc. it will inject the chemical that is adhered to the piece of glass. Regardless of the way the hazardous materials gets into the body, once it is in the body it is distributed throughout the body by the blood stream. In this way, the chemicals can attack and harm organs which are far away from the original point of entry as well as where they entered the body.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

When adequate engineering controls (i.e. fume hoods) and administrative hazard controls are not technically, operationally, or financially feasible, personal protective equipment must be used. "**Personal protective equipment**" **(PPE**) includes a wide variety of items worn by an individual to isolate the person from chemical hazards. PPE includes articles to protect the eyes, skin, and the respiratory tract (e.g. goggles, face shields,

coats, aprons, gloves, shoes, and respirators). PPE does not eliminate hazards but merely minimizes damage from hazards. The effectiveness of PPE is highly dependent on the user. Each type of PPE has specific applications, advantages, limitations, and potential problems associated with their misuse. PPE must match the hazards and the conditions of use and be properly maintained in order to be effective. Those using PPE must be fully knowledgeable of these considerations. Their misuse may directly or indirectly contribute to the hazard or create a new hazard. The material of construction must be resistant with the chemical's hazards and must maximize protection, dexterity, and comfort. Employers must provide appropriate personal protective equipment (PPE) for employees.

MUST BE WORN AT ALL TIMES IN THE LAB

- Closed toe shoes
- Lab coats
- Safety glasses/goggles as required
- Correct protective gloves for the job

Respirators

Respirators should never be used in lieu of using a fume hood.

Contact the Environmental Safety Compliance Office (ESCO) if your situation requires the use of a respirator. The Respiratory Protection Plan requires you to complete a medical questionnaire, a medical evaluation, and a respiratory fit test before wearing a respirator. These costs are covered by UMCES.

Gloves

No single glove type can serve as protection from all chemicals. Protective gloves are worn when handling hazardous materials, toxic chemicals, corrosive chemicals, radioactive materials, bio-hazardous materials, rough or sharp edged objects, and very hot or very cold materials. Disposable latex, vinyl or nitrile gloves are usually appropriate when handling chemicals in a laboratory. These gloves will offer protection from incidental splashes or contact. The appropriate glove material is based on chemical compatibility. Consider the following when selecting gloves:

- Degradation
- Breakthrough time
- Permeation rate.

- **Degradation** is the change in one or more of the physical properties of a glove caused by contact with a hazardous material l. Degradation typically appears as hardening, stiffening, swelling, shrinking, or cracking of the glove. The worst example is that the material may actually dissolve in the chemical. The slower the degradation occurs in the presence of a chemical the more protective the material is for that specific chemical. There is no standardized test for degradation; each manufacturer generally has its own test.

- **Breakthrough time:** Breakthrough time is how much time it takes from the initial contact of the hazardous material until it is detected on the opposite side of the glove (essentially, when it begins to soak through). Obviously, the greater the breakthrough time, the more protective the material is for that particular chemical. Breakthrough is measured using a standardized test (ASTM F739).

- **Permeation rate:** Permeation rate is a measurement of how quickly a chemical passes through a material at the molecular level. It can be thought of as a slow leak, similar to how air seeps through plastic soda bottles and makes your soda go flat (hence the expiration date on the bottles!). Thicker materials tend to have slower permeation rates. Different manufacturers report permeation rates differently, but a higher number generally means

