

# REGULATIONS CONCERNING THE USE OF RADIOACTIVE MATERIAL

## NOTICE TO EMPLOYEES

The Rosalind Franklin University of Medicine and Science has been issued ILLINOIS RADIOACTIVE MATERIAL LICENSE NUMBER IL-01480-01. A copy of this license and a copy of 32 Illinois Administrative Code (IAC) Part 340, entitled "Standards for Protection Against Radiation" and 32 Illinois Administrative Code Part 400, entitled "Notices, Instructions and Reports to Workers; Inspections", are available for inspection by any employee and may be found in Room 1.324, Ext. 8543.

Copies of this booklet will be issued to **all Authorized Users of Radioisotopes** and **should be drawn to the attention of their staff and students**, all of whom are required to comply with these regulations. See also "Instructions to Employees Concerning Radiation Safety".

Individuals have the right to see the records of their own personal radiation monitor badges, as well as notices of violations involving radiological working conditions.

**REGULATIONS CONCERNING THE USE OF RADIOACTIVE MATERIAL**

1. PURPOSE:

The purpose of this publication is to announce Institutional policy governing the rules and guidelines for those using Radioactive Material (RAM) at the Rosalind Franklin University of Medicine and Science. These rules are designed to meet the requirements of the Illinois Emergency Management Agency (IEMA), to fulfill the requirements of our own Radiation Safety Committee (RSC), and to assure the safety of all personnel.

2. RADIOISOTOPE COMMITTEE DESIGNATIONS:

The Radiation Safety Committee (RSC) consists of the Chairman, the Radiation Safety Officer (RSO), one member from each principal department using radioisotopes, a representative of the Administration, and a student representative.

3. PROCEDURE:

a. General Rules:

- (1) A person must have the permission of the Radiation Safety Committee to become an Authorized User (AU) radioactive material. A request for this permission, including renewals as well as new research projects using radioisotopes, is initiated by completing and filing a form "Application for the Use of Radioactive Isotopes" with the Chairman of the Committee. The review procedure will depend upon the type of proposed experiment. Certain types of experiments may need full committee review before approval while others may be approved by the Chairman, as delegated by the Committee. Only full time faculty members may become authorized users. Since all research proposals to utilize animals require the approval of the Animal Care Committee, any proposal to maintain live animals after injection with radioisotopes will require authorization from the Animal Care Committee even for acute experiments in the investigators' laboratory. For chronic experiments (lasting more than one day) the investigator must obtain a written statement from the Animal Care Committee that satisfactory arrangements have been made available. In all cases of research with isotopes in animals, the investigator will be required to obtain authorization from both the Animal Care Committee and the Radiation Safety Committee before beginning such research.

Precautions may be established for individual cases,

but in any case, the rules given in "Procedures and Precautions for use of Radioactive Material in Animals" on pages 9-11 will be adhered to.

Following the Committee approval, research project applications involving the use of radioactive material will be kept by the Radiation Safety Committee. If our current license does not cover the proposed use of the radioactive material, a license amendment will be requested from the IEMA. Approval of this amendment, granting permission for the particular use of the desired radioisotope, the particular chemical compound, and the amount of the radioisotope that may be purchased, must be received from the IEMA before the material can be purchased or the project started.

- (2) No human use of radioactive material will be carried out in the laboratories of the Rosalind Franklin University of Medicine & Science, 3333 Green Bay Road, North Chicago, IL 60064.
- (3) All orders, including grant purchases, for radioactive material must be forwarded to the Chairman of the Radiation Safety Committee for approval and recording before sending them to the Purchasing Office. Use the Radioisotope Order Approval Form. These orders must include our the university's license number and a statement that this material shall be delivered to the Authorized User under whom the research is being performed.
- (4) Upon receipt of radioactive shipments, the Authorized User or his designated competent alternate who is listed on the investigators application will open and inspect the shipping container (see page 15). If there is evidence of spillage, report immediately to the Chairman of the Committee, the RSO, or the RSO staff. If spillage has occurred, the Authorized User will be responsible for monitoring of the containers. Routine monitoring of packages is specified under 321 AC 341.150 (see p. 15). Packages containing less than 10 millicuries consisting solely of tritium, carbon-14, sulfur-35 or iodine-125 are exempt for routine monitoring, if there is no evidence of spillage. Records of receipt and monitoring must be maintained.
- (5) Unless otherwise provided for, received radioactive material will be stored in the laboratory of use.
- (6) Areas in which radioactive material is used must have the approval of the Chairman of the Committee and will be periodically inspected by the Radiation Safety Officer Staff.
- (7) Should an individual(s) fail to comply with the general rules as written above or specific rules listed below, the Radiation Safety Committee will issue a citation listing the nature of the infraction(s), the negligent party(ies) involved, the time of infraction, and the complainant.

