

UCONN HEALTH
OFFICE OF RADIATION SAFETY
PROCEDURES GOVERNING PROCUREMENT, USE
AND DISPOSAL OF RADIOACTIVE MATERIALS

UConn Health is authorized to use byproduct radioactive materials under specific license of broad scope issued by the U.S. Nuclear Regulatory Commission (NRC). Continuing license authority is contingent upon the establishment and maintenance of a radiation safety program that will insure that licensed radioactive materials are used in an acceptable manner and in accordance with federal and state regulations and institutional policies. The procedures contained in the Radiation Safety manual outline radiation safety practices applicable to personnel working with radioactive materials under the authority of UConn Health's NRC license.

The manual outlines procedures established by the Health Radiation Safety Committee to assist authorized investigators to fulfill their responsibilities for radiation safety. The responsibility for using radioactive material in a safe and acceptable manner ultimately rests with the authorized investigator. It is essential that all personnel working with radioactive material be familiar with the contents of the radiation safety manual and conducts his/her activities in accordance with the procedures contained therein.

Raymond W. Ryan, Ph.D., Chairman
Radiation Safety Committee

Attachment

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I. INTRODUCTION

A. Purpose

1. This manual (notebook) describes regulations, policies, and procedures for use of both licensed and non-licensed radiation sources. It is a compilation of authoritative standards, guidelines, directives and recommendations governing the use of radioactive materials. The rules and procedures set forth in this manual are designed to protect employees, patients, the public and the environment against unnecessary exposure to radiation.

The United States Nuclear Regulatory Commission (NRC) has developed standards and regulations pertaining to radiation safety, which must be adhered to in institutional radiation safety programs. The two most pertinent regulations are Parts 19 and 20 of Title 10, Code of Federal Regulations. Copies of these parts are appended.

- a. 10 CFR 19 - Notices, Instructions, and Reports to Workers

The regulations in this part establish requirements for notices, instructions and reports by licensees to individuals participating in licensed activities, options available to individuals in connection with Commission inspections/investigations, regulations, orders, and licenses regarding radiological working conditions.

- b. 10 CFR 20 - Standards for Protection Against Radiation

The regulations in this part establish standards for protection against radiation hazards arising out of activities under licenses issued by the Nuclear Regulatory Commission.

B. Definition and Coverage

1. The UConn Health complex, shall be defined as follows:

- a. UConn Health
263 Farmington Avenue
Farmington, CT 06030

- b. Office of the Chief Medical Examiner
11 Shuttle Road
Farmington, CT 06030

- c. UConn Health
400 Farmington Avenue
Farmington, CT 06032

- d. UConn Health
230 Farmington Avenue
Farmington, CT 06032

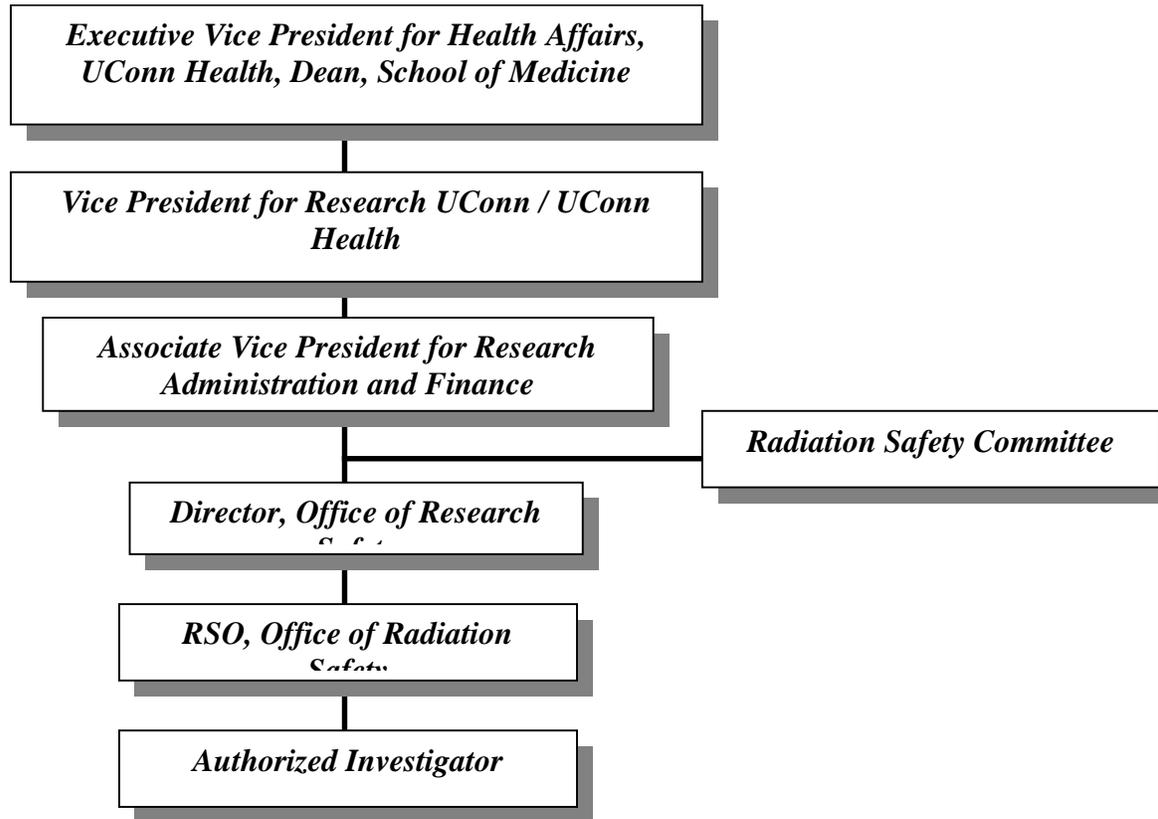
Such buildings and/or facilities existing on the premises at the above locations have been allocated to UConn Health for Research and Development and/or Medical Use, as defined in our license.