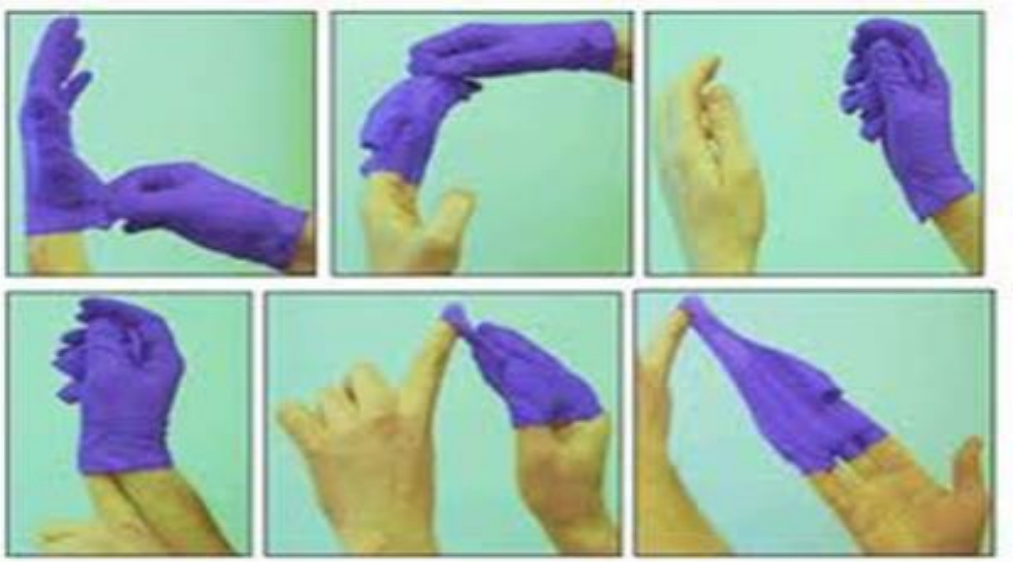
a quicker penetration rate. Please note, however that permeation and degradation do not always correlate. Gloves should fit the user's hands comfortably – they should not be too loose or too tight. Gloves may be worn for several hours and need to stand up to the task. Once contaminated, gloves can become a means for spreading infectious materials to yourself, others or environmental surfaces. Therefore, the way YOU use gloves can influence the risk of hazards in your work setting. These are the most important dos and don'ts of glove use:

- Work from clean to dirty—this will help prevent contamination
- Don't touch your face or adjust PPE with contaminated gloves
- Do not touch environmental surfaces – doorknobs, keyboards, computer mouse, or cell phone. This means TAKE OFF YOUR GLOVES before touching "clean" surfaces. If you need to wear a glove in the hallway to carry a hazardous material, make sure that the gloved hand is carrying the material and the non-gloved hand is operating door handles, elevator buttons, etc.
- Change gloves as required according to the manufacturer and the hazardous material(s) you are working with.
- Discard gloves inside out after use, never wash or reuse disposable gloves.
- Please remove gloves before leaving the laboratory.

Proper Glove Removal

It is important to know how to remove a disposable glove without contaminating yourself and other surfaces.

- Grasp one of the gloves and cuff and pull it partway off. The glove will turn inside out. It is important to keep the first glove partially on your hand before removing the second glove. This protects you from touching the outside of either glove with your bare hands.
- Leaving the first glove over your fingers, grasp the second glove near the cuff and pull it part of the way off. The glove will turn inside out. It is important to keep the second glove partially on your hand to protect you from touching the outside surface of the first glove with your bare hand.
- Pull off the two gloves at the same time, being careful to touch only the inside surfaces of the gloves with your bare hands.
- Dispose of the gloves by placing inside out and wash hands.



Always avoid touching the exterior with your bare hand.

Eye Protection – ANSI Z87.1

Thousands of people are blinded each year from work-related eye injuries that could have been prevented with

the proper selection and use of eye and face protection. Appropriate eye or face protection is required when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation. The standards for eye protection in OSHA are 29 CFR 1910.133 (this standard is based on ANSI standard Z87.1-1989).

Safety glasses protect from impact of flying particles and objects. Side shields protect the eyes from flying objects from the side. Personal prescription lenses do not provide optimal eye protection and are not a substitute for safety glasses. Safety glasses are not effective protection from chemical splash and vapors.

Goggles protect from chemical splash. Goggles should fit snuggly over and around the eyes or personal prescription lenses. The goggles should "breathe" (they should not fog up). They should provide good peripheral vision. Goggles must also be sufficiently comfortable. A pair of goggles pushed up on the forehead or lying on the bench top does not afford eye protection.

Face shields protect from impact hazards such as flying fragments, objects, large chips, and particles. If the probability of a vigorous reaction appears to be substantial, or the material involved in the work in progress is very corrosive to tissue, a facemask (face shield) should be used to supplement the goggles, provide additional protection to the face, and throat. Where there is a risk of a minor explosion, an explosion shield is placed between the worker and the reaction vessel. The face shield should cover the forehead, extend below the chin, and wrap around the side of the face. When worn alone, face shields do not protect employees from impact hazards. Use face shields in combination with safety spectacles or goggles, even in the absence of dust or potential splashes, for additional protection beyond that offered by spectacles or goggles alone.

