Radiation Safety Manual

Radioactive Material User Information: Policies and Guidelines

Radiation Safety Committee
Office of Research Safety
Office of Radiation Safety
University of Chicago

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Chapter I: Application for Radioactive Protocol

Policy

Each principal investigator or faculty group is required to have an approved protocol by the University Radiation Safety Committee (URSC) to order, possess and use radioactive material at the University of Chicago. The URSC approves protocols for the use of radioactive material for research, except for the use of radioactive material in human subjects based upon the principal investigators training and experience, safety evaluation of the proposed use, adequacy of facilities and equipment. The radioactive material protocol will expire after two years unless a renewal application is submitted before the expiration date.

Authority and Responsibility

University of Chicago Radiation Safety Committee is responsible for:

1 Review and approve the training and experience for all applicants.
2 Review on the basis of safety and approve or disapprove each proposed method of radioactive material use.
3 Review and approve or disapprove applications for the possession and use of radioactive materials.
4 Review the radiation safety program and institute corrective actions as the committee deems necessary.

Radiation Safety Officer is responsible for:

1 Review the application form, principal investigator training and experience form and associated forms to completeness and accuracy.
2 Work with the applicant to correct any deficiencies in the application.
3 Prepare the ballot and distribute the forms to the University Radiation Safety Committee.
4 Approve amendments and renewal applications as described in the institutional license issued by the Illinois Emergency Management Agency (IEMA), Division Nuclear Safety.
5 Notify principal investigators of the upcoming expiration of their protocol to assist with timely renewal.

Principal Investigator is responsible for:

1 Completing and signing protocol application for initial protocol submittal, renewal submittal and amendment submittal.
2 Submitting training and experience for new protocol applications.
3 Submitting an account authorization request form to provide an account number for recharge activities.
4 Conducting activities described in the application and in accordance with the University radiation safety policies and procedures or representations made by the applicant and any conditions added to the authorization.

Application Process

This information is intended to provide the research community with guidance in applying and maintaining an active protocol for ordering and using radioactive material at the University of Chicago. The three types of applications that may be submitted during the course of a protocol are:

- Initial application to possess an use radioactive materials,
- Renewal application to continue an existing protocol; or
- Amendment application to make changes to an existing protocol.

The application forms and other associated forms can be downloaded from our website.

The following provides general information to assist you in completing and submitting the proper application form:

1 The original application with the signature of the principal investigator must be submitted to the Office of Radiation Safety at MC 2106 or delivered to AMB M-031A. We do not accept faxed applications.
2 All applications must be typed. (Hand written applications will not be accepted.)
3 Each application must stand alone. Do not refer to previous applications.
4 If you are submitting an initial application, you must provide a statement of training and experience.
5 An application may be used for multiple radionuclides' you wish to be authorized to possess and use.
6 The long application form will be required for each new radionuclide to be added to an existing protocol.
7 Principal investigators desiring to increase or decrease the maximum activity to be ordered in a month, change the location of use or storage, or chemical/physical form of previously authorized radionuclide's may submit the shorter application form.
8 The University's license does not permit the use of radioactive material in human subjects. Note: Administration to human subjects is conducted under the University Medical Center license. Contact the Office of Radiation Safety if you have questions.

Initial Application for Non-Human Use of Radioactive Material

If a principal investigator has not submitted an Application for Non-human Use of radioactive material within the past two years, they will be required to complete a new Application for Non-Human Use of radioactive material and submit the application to the Office of Radiation Safety. The application shall include radioactive material the applicant wishes to acquire during the two year period the license will be active. (Please note: In the event that a change to the protocol is needed prior to the two year renewal process, an amendment may be filed at any time as noted below.) The Office of Radiation Safety will review the application forms, work with the applicant to correct any deficiencies, and distribute the application to the University Radiation Safety Committee (URSC) for approval. A majority approval of the voting members is required for

applications needing committee approval.
The following forms must be completed and submitted for the initial application process:

1 Application for Non-human Use of radioactive material (ORS Form A1). Follow the item by item instructions below for completing the application form. **Please note:** The application must be typewritten. Submit the original application form, faxes will not be accepted.
2 Principal Investigator's, PI Training and Experience Form (ORS Form A4).
3 Account Authorization Form ORS Form A5.
4 New User Amendment and Training Certification form (ORS Form A3) for all new RAM users or RAM users transferring from other labs. Please note: See the training requirements below for initial and annual radiation safety training for RAM users (e.g. new radioactive material users must attend the radioactive material user training session provided by the Office of Radiation Safety)

Amendment Application for Non-Human Use of Radioactive Material

Laboratories that have been granted approval for use of radioactive material may need to amend their authorization. Amendments are considered changes in laboratory locations, radiochemical, radiochemical order limits, proposed uses, and laboratory personnel, who work with radioactive material.

The following changes require an amendment to an authorization:

1 Notifications for room changes (adding new lab or discontinuing use in a lab). Radioactive material may only be used in laboratories, cold rooms, etc. approved by the University Radiation Safety Committee. In order to amend your areas of use, submit an Application to Amend Protocol for non-human use of radioactive material (ORS Form A2) listing the change (building, room number, type of room and indicate to add or delete). If the room change involves the termination of radioactive material work in that lab, the Office of Radiation Safety will perform a closeout survey certifying that no radiological hazards exist in the space. **Please note:** If your lab is moving or leaving the University, the Office of Radiation Safety requires advance notification (minimum 1 week) to schedule the radiological survey, radioactive waste removal, and cancellation of all radiation safety related services. Submit an email to the Office of Radiation Safety at radsafety@uchicago.edu. Surveys of lab equipment used in radioactive material experiments are required prior to packaging by a moving company. In addition, a close-out survey is conducted after the movers have removed all equipment.
2 Notification for changes in monthly order limits and changes in physical or chemical form.
   - To increase the monthly order limit: Complete and submit an Application to Amend Protocol for non-human use of radioactive material (ORS Form A2) listing the change to the Office of Radiation Safety.
   - To add a new radiochemical: Complete and submit an Application for Non-Human Use of radioactive material (ORS Form A1) listing the new radiochemical and radiation safety practices to the Office of Radiation Safety.
3 Adding laboratory personnel who will work with radioactive material. Laboratory personnel who work with radioactive material are required to be listed on the