2. Unless otherwise stated all rules and regulations, both governmental and institutional, will apply equally to all areas covered under the title of UConn Health as defined above.

C. Administrative Organization

1. Organizational Chart

The administrative structure to supervise the possession of radiation sources and their use within UConn Health facilities is set forth in the following organizational chart.



2. General Information

Chairman, Radiation Safety Committee Raymond W. Ryan, Ph.D., x-2865

Radiation Safety Officer James Fomenko, C.H.P., x-2250

Radiation Safety Office Building 20, room G022, x-2250

D. Radiation Safety Committee

1. General Description

The Radiation Safety Committee is the administrative body responsible for the safe use of ionizing and non-ionizing radiation producing sources and equipment within UConn Health and associated facilities. The role and responsibility of the Committee is established by federal regulation. Committee members are appointed by the Executive Vice President for Health Affairs, UConn Health, Dean, School of Medicine. It is composed of a representative from management, the nursing service, the Radiation Safety Officer (RSO) and other individuals with appropriate training and experience from each area of use. The Committee must meet at least quarterly. A quorum consists of one half the Committee membership, including the management representative, and the Radiation Safety Officer.

Approval of individuals to use radioactive materials is made by a subcommittee consisting of the Committee chairperson, the RSO and one other member appointed by the chairperson. The subcommittee will report its activities to the full Committee at each quarterly meeting.

A subcommittee designated as the Radioactive Drug Research Committee (RDRC) is composed of the chairperson of the Radiation Safety Committee, selected members of the RSC and the RSO. The RDRC evaluates all proposals for research use of radioactive materials in human subjects. The human research activities are reported to the full Committee and human research is done only with the approval of the Institutional Review Board.

2. Duties and Responsibilities

a. Responsibilities

The Committee is responsible for:

1. Ensuring that all individuals who work with or in the vicinity of radioactive material have sufficient training and experience to enable them to perform their duties safely and in accordance with NRC regulations and the conditions of the license.
2. Ensuring that all use of radioactive material is conducted in a safe manner and in accordance with NRC regulations and the conditions of the license.

3. Establish a program to ensure that all individuals whose duties may require them to work in the vicinity of radioactive material are properly instructed as required by Section 19.12 of 10 CFR 19.
4. Review and approve all requests for use of radioactive material within the institution.
5. Prescribe special conditions that will be required during proposed use of radioactive material such as requirements for bioassays, physical examinations of users and special monitoring procedures.
6. Review the entire radiation safety program at least annually to determine that all activities are being conducted safely and in accordance with NRC regulations and the conditions of the license.
7. Recommend remedial action to correct any deficiencies identified in the radiation safety program.
8. Maintain written records of all committee meetings, actions, recommendations and decisions.
9. Ensure that the byproduct material license is amended, when necessary prior to any changes in facilities, equipment, policies, procedures and personnel.

E. Radiation Safety Officer

The Radiation Safety Officer (RSO) implements the policies established by the Radiation Safety Committee and ensures compliance with federal and state regulations. The RSO reports to the Associate Vice President for Research Administration and Finance and the Radiation Safety Committee.

1. Responsibilities

- a. General surveillance over all activities involving radioactive material, including routine monitoring and special surveys of all areas in which radioactive material is used.
- b. Furnishes consulting services on all aspects of radiation protection to personnel at all levels of responsibility.
- c. Establishing procedures for purchasing, receiving, transferring or shipping of all radioactive materials.

- d. Distributing and processing personnel monitoring equipment; determining the need for and the evaluation of bioassays; maintaining exposure and bioassay records; notifying individuals and their supervisors of excessive exposures and recommending appropriate remedial action.
 - e. Conducting training programs and instructing personnel in proper procedures when working with radioactive materials.
 - f. Supervising the radioactive waste disposal program.
 - g. Performing required leak tests on sealed sources.
 - h. Calibration of radiation survey meters.
 - i. Maintaining an inventory of all radionuclides at UConn Health and limiting the quantities to that authorized by the license.
 - j. Investigating accidents, incidents or other abnormal occurrences involving radioactive materials.
 - k. Supervising decontamination procedures.
 - l. Maintaining all required records associated with the radiation safety program.
2. The Radiation Safety Officer has the authority to terminate immediately any use of radioactive material that is determined to be a threat to health or property. The RSO also has the authority to stop the purchase of radioactive materials for any violation of procedures or regulations until the situation is corrected.

F. Authorized Principal Investigator

An Authorized Principal Investigator is a UConn Health Faculty or professional staff member who has been authorized by the Radiation Safety Committee to use radioactive materials and to supervise the use of these materials by others. The Authorized Principal Investigator is responsible for insuring that individual user responsibilities are discharged by those using radioactive materials under his/her direction.

A copy of the Nuclear Regulatory Commission (NRC) Licenses and results of NRC inspections are available for review in the Office of Radiation Safety, Building 20, room G022.

