Safety Training

Summer 2004

I. Introduction

Safety is everyone's responsibility, and safety procedures should always be followed. Most of the potentially hazardous situations in a laboratory can be eliminated simply by being aware of your surroundings and using some common sense: Don't drink the bleach; Don't light a flame next to an open bottle of ether. Even with the obvious hazards removed by common sense, the fact that chemicals are inherently hazardous makes the research lab a potentially dangerous place. Add to this the fact that accidents are bound to happen, having the proper training will help minimize the effects of both chemical hazards and accidents.

For safety, prepare for the worst that can reasonably happen, and your experience will be much safer.

II. Personal Protective Equipment

A) Eye Protection: Safety glasses

Eye protection should be worn from the moment you enter a lab to the moment you leave. Even if you are not conducting experiments, others are. Your safety is primarily up to you, so you can't always trust others to be looking out for your safety. And lets not forget accidents. It is not unheard of for a researcher to be washing glassware only to find a small amount of unreacted chemical left in the bottom of a flask, usually unreacted metals such as sodium or magnesium. Some chemicals react violently when mixed with water and can cause explosions. Flying shards of glass can cause serious injury to the eyes as easily as anywhere else. Also, chemicals that don't cause explosions can still react violently and cause spattering. Even the unfortunate act of dropping a piece of glassware in the sink can cause fragments of glass to be thrown on the researcher.

Eye protection, therefore, should be worn at all times in the research lab. Federal regulations require eye protection conforming to the ANSI 87.1-1986 standard. Safety glasses/goggles must provide side protection. Regular prescription eye glasses do not provide sufficient protect from splashed chemicals or flying debris. Contact lenses are discouraged, but are acceptable so long as appropriate safety glasses are also worn. Appropriate eyewear will be provided.

For students working in laboratories with lasers, special eyewear is required. You advisor will help you choose the proper glasses. Those visiting a laboratory in which lasers are used should find out what hazards will be present before they enter a laser lab.

B) Foot Protection

Under no circumstances should open toed shoes be worn in a laboratory. Not only do they expose skin to chemical spills, they provide no protection against broken glass when you drop a flask. A recent Gustavus graduate told me about an unfortunate incident when he dropped a syringe, and the needle lodged firmly in his toe. Had he been wearing closed shoes rather than sandals, this would not have happened.

Appropriate foot-wear should also have non-skid soles. Try as we may, things get spilled...especially water. Slipping on a spill can be a very bad thing if you are carrying a chemical. Rubber soles give the best traction and will minimize the chances of injuring yourself by slipping and falling.

Leather shoes offer the best protection in the laboratory because spilled chemicals take much longer to seep through the leather than through other fabrics. Leather does not dissolve upon exposure to solvents as some synthetic materials do, though any protection is better than none.

C) Personal Apparel

Do not wear your best clothing in the lab. Chemical spills or splashes will surely ruin them. Many chemicals will cause permanent stains, and some chemicals will make holes in the fabric. To avoid exposure to chemicals, the areas of exposed skin should be minimized. It is strongly advised that mid-drift shirts, T-shirts, and shorts not be worn in the lab. Because summers can make this advisory difficult to heed, lab coats or aprons are recommended as a suitable measure of protection. In addition to providing full coverage, lab coats are easier to remove than other articles of clothing should a caustic or toxic agent be spilled on you.

Long hair should be tied back so that it does not interfere with any operations you are conducting. This is especially important if you are working with an open flame.

D) Hand protection

Hands present a unique problem in terms of minimizing chemical exposure. Gloves offer the best protection, but knowing what kind of glove to use is just as important as wearing them. No gloves are impermeable to all chemicals, so knowing what gloves to use for a specific application is critical to safe chemical manipulation. Disposable latex surgical gloves are the cheapest and are satisfactory for most inorganic reagents and solutions. They offer some protection against organic chemicals and solvents. Nitrile gloves are generally better than latex for exposure to organic solvents. Heavy nitrile gloves offer the best all-round protection. Charts that describe the strengths and weaknesses of the various types of glove can be found in many supply catalogues such as the VWR catalogue.