application. In order to update the laboratory personnel list, a New User Amendment and Training Certification Form (ORS Form A3) must be submitted to the Office of Radiation Safety. Please note: New RAM users must attend the RAM user training presented by the Office of Radiation Safety. In addition, labs are required to update their Annual Refresher Radiation Safety (Training Certificate Form) or the list of users that is posted in their lab reflecting the addition of lab personnel. **Please note:** See initial and annual refresher radiation safety training requirements below.

4 Adding or modifying survey instruments. In order to add a new survey instrument, add a new probe, or discontinue use of a survey instrument, you are to submit a memo or email to the Office of Radiation Safety outlining the change including the instrument's model and serial number. A member of the Radiation Safety staff will contact the lab designee to conduct the change. **Please note:** If you have purchased a new instrument, the Office of Radiation Safety will affix a sealed source to the instrument to be used for its operational checks. A copy of the calibration certificate must be submitted to the Office of Radiation Safety. If you are unable to locate the calibration certification, the Office of Radiation Safety will be required to recalibrate the instrument.

Renewal Application for Non-Human Use of Radioactive Material

Each application for non-human use of radioactive material expires two years from the initial application approval date. If you are unaware of the expiration of your authorization, please contact the Office of Radiation Safety at 773-702-6299. Approximately 30 days prior to the expiration, the Office of Radiation Safety will send notification to each Principal Investigator (PI) and their lab designee instructing the lab to submit the renewal application, if they wish to continue their authorized use of radioactive material. If a renewal application is not received in the Office of Radiation Safety prior to the expiration date, the laboratory will not be allowed to order radioactive material until a renewal application has been submitted to ORS and approved by the University Radiation Safety Committee.

If you need a copy of your previous application and/or amendments to complete the renewal application please call our office to obtain a copy.

The following forms must be completed and submitted for the renewal application process:

1 Application for Non-Human Use of radioactive material (ORS Form A1).

2 New User Amendment and Training Certification form (ORS Form A3) for those individuals new to the lab, who were not listed under the previous application as users of radioactive material. In addition, new radioactive material users must attend the new radioactive material user training, if they have not yet attended.

3 Updated Account Authorization Form (ORS Form A5), if your account will soon expire or if the previous account number has changed.

Please notify the Office of Radiation Safety by email at radsafety@uchicago.edu or memo if you do not wish to renew your protocol to possess and use radioactive materials. If you decide not to renew, our office will call to schedule a time to close-out your laboratory, if needed.

Radiation Safety Training

RAM User Training

Each individual using radioactive material must complete initial radioactive material user training and annual refresher training, thereafter.

RAM User Initial Training

- All new & current employees being added as RAM users to a protocol must attend the Office of Radiation Safety training course for RAM users prior to any use of radioactive material.
- The ORS RAM User training course is offered weekly. Refer to the Safety Training Academy for the course schedule and to register.
- Course duration is approximately 2.5 hours.
- A knowledge assessment will be provided to attendee's, so ORS can determine the effectiveness of the information provided and ensure all attendee's understand the information.

PI submittal of the New User Amendment and Training Certification form to ORS (fax no. 2-4008, mail MC2106 or deliver to AMB M-031A) is required to add a user to the protocol!

RAM User Annual Refresher Training Requirement

The Principal Investigator and all RAM users must complete the annual training requirement by one of the following methods:

- Attend one of the RAM user training course presented by ORS; or
- Complete the RAM User Refresher training module on the University Chalk Site and complete the knowledge assessment.

Laboratory Designee Training

Each laboratory must assign two individuals as laboratory designees to assist the PI with the radiation safety oversight in the laboratory.

Lab Designee Initial Training

- Each individual assigned the lab designee responsibilities must first attend the RAM user training course and then the laboratory designee training course presented by ORS.
- The RAM user course is presented weekly as noted above and the lab designee course is presented once a month.
- The lab designee course duration will be approximately 90 minutes.
- A knowledge assessment will be provided, so ORS can determine the effectiveness of the information provided and ensure the attendee's understand the information.

Lab Designee Annual Refresher Training

- The laboratory designee must complete annual refresher radiation safety training.
- The annual training for laboratory designee's shall be one of the RAM user refresher training methods as noted above.

Chapter II: Radioactive Material Ordering

Policy

The purchase of radioactive materials including both licensed and license-exempt quantities is handled through the Office of Radiation Safety (ORS). Only principal investigators with an approved* protocol will be allowed to order radioactive materials. The ordering will be limited to the isotopes, chemical forms, and maximum activity per month as listed in the protocol application.

Anyone found not following the procurement policy risks suspension of their protocol.

Authority and Responsibility

Office of Radiation Safety is responsible for:

1. Reviewing and approving the radioactive material orders submitted through the Buysite procurement system in a timely manner.
2. Ensure all radioactive material orders are meet the requirements of the principal investigators protocol.
3. Ensure all radioactive material orders meet the requirements of the University radioactive material license.

Principal Investigator is responsible for:

1. Having an approved protocol for the possession and use of radioactive materials.
2. Submitting an amendment application for radioactive material they would like to order that are not listed on their protocol (e.g. isotope, chemical form, over monthly order limit).
3. Ensuring the appropriate account numbers are used and entered into the BuySite procurement system for vendor payment.
4. Ensure individuals under his/her supervision do not order excessive amounts of radioactive material which are not needed.