Responsibilities:

1. Determine the type and amount of radioactive material to be used, develop appropriate safety precautions and, when necessary, conduct a cold run of procedures to insure against unexpected problems.
2. Instruct individual users under his/her supervision in practices for safely working with radioactive materials. Insure that these individual users attend appropriate Radiation Safety training lectures.
3. Insure that appropriate personnel monitoring devices or bioassay procedures are used.
4. Promptly inform the RSO of personnel and/or procedural changes or equipment alterations that may affect radiation control or personnel exposures.
5. Assure compliance with regulations for:
 - a. Acquisition and transfer of radioactive materials
 - b. Marking of radiation areas and equipment
 - c. Proper labeling of containers
 - d. Proper waste disposal
 - e. Maintaining records of receipt, transfer and disposal of radioactive material; semi-annual inventory; and laboratory surveys
 - f. Securing radioactive materials against tampering, loss, theft or unauthorized removal
 - g. Providing adequate instrumentation for assessing potential radiation hazards in their area and performing routine surveys of personnel and the work area
6. Insure that service personnel are not permitted to work on equipment, hoods or sinks in areas where RAM are used or stored without clearance from the Radiation Safety Office.
7. Comply with procedures for termination of employment or use of radioactive materials (Appendix XIII). Return personnel radiation-monitoring badges to the RSO. Radioactive materials must be turned in to the RSO or transferred to an authorized investigator. The RSO must be notified if the materials are to be shipped elsewhere. A final decommissioning survey of the laboratory is also necessary.

8. Assure that eating, drinking and the application of cosmetics are prohibited in areas where unsealed radioactive materials are present. Smoking is prohibited inside UConn Health.
9. Assure that required contamination wipe test surveys and meter surveys when appropriate are performed of all radioactive material use/storage areas and are documented.

G. Individual User

An Individual User is a member of the UConn Health community who uses radioactive material or a radiation-producing device under the direction of an Authorized Investigator.

A copy of the Nuclear Regulatory Commission (NRC) Licenses and results of NRC inspections are available for review in the Office of Radiation Safety.

Responsibilities:

1. Be familiar with the contents of the Radiation Safety Notebook.
2. Comply with the procedures and precautions contained in this document and with those established for his/her laboratory.
3. Keep his/her radiation exposure as low as is reasonably achievable.
4. Promptly report to the Authorized Investigator or Radiation Safety Office any condition, which may lead to a violation of NRC regulations or to an unnecessary exposure.

II. PROCEDURES FOR OBTAINING RADIOACTIVE MATERIALS

A. Policy

As a matter of policy, the investigator applying to the Radiation Safety Committee for authorization must hold an appointment on the faculty or staff of UConn Health.

B. Authorization Procedures

1. The Radiation Safety Committee desires to have a minimum of red tape to obtain radionuclides, but not all of it can be eliminated. The Investigator can save time and trouble by following these instructions and by using as much foresight as possible in anticipating his/her needs.
2. To obtain radionuclides, under the UConn Health is Byproduct Material license for use at Health Center facilities only, and not in human beings, obtain a license application form from the Radiation Safety Office. A copy of this form is available on the Radiation Safety website. These forms must be completely filled out in duplicate, signed and returned to the Radiation Safety Office. Only one requested radionuclide per application form.

The Radiation Safety Officer and Radiation Safety Committee will review these forms, and when approved, a copy of the approved application will be sent to the applicant for filing.

Radiation Safety Committee approval of any application will be for a period of 5 years or as otherwise authorized by the Committee. Also the Committee reserves the right to revoke any authorization issued under UConn Health Byproduct License should the need arise.

3. For radionuclides and uses not covered by UConn Health's Byproduct License, the Radiation Safety Committee and the U.S. Nuclear Regulatory Commission (USNRC) must both approve. Application is made to the Committee.
4. For human use applications, a form must be filled out in duplicate and submitted to the Radioactive Drug Research Committee (RDRC) for evaluation. Forms are obtained from and submitted to the Radiation Safety Office. The UConn Health Institutional Review Board requirements must also be met.

C. Purchasing of Radioactive Material

All purchasing of radioactive materials must be done by the Radiation Safety Office (RSO). Requisitions for radioactive materials must be entered on-line using the Husky Buy system. Call the office of Radiation Safety, x 2250, for guidance on how to properly enter radioactive material requests into the purchase requisition. **ALL** radioactive materials must be obtained through the Office of Radiation Safety including, but not limited to, "gratis" shipments and very small quantities.

D. Receipt and Delivery of Radioactive Materials (See also Appendix IV)

1. When a shipment of radioactive materials is received at UConn Health, the Receiving Department will immediately notify the Radiation Safety Office. The package will be picked up at the Receiving Department by RSO personnel who will inspect the package in accordance with 10 CFR 20.1906. The package is then delivered to the Investigator.
2. The Investigator is responsible for inspecting and opening certain packages, i.e., dry ice shipments and RIA kits that are not opened by the Radiation Safety Office.

E. Transfer of Radioactive Materials

Any transfer of radioactive material from an Investigator to another Investigator within a UConn Health facility must be in accordance with UConn Health Radioactive Material Loan or Transfer Policy. This policy is provided as Appendix XIV. Key points of this policy are as follows:

1. Prior to any transfer of radioactive material to an individual not working under your direct supervision and radioactive materials authorization, the Authorized Investigator or delegate must call the Office of Radiation Safety for approval.
2. Radioactive material sent off-campus or requiring transport **must** be done by the Office of Radiation Safety.
3. If the Office of Radiation Safety approves the transfer, the Authorized Investigator or delegate must ensure the radioactive material is properly:
 - a) Packaged,
 - b) Transported to the destination laboratory, as applicable, and
 - c) Recorded as a transfer on your radioactive materials inventory sheet.
4. The Authorized Investigator or delegate whom receives the radioactive material must also record the transfer on their radioactive materials inventory sheet.