For manipulating hot pieces of equipment, such as glassware removed from an oven, leather gloves offer acceptable thermal protection. **Hot glass looks just like cool glass**. Be careful in handling glass that you know has been heated.

III. Engineering Controls for Safety

A) Fume Hoods

One of the primary means of controlling exposure to chemicals is by using an efficient fume hood. Proper use of the fume hood is an important part of controlling exposure. Be aware of the air-flow in the hoods. If the power should go out in the building, the fume hoods will shut down and potentially toxic vapors will accumulate. If the ventilation system for the whole building goes out, you should leave the building.

1) Air-flow and eddy currents

The fume hood works by pulling air through the hood and exhausting it in outside. This carries any fumes from chemicals away from the researcher. For proper function, the face velocity of the air-flow (measured at the opening of the hood) should be around 100 linear feet/minute. If the flow is too high, "eddy currents" form and swirl vapors outside the hood, exposing the researcher. These eddy currents are air currents that run counter to the flow of the bulk are. They are similar to the swirling produced by logs or other debris in a river current. They are also generated by moving a solid object in a fluid, such as stirring water on the stove with a wooden spoon. Thus, quick motions by the researcher standing in front of the hood will cause eddy currents that increase a researchers exposure to vapors.

Equipment in the hood will also cause eddy current. For this reason, equipment (such as stir-pates) should be placed at least 6 inches from the front of the hood and should be elevated (using a lab-jack or ring-stand) by at least 3 inches to ensure proper air flow.

2) Vapor Density

Some chemical vapors are heavier than air, and some are lighter than air. Fume hoods generally offer control over where the air is drawn by employing a movable baffle. For example, ethanol has a vapor density of 1.1 (air = 1). Since the vapors rise, the baffle should be set to remove air from the hood through the top. Otherwise, vapors will accumulate in the top part of the hood. Likewise, for vapors that are heavier than air, the baffle should be set to draw from the bottom of the hood or vapors will accumulate near the work surface.

B) Safety Shields

When equipment is used at pressures other than ambient (high pressure or vacuum conditions), implosions and explosions are a possible. Working at temperatures other than ambient (cooling or heating) can cause implosions or explosions. In both cases, flying debris is the primary hazard. The primary means of protection from this flying debris is the movable sash on the fume hood. The glass is shatter-resistant safety glass. While conducting experiments in the fume hood, the sash should be open no more than 1/3 of its maximum height, preferably it should be closed when not manipulating equipment. **It is a good habit to always close the hood when you walk away from it.**

Although the sash will provide some measure of protection, if you are working at one of the extremes of temperature or pressure, a portable blast-shield should be used. Your supervising professor will be able to help you determine when it is appropriate to use the blast shield and where to locate one.

IV. Sharps in the Lab

A) Broken Glass

Broken glass is a major hazard in the laboratory. The sharp edges of broken glass can cause very deep cuts. Perhaps more dangerous than broken glass is "almost broken" glass. I call it "almost broken" because it takes very little to break it, and when it breaks it is usually in a way that maximizes the opportunity to be cut on the fragments of glass. The following are some of the most common occurrences of "almost broken" glass.

1) Star Cracks

Small, star-shaped cracks are often found on glassware. The crack is small, and often does not allow solvent to leak through, but is a serious hazard none-the-less. Gentle bumps on the lab bench or pokes with a stirring rod can cause the flask to fully break, causing a chemical spill or cuts from the broken glass. Star-cracked flasks should be set aside for repair. Under no circumstances should a flask with a star-crack be used under increased or reduced pressure, nor should they be heated or cooled as the stress can cause the flask to break.

