



UNIVERSITY *of* WEST FLORIDA

UWF
Radiological Control
Regulations and
Instructions

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UWF Department of Environmental
Health and Safety

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INTRODUCTION

The purpose of this handbook is to outline the University of West Florida's Radiological Control Program and to set forth recommendations and requirements relative to the safe use of ionizing radiation.

RADIOLOGICAL CONTROL PROGRAM

Radiological Control Committee (RCC)

Due to the initiation of the course in "Radioisotope Techniques" and the use of radioisotopes in research projects, it was deemed appropriate and necessary that a committee be appointed* to formulate policies that would assure radiological safety. The committee will meet twice a year.

The **Radiological Control Committee (RCC)** committee has the responsibility to perform the following duties:

1. Review and grant permission for, or disapprove, the use of radioactive isotopes within the University of West Florida from the standpoint of radiological safety.
2. Prescribe special conditions and requirements as may be necessary (such as physical examinations, additional training, designation of limited areas or locations of use, disposal methods, etc.)
3. Prepare and disseminate information on radiological safety for the use of and guidance of staff and students.
4. The committee and its chairman are requested to keep a record of the actions taken in approving the use of radioisotopes and other transactions, communications and reports involved in the work of this committee.
5. The chairman of the RCC is authorized to act for the committee between meetings, reporting his actions to the committee for review at appropriate intervals.

Radiological Control Officer (RCO)

The function of the **Radiological Control Officer (RCO)** is to carry out the policies of the RCC and to assure that radioactive materials are used in accordance with regulations as set forth in Control of Radiation Hazards (section IOD-91.1406, F.A.C) by the State of Florida Department of Health and Rehabilitative Services.

The RCO functions under the RCC and is a member of this Committee serving as its chairman. The RCC assumes the responsibility for:

- 1) dissemination of information
- 2) checking facilities and equipment
- 3) reviewing all proposals for isotope usage

- 4) approving construction with the committee of all new isotope facilities
- 5) obtaining and maintaining license approval

REGULATIONS GOVERNING RADIOISOTOPE PROCUREMENT, USE AND DISPOSAL

Procurement

All radioactive materials must be procured through the RCO. An instruction sheet entitled, "Procedure for Radioisotope Procurement and appropriate application forms may be obtained from the same officer. All incoming shipments of radioactive materials are inspected by Mr. Derek Krepp, Radiation Safety Officer, during office hours. The materials in their original packages will be stored immediately in the vault or refrigerator based upon the required storage requirements. No shipments are received during off-duty hours.

Location of Use

Radioactive materials are to be used only in those facilities which have RCC approval.

Transfer of Radioisotopes

1. On Campus Transfers: Material cannot be transferred from one department or laboratory to another without approval, since the original approval for use of radioactive material is given for a stated specific working area.
2. Off Campus Transfers: Radioactive material must not be shipped or transferred to or from the University without approval.

Instrumentation and Radiological Safety Equipment

Survey instruments must be available which are appropriate to the type and level of ionizing radiation being used.

Film Badges

Extremity Film badges or TLD's must be worn by working personnel in the following instances:

- When working with unsealed 1 MeV or greater beta emitters in amounts greater than 1 millicurie in any month.
- When working with any gamma emitters in amounts greater than 1 millicurie.
- When any individual receives a dose of 40 mrem or more on a whole body film badge or TLD for 2 consecutive months.

Shielding

When radioactive material is stored in a laboratory facility, it must be shielded in such a manner that the dose rate at the surface of the shield does not exceed 2.0 millirems per hour.

Waste Materials

Dry Waste

Special containers for disposals of dry wastes are to be available in all laboratories using radioactive materials. All radioisotope users should contact the RCO regarding the type of dry waste containers recommended.