III. USE OF RADIOACTIVE MATERIAL

A. Policy

1. Investigators must be approved by the Radiation Safety Committee prior to work with radioactive materials. They are responsible for supervising the work being done under their authorizations.
2. The minimum safety standards for use of radioactive materials must meet requirements set forth in Title 10, Code of Federal Regulations, Part 20, (10 CFR 20) - Standards for Protection Against Radiation. When human use of radioactive materials is intended, Title 10, Code of Federal Regulations, Part 35, also apply. In addition, any license conditions specified by the Nuclear Regulatory Commission must be adhered to.

B. Limits of Radiation Exposure

1. No person shall be permitted to receive a radiation dose equivalent in one calendar year in excess of that listed in this paragraph, except under the conditions specified in 10 CFR 20.1201(b) or 10 CFR 20.1206. Effort should be made to keep exposures as low as reasonably achievable. See details of the UConn Health ALARA program in Appendix XI.

	Type of Exposure	Rem Per Year
a.	Total Effective Dose Equivalent (TEDE) which is the sum of the Deep-Dose Equivalent (for external exposures) and the Committed Effective Dose Equivalent (for internal exposures) for the whole body	5
b.	Sum of the Deep-Dose Equivalent and the Committed Dose Equivalent to any individual organ or tissue other than the lens of the eye	50
c.	Eye Dose Equivalent (lens of the eye)	15
d.	Shallow Dose Equivalent to the skin or to any extremity	50

2. Individuals under the age of 18 years will not be permitted to receive a radiation exposure in excess of 10% of the limits set forth in paragraph 1 of this section.
3. The radiation dose equivalent limit to the embryo/fetus of a declared pregnant woman during the entire pregnancy is 0.5 rem. A declared pregnant woman means a woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception. This limit is based on the concern for reducing radiation exposure to the fetus, which may be particularly sensitive to radiation effects, especially during the first trimester. A declared pregnancy form and instructions on declaring a pregnancy is provided in Appendix XII. Unless a pregnancy is declared, the occupational exposure limits apply.

C. Employment of Minors in Radiation Areas

Federal regulations require that minors (persons under 18 years of age) do not receive during the calendar year from radioactive material and other sources of radiation in the licensee's possession a dose in excess of 10% of the limits specified in paragraph B.1., above.

For all practical purposes, it is impossible to guarantee that a minor actively working with radioactive material or in a potential radiation exposure situation will not exceed these restrictions. Therefore, the Radiation Safety Committee has restricted access for persons less than 18 years of age for work in UConn Health laboratories, which use radioactive materials unless an educational benefit to the minor can be shown. If an Investigator wishes to have a minor in his/her laboratory, prior approval must be obtained from the Radiation Safety Committee. He/she should send a letter to the Radiation Safety Office identifying the minor, the type of work involved, the potential for radiation exposure, the

educational benefit and what steps will be taken to insure that the minor will not receive a significant exposure. However, due to a variety of other regulatory restrictions, minors in general are not allowed in Research laboratories.

D. Training (See also Appendices VIII - X)

The minimum training requirements for each individual entering a restricted area where radioactive materials are present are described in 10 CFR 19.12. The Authorized Principal Investigator is responsible for training the individuals working in their laboratory. The Radiation Safety Office assists the Principal Investigator by providing lectures on radiation safety. Investigators are responsible for insuring that new individuals receive appropriate radiation safety training before they begin working with radioactive material in the laboratory.

E. Personnel Monitoring Services

The Radiation Safety Office will provide personnel monitoring services to assess radiation exposures, when appropriate. The Radiation Safety Office provides an exposure history report to all monitored personnel on an annual basis.

1. Whole Body Badges

- a. Except for individuals using soft beta emitters, pure alpha emitters or other radiation sources as determined by the RSO, everyone directly involved with radioactive material or ionizing radiation producing equipment at UConn Health facilities will be required to have and wear a whole body badge when working. Requests for badges should be made using the on line form available through the Radiation Safety website.
- b. Whole body badges are provided by the Radiation Safety Office on a monthly basis. Badges for a given month are delivered to the various departments. Employees then exchange the badge, which they have worn for the past month for a new one. The old badges are collected and sent off for processing. The minimum radiation exposure detectable on the current monitoring badge is 1 mrem. The exposures to the badges are reported monthly. Copies of these reports are on file in the Radiation Safety Office. All reports are reviewed by the Radiation Safety Officer. Individuals with excessive or unusual exposures are contacted as stipulated in the UCHC ALARA program (Appendix XI). Individuals may review their radiation exposure histories with the Radiation Safety Officer.
- c. A badge must first be placed in the plastic holder and then should be worn on the trunk of the body either at the waist, the chest or on the collar. The badge should always be worn with the front of the badge holder facing away from the body.
- d. Do not store the badge in a radiation area or in areas with excessive heat or moisture. Do not take the badge home or wear it during non-job related radiation exposures such as medical or dental x-ray examinations. The badge should be worn at all locations

(including non-UConn Health Facilities) where occupational exposure to radiation is possible.

- e. Cancel and return the badge(s) to the Radiation Safety Office if monitoring is no longer needed or employment at UConn Health has ended.

2. Thermoluminescent Dosimeter Ring Badges

TLD ring badges may be required for personnel handling certain radionuclides (i.e., high energy beta emitter, ...) to monitor finger and hand exposures. The TLD finger badge should be worn, preferably on the first finger, next to the skin under protective gloves. The ring is usually orientated so that the TLD chip is located on the palmar surface of the finger. The TLD chip should always face the direction of maximum radiation exposure.