Contact lenses Contact lenses are not eye protective devices, and wearing them does not reduce the requirement for eye and face protection. A hazard evaluation will include:

- Concentration of material
- Permissible exposure limits,
- Known eye irritant/injury properties,
- Form of chemical (powder, liquid, or vapor),
- Possible routes of exposure.

The assessment for contact lens wearers should include a review of the available information about lens absorption and adsorption for the class of chemicals in use.

Protective Clothing

There is a wide variety of protective clothing available (chemical resistant, waterproof, thermal resistant - i.e. hot work, protection from cuts, etc.). . Protective clothing also has permeation, breakthrough, and degradation properties just like gloves. Check with the vendor to choose the material that will protect you from the hazardous materials you will be working with. The presence of certain physical hazards or other specific elements of the procedure may dictate caution in the choice of style, for example, short sleeves may be preferable if there is a possibility that long sleeves could be caught in a mechanical operation. Disposable outer garments (i.e., Tyvek suits) may be useful when cleaning and when decontamination of reusable clothing is difficult.

Shoes

Closed-toed shoes must be worn at all times in laboratories and work areas where hazardous materials are stored or used. Exposed toes are a magnet for chemical spills, dropped objects, and trip hazards. The top of your foot is just as susceptible to caustic chemicals as your toes. Sandals and perforated shoes are not acceptable in laboratories. Such shoes offer no barrier between the laboratory worker and chemicals, broken glass, or heavy objects. Steel-toed safety shoes may be necessary when there is a risk of heavy objects falling or rolling onto the feet. Shoes with open backs are allowed at the discretion of the Supervisor. Sandals or flip-flops may only be worn while at your desk and to and from work and only if you have an appropriate pair of closed toe shoes, chemical resistant boots, or steel-toed shoes with you to wear in the laboratory or work area.

GLOBAL HARMONIZATION STANDARD (GHS)

The Hazard Communication Standard (HCS)/Right to Know (RTK) aligns with the Globally Harmonized System of Classification and Labeling of Chemicals. This revision of OSHA's Hazard Communication standard is a UN approved universal communication system for the handling of potentially hazardous materials. It replaces the various classification and labeling standards used in different countries by using consistent criteria for classification and labeling on a global level.

Labels

There will be six important components to all GHS labels:

1. Product Identifier	**Sulfuric Acid**
2. Pictogram(s)	
3. Signal Words	**Danger**
4. Hazard Statement	Causes severe skin burns and eye damage. Fatal if inhaled, harmful to aquatic life
5. Precautionary Statement	Do Not breathe dust/fume/gas/vapors/sprays Wear protective gloves, cloths, eye, and face protection
6. Supplier Information	Sigma Aldrich, Any town USA, 46414, Phone: 218-777-6666, Fax: 1-800-889-9999

Secondary Labels

Secondary labels are placed on containers used to hold material transferred from a different container. All secondary containers must be labeled. Labels help protect you. Should you accidentally knock over or break a container that is not labeled, you automatically want to clean it up and then find someone to inform them. However, the material may be very caustic and you could be injured. If, there was a label on it you would be more likely to take the appropriate precautions or find someone to notify rather than jumping in and getting hurt. Even if the material is going to be in that container for a short time, it must have the following four components on the label:

(This information can be copied from the original container.)

Secondary Container Label for an Acetone Container used in a Lab or a Shop

1. **Identifier** --->
2. **Signal Word** --->
3. **Hazard Statement** --->
4. **Pictogram** --->

Two important hazard-labeling systems used are:

- The Hazardous Materials Identification System (**HMIS®**) uses the bar code. It includes hazard evaluations; a rating system for acute and chronic health, flammability and physical hazards; labels providing at-a-glance information on the hazards and PPE; employee training; and a written compliance program.
- The National Fire Protection Association (**NFPA**) uses the diamond code. NFPA is a fire protection, hazard-warning system designed to provide rapid, clear information to emergency responders on materials under conditions of fire, chemical spill, or other emergencies.

