

**On-line Laboratory Safety Training
University Police and Safety Office (UP&SO)
Module 4**

Radiation Hazards

Radiation Safety for
Laboratories

How to Complete This Training:

1. View the slides in ALL of the modules contained under the “On-line Laboratory Safety Training” link.
2. Download, print, and complete the Laboratory Safety Review as instructed at the end of each module.
3. Once all module review sheets (quizzes) are completed, submit them to Health Technician Ted Jirik at the Safety Office. Address questions to Ted.Jirik@ndsu.edu or call at 231-8040.

Topical Areas—All Modules

- Introduction
- Employee Right to Know
- Waste Handling and Disposal
- Fire and Electrical Safety
- **Radiation Hazards**
- Biological Hazards
- Nanotechnology Safety
- Principal Investigator Responsibilities

Topical Areas—This Module

- In this module we will cover topics associated with radiation safety, specifically:
 - ALARA, “As Low As Reasonably Achievable”
 - Time, Distance & Shielding

Radiation Training

- A separate radiation safety training course is required for researchers interested in using radioactive material in their work.
- Additional regulations and oversight apply when using radioactive material—contact the Radiation Safety Officer at 1-7759 for more information.

Radiation Topics

The guiding concept for radiation safety is outlined in this ALARA Statement:

It is the policy and intent of the University that all levels of the Radiation Safety Program Administration strive to keep radiation exposures to levels which are *As Low As Reasonably Achievable*, with economic and social factors being taken into account

NDSU Radiation Safety Handbook

This principle guides all activities that involve the use of radioactive material and radiation emanating devices at the University.

Radiation Topics

Radiation is all around us and there are many different classifications of radiation, both hazardous and non-hazardous. Visible light and radio waves are types of radiation, however they are essentially harmless. The radiation safety program is most concerned with a form of radiation classified as *ionizing* radiation.

Radiation Topics

Laboratories using radioactive materials and certain other areas are designated. By regulation, no regulated radioactive material is allowed in an area that does not have radiation safety signs or warnings.

Radiation Topics

When you see this sign or the trefoil symbol at the center of this sign, it is your notification that a radiation hazard is present. All containers with regulated radioactive material will be labeled.



Radiation Topics

Sources of Radiation at NDSU

- X-ray machines – These present only a minimal hazard to the public because they are shielded with guards and these guards block the X-radiation.
- Radioactive isotopes used in research.
- Examples include H-3, C-14, P-32, P-33, S-35, & I-125.
 - The type of radiation emitted depends on the radioisotope.
 - Exposure in the laboratory is low due to the small amount of activity used per experiment.
 - Larger stocks of isotopes are locked in storage containers unless in active use by researcher.

Radiation Topics

- Radioactive laboratories should be locked unless attended.
- Source material and waste must also be locked in storage containers within the laboratory.
- Radioactive waste bags or containers should not be moved or handled unless you are an approved user of radioactive material.
- Do not handle or move vials or containers of radioactive material.
- If for any reason material is spilled or a container is tipped accidentally, contact the Principal Investigator of the laboratory immediately. If not available, contact the safety office at 1-7759. Information placards are available in all laboratory areas.

Minimizing Radiation Exposure

- Time
 - Reduce the amount of time with the material
- Distance
 - Keep radioactive material at a distance
- Shielding
 - Place barriers to radioactivity between you and the material

Examples of Shielding



- Lead for gamma shielding



- Plexiglass for beta shielding



- High energy waste should also be shielded

Routes of Internal Exposure

- Routes of internal exposure are the same as for other materials
 - Ingestion
 - Inhalation
 - Absorption

Ingestion Hazard

- These exposures can occur when radioactive material is present in contaminated food or drink.
- Never store food or drink in a refrigerator containing radioactive materials.



Inhalation Hazard

- These exposures can occur when radioactive material is airborne; is inhaled and absorbed by the lungs.
 - Use volatile radioactive material only in a fume hood.
 - Keep containers tightly covered.



Absorption Hazard

- Occurs through Skin Contact
 - These exposures can occur when radioactive material is spilled or aerosolizes onto the skin and absorbed or enters through cuts or scratches.
 - Always wear gloves.
 - Wash hands before leaving the laboratory.



Radiation Key Topics

The principle of radiation safety is guided by the ALARA concept, keeping exposure “As Low As Reasonably Achievable.” This is accomplished by practice of radiation hazard minimization through:

- Time
- Distance
- Shielding

Radiation Topics Summary

- In this module we covered topics associated with radiation safety, specifically:
 - ALARA
 - Time, Distance & Shielding
- Next, download and print the review sheet for the material in this module. Fill in the answers using the information we just covered. Hold onto this completed form and submit it along with the other review sheets from each of the modules once they have all been completed. Send the set of completed forms to Ted Jirik at the Safety Office.
- From this point, continue on with the training by reviewing the remaining online training modules and completing the review sheets associated with the additional topics.