

## Minimization of Radiation Exposure

Controls within facilities where radioactive materials are used or stored are established to minimize radiation exposure and radioactive contamination. High standards of cleanliness and good housekeeping, proper supervision, and well-instructed personnel are significant elements in the control of radiation exposures and radioactive contamination. The Principal Investigator is responsible for seeing that these conditions are met on a day-to-day basis in his/her laboratory.

### **Radiation Protection – Time, Distance, and Shielding**

Radiation protection actions are implemented to ensure that the dose received by any individual is as low as reasonably achievable or "ALARA", while not exceeding the maximum permissible limits. This objective may be achieved by any one, or a combination, of the following methods:

- **Time:** Limit the time spent in a radiation field in order to limit the exposure. For example, if a person entering an area where the radiation levels are 1000 mR/hr remains in the field for only 30 seconds, they would receive a relatively low dose of only eight millirem. The maximum permissible whole body dose is 500 mrem per year.
- **Distance:** Maximize the distance from a radiation source in order to minimize the exposure. The inverse square law states that radiation intensity from a point source varies inversely as the square of the distance from the source.
- **Shielding:** Most radioisotopes used at FSU are relatively easy to shield, particularly the beta emitters. Utilize plastic or glass to shield energetic beta emitters such as <sup>32</sup>P. Lead shielding is generally used to shield x ray and gamma emitters. The Radiation Safety Officer (RSO) can usually provide lead shielding.

### **Personnel Protective Measures**

- Eating and drinking are prohibited when working with radioactive material or with contaminated equipment.
- Smoking is prohibited in all laboratories.
- Wearing protective gloves and closed toe shoes are required when working with activity that is loose; e.g., powder or liquid.
- Surveying (when appropriate) and washing hands is required after working with loose radioactive material.
- Handling radioactive material should not be done if there are significant breaks in the skin (cuts or abrasions) that would permit entry of radioactive material or hinder the effective decontamination by vigorous washing.
- Pipetting radioactive solutions by mouth is prohibited.

### **Laboratory Procedures and Facilities**

- Each person working in the laboratory shall clean up his/her work area and apparatus, and properly dispose of or store the radioactive material.
- No person or object subject to radioactive contamination is to leave a laboratory without being monitored for radioactivity. Suitable monitoring techniques are required; such as, using a G-M survey meter or conducting wipe tests. Consult with the RSO if specific instructions are needed as to the proper technique for radiation monitoring.

- When working with radioactive material that may be dispersed into the air, such as; ashing, boiling, evaporating, or distilling, the work must be done in a fume hood. The airflow shall be no less than 100 linear feet per minute when averaged over the plane of the sash with the sash opened at least 18 inches. Work with fine particulate radioactive material must be done in a glove box. Any exceptions must be approved by the FSU Radiation Control and Policy Committee.
- Tables and bench tops on which radioactive material is used shall be made of, or lined with, a nonporous and chemical resistant material. Such surfaces are to be covered with a disposable material such as absorbent plastic-backed paper. When working under conditions that a spill or incident would not be confined to a small area, the work shall be done over a tray, or other provisions should be made to minimize the extent of a contamination incident.
- The extent of work areas and storage places for radioactive material within a laboratory are to be kept to a minimum. Radioactive material is to be stored and secured as far as practical from other work areas and behind sufficient shielding, when needed, to minimize the exposure of personnel.

### **Security Controls for Radioactive Materials**

#### Sealed Sources

Sealed sources less than exempt quantities are not regulated. You can purchase and use these items without the need for a license as long as they are kept in their original containers. However, whenever 10 or more exempt sealed sources are stored in the same area, they are no longer exempt from the regulations.

Sealed sources greater than exempt quantities must be approved for use via a proposal to the RSO unless they are in use in a generally licensed or exempt device (e.g.: liquid scintillation counter or gas chromatograph).

#### Unsealed Sources

Licensed unsealed sources of radiation are only to be handled by trained radiation workers. Those materials need to be secured to prevent unauthorized access. In order to accomplish this, laboratories must be locked when authorized users are not present or stock radioactive materials must be secured within the laboratory by the use of locked storage boxes, refrigerators or other security devices. Contact the RSO for information about lockboxes or questions regarding radioactive materials security.