This citation will be presented to the negligent party(ies) and copies of the citation will be forwarded to the appropriate Department Chairman and the Vice President for Research.

The recipient of the citation will be required to respond to the Chair of the Radiation Committee within 20 days, and indicate what steps have been taken not only to correct the infraction, but also to ensure that such infraction will be avoided in the future.

A second violation or abuse of the general and specific rules which results in a citation within six months of the first citation will automatically result in a review by the Radiation Safety Committee of the user's privilege to work with radioisotopes. The Committee may recommend to the Administration that such privilege be revoked. The Administration may appoint an ad hoc Committee of members of the Faculty to afford the user the right of due process and appeal, following which the Administration will determine whether to revoke the user's privileges for a specific period of time.

b. Specific Rules:

- (1) Areas or rooms in which radioactive material will be used or stored (at the discretion of the chairman of Radiation Safety Committee as to quantity) will be designated a radioisotope laboratory and will be posted with the appropriate warning sign. Personnel of this laboratory will follow the specific rules of this section and any others deemed necessary by the Radioisotope Committee for the particular type of procedures being conducted in the laboratory. Exceptions to any of the following rules must be obtained in writing from the Chairman of the Radiation Safety Committee.
- (2) Persons working with radioactive material are required to wear film badges. The control over these badges is in the office of the Chairman of the Radiation Safety Committee who will also keep the required exposure histories in the form of monthly exposure reports from the authorized company. Personnel who receive a high exposure (exceeding the limits defined by our ALARA program, see p. 24) will be required to file a report with the Radiation Safety Officer giving details explaining the high exposure. The Radiation Safety Officer will take any necessary action to prevent the recurrence of such high exposures. Copies of records of film badges (monthly reports and unused part of permissible accumulated dose) will be available to the individual in the secretarial office of the department concerned. A report of a complete blood count satisfactory to the university health service must be filed with the health service, prior to beginning any work with radioisotopes.

- (3) All containers and storage areas must display a label bearing the radiation symbol and the words "CAUTION RADIOACTIVE MATERIAL".
- (4) Wear laboratory coats or other protective clothing at all times in areas where radioactive material is used.
- (5) Wear disposable gloves at all times while handling radioactive material.
- (6) Monitor hands, shoes, clothing, and work surfaces with a low-level G-M survey instrument (if appropriate, for radio nuclides in use) for contamination after each use of radioactive material or before leaving the restricted area
- (7) Do not eat, drink, smoke, or apply cosmetics in any area where radioactive material is stored or used.
- (8)
  - a. Do not store or use food, drink, or personal items in any area where radioactive material is stored or used.
  - b. Do not discard food-related trash in radioactive laboratories regardless of place of consumption.
- (9) Secure all areas where radionuclides are used/stored when unattended. If you are out of the laboratory for any duration (interpreted as 5 minutes), the door must be closed. All rooms with radioactive material must be locked after hours.
- (10) Wear whole-body personnel monitoring devices (film badge or TLD) at all times while in areas where radioactive material is used or stored as required by the regulations or the terms of our license. These must be worn at chest or waist level where highest exposure is expected (outside of any lead aprons).
- (11) When required to wear finger badges (film or TLD), they must be turned inward towards radioactive material.
- (12) Dispose of radioactive waste only in specially designated/labeled receptacles.
- (13) Store and label radioactive materials correctly.
- (14) Use alarms and interlocks, and post areas as required.
- (15) Never pipette by mouth.
- (16) Confine radioactive solutions in covered containers plainly identified and labeled with name of compound, radionuclide, date, activity, and radiation level.
- (17) Always transport radioactive material in shielded containers with sufficient absorbent material.
- (18) Use absorbent material on countertops where radioactive material

is used.

