



Lab Safety

Spectrum

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UW - Madison Safety Department Chemical and Radiation Protection
30 N. Murray St. 262-8769 <http://www.fpm.wisc.edu/safety>

Radioactive Materials License No. 25-1323-01

Help Line 265-5518

For most people summer means a slower pace. However, at the UW the summer, especially June, is the busiest time for Safety. The reason for this is that the old workers have graduated and a new crop is entering the workforce. At the UW, we experience a 15% turnover in workers annually. We will use this summer newsletter to review spill response and radiation survey / inventory requirements.

Spill Response

Because of the kind of research work being done at the UW, certain types of spills can be expected. Examples include dropped pipettors, centrifuge tubes, microplates, etc. These spills are termed "simple" spills, meaning the worker should have the training and experience needed to clean the spill without needing help or special equipment from outside the lab.

Some spills, which for lack of a better term we call "complex" spills need outside assistance. These include:

- Spills of volatile materials that are large enough to be an inhalation hazard
- Spills of flammable liquids that are large enough and volatile enough to be a fire hazard
- Spills that occur outside of a building
- Spills that have entered a drain

The first two types require judgment about "large enough" based on the toxicity, vapor pressure and flash point of the material. The hazards of a spill increase with the amount of material spilled. Let's look at four examples and consider a one liter spill of each:

| | Exposure limit (Short-term) | Vapor pressure (20° C) | Flash point |
|--------------------------------------|--------------------------------|---------------------------|-------------|
| Benzene | 2.5 ppm | 75 mmHg | -11° C |
| Ethyl ether | 500 ppm | 440 mmHg | - 45° C |
| Methylene chloride (dichloromethane) | 150 ppm | 350 mmHg | None |
| Xylene | 150 ppm | 9 mmHg | 81° C |



It would be impossible to clean up a one liter spill of benzene safely without respiratory protection because it is highly toxic. In addition, if an ignition source is nearby, there is a substantial risk of fire. This is clearly a complex spill and will require outside assistance.

Ethyl ether is much less toxic but much more volatile and flammable. This is a complex spill that requires outside assistance because of the fire hazard.

Methylene chloride is relatively low toxicity and is non-flammable. However, exposure of the vapor to a flame or heating element may produce highly toxic phosgene gas. If a lab worker can stay upwind of the spill in a well ventilated area, it may be safe to clean it up. Otherwise cleanup will require outside assistance.

Xylene is about as toxic as methylene chloride, but it evaporates much more slowly, which reduces both effective toxicity and fire hazard. Unless the spill is very close to an ignition source, it is probably safe to clean it up.

If you can answer YES to the following 4 questions, it is safe for you to clean up the spill:

- Do you know what chemical was spilled?
- Do you know the hazards of the spilled chemical?
- Do you have a chemical spill kit?
- Can you protect yourself from these hazards?

If you answered NO to any of the above questions or need assistance with the spill cleanup, evacuate the area and call Safety at 5-5518, for assistance. Major spills, fire or risk of fire, explosions, etc. may require the assistance of the Madison Fire Department (call UW Police at 9-1-1).

Prevent the spread of contamination: Regardless of the size of the spill, prevent the spread of contamination. Do not panic, but stop what you are doing. Presume the area is contaminated. Inform others of the situation and restrict access to the area. If the spill was radioactive, survey yourself for personal contamination. Remove any contaminated clothing.

Quick response: If you can do so safely and quickly, cover the spill with absorbent and a sheet of polyethylene plastic. Both should be in your chemical spill kit. The absorbent will control the spread of the spill and the plastic cover will greatly reduce the rate of evaporation.

Prepare to clean: Review the MSDS for the chemical in use, your laboratory's emergency plan or information in the UW's Laboratory Safety Guide. If unsure how to proceed, call the Safety Department Help line: 5-5518 for information.

Gather decontamination materials (e.g., absorbent material, decontamination soap, etc.) Some procedures (e.g., work with Particularly Hazardous Substances or biological materials) require special decontaminating materials. These should be addressed in the protocol you are following.

Wear protective clothing: Put on gloves, laboratory coat, eye protection, booties, etc. (appropriate for the hazard) before attempting to clean the spill. If the spill is radioactive, remember to wear your dosimeter and have a survey meter.

