Safe Use of Hazardous Materials in Research

Safe research with hazardous materials requires knowledge of risks to the experimenter, campus community and environment. Experimenters learn to safely handle hazardous materials during their scientific training and experience, as well as through information and training provided by the UNC Department of Environment, Health and Safety (EHS).

Through campus committees, the University has established environment, health and safety policies and procedures to minimize risk and comply with state and federal law. These can be found in the EHS laboratory, radiation, and biological safety manuals, as well as the EHS web site (http://ehs.unc.edu). All researchers are welcome to participate in university environment, health and safety committees. Although many of these policies and procedures are directed at laboratories, any research involving hazardous materials must comply. Principal Investigators (PI) must ensure that their research complies with these policies and procedures, and that their personnel receive appropriate safety information and training.

Laboratories Must Have a Safety Plan

State and federal laws require that each laboratory have a Laboratory Safety Plan. University safety manuals cover general policies and procedures for laboratories, while each Principal Investigator prepares a Laboratory Safety Plan to address the hazards and precautions specific to his or her laboratory. The Laboratory Safety Plan identifies hazards and describes procedures for emergencies, special hazards and handling hazardous materials. The Plan includes laboratory locations, personnel, procedures, engineering controls, personal protective equipment and work practices. The Laboratory Safety Plan is divided into sections, each of which deal with a particular aspect of laboratory safety, including hazardous materials, radioactive materials, x-ray equipment, lasers, biological hazards, recombinant DNA, and the use of hazardous materials in animals. Instructions for the preparation of a Laboratory Safety Plan are found in Chapter 2 of the Laboratory Safety Manual.

PIs must update location and personnel information when changes occur. EHS queries PIs for location and personnel updates semiannually. PIs must update the remaining sections of the Plan annually.

Requirements for New Laboratory Personnel

Orientation training is mandatory for all new laboratory personnel. They must attend EHS orientation training as soon as possible after joining the lab. EHS offers training in laboratory safety, radiation safety, bloodborne pathogens and shipping of hazardous materials. Before beginning work in a laboratory, all personnel should take time to identify the nearest fire alarm, fire extinguisher, safety shower, eye wash station and spill kit.

Personal Protective Equipment

Exposure to hazardous materials may be controlled by various means. Engineering controls, such as fume hoods and ventilation are used widely on campus. Work practice controls are described in University environment, health and safety policies and procedures, and in your Laboratory Safety Plan. Personal protective equipment (PPE) is also an important way to minimize exposure by preventing absorption, inhalation, or physical contact. PPE includes gloves, safety glasses and lab coats. Appropriate PPE is described in your Laboratory Safety Plan. Proper selection and use of PPE is critical to protection; contact EHS for advice and questions. Appropriate PPE is designed for the task and fits the employee well. The PI is responsible for providing all laboratory personnel with appropriate PPE.

- University policy requires eye protection for all experimental procedures. Safety glasses with side shields offer the minimal protection; splash goggles and face shields are much better, especially for procedures involving liquids. EHS encourages laboratory personnel to wear eye protection at all times when in a laboratory.
- Gloves offer a degree of protection from hazardous materials and hot or cold materials. The type of hazardous material with which you work determines which glove you should wear. Laboratory personnel should consult the Laboratory Safety Manual and the manufacture for proper selection and use gloves. Disposable gloves are single use; they should be thrown away after each use.
- Latex gloves are common, but the University discourages their use because of the possibility of allergic reactions to the natural proteins found in them. Many alternatives to latex are available. If you use latex gloves, the University Latex Allergy Policy advises you to wear the powder-free type and wash your hands frequently.
- Sandals and open-toed shoes may not be worn in University laboratories.
- Lab coats should never be taken home and cleaned. Departments should contract cleaning services for lab coats.

Other Requirements for Research Involving Hazardous Materials

Laws and university safety policies impose additional requirements for the use of radioactive materials, biohazardous agents, bloodborne pathogens, controlled substances, carcinogens, reproductive toxins and substances with a high degree of acute toxicity.