3. Bioassays

- a. Any individual using more than 100 millicuries of 3-H water, tritiated sodium borohydride, or tritiated gas per experiment or more than 10 millicuries of a 3-H labeled organic compound per experiment must have an assay performed on his/her urine within one week following single operations. If these quantities are used routinely, a weekly analysis of the urine must be performed.

The Radiation Safety Committee or the Radiation Safety Officer may require, at their discretion, urine bioassays for other radionuclides and/or other circumstances.

- b. All personnel who use one or more millicuries of iodine-125 in procedures where volatilization is likely (protein labeling, patient treatment with NaI, etc.) must visit the Radiation Safety Office to be monitored for thyroid uptake of radioiodine within 7 days. Personnel handling iodine-131 under similar conditions must visit the Radiation Safety Office for monitoring within 3 days.
- c. All bioassay procedures will be performed by the Radiation Safety Office or by persons or organizations approved by the RSO. Arrangements for bioassay procedures may be made by contacting the Radiation Safety Office.

F. Laboratory Survey Equipment

1. Each laboratory will usually have on hand or have ready access to a portable survey meter capable of detecting low levels of radiation. The instrument is to be used for evaluating the radiation environment and monitoring personnel and work areas for contamination.

2. Survey meters must be calibrated periodically. The Radiation Safety Office performs this service routinely at one-year intervals. Contact the Radiation Safety Office to have new instruments added to our list for automatic periodic calibration.

G. Security

Radioactive materials must be secured against tampering, loss, unauthorized removal and theft when not attended. The entrance door(s) to the laboratory must be closed and locked, unless other arrangements have been permitted, when the laboratory is unattended. The radioactive materials security and enforcement policy is attached in Appendix XVI and is an NRC requirement.

H. Record Keeping Requirements

1. The Radiation Safety Office shall maintain all records required to satisfy requirements specified in Nuclear Regulatory Commission regulations and conditions of UConn Health's byproduct material licenses.
2. Each Authorized Investigator shall file with the Radiation Safety Office a semi-annual inventory of radioactive material on hand and other items as requested. Inventory forms will be provided by the Radiation Safety Office at the time the inventory is to be conducted. Failure to return this inventory will result in temporary suspension of ordering privileges.
3. The Radiation Safety Office will compile a master record of waste disposal from information provided by Investigators. Radiation Safety will also maintain records of waste transferred to a licensed disposal contractor.
4. Individual Users must keep records of receipt of licensed material and disposal to sanitary sewers, in animal remains, and to waste disposal containers provided by the Radiation Safety Office. Any removal of radioactive materials from stock solutions must be documented on a use log and maintained such that the use of the material can be tracked.
5. The Radiation Safety Office shall maintain records of quarterly laboratory surveys. Authorized Investigators shall maintain records of monthly surveys they conduct in their laboratories.

IV. RADIOACTIVE WASTE DISPOSAL

It is the policy of UConn Health that all forms of radioactive waste be picked-up and processed by the Office of Radiation Safety. Sewer disposal is usually limited to decontamination

activities. The details of the program are provided in Appendix V – Radioactive Waste Disposal Procedures.

V. RADIATION PROTECTION PROCEDURES

All Authorized Investigators must comply with the following procedures and must ensure that Individual Users under their direction adhere to these rules.

A. Identification of Use Areas and Equipment

1. A “Caution Radioactive Material” sign must be conspicuously posted on each door to laboratory areas where radioactive materials in an amount exceeding 10 times the quantity as specified in Appendix C, 10 CFR 20, are used or stored. The names(s) and phone number(s) of personnel to be contacted in case of an emergency should also be posted.
2. Storage areas shall be conspicuously marked with a “Caution Radioactive Material” sign. All containers in which materials are stored or transported must be similarly identified. These signs should state the radionuclide, activity and the date.
3. Any accessible area where an individual could receive a dose equivalent in excess of 5 mrem in one hour at 30 cm from the radiation source shall be posted with a “Caution Radiation Area” sign.
4. One or more “Caution High Radiation Area” signs will be conspicuously posted so that they are visible from the entrance to, and from any place in an area where radiation levels sufficient to expose a major portion of the body in excess of 100 mrem in any one hour are present.
5. Equipment contaminated with radioactive material shall be appropriately labeled. Lab ware and laboratory containers such as beakers, flasks and tubes, which are used with radioactive materials, should be labeled.
6. Sinks used for washing radioactive material contaminated items, such as glassware, must be labeled with "Caution Radioactive Material" tape. A disposal log sheet must also be conspicuously posted and information placed on this log when such operations are performed. Facilities personnel may not work on such sinks unless prior approval is obtained from the Office of Radiation Safety. See the sewer disposal form in the “Records” Section of this notebook.

B. Shielding

Appropriate shielding should be provided so that the dose equivalent measured at 30 cm from sources (i.e., stock solutions, ...) will not exceed 2 mrem in any hour. Contact the Radiation Safety Office regarding shielding materials and techniques.

C. Radioactive Gases, Powders, and Aerosols

Procedures involving aerosols, powders, or gaseous products, or procedures, which might produce airborne contamination, shall be conducted in an approved hood, dry box, or other suitable closed system. Each hood system must be alarmed or otherwise equipped to provide an immediate indication of airflow loss.