2) Frozen Joints

When a ground glass stopper becomes "frozen" or stuck in a joint, it can be difficult to safely separate them.

a) The first thing to try is to hold the two pieces, with both hands touching, as close a possible to the joint. With a firm but gentle grasp, try to loosen the joint with a slight twisting motion. **Do not force the twist! If the glass breaks, you will grind it into your hand with the strong twisting motion!**

b) If that fails, you may try heating the joint gently with warm water or a steam bath. The glass on the outside of the joint will expand faster than the glass on the inside of the joint. As it expands, the joint may loosen.

c) If gently heating in a steam bath fails, you may have to use a flame to gently heat the joint. Make sure the joint is free of flammable material. Using the yellow part of the flame, heat the outer part of the joint slowly. Use a gentle twist as described above to try to loosen the joint. **Caution! Hot glass looks just like cool glass. Handle any glass that has recently been heated with care!** If this fails, it is not worth trying any other methods to separate it. A glass blower may be able to free up the joint.

In all cases, it is advisable to wear leather gloves when trying to free up the joint. Most importantly, don't try to force frozen joints. If they break, there is enough force to drive the broken glass into you hand. **The best way to prevent frozen joints is to dismantle the glassware as soon as possible after a procedure.**

B) Needles

In an organic lab, hypodermic needles used for introducing reagents into an air-free system present one of the primary sources of puncture wounds. Once removed from the protective plastic sheath in which needles are supplied, needles should never be placed back into the sheath, as it is easy to confuse a contaminated needle with a clean needle. Used needles may be stuck into a rubber stopper or cork ring to protect the sharp end of the needle. Under no circumstances is it appropriate to leave an unprotected needle sitting in the lab. Used needles should be placed in an appropriately labeled sharps disposal box.

C) Razor Blades

Razor blades are commonly used in the lab for cutting rubber/plastic tubing and parafilm. Exposed blades cannot be left out in the lab. Box cutters and utility knifes are preferred over plain razor blades as the blade is retractable in either of these devices. Used blades should be disposed of by placing in an appropriately labeled sharps disposal box.

V. Fire Safety

Because organic chemistry uses relatively large volumes of flammable solvents, organic chemistry labs present a frequent fire hazard. For this reason, **smoking is not allowed in any lab.** Gustavus has a "no tobacco" policy, so this is unacceptable in any building, but it is particularly important in a research lab. The use of open flames in a lab should also be kept to a minimum, and extreme caution should be used when working with an open flame. The following is basic information regarding fire safety.

A) Fire Extinguishers

Fire extinguishers should be available in each lab. There are three types of fire extinguishers. Water based (not used much anymore), Carbon Dioxide (CO_2) based, and Dry Chemical based. Which one you should use depends on what kind of fire is present. Water based extinguishers should never be used on water-insoluble solvent fires nor on electrical fires. For this reason, the two most common types of extinguishers found in a research lab are compressed CO_2 and dry chemical. Never use a CO_2 extinguisher on a metal fire. Many metals are strong reducing agents that will reduce CO_2 to methane (CH_4). This gives the fire more fuel. Metal-X or sand should be used to smother metal fires.

B) Fire Extinguisher Use

Fires require heat, fuel, and oxygen to burn. In general, fire extinguishers work by suffocating the flames (removing oxygen from the mixture). With this in mind, the best way to use a fire extinguisher is to aim the extinguisher's nozzle at the base of the flame, pull the trigger, and gently sweep the nozzle back and forth. This knocks the flames down and removes oxygen from the source of the flames.

PASS: Pull, Aim, Squeeze, and Sweep. These are the steps for using an extinguisher. Pull the pin that secures the trigger. Aim the nozzle at the base of the flames. Squeeze the trigger. Sweep the nozzle back and forth.

C) Fight or Flight

When a fire breaks out, it is important to remain calm. A few seconds of thought can make the difference between accident and catastrophe. You, the researcher, have a decision to make. You can quickly assess the fire and decide whether or not it is possible for you to use a fire extinguisher to put it out. **If you decide not to fight the fire, alert your supervisor and evacuate the area.** There will be no repercussions for deciding not to fight the fire. You are not a trained firefighter and are not expected to act as one.