- All such containers must be conspicuously labeled.
- Dry waste, contaminated with radioactivity, the half-life of which is less than 30 days shall be held by the user for at least 10 half-lives and then disposed of according to procedures prescribed by the RCO, as nonradioactive waste.
- Dry waste contaminated with radioactivity, the half-life of which is greater than 30 shall be sealed in a plastic bag for disposal by the RCO. The bag should be labeled as follows:
 1. user's name
 2. Isotope(s)
 3. Approximate quantity of activity
 4. Date
- The bags shall be stored in the radionuclide storeroom until the activity drops to background level, and then disposed of as nonradioactive waste.

Maximum Permissible Dose

	<u>Rems per Year</u>
1. <u>Occupational Dose</u>	
(a) 1. Total effective dose equivalent, or	5
2. Sum of deep dose equivalent and the committed does Equivalent to any individual organ or tissue other than the Lens of the eye	50
(b) 1. Lens of the eye dose equivalent.	15
2. Shallow dose equivalent to skin or to extremity	50
3. <u>Non-Occupational Factors</u>	

Non-occupational exposure shall not exceed one-tenth the values given in item 1.

NOTE: The RCO is to be notified immediately in the event of exposure in excess of the maximum permissible level, excessive spills, gross contamination or other accidents.

In the event of an exposure equal to the M.P.D. or greater, the following procedure should be followed:

- 1) Supply the RCO written details of the exposure.
- 2) Indicate the procedure which will be followed to prevent reoccurrences of such exposure. Records of surveys, radiation monitoring and disposal shall be kept as specified in Chapter 64E-5 Part III, F.A.C. (see Reference F).

Rules for operation of the university radioisotope laboratory

The problems of control which are encountered in the usual tracer experiments are simplified by the low levels of radioactivity which are usually employed. Since most tracers are emitters of beta and gamma radiation, the literature cited for student and personnel reference and reading are adequate sources for radiation safety instructions. If experiments are planned involving high levels of activity, alpha emitters, or other hazardous isotopes, special arrangements must be made with the Radiological Control Committee.

The following regulations apply to all persons who work with radioactive materials. Specifically, this includes those persons who are: Enrolled in radioisotope courses, or undergraduate, or graduate students conducting research, or temporarily utilizing the facilities of this laboratory (All persons working with radioisotopes must be named in the license or be directly supervised by a person named in the license.)

General

1. Before starting work with radioactive materials, each person shall make known any previous work with radioactive materials or radiation sources and any exposure over the maximum permissible dose.
2. Topcoats, hats, and other personal belongings including books (other than those required for work) should not be brought into the laboratory, where they may become contaminated.
3. Eating, drinking, smoking and application of cosmetics in the laboratory (including the locker room and counting room) are forbidden.
4. All radioactive materials, except sealed sources, must be handled over absorbent paper, the latter preferably over a sheet of polyethylene film placed in a tray. To dispose of the paper and film, follow directions similar for discarding other radioactive wastes as outlined in Safe Handling.
5. High standards of cleanliness and good housekeeping should be maintained throughout the laboratory.
6. Protective clothing (e.g. laboratory coat) should be worn in the laboratory but not taken into the counting room.
7. Rubber gloves should not be taken into the counting room.
8. Pipetting liquids of any type by mouth or the performance of any similar operation by mouth suction is forbidden.
9. Before leaving the laboratory, the hands shall be washed and then checked with a suitable survey meter. Contamination remaining after a thorough washing shall be reported to the instructor.
10. If, in the course of work, personal contamination is suspected, a survey with a suitable instrument shall be made immediately, to be followed by the required cleansing. Routine precautionary surveys should be made at frequent intervals.