Clean the spill: Absorb liquid spills using paper towel, spill pillows, Floor Dry™, etc. Place a spill pillow over the spill or sprinkle Floor Dry™ over the surface of the spill. Place absorbent materials along with contaminated disposable protective equipment in a plastic bag for disposal. Neutralize spills of corrosive materials and then absorb.

For radioactive material, survey the contaminated area. Mark the perimeter of the spill and any isolated spots. Clean by wiping the contamination with dampened paper towels working from the perimeter towards the center of the spill. Cleaning solutions such as Dow™ "Scrubbing Bubbles", Windex™, Fantastic™, or 409™ are generally as effective. When finished with the decontamination, survey the area to make sure levels are below 650 cpm and perform a thorough survey of your hands, shoes, laboratory coat, pants and your face. If contamination is on skin, flush immediately under running water for at least 15 minutes. For a chemical splash in the eye(s), flush under running water for 15 minutes. In the event you or a co-worker may have been exposed to a hazardous material follow these three steps:

1. Perform any appropriate first aid such as stopping the bleeding, using an eyewash, or cleansing the affected area with soap and water. If you are not comfortable providing assistance or the situation seems beyond your ability to render aid, call 9-1-1. When in doubt, call 9-1-1.
2. Inform your supervisor or any other person on your emergency call list about what has happened.
3. Seek additional medical assessment or treatment if needed. The UW Hospital Emergency Services Department is always available to assist.

Hydrofluoric Acid (HF) rapidly penetrates deep into skin tissue. This type of spill requires special considerations. For spills on skin / eyes, flush for only 5 minutes and promptly apply a calcium gluconate gel and get immediate medical attention.



In summary: Hazardous material spills that do not endanger workers in the immediate area may be cleaned up by laboratory personnel who have been trained and are properly equipped to clean up the spilled material safely. This includes all spills that are not an inhalation hazard. Hazardous material spills that cannot be safely adsorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area are considered to be emergencies requiring outside assistance by the Madison Fire Department (MFD).

Mercury

Mercury spills are one of the most common chemical spills. Mercury can be found in a variety of products. Elemental mercury is found in barometers, manometers, thermometers, hydrometers, and pyrometers, switches, and fluorescent lamps. UV lamps contain mercury. The ionized vapor atmosphere generates a bluish-green light rich in ultraviolet radiation that is used for infection control. Mercury compounds include Zenker's solution, Nessler's reagent, Harris' Hemotoxylin solutions, oxides, chlorides and sulfide salts, and amalgams.

Fortunately, elemental mercury is simple to clean up and poses little risk to your health unless it is spilled within heated devices or gets trapped in upholstery, carpeting, or other surfaces where there is an increased likelihood of human contact. How to handle certain spill situations:

Mercury thermometer spills on smooth surfaces:

Isolate the area by marking off the spill section to prevent inadvertent spreading of the mercury. Wear 2 pairs of chemical resistant gloves (nitrile or silver shield), lab coat, and eye protection during cleanup operations. Using a scraper, push the scattered mercury droplets together into a larger droplet. Aspirate the larger mercury droplets and place them into a zip lock bag or screw top container. Sprinkle mercury absorbent powder lightly over the remaining micro-droplets of mercury. Spray a water mist over the powder. Using the scraper, mix the materials into a paste amalgam. The resulting substance will not emit dangerous mercury vapors. Scoop up the amalgam and wipe down the surfaces with a scraper and damp sponge. Place the amalgam, sponge, gloves, scraper, scoop, and all other mercury contaminated debris into the zip lock bag or container. Tape sharp ends of the glass thermometer and place it into the bag or container as well. Label the bag or container as mercury thermometer spill debris. Complete a Surplus Chemical Form. Waste pickup will be scheduled.

Mercury manometer spills on any surface and mercury spills on porous surfaces (carpet, upholstery, concrete, etc.): The preferred method to clean up large mercury spills on any surface or any size mercury spill on porous flooring or carpeting is the use of a mercury vacuum available from Safety (call 5-5518).

In some instances the surface cannot be cleaned or decontaminated. Carpets and fabrics are typically disposed of as hazardous waste. Post clean-up monitoring can be conducted by Safety.