If it is a small fire and is contained (in a beaker, for example), you can usually put the flames out by placing a piece of wire gauze screen with a ceramic fiber center or, possibly, a watch glass over the top of the container. For larger fires, the best advice is to get away from it and notify your supervisor.

D) Location of Safety Equipment

One of the first things you should do in any lab is locate where the fire extinguishers, safety-shower or fire blanket, and eyewash stations are. Should your clothing catch on fire, **DO NOT RUN!** Walk *purposefully* toward the fire shower or blanket. Running will fan the flames and intensify them.

E) Fuel Sources and Ignition Sources

Many flammable organic substances are the source of denser than air vapors that can travel for some distance down a bench or across the floor. These vapors are easily ignited and present a particularly high danger, as the source of the vapors may be quite some distance from where you are working. **Never pour flammable compounds into the sink or the trough running down the center of the bench.** You may not be working with an ignition source, but someone on the other end may be.

Aside from open flames, the most common ignition sources for fires are electrical devices. Electric motors, stir plates, hot plates, and heating mantles can cause sparks on the inside of the device. When transferring flammable material, be aware of possible ignition sources. **Never heat a flammable solvent with an open flame!**

VI. Right-to-Know Laws

The federal government and the state of Minnesota require that employers provide their employees with complete information about hazards in the work place. These regulations are referred to as ***Right-to-Know Laws***.

A) Chemical Hygiene Plan

In 1990, the federal government extended the Hazard Communication Act, which established the Right-to-Know Law, to include a provision that requires the establishment of a Chemical Hygiene Plan at all academic laboratories. The Chemical Hygiene plan is a written manual containing safety regulations and laboratory safety procedures. The plan also must provide for training of employees (which is the reason you are here). Gustavus Adolphus College's plan is located on Dr. Bur's website (http://gac.edu/~sbur/Safety.html).

B) Material Safety Data Sheets (MSDSs)

One of the best sources of information is the Material Safety Data Sheet (MSDS) for the compound in question. This sheet provides a plethora of information, some of it confusing even if you are an experienced researcher. A link to a searchable MSDS database is on the safety website (http://gac.edu/~sbur/Safety.html). Following is description of the anatomy of an MSDS.

1) Section 1. Identification

- **Name:** The first section of the MSDS contains identification information. This includes the IUPAC name, the common name, and other archaic names that may be used.
- **CAS No.:** Chemical Abstracts (the largest chemical abstracting organization in the world) assigns a unique number to every substance reported in the literature (including patents).
- **Molecular Weight**
- **Formula Weight**
- **Other product codes:** Depending on the manufacturer of the chemical, various codes for identifying the compound are listed.

2) Section 2. Composition

This section describes the purity of the compound

3) Section 3. Hazard information

This data can vary in format depending on the manufacturer, but it contains information about the health hazards, flammability, reactivity, etc. associated with the compound.

4) Section 4. First Aid

5) Section 5. Fire Fighting Measures

6) Section 6. Accidental Release

This section describes how to deal with accidental spills of the compound.

7) Section 7. Handling and Storage

This section describes proper procedures for handling and storing the compound

8) Section 8. Exposure Controls/Personal Protection

This section gives you information on what equipment you should have on when using the compound. The terms used can be hard to understand, but here are the important ones:

- **Threshold Limit Value (TLV):** The American Conference of Geovernment Industrial Hygienists (ACGIH) developed the TLV. This is the maximum substance in air that a person should be exposed to on a regular basis. It is expressed in ppm or mg/m^3. Note that this value assumes that a person is exposed to the chemical 40 hours per week, on a long-term basis. This may not be of much value in the context of undergraduate research.

- **Permissible Exposure Limit (PEL):** This is the same thing as TLV except it was developed by OSHA (Occupational Safety and Health Administration - the federal administration charged with enforcing the Hazard Communication Act). Current PEL values are available on the Safety web site (http://gac.edu/~sbur/Safety.html) as an Excel spread sheet.

