workers is approximately 0.02 – 0.03 rem per year (0.2 – 0.3 mSv per year). Exposures are kept as low as reasonably achievable (ALARA) by using time, distance, and shielding. Keep exposures as short as possible. Use distance, 6-feet will reduce your exposure to 2.5% the exposure at 1 foot. Use shielding; plastic for beta emitters and lead for gamma emitters.

Emergency Procedures

Every person working with hazardous materials, whether they are a researcher, a student, or a Facilities employee, should be trained to respond to an emergency situation involving the compounds they use.

The first step in emergency response is to assess the emergency. Spills are divided into minor and major. A minor spill is one that you or your lab co-workers have the capability to clean up yourself. For a more serious spill, a fire, an explosion, or any personal injury, call 911. If you call 911 requesting Auburn Fire Department to response, the building may need to be evacuated.

For minor spills, notify all individuals in the immediate area of the spill. Make sure that people do not walk through the area of the spill while you are trying to clean it up. Also, your co-workers may be able to assist you. If you have questions about cleaning a spill call Risk Management and Safety at 844-4805.

When working with hazardous chemicals or cleaning up a minor spill, wear protective gloves, lab coat, long pants, shoes, and safety glasses. Make sure that the gloves you wear are resistive to the chemical compound you are working with. Get all of your cleaning materials before you begin cleaning, this will reduce the need for you to have to leave to get more.

If you spill a chemical on your body or in your eye, use a safety shower or eye wash, as appropriate, and wash for at least 15 minutes (for HF, wash for only 5 minutes and use calcium gluconate gel).

If your department or lab group needs special training or an assessment of your work site, contact Laboratory Safety and personnel will assist you.

Auburn University
Department of Risk Management and Safety
316 Leach Science Center
(334) 844-4870
http://www.auburn.edu/administration/rms/

Auburn University
RISK MANAGEMENT AND SAFETY

Laboratory Safety Newsletter

This newsletter will inform you of a new federal requirement that applies to any AU employee who has chemicals in their area. We will also talk about laboratory safety issues.

High Risk Chemical Facility Regulation

The Department of Homeland Security (DHS) "released an interim final rule that imposes for the first time comprehensive federal security regulations for high risk chemical facilities." (see the DHS press release at http://www.dhs.gov/xnews/releases/pr_1175527925540.shtm). Many of you may be aware of the increased security requirements for certain biological and radioactive substances. This rule addresses the group of chemicals which might be useful to terrorists.

Under the rule, the DHS requires that facilities (e.g., Auburn University) submit a "snapshot" inventory of chemicals deemed to be "high risk" within 60 days of the rule's publication. The inventory will be evaluated against a DHS grading system and the facility will be given a ranking of from 1 to 4. This ranking will be used to determine the timeframe for the facility to implement certain security plans and procedures. The rule was to be released on 11 June, 2007, but release has been delayed. During this time, Auburn University has been developing an internet-based database to enable us to comply.

Also, as reported in the July 30, AU Report, AU will be involved in a voluntary EPA audit. The audit will require the collection of a second group of EPA listed hazardous chemicals.

Posted on our web site (http://www.auburn.edu/administration/rms/pdf/DHS-list.pdf) is a list of DHS and EPA Emergency Planning (EPCRA) hazardous chemicals and their chemical abstract (CAS) numbers. The EPCRA inventory will be useed for the EPA-mandated, peer inspection scheduled for early 2008.

Although there are approximately 1000 chemicals on the list, we do not believe that any one person at AU will have more than 100 chemicals from this list. This list applies to stock containers of chemicals, and not to commercial compounds which may include one of the chemicals as a component.

Obviously, submitting the inventory is a significant undertaking. To make the job easy, Risk Management & Safety (RMS) is working with Information Technology (IT) to develop an on-line system (https://auburn.edu/hci). Conceptually, each faculty or staff member with any chemicals within their area of responsibility, will enter the CAS number, chemical name and quantity, **in pounds,** of each chemical in their care. The database will select the appropriate DHS and EPCRA chemicals, sum the quantities and provide totals so that Auburn University can comply with the regulation.

Because we do not know the specific instructions you will be receiving from you department chair or director, we are providing you with advanced notification so you will be aware of the need to submit and begin completing your inventory. Additionally, RMS may be offering an amnesty program where we collect all unwanted chemicals from your lab so you do not have to include them in your inventory.

In the future, based upon the total quantity of these "high risk" chemicals that AU possesses, additional security plans and procedures will be required. We believe the timeframe for this "additional security" part will be about 3 to 5 years and will be very similar to plans and procedures that are currently established for some radioactive and biosafety labs.

Particularly Hazardous Substances (PHS)

Many research groups on campus use chemical compounds in their work. Some of these pose no hazard to workers. Examples of relatively benign compounds are potassium iodide, sucrose, etc. Some compounds are a physical hazard, being flammable, corrosive, asphyxiating, (e.g., xylene, phenol, chloroform, liquid nitrogen, etc.). Most workers understand the basic precautions for handling these hazardous materials. They wear protective gloves, safety glasses (or splash shields), lab coats, long pants, solid toe shoes, etc. The basic idea is to protect yourself from the physical effects of contamination on or in your body. Thus, you work with volatile chemicals in a fume hood and you don't reach into a container of hazardous liquids with your gloved hand, but use tongs. The information in the Auburn University Laboratory Safety Manual (http://www.auburn.edu/administration/rms/pdf/lsm-chp.pdf) is designed to provide guidance in working safely with hazardous laboratory chemicals.

