Northern Illinois University

General Information about Radiation Safety and NIU Research

Northern Illinois University is licensed by the State of Illinois to use radioactive material and x-ray generating equipment. Under that license small amounts of radioactive material are used in research work at NIU. Researchers at NIU also use radiation producing equipment such as analytical and medical x-ray machines.

This general radiation safety information document is being made available to provide information to ensure that students, staff, faculty and visitors are aware of the potential hazards associated with NIU research operations using radioactive materials or radiation-producing equipment. In compliance with State of Illinois regulations, NIU requires that students, staff or faculty member complete additional radiological worker training before performing unescorted work assignments as a radiological worker. A radiological worker is a worker that handles radioactive materials or operates radiation-producing devices.

This document provides general information about radiation, its risks, the controls that Northern Illinois University implements to ensure the safety of workers, visitors and the environment, and each individual's rights and responsibilities. For specific information about your work area contact your supervisor or the NIU Radiation Safety Officer at 815-753-9251.

What Is Radiation and Where Does It Come From?

The type of radiation referred to in this document is ionizing radiation-invisible particles or waves of energy emitted from radioactive atoms or radiation-producing machines. Non-ionizing radiation (e.g., laser light and microwave radiation) present different hazards and is controlled through the Laser Safety Program. The common types of ionizing radiation are alpha, beta, neutron, x-ray, and gamma radiation. Some radioactive atoms (e.g., uranium-238 and thorium-232) are naturally occurring; others (e.g., phosphorous-32, sulfur-35, and iodine-125) are man-made.

If energy from the radiation is deposited in a person, he or she receives a radiation dose. Radiation doses are measured in millirems (mrem) or rems. One thousand millirems equals one rem (1000 mrem = 1 rem).

Background radiation is radiation from our natural environment. Everyone is exposed to some amount of background radiation. This exposure primarily comes from cosmic rays, radioactive material in the earth (such as uranium-238) ingestion of naturally occurring radionuclides in food (such as potassium-40), and inhalation of radon gas. In the United States, the average background radiation dose is 300 mrem/year.

Manufactured sources contribute an additional background radiation dose of approximately 60 mrem/yr. Of this amount, approximately 54 mrem are from medical procedures (e.g., x-rays and certain diagnostic tests). Consumer products such as lantern mantels, smoke detectors, and uranium-glazed pottery contribute roughly 5 mrem/yr. Fallout radiation that is present in our environment contributes less than 1 mrem/yr. Figure 1 shows typical annual radiation doses in the United States.

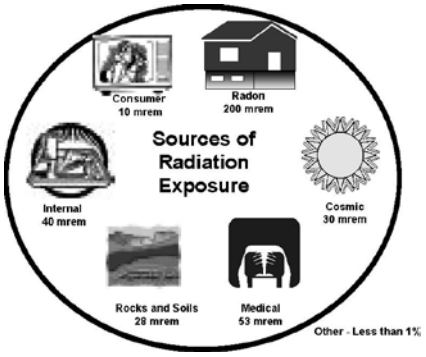

Figure 1. Annual Radiation Dose in the United States from Natural and Manufactured Radiation Sources.

Occupational Dose Limits

In the course of their work, some individuals may receive exposure above background levels. The Illinois Emergency Management Agency, Department of Nuclear Safety carefully monitors these levels at all radiation facilities in the State of Illinois and sets limits for acceptable doses. The State of Illinois annual dose limits for occupational radiation exposure at NIU are shown in Table 1. The NIU Radiation Safety Officer strives to keep radiation doses to workers, the public, and the environment As Low As Reasonably Achievable (ALARA). NIU has set ALARA levels below the annual dose limits set by the State of Illinois, shown in Table 1.

Table 1. NIU Annual Occupational Dose Limits		**State of Illinois Limits**
Group	NIU ALARA (mrem/yr)	Dose Limit (mrem/yr)
NIU radiological worker	500	5000
Minor, members of the public	50	500

Protecting the Embryo-Fetus

Although heritable effects from radiation exposure have not been observed in human, the embryo-fetus is known to be more sensitive to radiation than are adults. Therefore, NIU radiation workers who are pregnant, think they are pregnant, or are planning a pregnancy may want to notify the NIU Radiation Safety Office as early as possible. NIU Radiation Safety will arrange to have the workplace evaluated for potential hazards to the embryo-fetus. (If desired, this evaluation can be conducted confidentially.) Workplace or task modification is typically not necessary because NIU personnel who are monitored receive only background levels of radiation. NIU cannot give this special consideration until the pregnancy is declared.

For additional information on the reproductive effects of radiation and other toxic agents, contact NIU Laboratory Safety.

Monitoring Radiation Exposure

To ensure that exposures are ALARA, NIU monitors many of its radiation workers to determine the actual dose received from research work. These individuals are monitored for external or penetrating radiation and wear dosimeters to measure their exposures.

A dosimeter is a device that is worn like a nametag and measures the radiation dose a person receives from external sources. Currently, about 45 NIU radiation workers are monitored in this manner. Dosimeters are replaced and the radiation dose measured on a quarterly basis. The Radiation Safety Officer will be able to tell you whether or not you should be in this program. If you have any questions, please contact the Radiation Safety Officer at 815-753-9251.

NIU Radiation Safety Controls

Before any radiological work is allowed, it must be thoroughly planned and reviewed. Authorizations that describe the work, hazards, controls, and evaluations are formally reviewed by the Radiation Safety Committee to ensure that all work is performed safely.

The two basic types of radiation controls that are used at NIU are engineered and administrative. Engineered controls, such as shielding, ventilation, alarms, warning signals, and material containments, are the primary means of control. Administrative controls such as signs, procedures, dosimetry, and training, supplement the engineered controls.

All work is planned with the intention of keeping exposures ALARA. In particular, all radiological workers use the following techniques:

- Minimize the **time** you are exposed to radiation sources.
- Maximize your **distance** from radiation sources. The radiation level decreases significantly as you move away from the source.
- Employ appropriate **shielding** between you and the radiation source. For some sources, a plastic barrier is appropriate; for others, a lead shield is used.

Radiation Safety Signs

Radiation warning signs are posted on all laboratories where radioactive material is used or stored. These signs are yellow and magenta and have the radiation trefoil symbol.

General Emergency Response Guide for NIU

In an Emergency –

1. Remain Calm
2. Initiate life saving measures or first aid, if required
3. Attend to injured or contaminated persons and remove them from the area if possible
4. Alert others in the lab and evacuate the area
5. Call the Radiation Safety Officer for assistance as soon as possible.

In the event of fire, medical emergency or danger to life, health or the environment, call NIU police using **911.**

Remain in the immediate area for monitoring and to provide useful information for incident responders.

Employee/Visitor Responsibilities

You are responsible for doing your job safely. You should thoroughly understand all hazards and controls associated with your work. If you have safety concerns, discuss them with your supervisor, or with personnel from Laboratory Safety.

NIU Laboratory Safety Contact List

Contact Name	NIU Office Number	Cell Phone Number
Michele Crase Radiation Safety Officer	815-753-9251	815-751-4291
James Gable Chemical Safety Officer	815-753-1610	815-751-1934
Dave Scharenberg Designee	815-753-1093	815-761-5316