- (19) Use suitable ventilation systems when handling gases or volatile material.
- (20) **RADIOISOTOPE WASTE DISPOSAL** (see page 22): There will be **no disposal** of radioactive material via the sewers, whatsoever. Radioactive material may **NOT** be incinerated on our premises. The Radiation Safety Committee should be consulted for procedures involving disposal of radioactive animal carcasses.
- (21) **LARGE QUANTITY WASTE MATERIAL:** Large quantities of soluble waste, insoluble waste, animal carcasses or substances are to be stored in containers in appropriate storage rooms controlled by the Committee. The Chairman of the Committee must be informed of this type of disposal. The radioisotope, date, total activity and chemical form must be listed and attached to the container, and copy kept in the laboratory records.
- (22) **DO NOT ACCUMULATE RADIOACTIVE WASTE IN THE LABORATORIES.** The only exception to this is material which would spoil unless kept in the freezer. In this case, the Chairman of the Radiation Safety Committee must be notified of its existence so that it may be picked up for immediate **PROFESSIONAL** disposal or be permitted to decay to a safe level for incineration.
- (23) **RECORDS** of waste disposal must be kept in the log book of the laboratory and made available to the Radiation Safety Officer and submitted to him within 7 days of the time of radiation inspections of the department. These records should show the date of disposal, the isotope, its chemical form, the total activity, pathway of disposal and the room number of the laboratory origin.
- (24) **INVENTORY:** A quarterly inventory of all isotopes kept in each laboratory shall be performed and reported to the RSC on appropriate forms.

## **TRANSFER OF RADIOISOTOPE MATERIAL BETWEEN INSTITUTIONS**

1. A list of all radioactive isotopes to be transferred must be provided to the Radiation Safety Committee. This list should include the name of the isotope, quantity, and dated activity.
2. A copy of this list must be furnished, in advance, to the recipient institution to insure that these radioactive items are approved on its license.
3. The transporter should have a copy of the authority to accept these isotopes by the recipient institution.
4. Items transferred must be clearly marked and safely packaged, according to instructions available from the Radiation Safety Officer for our institution.
5. When the transfer is made, the amount of individual isotopes must be subtracted from the inventory of the donor institution and should be added to the inventory of the recipient institution by the AU and RSC.

## PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIAL IN ANIMALS

- A. Investigators wishing to use radioisotopes in animals must submit in detail their procedures to both the Animal Care Committee and the Radiation Safety Committee for approval. The Radiation Safety Committee dictates necessary safety procedures concerning use, care, disposal of waste and carcasses, cleaning of cages, and surveys of areas involved.
- B. Care of Radioactive Animals
1. Animals that have been given radioactive isotopes will not be stored in the general animal quarters.
  2. Animals used for radioisotope experiments not exceeding that working day in duration may be kept in the investigator's laboratory under his/her supervision or in a separate animal room under investigator's supervision for the working day only.
  3. Experiments involving housing of radioactive animals for longer periods . (greater than one day) must be specifically approved by the RSC.
  4. All cages are to be marked with "Caution, Radioactive Material" tape and the following shall be listed on the cage card:
    - a) Name of the isotope
    - b) Radioactivity per animal
    - c) Date of administration
    - d) Investigator's name
  5. Rooms containing unattended radioactive animals must always be locked.
  6. Animal care and cage cleaning shall be the responsibility of the authorized user, unless there exists personnel trained for this work.
  7. Any dry waste bedding and excreta shall be treated as radioactive waste, if any radioactivity is detected with an appropriate monitoring instrument. Each waste package must be labeled indicating its radioisotope contents.
  8. The bodies of radioactive animals will be placed in labeled bags and stored in a freezer set aside for that purpose.
  9. Animal cages and operating instruments will be cleaned by the investigator using gloves, soap and water. (See further instructions below.)
  10. Used cages shall not be used for non-isotope work until checked for detectable activity. Any contamination will be reduced to no greater than twice background by the investigator.
  11. For experiments in which radioactivity may become airborne (as in the use *in vivo* of  $^3\text{H}$  - or  $^{14}\text{C}$  - labeled metabolites) metabolic cages having closed air - space must be used. The investigators must discuss

this matter with the Animal House Director and obtain his written approval.