Releases to the environment from hoods or other release points must not exceed the maximum effluent concentrations in air as specified in Appendix B of 10 CFR 20, Table 2. Traps and filters are incorporated, as necessary, into the experimental set up to insure that environmental releases are as low as possible. Air sampling is usually required; contact the Radiation Safety Office prior to any such work.

D. Sealed Radiation Sources

Sealed radiation sources must be handled with tongs or other remote handling devices that will reduce exposure to the hands and body. This procedure is not required but is recommended when handling low activity check sources. Sealed sources shall be tested for leakage in accordance with license conditions at intervals not to exceed six months. Sources designed for the purpose of emitting alpha particles shall be tested at intervals not to exceed three months. The required leak tests shall be performed and records maintained by the Radiation Safety Office.

E. Laboratory Surveys

The immediate areas (e.g., hoods, bench tops, floors, ...) in which radioactive materials are being used must be checked for contamination at least at the frequency indicated in the Investigator's radioactive license, or as otherwise directed by the Radiation Safety Officer. Surveys generally consist of an evaluation with swipe media for removable contamination and may include a GM or NaI detector probed survey meter for evaluating fixed/removable contamination.

1. Authorized Investigators are required to document each radiation survey for their laboratory at the required frequency if radioactive materials are in use. Alternative survey requirements must have prior approval of the Radiation Safety Officer.
2. A quarterly survey of laboratories will be conducted by the Radiation Safety Office.

The quarterly surveys will consist of:

- a. A measurement of radiation levels with a survey meter sufficiently sensitive to detect 0.1 mR/hr.
 - b. A series of wipe tests to measure contamination levels.
3. A permanent record will be kept of all survey results, including negative results, and results of decontamination efforts.

F. Contamination Limits

Work areas and equipment will be kept as free of contamination as is practical.

1. a. In restricted areas, levels of removable contamination should not exceed 2000 net dpm per 100 cm² for beta and gamma emitters and 100 net dpm per 100 cm² for alpha emitters. Fixed contamination should not exceed 0.5 mR/hr at 1 cm from the surface.
 - b. Unrestricted areas should not have removable contamination levels in excess of one-tenth of the limits stated for restricted areas. Fixed contamination should not result in an exposure rate in excess of 0.2 mR/hr at 1 cm from the surface.
 - c. Notify the Radiation Safety Office if contamination has been identified in excess of the above limits.
2. Personnel must monitor skin and clothing regularly. Contaminated skin should be gently cleaned to as low as reasonably achievable. Contaminated clothing should be removed as soon as possible. Contaminated items must not be removed from the facility until they have been decontaminated through cleaning or decay. **The Radiation Safety Office must be notified immediately of all personnel contamination incidents.**

G. Repair and Maintenance of Contaminated Equipment

Equipment in which radioactive material has been used shall not be released for other work or repair by either University or contractor personnel or as surplus property until certified to be free of contamination by the Radiation Safety Office.

If repair of contaminated equipment is necessary, the Radiation Safety Office must be notified to assure that necessary precautions are observed.

H. Decontamination of Personnel (See also Appendices VI + VII)

1. If possible, obtain a quick meter survey of the contaminated area. Note the result.

2. The immediate washing of contaminated areas with warm water and a mild soap is the method of choice for two to three minutes at a time. Washing can be helped by scrubbing with a soft brush taking care not to abrade the skin. Dry the skin and monitor. Repeat washing, if necessary, three or four times. Record meter readings and note distances at which readings were taken. Information can be recorded on the "Incident Report Form" that is provided in the "Records" section of this notebook.
3. Call the Radiation Safety Office as soon as practical. Call the UConn Health Center Operator or see the back cover of this notebook for emergency numbers to report contamination incidents that occur outside of normal office hours (8am – 5pm).
4. Use of organic solvents or of acid or alkaline solutions for decontamination activities should be avoided.
5. Special attention should be paid to proper decontamination of creases, folds, hair and fingernails. Care should be taken to avoid spreading the contamination to uncontaminated parts of the body. Attempt to remove the contamination locally with absorbent material and, if necessary, with a proper masking of adjacent non-contaminated areas of the skin. Protect open non-contaminated wounds.
6. Special care should be taken not to contaminate the eyes or lips.
7. Decontamination of the eyes should be undertaken immediately. Irrigate the eyes with a copious amount of water or with appropriate medically approved solutions.
8. The individual should report to the Emergency Department for medical evaluation and treatment if an injury has occurred.

I. Decontamination of Areas and Equipment (See also Appendices VI + VII)

Call the Radiation Safety office immediately. See the back cover of this notebook for emergency numbers. Decontamination efforts should begin as soon as contamination is found and with the advice/assistance of Radiation Safety office staff. The extent, type and hazard of contamination should be evaluated and the limits of the affected area marked prior to starting the clean up. The Radiation Safety Office will assist in this evaluation and will recommend appropriate decontamination methods.

J. Transport of Radioactive Materials

In transporting radioactive material from one area to another, special precautions must be taken to avoid accidental spills or release of radioactivity to the environment. Materials producing external radiation should be shielded to keep radiation levels as low as reasonably achievable.