At first glance, the HMIS® and NFPA labeling systems appear quite similar:

- Both have four sections colored blue, red, yellow and white.
- The colors indicate the type of hazard.
  - **HMIS** blue indicates the level of **health hazard**, red for **flammability**, orange for **reactivity**, and white for **personal protection**.
  - **NFPA** blue is **health hazard**, red for **flammability**, yellow is for **reactivity,** and white denotes special firefighting measures/hazards (ie. Don't use water ~~W~~)
- The number ratings range from 0-4. Zero is no hazard and 4 is a severe hazard.

The American Coatings Association developed the HMIS system for the OSHA Hazard Communication Standard. The NFPA system was developed for emergency response personnel for short term, acute exposure to materials under conditions of fires or spills. **An important difference between NFPA/HMIS systems and GHS HazCom- is the way they use numbers.**

- With GHS, the lower the categorization number, the greater the severity of the hazard. This is opposite of the way numbers and severity relate to each other under NFPA and HMIS.
- With NFPA, the higher the number, the greater the severity.
  The numbers in the GHS system, as adopted by OSHA, do not appear on the label, instead they are used to determine what goes on the label.
- The GHS numbers do appear on GHS formatted Safety Data Sheets (SDSs), in Section 2. OSHA believes the use of numbers there will be less confusing since there is much more contextual information available to help the reader understand the hazard information. You may continue to use NFPA and HMIS rating systems for labels as long as you are consistent with the requirements of the Hazard Communication Standard and you are aware of the hazards of the chemicals you use. Over the long run, everyone will think globally and choose not to have both systems in play.

GHS vs NFPA/HMIS
GHS
1 = Severe Hazard
4 = Minor Hazard
Vs.
NFPA/HMIS
1 Minor Hazard
4 = Severe Hazard

SIGNAGE

Hazard warning signs are posted at the entrance(s) to each laboratory or other areas that utilize hazardous materials. This signage fulfills regulatory signage requirements as well as alerts everyone to specific hazards located in individual laboratories. It also gives emergency contact information for the Principal Investigator, laboratory safety, radiation safety, and a number for after hour facility maintenance. Please note the signage prior to entering a lab so you are aware of the dangers present. If you have an area that needs signage contact the Safety Officer.

CAUTION

Flammable

Corrosive

Health Hazard

Toxic

Aquatic Toxicity

Irritant

Think Safety

- Closed Toe Shoes
- Safety Goggles or Glasses
- Lab Coat
- Chemical Resistant Gloves

Oxidizer

ADMITTANCE TO AUTHORIZED PERSONNEL ONLY

CONTACT	NAME	OFFICE LOCATION	WORK EXT.	AFTER HOURS PHONE
FOR ENTRY OR ADVICE	Sherry Pike-Saville	AREL 239	8441	443-330-0737
IN EMERGENCY				
Maintenance: X 8334 After Hours: 410-221-8300		Safety Officer: X 8441 After Hours: 410-330-0737		

GHS Pictograms and Hazards

GHS chemical hazard pictograms are intended to provide the basis for or to replace national systems of hazard pictograms. Transport pictograms come in a wider variety of colors and may contain additional information such as subcategory number.

CMR (carcinogenity, mutagenicity and toxicity for reproduction) Specific Target Organ Toxicity (STOT)

STORAGE OF HAZARDOUS MATERIALS

The improper storage or mixing of hazardous materials can result in serious accidents and even disasters. Violent reactions could occur due to the storing or mixing incompatible materials. The following information is to offer guidance on the basic principles of safe storage and segregation of hazardous materials.

- Ensure all containers of hazardous materials are labeled with identity of the hazardous chemical(s) and appropriate hazard warnings.
- Segregate incompatible materials – (e.g. oxidizing acids and flammable solvents in separate locations) to prevent inadvertent mixing of incompatible chemicals which can produce harmful gases/vapors, heat, fire and explosions. The color codes on labels are used as a guide for storage groups. Store the flammables (red color code) together; reactive/physical hazard materials (yellow/orange color code) together and health hazard materials (blue color code) together. Each storage group should have its own separate storage area.
- Store hazardous materials away from heat and direct sunlight.
- Do not store hazardous materials under sinks.
- Do not store hazardous materials alphabetically except within a grouping of compatible chemicals.
- Ensure caps and lids are securely tightened on containers.
- Use approved flammable storage lockers or flammable storage containers to store flammable and combustible liquids. Flammable solvents should not be stored in fume hoods or vented cabinets, since the airflow will fan any fire and spread it quickly.