Employees/Laboratory Staff is responsible for:

1. Only ordering radioactive materials that are approved in the protocol and ordering within the order limits.
2. Ensuring proper information (e.g. shipping address, billing address, catalog, activity, etc.) outlined in this procedure is entered for radioactive material orders.
3. Ensuring that the “Radioisotope Order” button is checked for each radioactive material order placed through the Buysite procurement system.
4. Ensure only radioactive material items are included with radioactive material orders.

Ordering Process

1. Only radioactive material items may be included on a radioactive material order. If non-radioactive material items are on a radioactive material order the order will be rejected by ORS. Anyone found not following the proper ordering procedures risk having their ordering privileges denied and suspension of the protocol.
2. Radioactive material orders must be placed through the University Buysite

Procurement system.

3 Researchers are only allowed to order radioactive material listed on their approved radioactive material protocol. If you need a copy of the protocol application, please call the ORS at 2-6299.

4 When placing a radioactive material order you **MUST check** the **"Radioisotope order" box**. It is the third item down in the middle column on the active cart screen.

5 When entering a radioactive material order indicate the following on the order:

The shipping address must be:
Receiving Dock
The University of Chicago
Office of Radiation Safety
5835 South Cottage Grove Avenue
Chicago, Illinois 60637

The billing address must be:
Central Procurement Services
6054 S. Drexel Avenue
Suite 400
Chicago, Illinois 60637

6 **Your Profile (Buyer Info)**: Along with your name include the Principal Investigator name and HP10 # (e.g. James Marsicek/Dr. John Doe, HP10# 3937). This information (Principal Investigator and protocol number – HP10#) will assist ORS staff to approve your orders more quickly.

7 **Product Information**: Indicate the isotope, catalog number, product description, number of units, and activity (mCi or μCi). **If requesting a product from the Fresh Lot, please specify in the "Note to the Supplier" section**.

8 **Workflow**: After creating your order and submitting it, it will be sent to the Account Administrator (AA) for approval. Once approved by the AA the order will be sent to the Office of Radiation Safety (ORS). ORS approvers will review the order, compare the order to the approved protocol and if approved, will place the order from the vendor.

9 All orders approved by the Account Administrator by 12:00 pm (Noon) will be reviewed and approved the same day by the Office of Radiation Safety. Orders received after 12:00 p.m. may not be reviewed and approved until the next working day.

Please note:

- If the principal investigators radioactive material protocol has expired, we will not be able to place your order. If you are not sure of the expiration date, please call our office.
- If you should have any questions regarding any aspects of this process, please feel free to contact the Office of Radiation Safety at 773-702-6299.

*The definition of an approved protocol is one that is approved by the University Of Chicago Radiation Safety Committee that has no outstanding violations that would warrant a suspension.

Chapter III: Radioactive Material Accountability

Policy

All radioactive materials possessed under the University of Chicago and University of Chicago Medical Center radioactive material licenses shall be accounted for and secured at all times. The University requires principal investigators to maintain accountability for all radioactive material purchased or received under their radioactive material protocol. The Office of Radiation with the support of the University Radiation Safety Committee will assist in maintaining accountability and compliance with the University license and IEMA regulation.

Authority and Responsibility

Office of Radiation Safety is responsible for:

1. Receiving the radioactive material orders and conducting the package receipt survey.
2. Entering the radioactive material order into the principal investigators inventory list.
3. Distributing the radioactive material packages to the research groups and providing a Receipt and Disposal Log for tracking usage and disposal of material.
4. Maintain the master inventory of radioactive material at the University of Chicago.
5. Providing a copy of the active radioactive material inventory report to each PI and their Lab Designee(s) on a quarterly frequency.
6. Track the completion dates of the physical inventory report by the researchers to ensure the University license conditions are met.
7. Remove inventory items identified by the submitted researcher inventory report as being disposed and accompanied by a completed receipt and disposal record.

Principal Investigator is responsible for:

1. Ensure Receipt and Disposal Logs are completed properly and maintained on file.
2. Ensure Receipt and Disposal Logs are submitted to the Office of Radiation Safety.
3. Ensure radioactive material is properly stored and security.
4. Conducting a physical inventory of radioactive material possessed and stored under their radioactive material protocol.
5. Providing complete and accurate information on the quarterly inventory record and drain disposal log.
6. Submitting the physical inventory sheet and drain disposal log to the Office of Radiation Safety by the due date.
7. Reporting any discrepancies to the Radiation Safety Officer or designee.

Laboratory Designee is responsible for:

1. Ensure Receipt and Disposal Logs are completed properly and maintained on file.
2. Ensure Receipt and Disposal Logs are submitted to the Office of Radiation Safety.
3. Ensure radioactive material is properly stored and security.

4 Conducting a physical inventory of radioactive material possessed and stored under their radioactive material protocol.
5 Providing complete and accurate information on the quarterly inventory record and drain disposal log.
6 Submitting the physical inventory sheet and drain disposal log to the Office of Radiation Safety by the due date.
7 Reporting any discrepancies to the Radiation Safety Officer or designee.

Employees/Laboratory Staff is responsible for:
1 Ensure Receipt and Disposal Logs are completed properly and maintained on file.
2 Ensure radioactive material is properly stored and security.

