Radiation Safety Training
Annual Refresher Training

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UAlbany State University of New York
Annual Refresher Training

The University at Albany is committed to a Radiation protection plan of highest quality, in compliance with NY State regulations. Ensuring University personnel and members of the public exposure to radioactivity and all sources of ionizing radiation are maintained As Low As Reasonably Achievable.

ALARA!
Refresher Training Concepts:

• Radioactivity Basics
• ALARA Concepts
• Exposure limits
• Safety Responsibilities
• Emergency Procedures
• Regulatory References
Radioactivity Basics

**Radioactivity** – The spontaneous nuclear transformation of an unstable atom that often results in the release of radiation, also referred to as disintegration or decay.

**Units**

**Curie (Ci)** the activity in one standard gram of Radium = $3.7 \times 10^{10}$ disintegrations per second

**Becquerel (Bq)** 1 disintegration per second – International Units (SI)
Radioactivity Basics

**Radiation** – Energy in transit in the form of electromagnetic waves (gamma-γ or x-ray), or high speed particles (alpha-α, beta-β, neutron-η, etc.)

**Ionizing Radiation** – Radiation with sufficient energy to remove electrons during interaction with an atom, causing it to become charged or ionized.

– Can be produce by radioactive decay or by accelerating charged particles across an electric potential.
Radioactivity Basics

**Roentgen (R)** the unit of exposure to Ionizing Radiation. The amount of γ or x-ray radiation required to produce 1.0 electrostatic unit of charge in 1.0 cubic centimeter of dry air.

**Rad** the unit of absorbed dose. Equal to 100 ergs per gram of any material from any radiation. 

**SI unit = Gray**

1 Gray = 100 rads

**REM** the unit of absorbed dose equivalent. The energy absorbed by the body based on the damaging effect for the type of radiation. 

**REM = Rad x Quality Factor**

**SI unit = Sievert**

1 Sv = 100 Rem
ALARA

The University at Albany is committed to an effective Radiation Protection Program such that all exposures to ionizing radiation and levels of radioactivity to University personnel, members of the public and the environment are maintained As Low As Reasonably Achievable.
ALARA

A philosophy, necessary to maintain personnel exposure or the release of radioactivity to the environment well below applicable limits by means of a good radiation protection plan, through education, administrative controls and safe lab practices.
ALARA Principles

**TIME**

- Minimize your time near the source of radioactivity, prepare for your protocol
- Do not rush your experiment, work efficiently
- Rehearse, do mock trials without radioactivity
- Perform as much work as possible away from the source of radiation
ALARA Principles

**Distance**

- Use remote handling tools, or work at arms length
- Maximize distance from source of radiation
- **Inverse Square Law** – radiation intensity is inversely proportional to the square of the distance from the source

![Diagram showing inverse square law](image-url)
ALARA Principles

Shielding

- Any material between a source of radiation and personnel will attenuate some of the energy, and reduce exposure
- Select proper shielding material for type of radiation, use less dense material for Beta radiation, to minimize Bremsstrahlung (braking) radiation
ALARA Principles

Containment – Protecting yourself and others, and containing the source of exposure

• Always wear protective lab coat, gloves, and eyewear when handling unsealed radioactivity
• Post areas of possible radiation exposure, and clearly define radioactive work areas
• Do not engage in practices that will increase the possibility of release, inhalation, ingestion or absorption of radioactivity - Do Not Eat Or Drink In Labs
• Perform post work surveys, to detect and prevent the spread of radioactive contamination
• Segregate and minimize radioactive waste, minimize and monitor sanitary sewer discharges
Occupational Exposure Limits

The University at Albany has adopted NY State and Federal (NRC) guidelines for limits on occupational exposure.

From any source of ionizing radiation no individual adult shall receive a dose that exceeds:

1. **The annual limit, which is the more limiting of:**
   a. The total effective dose equivalent equal to 5000 mrem, or
   b. The sum of the deep dose equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye, being equal to 50,000 mrem.

2. **The annual limits to the lens of the eye, to the skin and to the extremities which are:**
   a. An eye dose equivalent of 15,000 mrem
   b. A shallow dose equivalent of 50,000 mrem to the skin or any extremity.
Occupational Exposure Limits

What does that mean?

1. a. (TEDE) Annual whole body exposure from an external radiation source must be less than 5 Rem/year.
   
   b. (CEDE) Annual exposure to a designated organ from combined external and internal radiation sources < 50 Rem/year. (Other than the lens of the eye)

2. a. (LDE) Annual limits to the lens of the eye from external radiation is less than 15 Rem/year.

   b. (SDE) Annual limits for a shallow dose to the extremities or skin is less than 50 Rem/year.
Occational Exposure Limits

Prenatal Radiation Exposure

Any University at Albany female radiation worker may voluntarily notify the RSO of her pregnancy. This declaration must be in writing. The University adheres to limits for prenatal exposure outlined in NRC regulatory guide 8.13, available at the EH&S Office.