- Liquids should be stored in unbreakable or double-contained packaging, should the container break/leak.
- Store inorganic acids in corrosive or acid storage cabinets
- Store acids in a dedicated acid cabinet.
- Bleach should be stored in a cool, dry, and well ventilated environment with the lid of the storage container tightly sealed. Bleach fumes can be dangerous and, when inhaled by individuals with compromised bronchial systems, can cause difficulty in breathing..
- Avoid stockpiling hazardous materials.
- Only compressed gas cylinders that are in use and secured in place shall be kept in the work area. All others, including empties shall be sent to the compressed gas storage area.

GHS SAFETY DATA SHEETS (SDSs)

The GHS has dropped the word "material" from Material Safety Data Sheet (MSDS). It is now called the **S**afety **D**ata **S**heet or **SDS**. It provides comprehensive information about the product that allows employers and workers to obtain concise, relevant and accurate information with regard to the hazards, uses and risk management of the product in the workplace. Manufacturers are required to supply an SDS for all hazardous materials they produce. The SDS contains 16 sections. While there were some differences in existing industry recommendations, and requirements of countries, there was widespread agreement on a 16 section SDS that includes the following headings in the order specified:

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 measures
7. Handling and storage
8. Exposure controls/personal protection
9. Physical and chemical properties
10. Stability and reactivity
11. Toxicological information
12. Ecological information
13. Disposal considerations
14. Transport information
15. Regulatory information
16. Other information including information on preparation and revision of the SDS

EMERGENCY PROCEDURES

Knowing proper emergency procedures is another important part of hazardous material safety. Check each of your UMCES Safety websites for specific instructions and information. Having read the SDS for the hazardous materials you work with can help you respond appropriately in case you or a co-worker is overexposed. For emergencies, including fires, accidents, explosions, and medical emergencies, dial 911.

Medical Emergencies

Take the SDS of the chemical that caused the injury to the Emergency Room if possible. Know where eyewash stations, emergency showers, first aid kits, and spill kits are located for your work area. Emergency procedures may include:

- Flushing eyes with water for 15 minutes in case of chemical contact.

- Washing skin with soap and water, and removing contaminated clothing;
- Moving to fresh air if a person has been inhaling hazardous dust, fumes, or vapors
- Getting emergency medical assistance if a person has swallowed a hazardous chemical. There are no general first aid measures for swallowing – vomiting may cause more harm, diluting with water may increase the risk. Call **911** or the Poison Hotline (**1-800-222-1222**) and have the appropriate SDS available.

Chemicals on Skin or Clothing

- Flush with water for no less than 15 minutes. For larger contamination, use the safety shower. Do not waste time because of modesty. Remove all contaminated clothing or jewelry.
- Solvents are capable of dissolving or dispersing one or more other substances dissolved in them. Do not use solvents to wash skin. Solvents remove the natural protective oils from the skin and can cause irritation, inflammation and the absorption of toxics into your body.
- For flammable solids on skin, first brush off as much as possible, then flush with water for at least 15 minutes. Read the SDS and make sure the flammable solid is not reactive with water before you rinse.
- For hydrofluoric acid rinse with water for at least 15 minutes.
- For phenol concentrations >10%, flush with water for 15 minutes or until the affected area turns from white to pink.
- In all cases of severe contamination, seek medical attention.

Inhalation

- Close containers, move to fresh air.
- If symptoms such as headaches, nose or throat irritation, dizziness, or drowsiness persist, seek medical attention. Explain what chemicals you were using and if possible take the appropriate SDS with you.

Ingestion

- Call 911 or the Poison Control Center (1-800-222-1222).
- **Do not induce vomiting** unless directed to do so by a health care provider.

Injection

- Wash area with soap and water and seek medical attention, if necessary.