C. The following procedures shall be followed in the Animal Research Facility:

1. The experimental work area shall be covered with plastic backed absorbent material.
2. The work area shall be marked with warning tape.
3. Survey Procedures
  - a) Areas where only small quantities of radioactive material are used (less than 100 uCi) will be surveyed monthly.
  - b) All other laboratory areas will be surveyed weekly.
  - c) The weekly and monthly survey must utilize a technique capable of detecting the isotope used and will consist of either:
    - (i) A measurement of radiation levels with a survey meter sufficiently sensitive to detect 0.1 mR/hr., or
    - (ii) A series of wipe tests to measure contamination levels. The method for performing wipe test will be sufficiently sensitive to detect 100 dpm.
  - d) A permanent record will be kept of all survey results, including negative results. The record will include:
    - (i) Location, date, and type of equipment used.
    - (ii) Name of person conducting survey.
    - (iii) Drawing of area surveyed, identifying relevant features such as active storage areas, active waste areas, etc.
    - (iv) Measured exposure rates keyed to location on drawing (point out rates that require corrective action).
    - (v) Detected contamination levels keyed to locations on drawing.
    - (vi) Corrective action taken in case of contamination or excessive exposure rates, reduced contamination levels or exposure rates after corrective action, and any appropriate comments.

D. Instructions for Cleaning and Decontaminating Animal Cages

1. Cages used to house radioactive animals shall be checked for residual radioactivity.
2. Cages found to have radioactivity greater than twice the background shall

be washed, using a cage washer, or put aside and allowed to decay until their radioactivity level have returned to background level. If contaminated cages are to be washed, they must be first decontaminated by wiping with a detergent solution to remove radioactivity to background before being washed in a sink. Wipes shall be disposed of in the container used for disposal of radioactive waste.

3. The cage washer and the area around the cage washer shall be surveyed after cleaning radioactive cages.
4. When washing floors of rooms housing animals containing radioactive material, personnel should use plenty of water, but avoid splashing.
5. To prevent personnel contamination, the personnel should wear laboratory coats, rubber gloves, and boots.

**IMMEDIATE ACTION for ALL SPILLS** (general)

- ◆ **CLEAR THE AREA:** NOTIFY all persons in the area (same room) that a spill has occurred. All persons not involved in the spill should vacate the room. Prevent access to the area by unauthorized personnel
- ◆ **PREVENT THE SPREAD:** Cover the spill with absorbent material. Do not attempt to clean up *major* spills. Ensure that there are no leaks or drains of RAM liquid. Confine the movement of all potentially contaminated personnel to prevent the spread. Do not track spilled RAM around on your shoes.
- ◆ **IDENTIFY:** Identify spilled isotope. Identify any hazardous material also involved.

**1. MAJOR SPILLS** (the amount of RAM or the area of the spill arouses your special concern)

a. **SHIELD THE SOURCE:** If possible, the spill should be shielded, but only if it can be done without further contamination, without spreading the liquid, or without significantly increasing exposure of personnel to radiation.

b. **CLOSE THE ROOM:** Leave the room and lock the door(s) to prevent entry. Post a sign for no-entry.

c. **CALL FOR HELP:** Immediately notify one of the following:

RSO (Radiation Safety Officer):	Dr. LeVan (x8318)
Radiation Technician:	Jesse Soco (x3446 or page)
Radiation Safety Committee Chair:	Dr. D. Kim (x3364)
After normal working hours:	Security (x3288)

d. **PERSONNEL DECONTAMINATION:** Contaminated clothing should be removed and stored properly. Flush contaminated skin thoroughly and then wash with soap and water.

e. **CLEAN UP:** To be conducted with the assistance of the RSO staff, including utilization of MSDS information if hazardous material is involved.

f. **INJURIES:** Injured persons should be decontaminated and first aid performed as necessary. With life threatening injuries, the individual should be given immediate life-saving first aid and Security (x3288) should be notified to obtain emergency medical treatment.