1. For transport between rooms no special packaging is required. However, containers (i.e., tubes, flasks, ...) with radioactive material solutions must be capped and should be transported in a suitable outer container that would protect the material if dropped.
2. For transport between buildings, radioactive materials should be shielded and packed so that there will be no spill or release in the event the package is dropped. The inner container should be packed in sufficient absorbent material that would absorb any liquid released through breakage or leakage.
3. For vehicular transport or removal from the UConn Health campus, or off campus facility, radioactive materials must be packaged according to Department of Transportation regulations. The Radiation Safety Office must be notified prior to transport. Severe federal penalties can be imposed for improper shipping of hazardous material. The Radiation Safety Office must receive from the intended recipient facility, a copy of their NRC or state radioactive material license showing that they are authorized to receive these radioactive materials **prior** to shipment. The Authorized Investigator/User is responsible for:
 - a. Completing the “Checklist for a Radionuclide Shipment” form. This form is provided in the “Records” section of this notebook.
 - b. Completing the swipe survey and appropriate labeling of the source containers,
 - c. Placing the source containers and refrigerant (dry ice, ice pack) into an appropriate box
 - d. Bringing the above items (a-c) to the Radiation Safety Office

The Radiation Safety Office will ensure that the radioactive materials are properly packaged and manifested prior to transport.

K. Individual Users

The purpose of this section is to provide procedures by which laboratory personnel may maintain a safe working environment and avoid contamination of equipment and facilities.

1. Never perform extensive radiochemical work with hazardous levels of material until the procedure has been tested by a dry run to preclude unexpected complications.

2. Where there is any chance that radioactive materials may become airborne, operations should be done in a fume hood or glove box. Iodination procedures must be done in a hood approved by the Radiation Safety Office.
3. Keep work areas clean and organized to minimize accidents, contamination and exposure.
4. Secure laboratory and storage areas against tampering, loss, theft, or unauthorized removal of radioactive and contaminated material. If radioactive materials are present within the laboratory, then the entrance door(s) must be closed and locked, unless other arrangements have been permitted, when the laboratory is unattended.
5. Wear prescribed monitoring equipment such as a whole body badge and a TLD ring badge.
6. Do not eat, drink or apply cosmetics in areas of your laboratory where radioactive materials are used and/or stored. Refrigerators/Freezers used for storage of radioactive materials shall not be used for storage of food or beverages. Smoking is prohibited inside UConn Health.
7. Use appropriate protective measures:
 - a. Wear a laboratory coat or other protective clothing when working with radioactive material or while in areas where they are used. Wear shoes with closed tops, sandals and similar footwear with exposed tops are not permitted while handling radioactive materials.
 - b. Wear disposable gloves at all times while handling radioactive materials. Change gloves as necessary to prevent spread of contamination.
 - c. Use protective barriers or shielding whenever possible. Lead barriers and lead-glass windows are appropriate for gamma emitters. Thick plexiglass shields are preferred for high-energy beta emitters.
 - d. Use remote handling devices such as forceps and tongs for handling high activity samples of gamma or high-energy beta emitters. Syringe shields must be used for preparation and administration of millicurie quantities of gamma emitters.
 - e. Use pipette-filling devices. **NEVER PIPETTE RADIOACTIVE SOLUTIONS BY MOUTH.**
8. When possible, use spill trays for performing all operations involving radioactive materials. Do not use cafeteria trays. In case of a spill, the tray limits the spread of contamination and simplifies clean up. Cover bench top work areas with easily decontaminated or removable materials such as absorbent pads with waterproof backing.
9. Keep "high activity" vials and syringes in shielded containers.

10. Confine radioactive solutions in covered containers that are clearly identified and labeled with the name of the radionuclide, chemical compound, date, activity, and radiation exposure rate, if applicable.
11. Label and isolate radioactive material, waste, glassware and contaminated equipment. Glassware and equipment should not be released for other use, or removed for cleaning, repair, or as surplus property, until demonstrated to be free of contamination.
12. Always transport radioactive material in accordance with established procedure.
13. Immediately report accidental skin contamination, inhalation, ingestion or injury from radioactive materials or other source of radiation to the Authorized Investigator and the Radiation Safety Office.
14. A survey of the immediate and adjacent work areas should be done at least once each day when radioactive materials are used. A record of all surveys, including negative results, should be maintained in the Radiation Safety notebook. Records of laboratory surveys performed at the specified frequency are required.
15. Survey hands, body and protective clothing before leaving the work area to eat, drink or work in another area. Perform decontamination as necessary
16. Decontamination should be performed in a manner that prevents the spread of contamination to other areas.
17. Comply with Radiation Safety Office requests to evaluate internal/external exposures to radiation through bioassay samples and procedures.

VI. EMERGENCY PROCEDURES (See Appendix VII)

Emergencies resulting from accidents in the handling of radioactive materials may vary from serious incidents involving high levels of radiation exposure or contamination to minor spills. It is difficult to know immediately the extent of a hazard that has been caused by the accident. In an emergency, the health and safety of personnel in the laboratory must be the primary concern.

A Radiation Emergency Call List is Located in the Outside Back Cover of this Notebook

A. Minor Spills

A minor spill involves little or no immediate radiation hazard to personnel.

1. Notify personnel in the area that a spill has occurred.
2. Restrict access to the contaminated area.

3. Confine or contain the spill immediately.
 - a. Liquid spill - use protective gloves, and cover the spill with absorbent paper.
 - b. Dry spill - use protective gloves, dampen absorbent paper and place over the spill.
4. Monitor involved personnel for contamination. Decontaminate if necessary. Record personnel monitoring results.
5. Clean up the spill. Use disposable gloves and remote handling tongs. Deposit clean up material into a plastic bag and then dispose into an appropriate radioactive waste container. Continue decontamination using detergent and water until no removable activity is detected by smear survey, or as otherwise authorized by the Radiation Safety Office.
6. Notify the Radiation Safety Office, x2250. During non-working hours, weekends and holidays, go to the back cover of this notebook to obtain emergency numbers for Radiation Safety staff or dial "0" for the operator if assistance is needed. The operator will contact a member of the Radiation Safety staff.