Spills

Clean up all minor spills and leaks immediately using the spill control material and personal protective equipment in your area. If it is a larger spill or very hazardous spill:

- Notify persons in the immediate area about the spill
- Evacuate all personnel from the spill area and adjoining areas that may be impacted by vapors or a potential fire, if necessary
- If the spilled material if flammable turn off all potential ignition sources. Avoid breathing vapors of the spilled materials. Be aware that some materials either have no odors or induce olfactory fatigue (i.e. the odor is detectable only briefly)
- Leave on or establish exhaust ventilation if it is safe to do so.
- Close doors to slow down the spread of odors.
- Notify safety and facilities management
- Essential personnel familiar with the incident need to stay in communication with responders.

Fires

Individuals are not required to fight fires, but those who choose to do so may fight small, incipient fires (no bigger than a wastepaper basket) as long as they have been trained in the proper use of fire extinguishers. Fight the fire from a positon where you can escape and only if you are confident that you will be successful. If the fire is large or spreading, activate the fire alarm. Evacuate the building and wait for the fire department's arrival to inform them of the exact location, details of the fire, and chemicals that are stored and used in the area.

Other Safety Tips:

- Label containers with receiving, opening and disposal dates.
- Consult safety references (i.e. SDSs) before working with peroxidizing compounds. Do Not move old containers of peroxide-forming chemicals. They are shock sensitive. Contact the Safety Officer for assistance in disposing of the container.

RADIATION SAFETY

Another occupational hazard present at UMCES is **radioactive materials (RAM)**. The Right to Know law does not cover this hazard. A brief description is included for your information.

UMCES works under the Broad Scope Radioactive Material License held by University of Maryland, College Park (UMCP). Maryland is an "Agreement State". This means that Maryland has signed a formal agreement with the U. S. Nuclear Regulatory Commission (NRC) pursuant to Section 274 of the Atomic Energy Act authorizing the State of Maryland to regulate certain uses of radioactive materials within the *State*. Maryland Department of the Environment monitors and audits this license.

Radiation is naturally present in our environment. Cosmic radiation comes from the sun and stars. The Earth contains radioactive materials in soil and rock. Air contains radon. Water, plant and animal organic matter all contain radioactive material. We all have internal radiation (potassium 4- and carbon-14) from birth. There are also manufactured sources of radiation. These include medical sources (x-rays, nuclear medicine), consumer products (television, smoke detectors, luminous watches and some ceramics), and industrial sources (nuclear power plants and industrial radiography). Radioactive materials are powerful research tools in biological and physical research. Strict exposure limits apply. The risk of work involving exposure to these sources of radiation is insignificant due to the controls in effect. No one may use, bring, purchase, or remove any radioactive material or radiation producing devices without the approval of the Radiation Safety Officer and the Radiation Safety Committee at UMCP. Contact UMCES' ESCO for more information

ALARA Policy

At all times, the amount of radiation received by an individual is kept -- As Low As Reasonably Achievable (ALARA).

Restricted Area

Labs that store or use radioactive material or radiation producing devices are classified as a "**restricted area**" by the Code of Maryland Regulations (COMAR) 26.12.01.01. A pre-requisite of entering that area requires that you are informed of the hazards involved. These areas (labs) are indicated by the radiation symbols, which are on the outside of the door to the lab. Outside each lab there is a notice posted for personnel who do not use radioactive materials. Read this material and sign the sheet prior to entering.

Pregnant Employee

If a pregnant employee encounters a restricted area in the course of designated work, she can make a declaration in writing of her pregnancy to her supervisor and the ESCO. She will be provided with special monitoring devices during the course of pregnancy to ensure that her exposure does not exceed 10% (0.5rem) of that normally allowed for adult workers (5rem). This declaration is optional to the individual.

