

CHAPTER 2

RADIOACTIVE MATERIALS

I. AUTHORIZATION TO USE RADIOACTIVE MATERIAL

A. Initial Approval

Any University faculty or staff member needing to utilize radioactive material in research studies, must obtain approval of the Radiation Control Committee. Approval is obtained by submitting a proposal to the Committee through the Radiation Control Office describing such items as: (a) the facility where the radioactive materials will be used, (b) the radionuclide(s) which will be used, and (c) the procedures which will be followed in using radioactive materials. This proposal should point out radiation safety precautions which will be taken to prevent the spread of radioactivity to the environs and to protect University personnel.

NOTE: (See [Appendix B](#) for content and suggested format for proposals).

No request for approval to use radioactive material will be denied by the Radiation Control Committee before the investigator is given an opportunity to discuss his application with the Committee.

The following forms must be completed and submitted with the proposal:

1. "[Statement of Training and Experience](#)" (RC-1 Form), Appendix B, for each investigator, staff member and student who will be using radioactive material under the proposal.
2. "[Proposal Summary Sheet](#)", Appendix B.

Prior to Committee approval and usage of radioactive material, facilities will be inspected by Radiation Control and Radiological Services personnel. The Radiation Control Office will also screen submitted RC-1 Forms. If it is determined an individual needs additional training or insufficient information is submitted, a [Documentation of Training Form](#), Appendix B, will be sent. This form offers three options of training for consideration by the RCO.

NOTE: Investigators wanting to conduct studies involving human subjects must submit proposals to the Human Use of Radioisotopes and Radiation Committee. A set of forms, separate from those used for the Radiation Control Committee proposals, must be used and can be obtained by contacting the Radiation Control Office at 392-7359.

B. Renewal of Authorization to use Radioactive Material

Renewal of proposals is required on a two year frequency. A renewal form, Appendix B, will be sent from the Radiation Control Office 15 days prior to expiration of current approval.

C. Amendment to Proposals

If radioactive materials other than those which were included in the initial proposal and approval are requested, an amendment to the proposal must be submitted to the Radiation Control Office describing the additional radioactive material, how, why and where it will be used. A [Proposal Summary Form, Appendix B](#), must also be submitted.

D. Transfer of Responsibilities

Prior to extended leaves of absence and sabbaticals, the Principal Investigator must obtain Radiation Control Office approval for transfer of responsibility for the day to day supervision of work involving radioactive material. The individual assuming the responsibility must be a Principal Investigator approved for the use of the same types of radioactive material.

E. Procurement and Receipt of Radioactive Materials

Principal Investigators may obtain radioactive materials after their proposal has been approved by the Committee. To comply with inventory and control requirements of the NRC and DOH, the Radiation Control Office shall approve all radioactive material requisitions and purchase orders prior to placement of orders.

1. Approval

Purchasing Division will withhold issuing purchase orders for radioactive materials unless the Requisition or Purchase Order has been assigned an "RC Number" indicating approval by the Radiation Control Office. The original Requisition to Purchase or Purchase Order must be submitted to Radiation Control. Upon approval, each radioactive material order will be assigned an RC number, and the original requisition or purchase order will then be returned to Purchasing for further processing. The vendor must be provided with the following: 1) The name of the **APPROVED PI FOR RADIOACTIVE MATERIAL**. (The name of a laboratory director or laboratory technician will not be acceptable and is guaranteed to delay, if not prevent, your package from being delivered.) 2) The building and room where the radioactive material is authorized to be used. (Do not indicate to the vendor that the package will be delivered to that building and room since the only approved delivery location is Bldg. 175.) For telephone orders (on previously approved blanket accounts), the vendor must still be provided with the above information.

2. Purchase Order Numbers

It is the responsibility of the Principal Investigator to notify the Radiation Control Office when a purchase order number is issued for radioactive material orders. Since purchase order numbers are used in identifying incoming shipments, it is important that the Radiation Control Office be informed as soon as possible.

3. Receipt of Radioactive Material Shipments

The Radiation Control Office is required to inspect all incoming packages containing radioactive material. After this inspection, the package will be delivered to the ordering laboratory, the person accepting the package in the laboratory is required to sign for the package on the Radioactive Material Package Receipt Log.

