

## UO NMR Lab Safety Policies

There are multiple potential hazards in an NMR lab. In order to use the NMR facility at UO, you must read and be familiar with the following safety information. Failure to comply with the correct standard operating procedures in the NMR lab can result in damage, personal injury, and even death.

Please let an NMR staff member know of problems as soon as you encounter something that seems not quite right. If you can't find a staff member, please submit a Problem Report using the form on the website.

### Magnetic Field Hazards

- 1) The defining characteristic of an NMR lab is the presence of strong magnetic fields. Every magnet has a stray magnetic field that extends beyond the physical structure of the magnet. The safety zone, or 5 Gauss line is indicated by tape marks on the floor around each magnet. NMR magnets are **ALWAYS ON**, so users must always exercise caution in the NMR lab.
- 2) Electronic, electrical, or mechanical medical implants may be affected or even stopped in the presence of a static or changing magnetic field.
  - a. For your own safety, if you have a pacemaker or other medical implant that could be adversely affected by strong magnetic fields, do NOT enter the NMR labs.
- 3) Magnets can exert large attractive forces on equipment or other ferromagnetic objects when brought. Before entering the lab, think about EVERYTHING you are about to bring in. Small objects (e.g., paper clips, hair pins, spatulas, wrenches, screwdrivers, etc.) can lead to significant problems in instrument performance. If such items were to get stuck in/on the instrument, the magnet would probably need to be de-energized in order to remove them. This would be very expensive and lead to extended down time. Large objects (e.g., gas cylinders) would be pulled with a large force, and significantly damage the instrument, as well as likely injury someone who attempts to stop the motion once it starts. These can cause bodies or limbs to be trapped between the equipment and the magnet.
  - a. Users must never bring ferromagnetic objects (i.e., materials that are strongly attracted to a magnetic field) close enough to the instruments to experience a force. Do not bring any metallic objects within the 5 Gauss line or 10 feet of any magnet.
  - b. Do NOT bring any compressed gas cylinders into the NMR lab without NMR personnel supervision.
  - c. Never put any object into the magnet except NMR tubes and sample holders.

### Cryogenic Hazards

- 1) All of the NMR magnets are superconducting, which means they are kept in a cryostat filled with liquid helium. A concentric dewar of liquid nitrogen is placed around the helium cryostat in order to keep the helium boil-off rate low. Additionally, liquid nitrogen may be kept in portable dewars around the facility. Cryogenics can pose several risks including: asphyxiation, frostbite, and chemical explosions.
- 2) In the event of a magnet quench, the superconducting wire inside the instrument transitions to a normal conducting state. This would boil off all of the liquid helium very quickly. The rapid expansion of helium as it vaporizes can displace the oxygen in the NMR lab and cause asphyxiation.
  - a. If you observe a sudden exhaust of gas from a magnet (and NMR staff are not performing a cryogen fill), **exit the NMR lab immediately**.
- 3) Direct contact with cryogenics can produce cold burns on the skin. Liquid helium is 4 K, and liquid nitrogen is 77 K. The gas that is exhausted during a fill can be extremely cold.
- 4) Both liquid helium and liquid nitrogen are cold enough to condense liquid oxygen from the atmosphere. Violent reactions such as rapid combustion or explosion may occur if accumulated oxygen were to come in contact with combustible materials.

- a. The NMR personnel must regularly refill the instruments with cryogens. During a fill, stay away from the gaseous exhaust as frostbite or asphyxiation might occur if you stand too closely.
- b. During low temperature NMR, be aware of liquid nitrogen splashing. When handling cryogens, you must be wearing safety glasses and cryogenic gloves.

## Chemical Safety & Housekeeping

- 1) The same principles of research safety apply in instrumentation laboratories when you are handling samples. Research samples, glassware, chemical storage, spills, and waste disposal must be properly handled.
  - a. You must wear long pants (or equivalent) and closed-toed shoes.
  - b. No food or beverages are allowed in the NMR lab.
  - c. The NMR lab is not a wet lab. All sample prep should be done in your lab. Do not prep samples at spectrometers.
  - d. Do not bring your lab coat or gloves into the NMR lab.
  - e. Should you break a sample in the NMR lab, use the items in lab to thoroughly clean up the area of the spill. Please dispose of the waste generated in your lab.
- 2) Sample spinners are extremely expensive, precision machined items.
  - a. Never take spinners out of the NMR labs.
  - b. Do not drop them on the floor or place them on their sides so that they may roll off the bench and on to the floor.
  - c. If your tube does not fit the spinner, either your tube or the spinner O-ring needs to be replaced. If you think it might be the O-ring, please contact the NMR facility staff for a replacement.
- 3) Keeping a shared lab clean requires the cooperation of everyone. Please do not leave KimWipes, paper towels, etc. laying around.
- 4) If you believe any sample may have spilled into or onto one of the instruments, please notify the NMR facility staff immediately. Place a written note on the keyboard to inform the next user.

## Emergencies

- 1) If the fire alarm goes off, please leave the lab and evacuate the building.
- 2) In the event of a quench, please exit the NMR lab immediately.
- 3) For all emergencies, call 911.

Here is a list of contact information in case of emergency:

Nanette Jarenwattananon, NMR Facility Director: (971) 808-0203, njaren@uoregon.edu

Casey Check, NMR Facility Assistant Manager: (412) 585-0121, ccheck@uoregon.edu

Environmental Health & Safety (EH&S) Office: (541) 346-3192