Safe Handling

- It is required that the total gamma irradiation of any part of the body should not exceed 100 mrem/week. (This limit is subject to being revised downward).
- Survey meters must be used to check the dosage level for various steps in experiments with radioactive materials.
- Approved warning signs must be properly displayed in all areas where there is a radiation hazard. This is essential for the protection of everyone who might have cause to enter the laboratory and would, therefore, include not only other students and staff, but also the janitor, watchman, fireman, etc.
- All containers containing radioactive materials, including sealed sources and standard sources, should be labeled with radiation warning tape. The isotope, amount, and date should be indicated.
- Radioactive material, including portable sources, should be stored in the special area provided, and there should be sufficient shielding to reduce the radiation level below 2.0 mr/hr at the shield's surface.
- Operations with loose radioactive materials, evaporation of radioactive liquids, handling of radioactive gases, and any process which could lead to the creation of airborne activity, e.g., release of spray from radioactive liquid, must be conducted in a hood or in a glove box if the latter offers greater protection.
- Disposable gloves shall be worn at all times while handling radioactive materials.
- A person with breaks in the skin of the hands must wear disposable gloves and should consult his instructor or advisor before starting work.
- Liquid waste should be stored separately from solid waste.
- For each radioisotope the wastes should be stored separately, or mixed according to the half-lives; e.g. carbon-14 waste should not be mixed with phosphorous-32 waste.
- Radioactive waste should be stored in containers which are labeled as to content, date, and radiation level. The containers should be tightly sealed and should not constitute a spillage or dust hazard. The containers should be stored in accordance with item 15.
- Waste reading above background should not be poured into the drain or into the normal refuse cans.
- Waste containing short-lived radioisotopes may be disposed of as ordinary waste after examination with an appropriate radiation detector shows the level or radioactivity to be not greater than background.
- The mode of disposal of waste containing long-lived radioisotopes depends upon the physical form of the waste and the chemical properties as well as the half-life (radiological and biological) of the material. In some cases disposal by ordinary means is possible after suitable volume and/or isotopic dilution, i.e., addition of solvent and/or a stable isotope or isotopes of the same element in an appropriate chemical form. Several commercial organizations have been licensed to accept and dispose of radioactive wastes.

Contamination

- Any contamination of the body or clothing must be reported to the instructor or advisor at once.
- Accidental contamination of apparatus, e.g., tongs, bench tops, hoods, floor, etc., must be reported, and the apparatus must be clearly marked as to the radioisotopes, the area contaminated (sometimes conveniently encircled with wax marking pencil), and survey-meter reading.
- Certain general procedures are effective for removing contamination. These involve the use of acids, complexing agents, abrasives, etc. The selection of a detailed procedure depends upon the chemical properties of the element to be removed, and therefore certain reagents which form insoluble compounds with the element must be avoided.
- Contaminated glassware, such as centrifuge tubes and pipettes, should be treated first with an appropriate solubilizing agent. This is followed by a wash with tap water and finally distilled water. A survey meter should be used to determine the effectiveness of the decontamination operation. If the extent of contamination to be removed is of the order 1 c , the portion of the washings containing the bulk of this activity should be stored. Under no circumstances should contaminated glassware or other apparatus be returned to the storage areas used for clean apparatus.

EMERGENCY PRECAUTIONS

It is evident that good housekeeping and attention to the details outlined above are mandatory in work with radioisotopes. However, there are two emergency situations which can occur in laboratories, and it is necessary to consider the procedures to follow in these possibilities beforehand. These are the accidental injury with objects contaminated with radioactive material and spills of radioactive solutions. Naturally, the specific emergency procedures to be followed in these cases differ with varying circumstances, but recommended general procedures should be publicized in advance of any such emergency. The following procedures are slightly modified from those in use at the Oak Ridge National Laboratory, and may be adapted to the workers in any particular laboratory:

Procedure in case of skin wound

Procedure in case of dealing with wounds in which there is a break in the skin that may result in introducing contamination into the body.

1. Place the wound under large volumes of running water immediately, i.e., within 15 seconds after the accident. Spread the edges of the wound if possible to permit the complete flushing action. While the wound is being flushed with water, rub it gently with wet cotton gauze using liquid soap if necessary to remove dirt and grease from the wound. This should be followed by step (2) or (3).