Off-Campus radioactive material shipment receipt is reported on the [Radioactive Material Package Receipt Form, Appendix A](#). [Appendix C](#) contains a detailed procedure for opening packages containing radioactive material.

F. Facilities

Radioactive materials are not to be used in any University facility without approval of the Radiation Control Committee and/or the Radiation Control Officer from the standpoint of radiation safety. Plans for all new buildings and modifications of existing structures, where radioactive materials are to be used, must be approved by the Radiation Control Office prior to the construction or modification of the structure.

Prior to termination of activities involving radionuclides, the Radiation Control Office must be notified in order to assure that facilities are free from contamination and that transfer of material is in accordance with regulations.

II. TRAINING IN THE USE OF RADIOACTIVE MATERIAL

The Radiation Control Officer and Radiation Control Committee are required to assure that all individuals approved to use radioactive material are competent to do so. The following standards are established in this regard.

A. Responsibility

The Principal Investigator is the individual primary responsible for planning, initiating and ultimately interpreting the results of the particular research or project employing radioactive material. In addition, there may be experienced assistants or trainees associated with the work. Any of these individuals might be faculty, staff, students or approved visitors to the University.

B. Training and Experience Requirements for Use of Unsealed Sources of Radioactive Material

The Principal Investigator (PI) must possess formal course or preceptor (on the job) training in all categories (A through F) called for in Appendix B, Statement of Training and Experience. If the above requirement is not met, a faculty associate already approved as a PI for the radionuclide(s) to be used who does have this training and experience and will take responsibility for the radiation safety aspects of planning and execution of the experiment, must be added to the professional team undertaking the work. The level and extent of training and/or experience must be commensurate with the amount and type of radioactive material to be employed, extent of hazard involved and sophistication of the techniques being employed. No individual may work independently with radioactive material unless he has been approved by the Radiation Control Committee in regard to training and experience. Trainees

(whether students or otherwise) may handle radioactive material only under the direct supervision of an approved experienced worker. Experienced, approved workers may undertake to train previously inexperienced individuals in the use of radioactive material using the traditional, well accepted Preceptor Method ("on the job training"). However, the individual in question must possess appropriate general technical experience and education to undertake the work, and his credentials must be registered with the Radiation Control Officer.

Furthermore, the nature of the initial experimental work undertaken must be appropriate for the training of the inexperienced individual. Since preceptor training alone has limitations, formal or informal coursework may be required in some cases (see D. below).

C. Training and Experience Requirements For Use of Sealed Sources of Radioactive Material

The Principal Investigator in charge of any facility utilizing sealed sources of radioactive material must be qualified in all aspects as listed on the Statement of Training and Experience, [Appendix B](#). Generally, other individuals can be designated experienced workers for use of the device in question provided they are trained in the normal use of the device, potential hazards, safety precautions and emergency procedures. In recent years, it has become common to include a moderate amount of radioactive material in certain devices designed for general laboratory or even consumer use, such as gas chromatography electron capture detectors. To use such a device, the Principal Investigator is not necessarily required to meet all training requirements for general use of radioactive material, but, must be able to demonstrate competence in regard to use of the device, potential hazards, safety precautions and emergency procedures.

D. Formal or Informal Coursework

Individuals applying to use radioactive material may be required by the Radiation Control Committee to successfully pursue a formal course, short course or other organized training session, in the following circumstances:

1. When the Principal Investigator has neither formal or preceptor training in handling radioactive material, and no appropriate Co-Principal Investigator can be located.
2. When the duration of the work, level of radiation involved, or degree of sophistication of the work suggest that preceptor training alone may be inadequate. In general, the Principal Investigator should require inexperienced associates to obtain some formal training if the duration of the work will exceed three months; if the amount of radioactive material in use at one time exceeds about 1 mCi (depending on the hazards of the radionuclides in question); if several different radionuclides are to be employed; or, if the procedures used will obviously be hazardous or difficult (i.e.: vacuum line manipulation of high-level samples; multiple-step organic synthesis of high-level samples).

3. Where the initial level of training and experience of the trainee is inadequate to begin the preceptor training.

III. PERSONNEL MONITORING PROGRAM

The Principal Investigator is responsible for assuring that personnel monitoring is provided in all radiation facilities for which he is responsible.