Mercury spills in ovens, incubators, hot water baths or other elevated temperature situations:

When the spill occurs in equipment with elevated temperature conditions such as an oven or incubator, an exposure to mercury vapor is more likely. Shut off the equipment and leave the area immediately. The cleanup should be performed after the device has cooled.

Mercury vapor monitoring should be performed prior to any cleanup; call Safety at 5-5518 to report the situation. Continued mercury vapor monitoring will need to be conducted after the cleanup is complete.

Laboratory Emergency Information

You have probably noticed the blue or yellow (at CSC) poster beside the door of most labs on campus. These forms are another example of emergency response guidance. They are designed to be used by the Madison Fire Department to obtain emergency response information. These are also used to obtain contact information in instances of an emergency. Suppose that your lab's -80° broke. Often these have notes on them, "If alarm sounds, contact ...", but if the primary contact is unavailable, this form provides information on others who are aware of things going on in the lab. These forms should be reviewed annually to insure the information is correct.

Radioactive Material Inventory / Survey

Labs which use radioactive material in research are required to maintain inventories of the quantities they have on hand and to conduct monthly surveys. When the state inspectors come onto campus in June or July of each year, they go into labs and verify that these two tasks are being performed. For example, they may point to a stock vial in the refrigerator and ask to see the inventory sheet that is associated with that vial. They may verify that the quantities of radioactive material you have listed on your inventory are in fact present in the lab.

Additionally, labs using radioactive material need to have calibrated, functioning survey meters, if even one survey meter is not in calibration, the lab is not allowed to purchase radioactive material. The survey meter is used in two ways:

- ✓ To directly monitor the worker and the work area when / after working with radioactive material and
- ✓ as part of the monthly survey to provide an immediate indication of contamination..



②Turn the meter on, check batteries and measure background (normally about 20 - 40 cpm). Survey by holding the detector 1 cm from the surface, moving the detector about 1 - 2 inches per second. When an increase in count rate is noted, measure the spot and clean it if it exceeds 650 cpm.

As part of the monthly survey, wipes of the work area and floor are taken and counted on a liquid scintillation counter. Wipe media should be moistened to better remove contamination.

Wipe an area of about 300 square cm with your wipe material (e.g., filter paper, cotton tipped applicators, etc.). Count the wipe on an LSC and post the results in your lab. Wipes exceeding our action limit (i.e., 230 cpm for high-energy beta or gamma emitters; 770 cpm for low energy beta [H-3, C-14, P-33, S-35, Ca-45] emitters) should be cleaned and resurveyed.

Chemical & Radiation Training / HazMat Transport Training

Radiation and Chemical Safety training classes are offered weekly at Union South; each class satisfies either OSHA or NRC training requirements. There is also a Transportation training class if you ship or receive (directly from the carrier -- e.g., FedEx) hazardous materials. The schedule for each of these classes is in the table below. Chemical and Radiation training normally begin at 9:30 AM and 12:30 PM, respectively, except on the dates noted. Transportation training is either 1 hour, basic, or 3 hour, shipping specific, training (visit our web site for more information).

| | | | | | |
|---|-----------------|------------------|-----------------|--------------------------------------|-----------------|
| Wednesday | May 11 | Monday | Jun 27 | Wednesday | Aug 10 |
| Thursday | May 19 | Tuesday | Jul 5 | Tuesday | Aug 16 |
| Friday | May 27** | Wednesday | Jul 13 | Monday | Aug 22 |
| Thursday | Jun 9 | Thursday | Jul 21 | Tuesday | Aug 30** |
| Wednesday | Jun 15 | Friday | Jul 29** | Thursday | Sep 8 |
| Tuesday | Jun 21** | Thursday | Aug 4 | Friday | Sep 16** |
| ** Chemical training on these dates begins at 1 PM; Radiation at 8:30 AM | | | | | |
| Transportation Training -- Shipping Hazardous Material (monthly) | | | | | |
| 11 AM - 3 PM Thursday | | Apr 28 | | 11 AM - 3 PM Monday Jul 18 | |
| 9 AM - 1 PM Tuesday | | May 24 | | 9 AM - 1 PM Tuesday Aug 23 | |
| 9 AM - 1 PM Thursday | | Jun 30 | | 11 AM - 3 PM Wednesday Sep 21 | |

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Help Line: (608) 265-5518