Signage

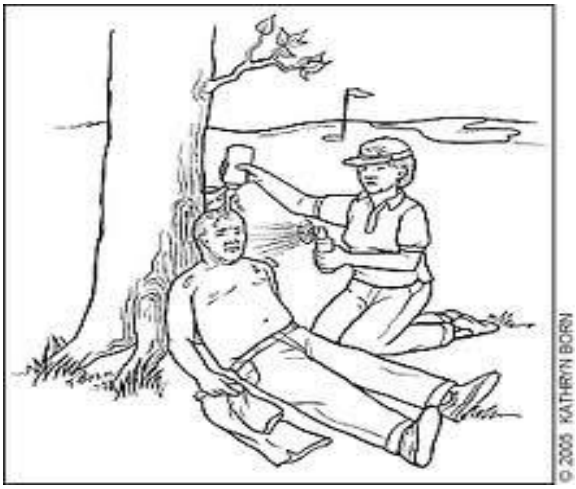
Radioactive material and radiation producing devices are labeled with the same radioactive symbol that is on the door signage. When radioactive materials are not being actively used by a trained employee they are secured behind a locked area (refrigerator, freezer, cabinet, or laboratory door). If you need to work in a laboratory or consult with someone in a laboratory that has radioactive materials or equipment present check with the Principal Investigator where and how the material is stored or if anyone is actively using radioactive material. If radioactive material/samples are not in a locked cabinet, refrigerator, or freezer the main door(s) to that laboratory must be locked at all times.

For additional information concerning radioactive material and the training program contact UMCES' Environmental Safety Compliance Officer (umces-safety@umces.edu).

WORKING OUTDOORS


SUN SAFETY
Sun Safety
easy as...
1
Cover up
2
Use Sunscreen
3
Seek Shade

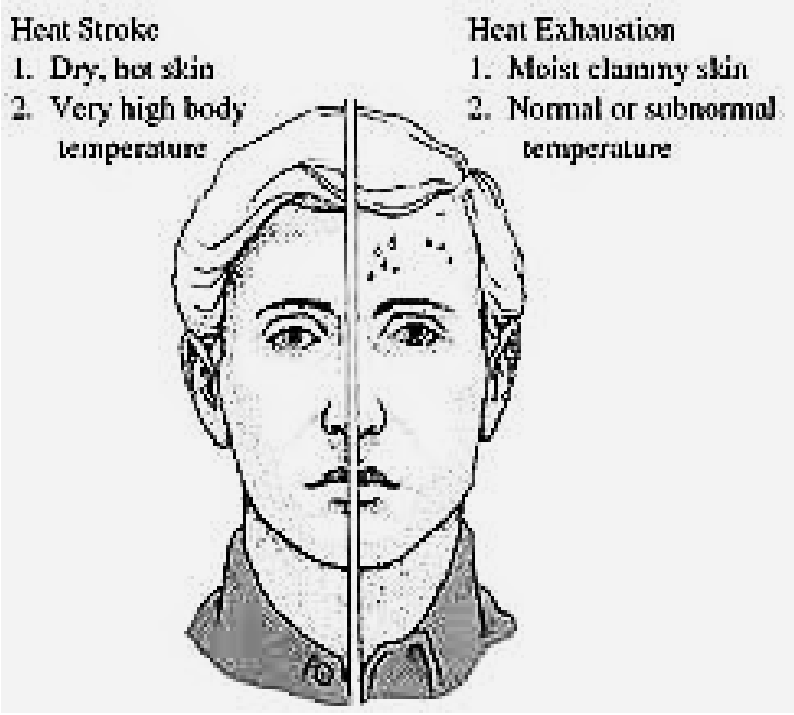
Summers in Maryland can be beautiful…and brutal. If you're not familiar with the heat and humidity this area affords, it's quite a different experience. Watch out for these common signs of heat related medical issues while working on campus this summer.



Heat Cramps- symptoms present as painful, cramped muscles; flushed, moist skin with a mild fever. Move the person to a cool, shaded area. Remove excess clothing and place cool, damp cloths on skin (NOT ice packs). Give them Gatorade/Powerade to help re-hydrate (this is preferable to water initially to replace lost electrolytes). Allow them to rest while hydrating, and slowly and gently stretch the cramped areas.