9) Section 9. Physical and Chemical Properties

These are self-explanatory. The vapor density is useful for knowing how to set the baffle on your fume hood.

10) Section 10. Stability and Reactivity

This section details how stable the compound is and under what conditions it becomes dangerous. Of particular importance is the section on *incompatibilities* and *conditions to avoid*.

11) Section 11. Toxicological Information

This section will give you an idea of how toxic a substance is. Some definitions will help make some of these values a little clearer.

- **Lethal Dose, 50% mortality (LD_{50})**: This is the dose of a substance (usually in mg/kg) that will kill 50% of the animals to which it has been administered in a single dose. There are several means of administration: *Oral* (by mouth), *intraperitoneal* (injected into the lining of the abdominal cavity), *subcutaneous* (injected under the skin), and *surface application*.
- **Lethal Concentration, 50% mortality (LC_{50})**: This is the concentration (usually in ppm) that killed 50% of the animals to which it was administered.

It should be noted that the value of these numbers is in relation between certain compounds. For example, the lower a compounds LD_{50}, the more toxic it is. This should give you an idea of how toxic a substance is. Remember, however, that it is a rare experiment that will require you to inject the compound under your skin. By using the proper precautions, the compound should not pose a health risk, as exposure will be minimal.

12) Section 16. Other Information

This section is the last part with much relevance to the undergraduate researcher. This contains the National Fire Protection Association (NFPA) rating for the compound. The information consists of a **Health** rating, a **Flammability** rating and a **Reactivity** rating that describe hazards of the compound when a fire is present. The numbers are on a scale from 0 - 4, with zero being no hazard and 4 being high hazard. Often, this is designated graphically by four diamonds that are color-coded: blue for Health, red for Flammability, yellow for Reactivity, and white for unusual reactivity or special precautions to be taken.

Many of the compounds generated during research will not have MSDSs associated with them. If they are new compounds, no testing could have been done to establish the hazards of the compound. If no MSDS is available, treat the compound as if it is toxic, and avoid exposure. Many classes of compounds have specific hazards associated with them. For example, □,□-unsaturated carbonyl compounds are all carcinogenic as are all alkylating agents (alkyl halides, tosylates, etc.). Finding a similar compounds that has an MSDS is one approach to learning how to handle the compound. Asking a more experienced researcher, such as your advisor, is another approach.

C) Bottles

Most chemical containers will have useful information such as the name, molecular formula, molecular weight, boiling point, melting point, flash point, and general hazards associated with exposure. The NFPA rating may also be on the container. Some of the abbreviations used on labels are listed below:

- **bp:** Boiling Point
- **mp:** Melting Point
- **Flash point (FP):** The temperature at which there is enough vapor to ignite. Liquids should not be heated above this point with an ignition source anywhere nearby. Particularly hazardous are compounds whose flash point is at or below room temperature (20˚ C).
- ***d:*** Density (g/mL)
- n_D: Refractive index

D) Chemical Catalogues and Indices.

One of the best places for general information is the Aldrich Catalogue of Fine Chemicals. Chemicals are listed in alphabetical order, but are indexed by both molecular formula and CAS number. Another great source of information is the Lancaster Catalogue. Like the Aldrich catalogue, but most entries contain literature references for how the chemical has been used. The Merck Index and the CRC handbook are also useful sources for physical properties and hazard information.

VI. Disposal of Waste

The handling of hazardous waste is a highly regulated affair. In general, the following must be observed:

1) Non-hazardous solids: Solids such as paper and corks that do not present a hazard can be thrown in an ordinary waste basket.

2) Broken Glassware: Broken glass should be put into a container specifically designed for broken glass.

3) Solids: Solid waste, such as solid chemicals, silica gel, alumina, and celite should be placed in an appropriately labeled container for disposal.

4) Non-halogenated Solvents: Organic solvents such as THF, Ether, hexanes, and ethyl acetate should be disposed of in an appropriately labeled container. Because the cost of disposing halogenated solvents is much higher than non-halogenated, it is important to segregate these two classes of waste.