**2. MINOR SPILLS** (any spill other than that judged to be a major spill)

a. **CLEAN UP:** Use disposable gloves, absorbent paper, and remote handling tongs. Carefully fold the absorbent material and insert it into a plastic bag (use a second one, if necessary) and dispose of it in the radioactive waste containers. Also insert all other contaminated materials, such as disposable gloves, into the plastic bag. Follow MSDS sheet for clean-up of hazardous material.

b. **SURVEY:** With an appropriate survey instrument, check the area around the spill, hands, and clothing for contamination. For alpha and low energy beta emitters, conduct wipe tests at the spill area. Continue to decontaminate, as necessary.

**REPORTS:** For *major* incidents a preliminary written report must be filed with the RSO within 24 hours and a final written report within two (2) weeks. For *minor* incidents a written report must be filed with the

RSO within 48 hours. All incidents involving improper handling of RAM have to be reported to the RSO. Accidental ingestion, injection, or inhalation of RAM or exposure to sources of radiation should be reported immediately to the RSO by phone.

### **3. EXPOSURE TO SOURCES OF RADIATION**

Terminate the source of exposure and prevent others from being exposed. Use additional shielding as needed. Notify the Radiation Safety Officer (Dr. LeVan, X8322, Pager 847-817-2060) so that the nature and extent of exposure can be determined. Seek medical attention if severe exposure is suspected.

### **4. LOSS, THEFT, OR DAMAGE TO A SOURCE OF RADIOACTIVE MATERIAL**

In addition to following the applicable procedures outlined above, notify the RSO immediately and the Illinois Emergency Management Agency at (800)-782-7860 or (217) 782-7860.

RADIATION SAFETY OFFICER (RSO): Dr. John LeVan  
OFFICE PHONE: Ext. 8322                      PAGER: (847)-817-2060

ALTERNATE NAMES AND TELEPHONE NUMBERS DESIGNATED  
BY RSO:

Dr. Donghee Kim, X3364

## INSTRUCTIONS FOR RECEIVING RADIOACTIVE MATERIALS AT THE UNIVERSITY

In the handling of radioactive materials, the primary objective is the health and safety of persons on University property. The second objective is the safeguarding of the material. To meet these objects the following procedures have been instituted.

The radioactive material is only received by the receiving clerk or the designated substitute as assigned by the Office of the Purchaser.

1. The receiving clerk will look at all parcels marked "RADIOACTIVE". If the package is not intact, is damaged, or is wet from the inside, the package will not be accepted.
2. If the package is visibly acceptable the radiation safety assistant (RSA) is telephoned immediately so he can come and pick it up.
3. The RSA checks for radiation leakage, contamination or damage to package.
4. The RSA measures the exposure rate at 1 meter from the package surface. If  $> 10$  mR/hr the procedure is stopped and the Radiation Safety Officer (RSO) is notified. If the exposure rate at 1 meter is acceptable the RSA measures the surface exposure rate. If  $> 200$  mR/hr, the procedure is stopped and the RSO is notified.
5. The RSA verifies the purchase was authorized, marks the package as acceptable, and then calls the addressee for pick up.
6. Records of receipt and monitoring of packages are kept by the Radiation Safety Assistant.
7. If a package marked "**RADIOACTIVE**" is received at the end of the day and the RSA and/or the addressee is not available to pick it up, the package will be locked in a special room or freezer designated for such parcels, for storage overnight or over the weekend. The RSA will then be telephoned on the next business day morning to pick up the package.

## **PROCEDURE FOR SAFELY OPENING RADIOACTIVE MATERIAL PACKAGES**

For packages received, the following procedure for opening each package will be performed in a restricted area as soon as practical after receipt by the addressee.