Radionuclide Receipt and Usage

The receipt and usage of radioactive material at the University of Chicago shall follow this procedure:

1 The Office of Radiation Safety picks up the radioactive material from the University of Chicago Hospital Receiving Dock located at 5835 South Cottage Grove Avenue during normal working hours. The Office of Radiation Safety discourages delivery of radioactive material during off-duty hours. If off hour deliveries are requested, the Radiation Safety Officer or Radiation Safety Officer Designee must authorize the shipment.
2 The Office of Radiation Safety will inspect and survey the package(s) as described in the Procedure for Safely Opening Radioactive Material Packages.
3 The radioactive material is entered into the principal investigators inventory list by the Office of Radiation Safety.
4 The Office of Radiation Safety secures the radioactive material packages until the packages are picked-up by the laboratory personnel.
5 The Office of Radiation Safety notifies the laboratory personnel when their radioactive material order has arrived and is ready for pick-up.
6 The Office of Radiation Safety will issue a Receipt and Disposal Log (also identified as Radionuclide Package Receipt and Disposal Record) with each radioactive material order placed by the principal investigator. The log incorporates receipt, usage and disposal information for radioactive material orders. This documentation process is what is called the “Cradle-To-Grave” concept for tracking radioactive material from the time the material is received on campus to the time of its disposal.
7 Whenever any radioactive material is removed from the vial the radioactive material user must record the date, the volume of material removed, approximate percent of activity disposed as radioactive waste, manifest numbers of the waste containers, and his/her initials.
8 When the contents of the stock vial are exhausted or no further aliquots will be removed, lab personnel must enter the residual or remaining activity and the disposal box manifest number of the corresponding stock vial on the Package Receipt and Disposal record. Each user must also record disposal container manifest numbers for waste generated on the usage log.

9 A copy of the completed Package Receipt and Disposal record must be submitted to the Office of Radiation Safety. Items listed on the radioactive material inventory will not be deleted until the completed Package Receipt and Disposal record is submitted. Receipt and Disposal records submitted to the Office of Radiation Safety with missing information will not be removed from the PI inventory until the missing information has been completed.

Radioactive Material Inventory and Drain Disposal Records

At a quarterly frequency each principal investigator (PI) is required to conduct a physical inventory of radioactive material possessed under their radioactive material protocol issued by the institutions Radiation Safety Committee and submit their drain disposal logs. The scope of this process is as follows:

1 Physically identifying each radioactive material item listed on the inventory report provided by the Office of Radiation Safety.
2 Submit the completed inventory report and completed receipt and disposal logs to the Office of Radiation Safety by the due date.
3 Provide a completed "Drain Disposal Log" of radioactive material disposed down the sanitary sewer system during the previous quarter by the due date.

Instructions for Completion

The following instructions are provided to assist the Principal Investigator group complete the inventory and drain disposal records.

<u>Physical Inventory of Radioactive Materials</u>

- At the end of each calendar quarter the Office of Radiation Safety will generate the inventory report of radioactive material possessed under each Principal Investigator's protocol. The current inventory report will be emailed to the Principal Investigator and to his/her laboratory designee(s). Please Note: A due date or deadline for submittal of the completed inventory will be identified in the inventory email.
- The PI or Laboratory Designee must physically identify all stock vials, kits, etc. on the list to ensure that there is one-to-one correspondence between the actual inventory in the laboratory and the Inventory Report. If the radioactive material that is remaining in the stock vial or kit could be used in an experiment place a check mark next to the item in the column indicating "Check if In Use".
- If an item that appears on the Inventory Report has been disposed (placed in the radioactive waste), the PI or Lab Designee must indicate this on the Inventory Report by placing a check mark next to the item in the column indicating "Check if Disposed".
- For unsealed radioactive material the completed Receipt and Usage Log (new version called "Receipt and Disposal Record") for the corresponding stock vial or kit MUST be submitted. Disposed items will not be removed from the inventory list without a completed Receipt and Usage Log. Please Note: The following sample forms are available on our website to assist you: Sample Receipt and Usage Log or (Sample Receipt and Disposal Record).

- If you plan to dispose of sealed radioactive sources (encapsulated sources); please contact the Office of Radiation Safety for proper disposal. The sealed sources must be transferred to the Office of Radiation Safety separately from the unsealed radioactive material.
- Either the PI or Lab Designee must sign the bottom of the Inventory Report.
- If you find a discrepancy between the Inventory Report and your actual inventory (e.g. items missing, additional items found not listed on the report), please contact the Office of Radiation Safety for assistance.
- The inventory report provides the following information: Principal Investigator (PI) and Lab Designee contact information; permit number and expiration date; and a listing of the approved isotopes and chemical forms for the PI's permit. If you note any discrepancies in the phone numbers, email addresses, etc. at the top of the Inventory Report, please indicate the correct information next to the item.
- When the inventory has been completed the Inventory Report and Receipt and Usage logs must be returned to the Office of Radiation by the due date. You may submit via fax (2-4008) or mail via Faculty Exchange to AMB M-031A, MC 2106. Please Note: If sending Faculty Exchange make sure you mail well in advance of the due date to ensure delivery to our office by the due date to avoid late charges.

Drain Disposal Log for Laboratories using Unsealed Radioactive Material

- The University is required by regulation to track the amount of radioactive material discharged via the sanitary sewer system. Therefore, each Principal Investigator laboratory shall track the daily drain disposal of radioactive material and submit the drain disposal log for each calendar quarter.
- If your lab conducted drain disposal during the previous calendar quarter the drain disposal log must be submitted to the Office of Radiation Safety with the Inventory Report. The drain disposal log will enable the Radiation Safety staff to maintain a master accounting ledger regarding the amounts of aqueous radioactive waste released from the laboratories along with a total activity for the University.
- Replace the previous drain disposal log with a log for the new quarter. Click on the following link for a copy or go to the forms page for the Drain Disposal Log New Quarter.
- If your lab did NOT conduct any drain disposal during the previous calendar quarter, please complete the drain disposal log for the previous quarter. Click on the following link for a copy or go to the forms page for the Drain Disposal Log Previous Qtr.. Complete the log by indicating the PI name, Lab Location and checking the box "Lab Conducted No Drain Disposal". *Submit the drain disposal log to the Office of Radiation Safety with the Inventory Report.