5) Halogenated Solvent: Methylene chloride, chloroform, and carbon tetrachloride should be disposed of in an appropriately labeled container. Again, it is important to segregate halogenated solvents from non-halogenated.

6) Strong inorganic Acids and Bases: Solutions of strong acids such as H_2SO_4 and HCl should be collected in an appropriately labeled container. Likewise, solutions of strong bases such as NaOH or KOH should be collected in an appropriately labeled container. **Because the reaction between strong acids and strong bases is very exothermic, they should not be mixed in the same waste container.**

7) Aqueous Waste: Many aqueous solutions of inorganic salts ($NaHCO_3$, NaCl, Na_2SO_4, etc.) can be disposed in the sink. **Heavy metal contaminated solutions (mercury, cadmium, etc.) should be collected in a separate waste container.** These ions are highly toxic.

When in doubt, ask your supervisor and/or consult a copy of Prudent Practices in the Laboratory: Handling and Disposal of Chemicals (National Research Council, 1995) (full text available on-line at http://books.nap.edu/books/0309052297/html/R1.html#pagetop). A copy of this book in on reserve in Dr. Bur's office.

VII. General Considerations

1) No Food or Drink in the Lab

All chemicals are potentially toxic. To prevent accidental ingestion, food and drink are not allowed in the lab. There is always the possibility that what you are eating or drinking has become contaminated with a hazardous material.

2) Unauthorized Experiments

Never undertake unauthorized experiments. The risk of an accident is higher, particularly if the experiment has not been completely checked to minimize hazards. Also, never work alone in a laboratory. Many potentially hazardous substances (such as ether and chloroform) can cause you to lose consciousness if spilled. If you are seriously injured in an accident, you may not be able to call for help.

3) Mixing Stock Chemicals

Never pour any reagent back into the stock container. There is always the chance that you will accidentally pour back some foreign substance that will react explosively with the chemical in the stock bottle. By pouring compounds back into the stock bottle, you may introduce impurities that could spoil the reaction of the next person who uses the chemical. Pouring a substance back into the stock bottle is therefore dangerous, at worst, and discourteous, at best.

4) Don't Sniff the Chemicals

Even though many substances you may create in the lab have interesting (and sometimes awful) smells, never directly inhale the vapors of any substance. Pass a stopper or spatula with some of the substance under your nose, or hold the container away from you and gently waft the vapors toward you with your hand.

5) Know What You're Doing

Whenever you run a reaction, be familiar with all of the chemicals and techniques you will use. For chemicals, this means looking up the MSDS for the compound and knowing the potential hazards associated with it. Techniques can be found in most standard textbooks or protocol books. Ask your supervisor for the appropriate resources. It is also useful to find a written procedure that closely resembles your experiment. Again, your supervisor can help you with this.

6) Know What Your Neighbor Is Doing

It isn't enough to just know what you are working on. You should also be familiar with the kinds of chemicals your lab-mates are working with. If they are working with a flammable solvent, for example, you should be careful with any ignition sources or open flames.

7) Label Everything!

Every reaction that you run and every compound that you isolate should have an appropriate label. Should an accident happen, emergency response team will need to know what everything is and determine the hazard that it poses. If there are no labels, they must treat everything as though it were extremely toxic. This is both a waste of resources and time. On a more day-to-day level, you might be surprised how easy it is to forget what a given vial or flask contains. If you lose a key compound, you've wasted a lot of time making it. It is also courteous to label things, as your lab-mates will want to be informed about the environment in which they are working. A simple labeling scheme consists of your initials and the notebook page on which the compound was generated (or that describes the reaction). For example, the compound whose preparation is described on page 45 of my notebook would be labeled "SKB-045." If several compounds are isolated, label them a, b, c, etc. (SKB-045a, SKB-045b, etc.).

8) Secure Hoses!