2. If the wound is contaminated with the “very hazardous materials and if it is located on the body where tourniquet can be applied, and if the medical aid is close at hand, apply a tourniquet and rush the person to medical aid. It is desirable to stop venous flow but not to restrict arterial flow. Proceed with step (a) below.
 - a. If the medical aid is not available in 15 minutes or if the wound is contaminated with moderately dangerous or slightly hazardous radioisotopes, apply the tourniquet if it can be applied so as to stop only the venous flow (otherwise omit the tourniquet entirely), and continue washing for at least 5 minutes. If the wound is on the finger, a milking action can be used effectively to increase the bleeding and to retard the venous flow of blood. Save the object causing the wound for examination to estimate the extent of hazard. Proceed with step 3.
3. Report to the medical department as soon as possible after 5 to 10 minutes of washing. The wound should be tested with probe counters; if there is residual radioactive contamination, the physician will treat the wound and forward excised tissue to the health physics laboratory for radiochemical analysis.

Procedure in case of spill of radioactive material.

1. Try to estimate the hazard caused by the spill, and evacuate persons from the areas. Require those remaining in the area (including yourself) to wear appropriate clothes and other protective devices as required.
2. Prevent spread of activity by
 - a. Cutting off room ventilation fans.
 - b. Applying absorbents such as paper, sand, etc., to the contaminated area.
 - c. Roping off or barricading contaminated area and placarding with signs bearing the conventional radiation-danger symbol and pertinent hazard information.
 - d. Closing windows and doors.
3. Sound alarm and summon help as needed.
4. Permit only authorized newcomers to enter the contaminated area, and then only after proper clothing is used.
5. Permit no one to leave the contaminated zone until he is checked for radioactive contamination and decontaminated in appropriate manner if necessary.
6. Consider protection for those performing cleanup work.
 - a. Provide masks or other protective devices if necessary.
 - b. Provide expendable protective clothing.
 - c. Erect shielding or limit the working time if necessary.

- d. Have all persons engaged in cleanup operations go to a contamination checking station after each operation.
 - e. Use suitable instruments to monitor and estimate the exposure of each person engaged in the clean-up.
7. In cleaning up the spill, do not spread contamination.
 8. If material involved in the spill is short-lived, it may be better to seal off the affected area and leave for the period of decay involved.
 9. Either dispose of or decontaminate materials involved in the contaminated area of the radioactive material.
 10. Keep proper records on all spills and how decontamination was affected.
 11. Refer to the literature for a discussion of decontamination procedures applied to specific cases.
 12. Many spills of radioactive material can be avoided or the consequences minimized by the proper design of laboratories and equipment. Obviously the best policy with respect to spills is to avoid having them by providing adequate equipment and conducting training programs.

One other useful precautionary measure is utilized in many laboratories. This is to arrange a working agreement between the fire department and the persons responsible for radiation protection. The fire department should know in which building work is done with radioisotopes in quantities greater than microcurie amounts. In some laboratories a distinctive marker is placed on doors of rooms in which millicurie amounts of activity are used. The telephone number of the person responsible for the area may be included on the marker should it be necessary to reach him in case of fire or explosion.

REFERENCE MATERIAL

The Handbooks listed here are obtained from the U.S. Department of Commerce, National Bureau of Standards, by writing to the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

- A. Handbook # 42 - “Safe Handling of Radioactive Isotopes”
- B. Handbook # 48 - “Control and Removal of Radioactive Contamination in Laboratories”
- C. Handbook # 51 - “Radiological Monitoring Methods and Instruments”
- D. Handbook # 59 - “Permissible Dose from External Sources of Ionizing Radiation”
- E. Handbook # 69 - “Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and for Water Occupational Exposure”
- F. “Control of Radiation Hazard Regulations,” Chapter 64E-5, Florida Administrative Code. Florida Department of Health, 1997.