- Flammable, pyrophoric and reactive chemicals should be minimized and must be safety stored when not in use. Contact EHS to dispose of excess chemicals.
- OSHA law has additional requirements for carcinogens, reproductive toxins and substances with a high degree of acute toxicity. If you use such chemicals you must consider special containment devices, decontamination procedures, and restricting their use to designated areas.
- PIs must review radioactive material ordering, receipt, storage, use and disposal responsibilities with each member of the laboratory.
- PIs who use or possess a Select Agent (an agent with significant potential for use by terrorists) must notify EHS and follow additional security requirements.
- PIs whose research involves blood and other potentially infectious materials must prepare an Exposure Control Plan. Potentially exposed employees must receive additional training and be offered vaccines at no charge.
- The University Employee Occupational Health Clinic (UEOHC) provides vaccinations and other occupational health services to university employees. Employees with nonemergency hazardous material exposures and injuries should contact the UEOHC.
- Faculty, staff or students who are pregnant, think they may be pregnant or are planning a family and may potentially be exposed to chemical reproductive toxins, radioactive material or other ionizing radiation may voluntarily contact EHS for counseling, evaluation and, when appropriate, exposure monitoring.
- The U.S. Department of Transportation and Federal Aviation Administration require training for employees preparing hazardous materials for shipment, which is available from EHS. Regulated hazardous materials include radioactive material, infectious substances, fixed tissue, biologicals in alcohol solutions, dry ice, formalin, unknowns and other chemicals.
- Hazardous materials must have appropriate security to prevent accidental exposure, unauthorized access and theft. Radioactive materials, select agents, controlled substances and drug precursors require additional security controls. Keep these substances in locked storage. Lock laboratories when not occupied. Keep an inventory of these materials so unauthorized removal can be detected. Notify the Department of Public Safety of theft or the presence of unfamiliar or unauthorized personnel.
- Waste management and disposal procedures for chemical, biological and radioactive laboratory waste are provided in EHS's orientation training, safety manuals and web site. Contact EHS for removal of chemical and radioactive waste from your laboratory, at no charge to you. Federal, state and local laws severely restrict disposal in the normal trash or sewer. PI support is critical for waste procedure compliance. Contact EHS is you have any questions regarding the disposal of chemical, biological and radioactive waste.

Environment, Health and Safety Surveys

As required by state and federal law, EHS inspects and surveys all campus laboratories annually, and sometimes more frequently. These surveys are comprehensive and address recordkeeping, fire safety, egress, engineering controls, personal protective equipment, work practices and, where appropriate, chemical, biological and radiation safety. EHS survey findings are sent to the PI and are available to all laboratory personnel. Previous EHS survey findings are a good measure of laboratory risks. Please contact EHS if you have questions about survey findings or environment, health and safety policies and procedures.

Summary of Documents on File in Your Laboratory

The following documents must be available to all laboratory personnel at all times. They must be reviewed with all new staff before working in the laboratory and annually thereafter. These reviews must be documented.

1. **Laboratory Safety Plan.**
2. **Laboratory Safety Manual.** This manual contains university environment, health and safety policies and procedures (including storage and disposal procedures), as well as guidance on the selection and use of engineering controls and personal protective equipment. It also lists emergency phone numbers and regulated carcinogens.
3. **Worker Registration Forms.** All new laboratory personnel must complete a "Lab/Radiation Worker Registration Form" (see http://ehs.unc.edu), even if they had previously worked for a different Principal Investigator. Provide a copy of the form to EHS.
4. **Training Documentation.** Documentation of each laboratory employee's orientation training, other applicable EHS training, and the Laboratory Safety Plan and Manual annual review.
5. **Material Safety Data Sheets** (MSDS) for those chemicals used routinely. Researchers should consult the MSDS when using a particular compound for the first time. Keep your file or binder up-to-date by requesting the latest MSDS when placing orders and keeping MSDS that arrive with incomming chemicals. MSDSs also may be obtained from EHS via http://ehs.unc.edu.

If applicable, the following documents must be kept on file in the laboratory:

6. **Radiation Safety Manual.** This manual explains the principles of radiation protection, survey requirements, personnel monitoring and emergency procedures. It the contains the "Inventory Record and Radioactive Waste Disposal" form and the "Certification of Current Inventory" form (Appendix C), which is used for ordering radioactive materials.
7. **Biological Safety Manual.** This manual describes safe handling procedures for pathogens. It includes procedures and forms for registering recombinant DNA experiments with the Institutional Biosafety Committee.
8. **Exposure Control Plan.** This plan contains procedures for the safe handling of blood and other potentially infectious substance, as well as personnel training requirements and vaccination options.

For More Information

EHS's website at http://ehs.unc.edu has manuals, training schedules, MSDSs and other safety information. The Laboratory Safety Plan is also available on the website.

EHS highly recommends that each laboratory obtain a copy of *Prudent Practices in the Laboratory: Handling and Disposal of Chemicals* (National Academy Press) and *Safety in Academic Chemistry Laboratory* (available free from the American Chemical Society).

Please contact EHS for questions or more information on the safe handling of hazardous substances.