Hoses connected to water condensers should be wired to insure that they do not come loose. Many a chemistry department has been flooded by a condenser hose that comes loose after everyone has left for the evening. This becomes a serious issue when electrical equipment is in the area that gets flooded. Water can also seep into lower levels of the building and cause serious damage to important records and office equipment. Rather than get nominated for a hacker award, make sure the hoses can't come off.

9) Electrical Equipment

Electrical equipment is more than just a source of ignition for flammable vapors. Many instruments require a lot of current, and can electrocute a careless researcher. Instruments like the NMR (the circuitry box next to the magnet) and laser power sources should be treated with care. When in doubt about the nature of a piece of electrical equipment, ask your advisor.

VIII. Response to Chemical Accidents

Accidents happen. If we are prepared for them, they do not have to have serious consequences. In general, Campus Safety and Security (dial 8888 from any campus phone) is responsible for coordinating a response to accidents that have the potential for serious consequences. Following are procedures for responding to accidents in the lab.

1) Quick Reference Guide

Evacuate

- Leave the spill area; alert others in the area and direct/assist them in leaving.
- Without endangering yourself: remove victims to fresh air, remove contaminated clothing and flush contaminated skin and eyes with water for 15 minutes. If anyone has been injured or exposed to toxic chemicals or chemical vapors, call 8888 and seek medical attention immediately.

Confine

- Close doors and isolate the area. Prevent people from entering spill area.

Report

- From a safe place, call the Campus Security and Safety (dial 8888)
- Report that this is an emergency and give your name, phone and location; location of the spill; the name and amount of material spilled; extent of injuries; safest route to the spill.
- Stay by that phone, Security will advise you as soon as possible.
- The Campus Safety Department will clean up or stabilize spills, which are considered high hazard (fire, health or reactivity hazard). In the case of a small spill and low hazard situation, Dr. Bur or Campus Security and

Safety will advise you on what precautions and protective equipment to use.

Secure
- Until emergency response personnel arrive: block off the areas leading to the spill, lock doors, post signs and warning tape, and alert others of the spill.
- Post staff by commonly used entrances to the area to direct people to use other routes.

After an accident, supervisor(s) must complete and fax in reporting forms within 24 hours. Workers' Compensation policy and reporting forms are available through the Office of Human Resources (7304).

2) Small Chemical Spills
- Use vermiculite to absorb liquids, then sweep up the solid and dispose in a solid waste container.
- Sweep up solids and dispose in solid waste container

3) Skin Exposure
- Run cool water over contaminated skin for at least 15 minutes. **Do not use hot water,** as this will increase the rate at which the compound reacts with your skin. **Do not use soap or any other chemicals,** as they will disrupt cell membranes and drive the chemical deeper into the skin.
- For severe chemical burns or exposure to large areas of the body, remove clothing (this is no time for modesty!), use the safety showers, and have someone notify Campus Security and Safety immediately. Stand under the shower for at least 15 minutes or until a response-team member instructs you otherwise.

4) Eye Exposure
- Remove Glasses and use eye-wash. Hold the eye-lid open while running water over the surface for at least 15 minutes.
- For severe chemical exposure to eyes, use the eye-wash and have someone call Security and Safety (8888) immediately.

5) Cuts and Punctures
- Clean debris out of cut as best you can.
- Wash the cut under cool water.
- Apply pressure to stop bleeding
- Consult the Blood Borne Pathogen manual for cleaning up blood from surfaces. (In general, wear gloves and wipe up blood with paper towel. Dispose of paper towel in a biological hazards bag. Use a dilute bleach solution to clean the affected surface, and wipe up with towel. Dispose of this towel in the same bag.)

6) Burn (thermal)

- Run burned area under cool water or submerge in ice-water until burning subsides.
- Do **not** use any kind of salve as this traps the heat in the tissues.
- For severe burns, have someone call Campus Security and Safety (8888) for assistance.

7) Ingestion of Chemical

- Call Campus Security and Safety.
- **DO NOT DRINK ANYTHING** unless instructed to do so.