- Dose to the embryo/fetus during the entire pregnancy, from occupational exposure to a declared pregnant woman, shall not exceed 500 mrem.
- Exposure will be monitored on a monthly basis, to ensure a uniform rate, not to exceed 50 mrem, avoiding substantial variations.
- This lower dose limit shall remain in effect until the declaration is withdrawn or the woman is no longer pregnant.
Safety Responsibilities

NYS Department of Health

• Regulatory Authority for Radioactive Material & Radiation Producing Equipment
• NYS is an “agreement state” with NRC
• Grants certain authority to the University at Albany through broad scope license #459-1
• Bureau of Environmental Radiation Protection

NYS Department of Health
ESP, Corning Tower, 12th Floor
Albany, NY 12237
(518)402-7550
Safety Responsibilities

Radiation Safety Committee (RSC)

- Granted authority from the Office of the President of the University
- Comprised of senior management personnel and representation from departments where radiation or radioactivity is used
- Shall approve all use of radioactive materials and radiation producing equipment within the University facility
- Establish and review an effective, safe Radioactive Protection plan, and the activities of the Radiation Safety Officer
Safety Responsibilities

**Radiation Safety Committee**

**Radiation Safety Officer (RSO)**

- Has been delegated authority to ensure the implementation of the Radiation Protection Program and is responsible for the day to day conduct of the program
- Is a member of the RSC, and brings issues of compliance, efficiency and safety to the committee for resolution
- Provides technical assistance and guidance to all users of radioactive material or radiation producing equipment
Safety Responsibilities

Radiation Safety Committee

Radiation Safety Officer

Principal Investigator (PI)

• Individuals who are authorized by the RSC to use radiation producing equipment or possess radioactive material, and supervise their use

• Responsible for compliance with all guidelines, policies, and safety procedures set forth in the University’s Radiation Protection Plan

• Supervisory person directly responsible for training and safety in the lab
Radiation Workers Responsibilities

1. Any individual who may use radioactive material or who may operate equipment that emits radiation, is responsible for compliance with the general safety requirements in the Radiation Safety Manual.

2. Be familiar with and follow specific instructions for protocols and radiation protection provided by the Principal Investigator and Radiation Safety Officer.

3. Keep radiation exposure to the lowest achievable by using protective devices and appropriate ALARA principles.

4. Wear designated radiation monitoring badges and rings, when required.
Radiation Workers Responsibilities

5. Maintain good lab practices and good housekeeping in radioactive materials labs

6. **Do Not Eat, Drink, Smoke or Apply cosmetics** in areas approved for radioactive material use

7. Monitor the area and equipment prior to, during and after the use of unsealed radioactivity, and repairs or modifications to radiation producing equipment

8. Report suspected spills or releases of radioactivity immediately to the RSO

9. Report any condition which may lead to or cause a violation in our Radiation Protection Plan

10. Become familiar with emergency responses that may involve personnel exposure to radiation or radioactivity
Emergency Response

Unsafe radiological conditions should be promptly reported to the RSO in the EH&S Office at 442-3495. After hours, call 911 from an University phone to reach University Police Department (or 442-3131 from a personal phone), or dial 9-911 on the East Campus. Report emergencies such as personnel contamination, radioactive spills, lost or stolen radioactive material (including waste) or other potentially hazardous conditions.

Any accident involving medical emergencies, shall take priority over the concern for radioactivity.
Spill Procedures

All spills of radioactivity should be cleaned up as soon as possible to prevent the spread of contamination. Immediately notify the RSO for assistance and supervision.

- Notify others in the area to the presence of the spill
- Isolate the contaminated area, using physical boundaries or radiological rope or tape from your spill kit
- Prevent the spread of contamination, cover liquid spills with absorbent material, dry spills with damp material
- Survey spill area boundaries and personnel for radioactive contamination
- Notify laboratory PI and RSO
Regulatory References

The University at Albany’s Radiation Protection plan is outlined in the University’s Radiation Safety Manual. It is governed and licensed by NY State Department of Health (10 NYCRR part 16), and regulations by NYS Dept. of Environmental Conservation and NYS Dept. of Transportation. In strict compliance with regulations of the federal government.
STATE OF NEW YORK
NOTICE TO EMPLOYEES
STANDARDS FOR PROTECTION AGAINST RADIATION

YOUR EMPLOYER'S RESPONSIBILITY
The regulation, record, and reporting of any source of radiation in the State of New York is controlled by the provisions of the Federal Food, Drug, and Cosmetic Act, Radiation Management Act, and Nuclear Regulation Act. The Radiation Safety Office of the University at Albany is responsible for enforcing these regulations.

REPORTS ON YOUR EXPOSURE TO RADIATION
Your employer is responsible for providing you with a written report of your exposure to radiation. This report will be based on your personal monitoring, surveys, and assessments. The report will be sent to your employer no later than 30 days after the end of the calendar year in which your exposure occurred.

INQUIRIES
Inquiries regarding the standards for protection against radiation may be directed to the Office of Environmental Health and Safety, State University of New York, University at Albany, 1400 Washington Avenue, Albany, NY 12222.

University at Albany
State University of New York

Notice #1

Radiation Safety Manual
Office of Environmental Health and Safety
As Low as Reasonably Achievable
Gloves
Lab Coat
Dosimeter
Survey Meter
Time Distance Shielding

Office of Environmental Health & Safety
University at Albany

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Have a Safety Question?

Give Us A Call At:
442-3495

Environmental Health & Safety
Annual Radiation Refresher Training Completed:

Click here to confirm completion