1. Wear disposable gloves to prevent hand contamination.
2. Visually inspect the package for any sign of damage (e.g., wetness, crushed). If damage is noted, stop the procedure and notify the Radiation Safety Officer (RSO).
3. Measure the surface exposure rate. If  $> 200$  mR/hr, stop procedure and notify the RSO.
4. Open the outer package (following supplier's directions if provided) and remove packing slip. Open inner package to verify contents (compare requisition, packing slip, and label on bottle). Check integrity of the final source container (inspecting for breakage of seals or vials, loss of liquid, discoloration of packaging material). Check also that the shipment does not exceed license possession limits. If anything is other than expected, stop and notify the RSO.
5. Wipe external surface of final source container with a cotton swab or filter paper. Assay the wipe sample in a low-background area to determine if there is any removable radioactivity. If any contamination in excess of 200 dpm per  $100\text{ cm}^2$  is detected, clean up container according to spill cleanup procedures contained in the Emergency Response Procedures.
6. Survey the packing material and packages for contamination before discarding. If contamination is found, treat as radioactive waste. If no contamination is found, obliterate all radiation labels prior to discarding in regular trash.
7. Records of receipt and monitoring are kept in the laboratory and the radioisotope is added to the laboratory inventory.

## AREA SURVEY PROCEDURE

The AU is responsible for all cleaning, posting, surveys, and records in his/her laboratory as described in this section. The actual jobs may be delegated to an individual in the laboratory.

1. All preparation and use areas will be surveyed each day of use with a low-range survey instrument (as appropriate for radionuclides used) and decontaminated if necessary.
2. Individuals shall monitor hands, shoes, clothing, and work surfaces with a low-range survey instrument (as appropriate for radionuclides used) for contamination after each use of radioactive material or before leaving the restricted area and decontaminate as necessary.
3. Laboratory areas where only small quantities of radioactive material are used (less than 200 uCi) or areas where material is in storage only will be surveyed monthly.
4. Waste storage areas and all other laboratory areas (those using greater than or equal to 200 uCi) will be surveyed weekly.
5. The weekly and monthly surveys will consist of:
  - a. A measurement of radiation levels with a survey meter sufficiently sensitive to detect 0.1 milliroentgen per hour for the radionuclide involved. Survey the areas depicted in section 7c of this procedure.
  - b. A series of wipe tests to measure contamination levels in the areas depicted in section 7c of this . The method for performing wipe tests will be sufficiently sensitive to detect 220 dpm per 100 cm<sup>2</sup>, beta/gamma, for the radionuclides involved. Wipes for areas of use or other high-background areas will be removed to a low-background area for measurement.
6. If contamination is detected, the area will:
  - a. Be cleaned or posted and restricted from use if the contamination level exceeds 2,200 dpm per 100 cm<sup>2</sup> beta/gamma; or
  - b. Be covered, cleaned, or identified to all employees if the contamination level exceeds 220 dpm per 100 cm<sup>2</sup> but is less than 2,200 dpm per 100 cm<sup>2</sup>, beta/gamma.
7. Records of all area survey results, including negative results, will be kept in the laboratory logbook for (5) years after each survey. The record will include:
  - a. Manufacturer, model, and serial number of the instruments used to perform surveys and analyze wipe tests.
  - b. Date of the survey.

- c. A drawing of the area surveyed identifying relevant features such as active storage areas, active waste areas, etc.
- d. Measured exposure rates (in units of milliroentgen per hour) keyed to locations on the drawing.
- e. Detected contamination levels (in units of dpm/100 cm<sup>2</sup> or microcuries/100 cm<sup>2</sup>) keyed to locations on the drawing.
- f. Corrective action taken in the case of contamination of exposure rates in excess of action levels or the regulations, reduced contamination levels or exposure rates after corrective action, and any appropriate comments.
- g. The identification of the individual performing the survey.

NOTE: For the surveys referenced in Items 1 and 2 above, only the date and the identification of the person performing the survey need to be recorded when no abnormal exposure rates are identified.

## BIOASSAY FOR <sup>125</sup>I, <sup>131</sup>I and <sup>3</sup>H

1. All potentially exposed personnel utilizing I-125 or I-131 in unsealed form and in excess of the values in Table I, are required to undergo a thyroid scan bioassay preferably within 72 hours after potential exposure, but not later than 10 days. The values in Table I must be considered as the cumulative amounts handled in any 3 month period.