Heat Exhaustion- symptoms present with muscle cramps, fatigue and weakness; skin will be pale and moist (clammy feeling); headache, diarrhea, nausea and/or vomiting. Move the person to a cool place and have them rest. Remove any excess clothing. If there is a fan available, use it to help facilitate cooling. Give them Gatorade/Powerade to help rehydrate. **CALL 911 IF THERE IS NO IMPROVEMENT.**

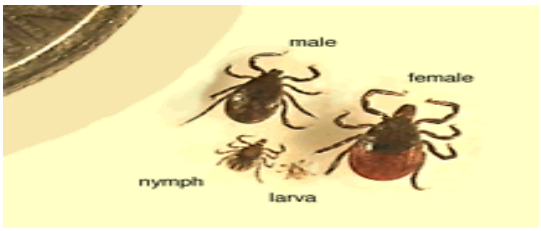
Heat Stroke- THIS IS A LIFE THREATENING ISSUE, CALL 911 IMMEDIATELY!
Symptoms present with warm, dry skin and a high fever; nausea and/or vomiting; rapid heartbeat; mental acuity impairment (agitation, confusion, stupor, lethargy). Move the person to a cool place to rest as soon as possible. Remove excess clothing, and place ice bags on groin/armpit areas to facilitate cooling. If the person is alert, give them Gatorade/Powerade to assist with electrolyte replacement.



Remember… stay hydrated! If you'll be working outside, drink more water than you would if you were working inside. Small, frequent sips are the key. Don't wait until you're thirsty to take a drink!

LYME DISEASE -caused by Deer Ticks (*Ixodes scapularis*), causes "bull's eye" rash

Symptoms present with fever, headaches, swollen lymph nodes, fatigue, stiff neck, muscle ache, and characteristic bull's eye rash at bite site. Help protect yourself by wearing long pants/sleeves and tucking your pant legs into your socks/boots. Spray your clothing with repellants. If you find a tick on you, remove it with tweezers, making sure to remove the entire tick.



West Nile/Zika Virus – transmitted by bite of infected ***Aedes*** species mosquito.

Symptoms of both include fever, headache, body aches, swollen lymph nodes, rash, joint pain. Zika typically also presents with conjunctivitis. Help protect yourself by using insect repellent with DEET, wearing long sleeves and pants, and avoiding sources of standing water if possible as mosquitos breed in this environment

POISONOUS PLANTS

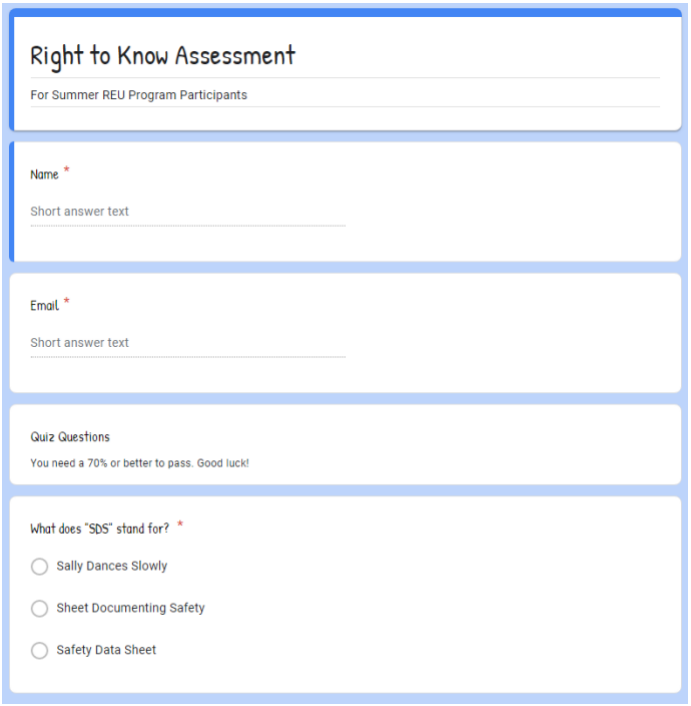
Symptoms:

- Rash begins 1 hour to 5 days after contact with plant
- Additional symptoms can include throat swelling, dizziness, burning feeling, weakness, and breathing problems (anaphylaxis)
- Wear long sleeved shirts and long pants tucked into boot
- Wear cloth or leather gloves
- Rubbing alcohol removes the oily resin up to 30 minutes after exposure.

Poison Ivy

Poison Oak

Poison Sumac



Congratulations! You have now finished Hazard Communication/Right to Know training. Please click the link to the left

It will direct you to a short quiz you MUST take. Have a great summer!