The Drain Disposal Log must be submitted to the Office of Radiation Safety whether or not you conducted drain disposal during the previous quarter. If you should have any questions regarding the inventory process or you drain disposal records, please feel free to call the Office of Radiation Safety at 773-702-6299.

Please Note the following:

1. The inventory form must be completed and returned to the Office of Radiation Safety by the due date (approximately fifteen working days from the notice letter).
2. Additional orders will not be placed if the inventory form is not returned within the prescribed time.
3. Late charges will be assessed for inventory forms not returned by the due date.
4. The University Radiation Safety Committee has authorized the Office of Radiation Safety to physically perform the inventory for principal investigators that fail to return their inventory. There will be a charge for this service.
5. These inventory records are required by State regulations and are maintained by the Office of Radiation Safety for review by regulatory inspectors.

Chapter IV: Transferring Radioactive Material

Policy

It is the policy of the University of Chicago to transfer radioactive material between University principal investigators, acquired from an outside institution or transfer radioactive material to outside institutions in a manner that is compliant with the University license, IEMA regulations and applicable transportation regulations (e.g. International Air Traffic Association (IATA) regulations and U.S. Department of Transportation (DOT) regulations). Radioactive material shipments shall be prepared and offered for shipment by properly trained University employees (e.g. Office of Radiation Safety trained staff).

Authority and Responsibility

Office of Radiation Safety shall be responsible for:

1 Ensuring proper transfer of radioactive material between University of Chicago principal investigators;
2 Preparing and offering radioactive material packages for shipment;
3 Maintaining current IATA and DOT training for staff shipping radioactive materials; and
4 Maintaining required shipping records.

Principal Investigators, Employees, Students and Departments are responsible for:

1 Contacting the Office of Radiation Safety for approval to transfer radioactive material to another University of Chicago principal investigator laboratory;
2 Contacting the Office of Radiation Safety concerning shipping radioactive material to an outside institution; and
3 Providing the Office of Radiation Safety with required information for shipment as outline in the policy proper placards to motor vehicle carriers, if applicable; and
4 Complying with all aspects of this program.

Internal Transfer of Radioactive Materials between Principal Investigators

- In cases where the radioactive material is to be acquired from a radioisotope user at the University of Chicago, the person who is to be the supplier principal investigator (PI) must verify that the recipient principal investigator is authorized to receive the radioactive material.
- The supplier principal investigator must contact the Office of Radiation Safety to verify that the recipient PI has an approved application on file. Approval must be obtained from the Office of Radiation Safety prior to the transfer of radioactive material.

Please note: If the recipient received radioactive material and was not authorized to possess the material, the University would be in non-compliance with the radioactive material license issued by IEMA, Division of Nuclear Safety. In addition, this will jeopardize the supplier Principal Investigators protocol privileges.

Acquiring Radioactive Material from an Outside Institution

Laboratories receiving radioactive material as a loan or gift are required to have an approved application on file with the Office of Radiation Safety and must PROMPTLY notify Radiation Safety of the receipt of such a loan or gift.

Transferring Radioactive Material to an Outside Institution

- Radioactive material being shipped outside the University must be approved by the Office of Radiation Safety.
- To ship radioactive material to another institution, the U of C, Office of Radiation Safety must obtain authorization from the recipient institution's Radiation Safety Office and a copy of their institutions radioactive material license. Please notify our office in advance of the shipping date, so that our staff can complete the necessary shipping documents and obtain the necessary licensing documents and packaging materials.
- If you are shipping radioactive material to another institution, you must provide the Office of Radiation Safety with the following information well in advance of shipping the radioactive material:
    - Shipment Address of the institution;
    - Telephone Number and Contact Name of end user;
    - Radiation Safety Officer name and contact number;
    - The isotope, chemical and physical form of the radioactive material;
    - Shipment method, your shipper account number (e.g. FedEx number) and all packaging materials; and
    - Projected activity at time of shipment and shipping date.

Please note: The principal investigator or his/her staff must not transport radioactive materials in their own vehicles. All shipments of radioactive material must be completed by the Office of Radiation Safety staff trained in the shipping regulations issued by the U.S. Department of Transportation (DOT) and the International Air Transportation Association (IATA).

Chapter V: Occupational Exposure Monitoring

Policy

It is the policy of the University of Chicago to monitor personnel working with or around radiation emitting sources or devices and who are likely to receive 10% of the annual radiation dose limits identified in the Illinois Emergency Management Agency (IEMA), Division of Nuclear Safety regulations.

Purpose

The purpose of this policy is to establish guidelines to ensure personnel exposures to radiation are maintained as low as reasonably achievable (ALARA) and meet the University of Chicago ALARA goals.

Authority and Responsibility

Office of Radiation Safety is responsible for:

1 Providing radiation monitoring devices as requested by personnel.
2 Ensure appropriate personal monitoring equipment is provided for the type or radiation to be monitored.
3 Providing instructions to personnel on how to wear personal monitoring equipment.
4 Reviewing personnel monitoring reports.
5 Investigating causes for employee exposures which exceed the ALARA investigational limits or have abnormally high exposure readings.

Principal Investigator is responsible for:

1 Requesting personal monitoring equipment (e.g. whole body, extremity, collar) for their laboratory staff as required by this policy.
2 Ensure sufficient shielding is available for all personnel working with radiation emitting sources or devices to limit radiation exposure.
3 All personnel are knowledgeable in the requirements of this policy.