A. Personnel Monitoring Requirements

Personnel monitoring devices must be worn by personnel as specified below

1. Whole Body Luxel/Film/TLD Badges shall be worn when:
 - a. using or assisting in the use of unsealed sources of a beta emitter where the maximum beta energy is 300 keV or higher.
 - b. using or assisting in the use of unsealed sources of a gamma emitter where the gamma ray energy is 50 keV or higher.
 - c. working with neutron sources. Special neutron badges may be required in addition to other badges.
 - d. specified by the RCO and/or the RCC.
2. Extremity badges or rings shall be worn when:
 - a. an individual is using or assisting in the use of unsealed sources of radioactive materials of 1,000 microcuries (37 MBq) or more of beta-emitting radionuclides with a maximum beta energy of 1,000 kiloelectron volts or more in any month.
 - b. an individual receives a dose of 40 millirem (400 μ Sv) or more on a whole body Luxel/film/TLD badge for 2 consecutive months while working with unsealed sources.
 - c. specified by the RCO and/or the RCC.

All monitoring devices shall be obtained from the Radiation Control Office, see Appendix A for Personnel Monitoring Device Application form. Each Luxel/film/TLD badge shall be assigned to and worn by only one individual. Luxel/film/TLD's may be exchanged monthly, bi-monthly, or quarterly depending upon monitoring device wear location and expected radiation exposure. Delivery, exchange and pickup of badges shall be the responsibility of the Radiation Control Office; however, these functions are performed in cooperation with Film Badge Coordinators in some work areas. In the event that a monitor is damaged, lost, or accidentally exposed, it is the responsibility of the Principal Investigator to notify the Radiation Control Office immediately for monitor replacement or processing. Permanent records of monitor readings are maintained by the Radiation Control Office. A copy of the monthly readings is mailed to the Film Badge Coordinator in each work area.

3. Pocket Dosimeters

Pocket dosimeters may be required to be worn in addition to the Luxel/film/TLD badge if other types of monitors are inadequate in the judgment of the Radiation Control Officer or the Radiation Control Committee. This shall apply where the investigator is working in a high radiation area or in some instances, working with high level radioactive materials or other ionizing radiation. When these devices are used, the Principal Investigator is responsible for maintaining daily pocket dosimeter records. Copies of these records shall be submitted quarterly to the Radiation Control Office.

B. Exposure Reports

The Radiation Control Office will provide annual radiation exposure reports to those individuals who have been assigned a Luxel/film/TLD badge or other monitoring device. Termination radiation exposure reports will also be provided to those badged individuals who terminate employment requiring personnel dosimetry. Forwarding addresses must be available to facilitate this mailing.

IV. BIOASSAY PROGRAM

A. Biological Samples

Biological samples may be taken from all personnel working with heavy elements, millicurie quantities of tritium or other radionuclides, at intervals specified by the Radiation Control Officer. Biological samples will be taken from all personnel who have ingested or who are suspected to have ingested, radioactive material and on other occasions deemed necessary. Requirements of the bioassay program for tritium are found in [Appendix F](#), Application of Bioassay for Tritium.

B. Partial body/whole body counting

Thyroid monitoring of individuals working with radioiodine is required as specified in [Appendix G](#), Application of Bioassay for I-125 and I-131.

C. Participation

All personnel working with tritium and radioiodine will receive a questionnaire each month regarding their use of these radionuclides. If the amount of activity used does not meet the participation criteria this fact should be noted on the questionnaire. The questionnaire serves to remind individuals of the program requirements and to verify participation of all individuals in the program.

Analysis for other radionuclides can be performed upon request.

D. Exposure Reports

The Radiation Control Office shall include bioassay results in the annual radiation exposure reports.

V. SECURITY OF RADIOACTIVE MATERIAL

In order to maintain safety and security associated with the use of radioactive material, the Principal Investigator or other individuals responsible for the use of radioactive material, will maintain these materials in a locked enclosure (cabinet, refrigerator, etc.) or otherwise secure the facility from unauthorized access or removal.