**TABLE I**  
**IODINE**

<u>Type of Operation</u>	<u>Volatile or Disposable</u>	<u>Bound to a non-volatile Agent</u>
Processes in an open room	0.1 mCi	1 mCi
Processes in a hood with adequate wind velocity	1 mCi	10 mCi
Processes in a closed glove-box	10 mCi	100 mCi

Instrumentation for Thyroid Bioassay of radioactive Iodine is located at the North Chicago Veterans Administration Hospital. This consists of a Thyroid Uptake Machine Atomlab 900 Biodex Medical Systems Inc. Serial #722052. Arrangements for thyroid bioassay should be made through Dr. T. Balachandra, Chief of Nuclear medicine, NCVA, Room 133, (688-1900, ext. 84459).

2. Individuals planning to work with tritiated organic compounds in excess of the levels in Table 2 are required to perform a pre-work bio-assay on a urine sample as outlined below, and to repeat this monitoring operation at two-week intervals while such work continues.

**TABLE 2**  
**TRITIUM**

<u>Type of Operation</u>	<u>Tritiated Organic Compounds</u>	<u>Tritium Gas in Sealed Process Vessels</u>
In open room	10 mci	10 Ci
In a fume hood of adequate wind velocity	100 mCi	
In a closed glove-box	1 Ci	

Personnel using 3H-labelled compounds in excess of the values described in Table 2 will be required to perform the following procedure for both the pre-work bioassay and subsequently at two-week intervals while such work continues. A

24-hour urine sample will be collected. 2.0 ml of urine and 5.0 ml of water-miscible scintillation fluid will be counted in a scintillation fluid counter by the individual involved. (Blank will be 2.0 ml of distilled water and 5.0 scintillation fluid). Any countable contamination with  $^3\text{H}$  or Iodine above background in the urine will be discussed with the owner of the urine. If urinary excretion rate exceeds 3 microcuries per liter, the Radiation Safety Officer and/or the Radiation Safety Committee will take corrective action to lower the potential for further exposure. All such discussions and activities described above will be reviewed in the minutes of quarterly meetings of the Radiation Safety Committee.

3. Copies of all bioassays dated and signed must be submitted to the Radiation Safety Committee for permanent record. ANSI (American National Standards Institute) consensus standards will be used.

## DISPOSAL OF RADIOACTIVE MATERIAL

### 1. Scintillation vials

All vials containing  $^{14}\text{C}$  or  $^3\text{H}$  in the counting fluid should be kept separate from other radioisotopes or from other RAM waste. We are permitted to dispose of vials containing only  $^{14}\text{C}$  or  $^3\text{H}$  at a substantially reduced cost provided that the activity does not exceed 0.05uCi/ml of counting fluid. This material is classified as "deregulated waste" and is burned rather than buried. You must keep these vials separate and keep the concentration below the allowable level.

### 2. Isotopes with half lives less than 90 days ( $^{32}\text{P}$ , $^{33}\text{P}$ , $^{125}\text{I}$ , $^{35}\text{S}$ , $^{51}\text{Cr}$ , $^{86}\text{Rb}$ , $^{141}\text{Ce}$ ) (Also $^{24}\text{Na}$ , $^{28}\text{Mg}$ , $^{42}\text{K}$ , $^{46}\text{Sc}$ , $^{111}\text{In}$ , $^{131}\text{I}$ )

All solid or liquid RAM waste should be segregated by individual isotope and clearly labeled with the isotope, the amount in Ci and the date. This waste should be placed in a plain plastic bag with one piece of yellow/purple tape indicating that it is radioactive. This procedure will facilitate subsequent disposal after the isotope has decayed.

### 3. Other isotopes with half lives greater than 90 days

These isotopes should be placed in yellow 'radiation' bags and clearly labeled with the amount and type of isotope.

Minimize contamination of glass/plastic/needles with these isotopes since the removal company will no longer handle such items. The minimum volume is best. Keep these items separate!

Liquid RAM waste should be kept in appropriate, solid, closed containers.