Employees are responsible for:

1 Wearing the personal monitoring equipment (dosimeter) assigned while working in areas where radiation emitting sources or devices are used and/or stored.
2 Making sure that the dosimeter does not leave the University property at any time except when being sent out for development and reading.
3 Making sure that the dosimeter for a particular wear period is exchanged for a dosimeter for the new wear period by the return due date.
4 Informing the Radiation Safety Officer, in writing, if they want to declare their pregnancy.
5 Using appropriate ALARA principles (time, distance and shielding) when required or applicable to maintain individual exposure to within ALARA levels.

Monitoring Requirements

- All persons whose work is associated with radiation that could result in exposure above 10% of the above limits must wear radiation monitoring badges (5% for

persons under 18 years of age). * Whole body badges and extremity badges are issued for a two-month wear cycle and are used to monitor exposure from high-energy beta, gamma-ray, and neutron sources.

- Whole body badges and ring badges do not respond to the weak beta radiation from H-3, C-14, or S-35. Workers who use H-3 and C-14, and less than 1 mCi a month of S-35 or P-32, are not required to wear a radiation badge, but may request one. Workers using 1 mCi a month or more of P-32 or other high energy beta emitter must wear a whole body badge.
- Workers that use 10 mCi or more of P-32 or other high-energy beta emitters at a time or use more than 1 mCi of a gamma-ray source are required to wear a whole-body dosimeter and ring badge.
- Employees whose work is associated with radiation from X-ray producing equipment and are likely to receive exposure in excess of 10% of the annual dose limits must wear radiation monitoring badges (dosimeters).
- A declared pregnant women must be monitored if she is likely to receive during the entire pregnancy, from radiation sources external to the body, a deep dose equivalent in excess of 1 mSv (0.1 rem) or is likely to receive a committed effective dose equivalent in excess of 0.5 mSv (0.05 rem). Pregnant employees have the option to voluntarily declare their pregnancy, in writing, to the Radiation Safety Officer. Declaration of the pregnancy allows the radiation exposure to the fetus to be closely monitored and allow for additional precautions, if needed. If you should have any questions, please contact the Office of Radiation Safety.
- Exposure Limits
  1 Total Effective Dose Equivalent (TEDE) [Exposure to the Whole Body]: 5000 mRem
  2 Eye Dose Equivalent (LDE) [Exposure to the Lens of the Eye]: 15,000 mRem
  3 Shallow Dose Equivalent (SDE) [Exposure to the Skin or any Extremity]: 50,000 mRem
  4 Minor Dose Limits [Less than 18 years old]: 10% of Adult Doses listed in Items 1 – 3 above
  5 Declared Pregnant Worker [Dose Equivalent to an Embryo/Fetus]: 500 mRem during the gestation period

Requesting or Canceling Radiation Monitoring Badges

1 To initiate monitoring service for exposure to radiation an individual must complete all information on both sides of the radiation monitoring request card. (Cards are available in the Office of Radiation Safety or at the badge drop off location.) This will ensure the proper monitoring device(s) is issued to the individual and will assist in determining if the individual has any previous exposure history. The individual shall submit the card to their Principal Investigator or supervisor for signature. The completed request card shall be submitted to the Office of Radiation Safety Office in AMB M-031A.
2 The Office of Radiation Safety will issue the monitoring device(s) to the individual as noted on the request card.
3 Radiation monitoring badges must be ordered and discontinued by the Office of Radiation Safety several weeks in advance. Request cards must be received in our

main office (AMB M-031A) by the 15th of the month to ensure that a permanent badge is started or canceled effective the first of the following month. If the deadline for starting a permanent badge for the next month has been missed, Radiation Safety can assign a temporary film badge. Indicate on the request card that a temporary film badge is needed until the permanent badge starts. The temporary film badge will be available for pick-up in room M-031A.

Location of Individual Monitoring Device

The radiation monitoring device shall be worn in the appropriate location on the whole body or extremity as follows:

- The whole body monitoring device shall be worn at the unshielded location of the whole body likely to receive the highest exposure. Note: When a protective apron is worn, the location of the monitoring device is typically at the neck (collar). The whole body means, for purposes of external exposure, head, trunk (including male gonads), arms above the elbow and legs above the knee.
- The extremity monitoring device shall be worn on the extremity likely to receive the highest exposure and shall be oriented on the appropriate finger (label inward toward palm) to measure the highest dose to the extremity being monitored. The extremity badge must be protected from contamination; therefore, it must be worn under gloves when you are working with unsealed radioactive material.
- The monitoring device to monitor eye dose equivalent shall be located at the neck (collar), outside any protective apron being worn by the monitored individual, or at an unshielded location closer to the eye.
- The monitoring device to monitor the dose to an embryo/fetus of a declared pregnant woman shall be located at the waist under any protective apron being worn by the woman.

Please Note: Radiation monitoring badges are to be worn only by the individual to whom they are assigned to.

Exchange and Processing of Monitoring Device

- Each monitored individual shall exchange their radiation monitoring device monthly for the new wear period monitor by the 10th day of the month of the current (new) badge wear period.
- The (Badge Distribution Location) document indicates the pickup and drop-off location for your laboratory/department radiation monitoring badges.
- The Office of Radiation Safety will assign a temporary badge to you if you lost your dosimeter (radiation badge). Contact the Office of Radiation Safety as soon as you know the dosimeter is lost.
- The Office of Radiation Safety will collect and ship the monitors to the outside vendor for processing.
- The vendor provides exposure reports to the Office of Radiation Safety and a copy is provided to the Principal Investigator or Department.
- The exposure reports are reviewed by the Radiation Safety Officer (RSO) or designee.