VI. CAUTION SIGNS, NOTICES, AND POSTERS

Each Principal Investigator is responsible for posting of proper warning signs in all areas in which radioactive materials and radiation producing devices are used. Appropriate warning signs are available from the Radiation Control Office.

The following signs must be posted in each radionuclide lab:

Emergency Notification
Emergency Procedures

Notice to Employees
Safety Rules for a Radioisotope Laboratory

VII. RADIATION DETECTION INSTRUMENTATION AND SAFETY EQUIPMENT

A. The Principal Investigator is responsible for assuring that suitable radiation detection instruments and other necessary safety equipment are available in all radiation facilities for which he is responsible and that the equipment is working order.

B. Radiation Detection Instruments (Survey Meters)

Calibrated survey meters which are appropriate for the type and level of ionizing radiation being used must be available. Survey meters must be calibrated every 6 months. Contact the Radiation Control Office for instrument calibration and minor repair services.

VIII. LABORATORY SURVEYING AND MONITORING

Each Principal Investigator is responsible for routine (weekly) area surveying and monitoring of radiation facilities to assure the absence of contamination. Monthly surveys are required when radioactive materials are in storage. Permanent records shall be maintained by the investigator, for at least three years, for review by Radiation Control and DOH inspectors. The Radiation Control Office provides Radiation/Contamination Survey Forms, [Appendix A](#), for recording survey results. Periodic and unannounced surveys and monitoring of radiation facilities will be made by representatives of the Radiation Control Office. Upon request, the Radiation Control Officer or his representative will survey and monitor a laboratory, experimental setup, and/or waste storage facilities.

IX. EMERGENCY PROCEDURES

- A. Minor Spills: (Less than 100 microcuries of activity and/or 5 mR/hr @ 1 foot)
1. NOTIFY - Notify persons in the area that a radioactive spill has occurred.
 2. PREVENT THE SPREAD - Cover the spill with absorbent paper.
 3. CALL FOR HELP - Report incident to the Radiation Control Office (392-7359 or 392-1589). If possible have someone not involved in the spill make the report. In the event the Radiation Control Office cannot be reached, utilize [Emergency Call List](#) (Page iii).
 4. CLEAN UP - Use disposable gloves (and remote handling tongs for high energy beta's and gammas). Do not spread contamination – use absorbent paper and carefully wipe spill from outside to inside. Insert into a plastic bag and dispose all waste in a radioactive waste container. Include all other contaminated materials such as disposable gloves.
 5. SURVEY - If using an isotope other than a low energy beta emitter, use a survey meter and check the area around the spill, your hands, shoes, and clothes for contamination. A swipe survey shall be performed to demonstrate that decontamination results are below the University of Florida limit of 100 dpm/100 cm².
- B. Major Spills: (More than 100 microcuries of activity *or* 5 mR/hr at 1 foot or personal contamination)
1. CLEAR THE AREA - Notify all persons not involved in the spill to vacate the room. These people shall remain near the room to be checked for contamination.
 2. PREVENT THE SPREAD - Cover the spill with absorbent material, but do not attempt to clean it up. Confine the movement of all potentially contaminated personnel to prevent the spread.
 3. CALL FOR HELP - Notify the Radiation Control Office (392-7359 or 392-1589) immediately. If possible have someone not involved in the spill make the notification. In the event the Radiation Control Office cannot be reached, utilize [Emergency Call List](#). (Page iii)
 4. SHIELD THE SOURCE - If possible shield the spill, but only if it can be done without further contamination or without significantly increasing your radiation exposure.
 5. CLOSE THE ROOM - Leave the room and lock the door(s) to prevent entry. Post a sign “Contamination DO NOT enter until cleared by Radiation Control.”
 6. PERSONNEL DECONTAMINATION - Contaminated clothing should be removed and stored for further evaluation by the Radiation Control Office. If the spill is on the skin, flush thoroughly and then wash with mild soap and lukewarm water. Proceed to decontaminate and survey under the direction of a Radiation Control Representative.

7. FACILITY DECONTAMINATION –

- Upon direction of the Radiation Control Office, proceed to clean up spill and survey as in I.d. and I.e. above.
- Shoe covers should be used to prevent personal contamination.
- Both body and extremity badges may be required.