A special group of hazardous materials poses a greater potential for injury. These Particularly Hazardous Substances are an OSHA class of substances which require additional safety precautions because they are either carcinogens (known, probably, or possible), reproductive toxins or substances with a high degree of acute toxicity.

Substances with a high acute toxicity are perhaps the easiest to understand. These include chemicals with a toxicity (i.e., LD_{50}) < 50 mg/kg when administered orally to test animals, or 200 mg/kg when absorbed through the skin and those with a lethal concentration of 200 to 2000 ppm in air. Chemicals in this category include strychnine (< 5 mg/kg), sodium cyanide, arsine, sodium azide, chlorine, methyl fluorosulfonate, nitrogen dioxide, etc.

Reproductive toxins are chemicals that may affect the reproductive process including those that produce chromosomal damage (mutations) as well as substances with lethal or teratogenic effects on fetuses. They also include substances that can affect the male or female reproductive organs and the ability to reproduce. OSHA regulated reproductive toxins include dibromochloropropane (DBCP), lead, ionizing radiation and ethylene oxide. The NIOSH list includes such substances as arsenic, DDT, benzene, toluene, some glycol ethers, methyl mercury, etc.

A carcinogen is any agent that can initiate or speed the development of malignant or potentially malignant tumors, malignant neoplastic proliferation of cells, or cells that possess such materials. Many compounds have some potential for being a carcinogen. Chemical form, concentration, procedure, etc. are all factors to be considered in carcinogen risk analysis. Two important groups of carcinogens are those **known** to be human carcinogen and those **reasonably anticipated** to be human carcinogen. Chemicals in the carcinogen class include arsenic, asbestos, benzene, formaldehyde, styrene, etc.

Unlike the immediate risk posed by chemicals with a high degree of acute toxicity, the relationship between "cause" and "effect" for carcinogens and reproductive toxins is blurred. Thus, the result of an exposure to a carcinogen may not be seen for 20 or 30 years post-exposure. Besides the long latent period, the type of effect produced by these two groups (e.g., carcinogens, birth defects) is the same as the diseases / effects which occur naturally.

Sometimes we hear comments like, "the exposure is too small to be harmful," or "this compound couldn't possibly get airborne," or "we used 10-times that amount 20 years ago." Remember, individual sensitivity varies. The effect of an exposure may be affected by other chemical exposures that may act synergistically. Over 20 – 30 years, chronic exposure to even low levels can increase the risk. Thus, causality becomes blurred and each worker must understand the hazards of the material they are working with and apply proper safety principles to protect themselves and others for both the short and long term.

Because of the risks that particularly hazardous substances pose to workers, a safety review over and above the basic protocol review should be performed. Things to consider during this review:

1) ***Identify the substance***. Remember, the chemical reaction may not progress as you think it will, using less / more than the procedure recommends will influence the reaction or understand how the process will respond at different temperatures / pressures, etc.
2) ***Understand the routes of exposure*** and ***determine the protective equipment needed***. Not all protective gloves provide the same measure of protection. Choose a glove based upon the chemicals you are using. Sometimes the best glove for one step of a procedure may not be suitable for use during another step. Some procedures (e.g., formaldehyde) require use of impermeable aprons and gloves.
3) ***Designate and label a suitable workplace*** to protect you from exposure. Other workers in the lab should be made aware of the use of these materials. Discuss the protocol in your lab meetings and post the area with an appropriate warning sign.
4) ***Prepare for emergencies***. Even the best prepared procedure may not go according to plan. Have your emergency supplies nearby so you can respond to an accident. Insure other lab members know what to do should you be overexposed or if there is a fire.
5) ***Plan for collection and disposal of wastes*** and ***clean up when completed***. Often these procedures are 1-time use. You shouldn't leave Particularly Hazardous Substances lying around the work area.
6) ***Use prepared kits*** rather than making your own compound. A good example of this can be found in the use of ethidium bromide. This is a powerful mutagen widely used in biochemical research labs for visualizing DNA. The most risky phase of use is when it is transferred as a powder from one container to another or while making ethidium bromide solutions. A safer alternative is to buy the ethidium bromide as a premixed solution.

When the review is completed, your lab has now documented the procedure. The review form should be incorporated into your lab's SOP file so any future use of that protocol will not require the same level of intensive planning, but can simply be a review of the protocol and any comments made by the last person to conduct the procedure.

In the future, Risk Management & Safety will be posting a list of commonly used Particular Hazardous Substances and will develop procedures to assist you in conducting this safety review.

Radioactive Material

Radiation is a Particularly Hazardous Substance. It has been thoroughly studied and the exposure risks quantified. As a reproductive toxin, the fetal risk is considered insignificant for fetal exposures below 10 rad (0.1 Gray). It is also a carcinogen, the risk for cancer increases linearly with dose.

There is a natural background level of radiation. The average person in the US gets about 0.3 rem per year (3 millisevert per year) from cosmic rays, terrestrial radiation, radon, and radioactive material in food. An additional 0.06 rem per year (0.6 mSv per year) comes from medical and dental x-rays. While the dose varies somewhat with altitude and soil, a good average exposure figure is 0.36 rem per year (3.6 mSv per year). One of the goals of radiation safety is to keep worker exposures as low as reasonably achievable.

We monitor the exposure of certain radiation workers. This group consists of x-ray workers (e.g., Vet School, medical clinic, x-ray diffraction) and lab workers handling high-energy beta emitters (e.g., P-32, Sr-90) or x-/γ-ray emitters (e.g., Cr-51, I-125). The average annual exposure of Auburn University