Review and Investigation of Exposures

The RSO will review the exposure reports and evaluate individual exposures exceeding the following ALARA investigational limits:

- **Quarterly Investigational Limits for Monthly Wear Dates**
  - **Total Effective Dose Equivalent (TEDE)** [Exposure to the Whole Body]: Level I Investigational Limit: >/= 125 mRem and Level II Investigational Limit: >/= 312 mRem
  - **Eye Dose Equivalent (LDE)** [Exposure to the Lens of the Eye]: Level I Investigational Limit: >/= 375 mRem and Level II Investigational Limit: >/= 938 mRem
  - **Shallow Dose Equivalent (SDE)** [Exposure to the Skin or any Extremity]: Level I Investigational Limit: >/= 1250 mRem and Level II Investigational Limit >/= 3125 mRem
- **Bimonthly Investigational Limit for Bimonthly Wear Dates**
  - **Total Effective Dose Equivalent (TEDE)** [Exposure to the Whole Body]: Level I Investigational Limit: >/= 83 mRem and Level II Investigational Limit: >/= 208 mRem
  - **Eye Dose Equivalent (LDE)** [Exposure to the Lens of the Eye]: Level I Investigational Limit: >/= 250 mRem and Level II Investigational Limit: >/= 625 mRem
  - **Shallow Dose Equivalent (SDE)** [Exposure to the Skin or any Extremity]: Level I Investigational Limit: >/= 833 mRem and Level II Investigational Limit >/= 2080 mRem

The RSO or RSO designee will conduct his/her investigation as follows:

1 If a personnel dose is less than Investigational Level I no further action will be taken unless deemed appropriate.

2 If a personnel dose is equal to or greater than Investigational Level I but less than Investigational Level II the RSO or RSO designee will submit a notice to the individual who received the exposure informing them of the exposure and to remind them of ALARA principles to be used. No further action will be taken unless deemed appropriate by the RSO or RSO designee.

3 If a personnel dose is equal to or greater than Investigational Level II the RSO or RSO designee will submit a notice to the individual who received the exposure informing them of the exposure and to remind them of ALARA principles to be used. In addition, the notice will require the individual to complete a questionnaire to evaluate any factors affecting the exposure and return the questionnaire to the appropriate Safety Office.

4 If the RSO or RSO designee determine further investigation is warranted due to an abnormally high exposure reading(s) the following may be conducted:
   - Request the vendor to reprocess the radiation monitor device(s) involved to verify the reading.
   - Evaluate the equipment involved, if necessary.
   - Perform any necessary radiation surveys to assist in determining the cause.

5 A summary of personnel exposures exceeding Investigational Levels I and II will be presented to the University Radiation Safety Committee.

6 In the event a worker's or a group of workers' doses need to exceed an investigational level, a new, higher investigational level may be established for that individual or group on the basis that it is consistent with good ALARA practices. Justification for new investigational levels will be documented and must be approved by the University Radiation Safety Committee.

7 The employee(s) who receive a notice of exceeding a investigational level must complete the following:

- If receiving a notice for a dose equal to or greater than Investigational Level I but less than Investigational Level II, the employee shall review their procedural technique for possible reduction of exposure and apply the basic rules of time, distance and shielding to keep their exposure ALARA.
- If receiving a notice for a dose greater than Investigational Level II, the employee shall complete the questionnaire after consultation with their supervisor and the RSO or MP, if needed. The questionnaire shall be returned to the appropriate Safety Office within 10 working days. In addition, the employee shall review their procedural technique for possible reduction of exposure and apply the basic rules of time, distance and shielding to keep their exposure ALARA.

8 The RSO or RSO designee will determine if any other actions should be implemented to assure adequate protection in the future.

Chapter VI: Safe Use of Radioactive Material

Policy

The University Radiation Safety Program has been established to provide guidance for researchers in the safe use of radioactive materials and ensure compliance with the University radioactive material license, state regulations and federal regulations.

Authority and Responsibility

Office of Radiation Safety is responsible for:

1 Developing the Radiation Safety Program for safe use of radioactive materials;
2 Ensuring compliance with the University license, state regulations and federal regulations pertaining to the safe use of radioactive materials;
3 Providing training to employees.

Principal Investigator and Department are responsible for:

1 Providing adequate resources to maintain a safe work environment for laboratory staff;
2 Complying with all aspects of the radiation safety program for the safe use of radioactive materials.
3 Reporting loss, theft, or damage to any source of radioactive material to the Office of Radiation.
4 Ensuring the security of radioactive materials.

Employees and Students are responsible for:

1 Complying with all aspects of the radiation safety program for the safe use of radioactive materials.
2 Reporting loss, theft, or damage to any source of radioactive material to the Office of Radiation.
3 Ensuring the security of radioactive materials.

Facilities

It is each principal investigator's responsibility to provide adequate shielding and monitoring instruments for use with their radioactive material and to ensure compliance with the regulations and the appropriate radiation safety practices will be met by anyone working with their material. In addition, it is each applicant's responsibility to ensure they have access to a functional fume hood for use of volatile radioactive material. The Office of Radiation Safety must be notified when fume hoods used in radioactive material experiments become nonfunctional. In addition, the Office of Radiation Safety must be notified prior to service calls for clogged sinks, non-functioning hoods, or exhaust system filter changes.

Opening Packages

- Packages containing radioactive material must be opened in an area designated for the use of radioactive material, such as a lab bench covered with absorbent paper. Packages containing volatile radioactive material must be opened in a functional hood.

- Don gloves and carefully open the outer and inner packaging. Users should verify that the shipment contains the isotope, chemical compound, and activity ordered. Users should check the integrity of the final source container by inspecting for signs of damage, i.e., vial breakage, package discoloration, or fluid loss. Packaging material, such as the box, plastic inserts, etc. shall be monitored for contamination prior to disposal.
- If any contamination is found it must be identified and the incident reported to the Office of Radiation Safety.
- If the packaging material is not contaminated, obliterate, cross-out, or cover with an "Empty" label all radioactive material labels prior to discarding it into the regular trash.

