General Radiation Safety Information About USF Research

Small amounts of radioactive materials are used in research work at the University of South Florida (USF). Researchers at USF also use radiation-producing equipment such as analytic type x-ray machines.

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

This document provides general information about radiation, its risks, the controls the University of South Florida 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 USF Radiation Safety Office at 813-974-1194.

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) presents very different hazards and is controlled through the Non-ionizing Radiation 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 natural; others (e.g., phosphate-32, sulfur-35, and iodine-125) are man-made.

If the 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 equal 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/yr.

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 mantles, 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.

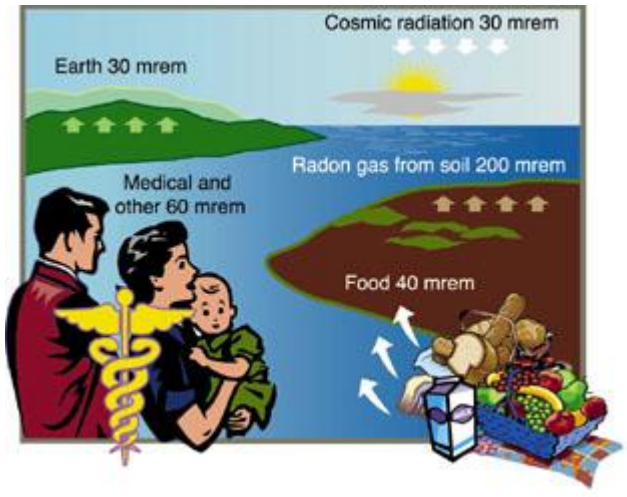


Figure 1.
Annual Radiation Doses in the United States from Natural and Manufactured Radiation Sources.

Occupational Dose Limits

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

Table 1. USF Annual Occupational Dose Limits.

Group	***USF ALARA (mrem/yr)***	***Dose limit (mrem/yr)***
USF radiological worker	**500**	**5000**
Minors, members of the public, and general employees	**50**	**100**

Protecting the Embryo-Fetus

Although heritable effects from radiation exposure have not been observed in humans, the embryo-fetus is known to be more sensitive to radiation than are adults. Therefore, USF employees who are pregnant, think they are pregnant, or are planning a pregnancy may want to notify USF radiation safety as early as possible. USF 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 most USF personnel who are monitored receive only background levels of radiation. USF cannot give this special consideration until the pregnancy is declared.

For additional information on the reproductive effects of radiation and other toxic agents, contact the USF Radiation Safety office.

Monitoring Radiation Exposure

To ensure that exposures are ALARA, USF monitors many of its radiation workers to determine the actual dose received from research work. Most of 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 500 USF radiation workers routinely wear dosimeters. Dosimeters are replaced and the radiation doses measured bi-monthly. The radiation safety office will be able tell you whether or not you should be in this program. If you have any questions please contact USF RSO – 813-974-1194.

USF 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 implemented to ensure that all work is performed safely. Each individual's roles and responsibilities are specifically assigned during this process.
The two basic types of radiation safety controls that are used at USF are engineered and administrative. Engineered controls, such as shielding, ventilation, alarms, warning signals, and material containment, 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 with yellow and black or yellow and magenta signs with the radiation trefoil symbol indicate where the radiation associated with USF research operations may be present.

Radioactive Material Area Sign.

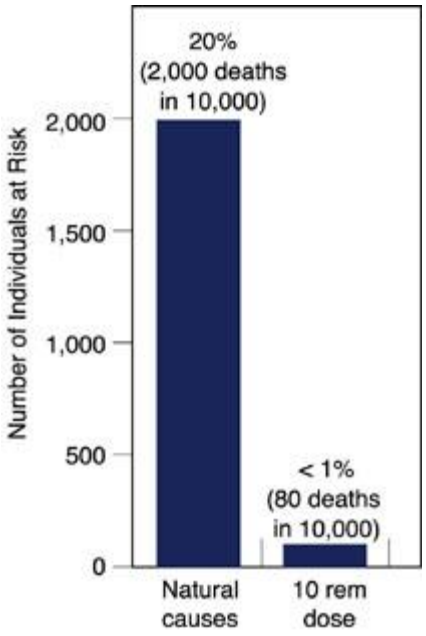
Risks Associated with Radiation Exposure

The most controversial and widely studied risk from occupational radiation exposure is an increased risk of cancer. The amount of risk depends on the amount of radiation dose received, the time over which the dose is received, and the body parts exposed. Although scientists assume low-level radiation exposure increases one's risk of cancer, medical studies have not demonstrated adverse health effects in individuals exposed to small chronic radiation doses (i.e., up to 10,000 mrem above background).

The increased risk of cancer from occupational radiation exposure is small when compared to the normal cancer rate in today's society. The current lifetime risk of dying from all types of cancer in the United States is approximately 20 percent.

If a person received a radiation dose of 10 rem to the entire body (above background), his or her risk of dying from cancer would increase by one percent-to 21 percent. This is a large amount of dose; most USF radiation workers receive less than 100 mrem (0.1 rem) a year.

The National Commission of Radiation Protection (NCRP report 116) has stated that a cumulative occupational radiation dose of 1000 mrem (1 rem) may increase chances of eventually developing cancer during a lifetime by 0.05%.



Estimated Cancer Risks to a population of 10,000.

General Emergency Response Guide For USF

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 any area where they may receive a radiation dose.
4. Alert people in lab to evacuate.
5. Call Radiation Safety for assistance as soon as possible.

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

Remain in the immediate area for self-monitoring and to provide useful information for incident management.

USF Radiation Emergency Procedures are posted **(pink colored paper)** in all research labs that handle radioactive materials.

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 USF Radiation Safety office personnel before beginning the work.

You must attend radiation worker training before beginning any job that involves radioactive materials or radiation-producing devices. If you are a supervisor or manager, you are responsible for providing a safe work environment.

If you are a visitor, you are responsible for obeying all posted signs, and reporting any unsafe conditions to your hosts.

Contact	USF Office
Adam Weaver Radiation Safety Officer	813-974-1194