B. Major Spills

A major spill could result in a significant exposure to personnel.

1. Notify all personnel in the area of the accident. Ask personnel not involved in the spill to vacate the area.
2. Individuals who may have been contaminated should be taken to a nearby contamination free area for evaluation. Confine the movement of all personnel potentially contaminated to prevent the spread of radioactive material.
3. If personnel contamination is apparent, then take appropriate action. Remove contaminated clothing and place in plastic bags. Wash contaminated skin with mild soap and warm water. See Section V. - Radiation Protection Procedures, Subsection H. - Decontamination of Personnel, for additional information. Document all personnel contamination survey results.
4. Cover the spill with absorbent pads. Prevent access to the contaminated area. Wait for the arrival of, or for further instructions from Radiation Safety personnel.
5. Notify the Radiation Safety Office - x2250. After normal working hours report the accident to the UCHC police or to the emergency operator (7777) and ask to have Radiation Safety personnel contacted. Radiation Safety personnel will monitor all persons involved for contamination and will recommend steps necessary for clean up.

C. Fires and Explosions Involving Radioactive Material

1. Notify all personnel in the area at once. Remove any individuals who are severely injured as appropriate and necessary to a safe area. Life saving activities is top priority.
2. Dial 7777 to initiate UConn Health emergency response system. State the problem; give the location and the telephone number.
3. If a radiation hazard is not immediately present, attempt to extinguish the fire with the appropriate type of fire extinguisher.
4. Fire or explosion may result in airborne radioactivity. Keep upwind and avoid smoke, fumes, and dust. Hold breath if practical.
5. Restrict access to the incident area and prevent unnecessary handling of incident debris. Do not permit anyone to leave except for medical treatment. Get names and addresses of persons removed.
6. Segregate clothing and tools used at the fire. The Radiation Safety Office surveys these items for radioactive contamination before returning them for normal use.
7. Take appropriate action for injuries, spills or contaminated personnel.

D. Injured Contaminated Personnel

1. Make every effort possible to rescue injured and trapped persons and remove them as appropriate and necessary from the incident area.
2. If appropriate, initiate UConn Health emergency response system by dialing 7777 on the telephone. State the nature of the problem, the location and telephone number.
3. Unless administered by a Physician, Nurse, Emergency Medical Technician or appropriate medical staff, first aid should be limited to those persons where it is necessary to save life or minimize injury.
4. Wash minor wounds immediately under running water while spreading the edges of the wound.
5. Remove and save all articles of contaminated apparel. (i.e., lab coat, shoes, jewelry,...)
6. Injured and potentially contaminated persons not requiring immediate medical aide should not be permitted to return to work or leave the premises without the approval of a Physician and clearance from Radiation Safety personnel.

7. If it is necessary to send an individual to the Emergency Department before a Physician or Radiation Safety personnel have arrived, then inform emergency personnel that the injured person may be contaminated with radioactive material. Notify the Emergency Department (X2588) of the pending arrival of the possibly contaminated patient. Refer to the Emergency Call List in the outside back cover of this notebook.

E. Loss or Theft of Radioactive Materials

In case of loss or theft of radioactive materials, or suspected loss or theft, contact the Radiation Safety Office immediately.

F. Accident Reporting

All releases to the press and the public concerning incidents involving radiation or radioactive materials will be made by the Office of Communications, x4710.

Office of Communications: Mr. James Walter x-4710

VII. USE OF RADIONUCLIDES IN ANIMALS

A. Authorization

An Authorized Investigator planning to use radioactive material in animals must complete an Animal Care Information form. If the Center for Laboratory Animal Care is to be involved in the housing, care, or feeding of the animals, then the Radiation Safety Office and the Center for Laboratory Animal Care must both approve the procedure involving the care of the radioactive animals.

B. Procedures

1. The Authorized Investigator must insure that cages housing animals containing radioactive material are posted with a caution radioactive material label or sign. The label/sign must indicate the radionuclide, date of administration, activity administered, and the name and phone number of the Authorized Investigator and/or Individual Users.
2. The Authorized Investigator must insure that a Caution Radioactive Material sign is posted on the door to the room if radioactive material is used or stored or as otherwise permitted by the Radiation Safety Office.
3. Authorized Investigators must make every effort to insure containment of radioactive waste by use of plastic-backed absorbent paper or other excreta collection system, as appropriate. They are also responsible for ensuring that radioactive waste is properly disposed of and recorded.

4. Procedures for Caretakers must be written and posted on or near the animal cages. Investigators should provide special instructions for the possibility of animal death or illness. Otherwise, the carcass may be irretrievably disposed of as radioactive waste. The Investigator will provide a copy of the proposed procedures for review and approval by the Radiation Safety Office and the Center for Laboratory Animal Care.
5. In cases where the cages or room must be cleaned, the Authorized Investigator is responsible for cleaning or supervising the cleaning.
6. The Radiation Safety Office will determine, at the time of approval of the animal care procedure information form, if personnel radiation monitoring badges are needed by Animal Care personnel, if the animal quarters should be a restricted area, and any other precautions that should be taken.
7. Animal rooms or cages will be locked or otherwise secured when not attended by Authorized Investigators, Individual Users or Animal Caretaker personnel.
8. Authorized Investigators and their staff are responsible for surveying cages, animal rooms and other related items for contamination and documenting the results. Contaminated items/areas are to be decontaminated prior to their release from radiation precautions.