NOTE: Decontamination shall be the responsibility of the experimenter and/or his supervisor and shall be carried out under the direction of the Radiation Control Officer or persons designated by him, and with the cognizance of the other University officials who may be responsible for the facility or laboratory.

X. RADIOACTIVE MATERIAL INVENTORY

Each Principal Investigator is responsible for providing quarterly radioactive material inventory reports to the Radiation Control Office. Permanent records of inventories shall be maintained by the Principal Investigator for review by Radiation Control and DOH inspectors. Inventory record forms are available from Radiation Control. [Appendix H](#) contains detailed instructions for completing the [Quarterly Radioactive Material Inventory](#) form. Maintenance of the [Utilization Form](#), also described in [Appendix H](#), will facilitate this process.

XI. TRANSFER OF RADIOACTIVE MATERIAL

A. On Campus Transfers

Since approval for the procurement and use of radioactive material was initially given for the original working area and proposed research under the supervision of the approved Principal Investigator, radioactive material shall not be transferred from one area to another or to other individuals without approval of the Radiation Control Office.

After approval on the proper transfer form, transfers must be recorded on both the transferring and receiving laboratory's' radionuclide utilization forms.

B. Off-Campus Transfers

Radioactive material shall not be shipped or transferred to, or from any University facility, or outside organization without prior approval of the Radiation Control Office.

C. Disposal of Equipment Containing Radioactive Material

Prior to the disposal of obsolete or irreparable equipment (radioactive material refrigerators, liquid scintillation counters, gas chromatographs, etc.), the Radiation Control Office must be notified in order to remove warning labels and sources, amend inventory lists, and to verify the absence of contamination, where applicable.

XII. RADIOACTIVE WASTE DISPOSAL

A. Procedures

[Radiation Control Technique #2, Instructions for Preparation of Radioactive Waste for Disposal](#), contains radioactive waste disposal procedures which are applicable to the majority of waste generated in laboratories and is available from the Radiation Control Office or the Hazardous Materials Management Office. The Hazardous Materials Management Office (392-8400) should be contacted for disposal information for unusual types of waste. In addition to the radioactive material warning label, waste must be identified as to other hazards present such as poisons, carcinogens, organics or corrosives. Red or biohazard bagged waste will not be picked up. If you have active biohazardous waste and are unsure of an inactivation procedure, contact the Biological Safety Officer (392-1591).

B. Waste Reduction Methods

1. Minimize waste by preventing unnecessary contamination.
2. Clean and reuse lab equipment when possible. RECYCLE.
3. Only dispose of materials that are actually contaminated. Packing materials and boxes which have not been in contact with radioactive material shall be disposed of in regular trash after radioactive warning labels have been removed or obliterated. If a spill occurs on mat paper, only the contaminated area should be placed with radioactive waste. Remaining paper may be placed in regular trash. **SEPARATE RADIOACTIVE WASTE FROM NONRADIOACTIVE WASTE.**
4. Review your procedures and determine what processes contaminate clean material and formulate measures to minimize amount of contamination, e.g., unnecessary transfer between pieces of glassware. **PREPLAN.**
5. Your commitment is absolutely essential to achieve volume reduction and to assure ongoing employee training that reduces contamination.

All radioactive materials labels on empty shipping containers must be removed or defaced prior to disposing of the container in regular trash.

XIII. SEALED SOURCE LEAK TESTS

All beta, gamma, and neutron sealed sources shall be leak tested at intervals not to exceed six months, and all alpha sealed sources shall be leak tested at intervals not to exceed three months, unless more frequent intervals are prescribed by the Radiation Control Officer and/or the Radiation Control Committee. Leak tests shall be performed according to written procedures.

XIV. SPECIAL PROCEDURES FOR ANIMAL USE IN RESEARCH

- A. Animals containing radioactive material shall not be caged and/or kept in a laboratory except with the consent of the Radiation Control Officer and/or his designee. Special cage areas and a procedure room are provided by the Animal Resources Department in the Communicore Basement, JHMHC. Procedures for radioactive material use in these areas are posted at each location.

- B. Use of animals in research shall conform to rules in the "Guide for the Care and Use of Laboratory Animals" and/or those policies of the Institution's Animal Care and Use Committee.