### 4. Disposal of all isotopes

The Biochemistry and Molecular Biology Office (x-3221) should be called to have J. Soco, Radiation Safety Assistant, (or his representative) assist the laboratory technician in removing RAM waste to the storage area.

**PROGRAM FOR MAINTAINING OCCUPATIONAL RADIATION EXPOSURE**  
**ALARA PROGRAM**

1. Management Commitment

The management of this institution is committed to keeping individual and collective doses As Low As is Reasonably Achievable (ALARA).

Modifications to operating and maintenance procedures and to equipment and facilities will be made if they will reduce exposures unless the cost, in our judgment, is considered to be unjustified. We will be able to demonstrate, if necessary, that improvements have been sought, that modifications have been considered, and that they have been implemented when feasible. If modifications have been recommended but not implemented, we will be prepared to describe the reasons for not implementing them.

The management will keep staff members apprised of the University's commitment to the ALARA concept. This will include efforts, through training and policy statements, to ensure that personnel understand this commitment and how to implement it.

Additionally, the management will ensure that an individual with qualifications commensurate with the scope of the radiation safety program will be appointed as the Radiation Safety Officer to coordinate the radiation safety program for the facility.

2. Radiation safety officer (RSO) Responsibilities

The RSO will perform an annual review of the radiation safety program, including

ALARA considerations. This will include reviews of operating procedures and past dose records, inspections, etc., and consultations with the radiation safety staff or outside consultants. The results of the annual review will be documented and maintained. The RSO will also prepare a summary report of the results for inclusion in the annual report.

The RSO will review, at least quarterly, the radiation doses of authorized users and workers to determine that their doses are ALARA (see section 3 below). The RSO will also review the results of radiation surveys in unrestricted and restricted areas to determine that dose rates and amounts of contamination were at ALARA levels during the previous quarter. These reviews will be documented, maintained, and reported to the RSC.

The RSO will investigate all known instances of deviation from good ALARA practices and, if possible, will determine the causes. When the cause is known, the RSO will implement changes in the program to maintain doses ALARA.

3. Individuals Who Receive Occupational Radiation Doses

- A. Workers will be instructed in the ALARA concept during initial training, at the annual refresher course, or by other means deemed appropriate by the RSC. Workers will also be informed of their individual responsibility concerning the ALARA concept, its relationship to work procedures and work conditions, and in recourses available if they feel that ALARA is not being promoted on the job.
- B. The Radiation Safety Officer will review and maintain the records (dosimeter processor's report) results of personnel monitoring, not less than once in any calendar quarter, as is required by 32 IAC 340.1010-340.1060. The following actions will be taken at the Investigational Levels as stated in Table 3:
- i. Quarterly exposure of individuals to less than Investigational Level I:
- Except when deemed appropriate by the RSO, no further action will be taken in those cases where an individual's exposure is less than Table 3 values for the Investigational Level I.
- ii. Quarterly personnel exposure equal to or greater than Investigational Level I, but less than Investigational Level II:
- The RSO will review the exposure of each individual whose quarterly exposures equal or exceed Investigational Level I. He will report the results of his reviews at the first RSC meeting following the quarter when the exposure was recorded. If the exposure does not equal or exceed Investigational Level II, no action related specifically to the exposure is required unless deemed appropriate by the Committee.
- iii. Quarterly exposure greater than Investigational Exposure greater than Level II:
- Exposure greater than Level II may require further action by the RSO. The Committee will, however, consider each such exposure in comparison with those of others performing similar tasks as an index of ALARA program quality and will record the review in the Committee minutes.
- C. The RSO or his designate will discuss the results of any quarterly exposure greater than Level I with the individual to determine the causes of the exposure, to minimize future exposure, and to counsel the individual on the biohazards of the exposure.

**TABLE 3**

	Investigational Levels- (mrems per calendar quarter)	
	<u>LEVEL I</u>	<u>LEVEL II</u>
Whole body; head and trunk; active blood-forming organs; lens of eyes; or gonads	125	375
Hands and forearms; feet and ankles	1875	5625
Skin of whole body*	750	2250

\*Not normally applicable to nuclear medicine operations except those using significant quantities of beta emitting isotopes.