Survey Requirements

Surveying for contamination must be performed by the RAM user during and after each experiment or use. Particular attention should be directed to the hands, shoe soles, lab coats, working surfaces, equipment used, waste storage areas/containers, radioactive material storage units (refrigerators, freezers, etc.), and the floor in the working area.

Proper Survey for Detection of Specific Isotope Used

- Users working with H-3 must perform wipe tests to survey for contamination and use a liquid scintillation counter to analyze the wipe tests. The following procedure must be followed when performing the wipe tests:
    - Wear appropriate personal protective equipment (e.g. gloves, lab coat);
    - Use small pieces of absorbent material (Kimwipe, filter paper, paper towel, cotton-tipped applicator) for wiping the area to be surveyed;
    - An area of 100 cm2 or more should be wiped for each area to be surveyed;
    - Wipe all potentially contaminated areas in an S-shaped pattern;
    - Place each wipe sample in a vial (one sample per vial) and add the appropriate type and volume of cocktail to each vial (4 ml for a 5 ml vial);
    - Prepare a "blank wipe" sample to determine the background reading;
    - Each sample (including the background sample) must be counted for 1 minute;
    - Use the LSC protocol that is programmed for detection of the appropriate isotope energies.
- Radioactive material users working with C-14, Na-22, P-32, P-33, S-35, Cl-36, Ca-45, Cr-51, Zn-65, Rb-86, Nb-95, Tc-99m, or I-123 must survey with a thin-end window or pancake Geiger- Müeller (G-M) detector. Review the section of this manual for effective use of the survey instrument. Remember to complete the battery test and operational check prior to use.
- Radioactive material users working with I-125 must survey with a sodium iodide scintillation detector. Review the section of this manual for effective use of the survey instrument. Remember to complete the battery test and operational check prior to use.

Survey Documentation

- Frequency for Usage of 250 μCi per month or more: Each laboratory is required to document a survey once per week unless radioactive material has not been used since the last documented survey. This statement means that a survey is only required to be documented weekly during the times you use the material. (For example: If the survey was documented on Friday and someone used material on Saturday, you need to document a survey the following week, even if there was no more material used the next week.) Therefore, a survey is not required based solely upon items being on the laboratory inventory. The use of any isotope requires a documented survey for the corresponding week.
- Frequency for Usage of Less Than 250 μCi per month: The laboratory possessing and using less than 250 μCi per month may apply for a monthly survey frequency that must be approved by Radiation Safety. If a laboratory is not approved for a monthly survey frequency, they must document surveys as indicated in 3.b.1).
- Standardized Survey Forms: Surveys must be documented with one of the standardized survey forms provided by the Office of Radiation Safety. The entries on either survey form must show the areas surveyed, the date of the survey, the radiation measurements, the instrument used, decontamination results, and the initials of the person or persons performing the survey. The following standardized survey forms are posted on the Radiation Safety website: Survey Form Non-Sketch and Survey Form Sketch.
- The standardized survey form provides some brief instructions and includes a check box to signify the weeks you had no usage since the last survey. It is recommended that the laboratory staff check the Package Receipt and Disposal records each week to determine if radioactive material was used during the week (since the last survey) and to determine whether or not a documented survey is required. The following form is on the ORS website to assist in conducting and documenting a weekly check of radioactive material usage in the laboratory: Weekly Check for RAM Usage.

Decontamination Guidelines for Removable Contamination

- Researchers are required to conduct decontamination procedures when removable contamination exceeds the action levels listed below. Removable contamination is defined as radioactivity that can be transferred from a surface to a smear paper by rubbing with moderate pressure.
    - Wipe test greater than 400 cpm
    - Removable contamination above the survey instrument background exposure reading for GM and NaI probes (see 4.e for average background readings).
- After decontamination has been completed the area where the contamination was present must be resurveyed following the appropriate procedure to ensure the area is properly decontaminated. The contamination incident must be properly documented on the survey report.

Shielding Requirements for Fixed Contamination and Elevated Exposure Rates

- Researchers are required to ensure exposure rates in occupied areas are

maintained as low as reasonable achievable. Therefore, appropriate shielding must be used to decrease exposure rates in these areas below the action levels listed below. Fixed contamination is defined as radioactivity remaining on a surface after repeated decontamination attempts fail to significantly reduce the contamination level. You may expect to find elevated exposure rates around your waste storage areas, stock and sample storage areas, and work areas.

  - GM survey instrument reading >0.25 mR/hr or 600 cpm, or 6 cps for Mini-Monitors and Rad-Monitors that read in cps
  - NaI survey instrument reading >1000 cpm

- After shielding of the fixed contamination or area of elevated exposure rates the area must be resurveyed to ensure the shielding has been properly positioned and sufficient shielding thickness was used. The actions taken to reduce the exposure rate must be properly documented on the survey report.

Survey Instruments

- Users working with C-14, Na-22, P-32, P-33, S-35, Cl-36, Ca-45, Cr-51, Zn-65, Rb-86, Nb-95, Tc-99m, or I-123 must have access to a survey instrument with a thin-end window or pancake Geiger-Müeller(G-M) detector.
- Users working with I-125 must have access to a survey instrument with a sodium iodide scintillation detector.
- Principal investigators using 1 mCi or more of C-14, Na-22, P-32, P-33, S-35, Cl-36, Ca-45, Cr-51, Zn-65, Rb-86, Nb-95, Tc-99m, or I-123 at any one time are required to have a working survey instrument with a thin-end window or pancake Geiger-Mueller probe in the laboratory at all times.
- Principal investigators using 1 mCi or more of I-125 at any one time are required to have a working survey instrument with a low energy sodium iodide crystal probe in the laboratory at all times.

Survey Instrument Calibration

- Survey instruments in use must be returned to the Office of Radiation Safety for recalibration on an annual basis. If needed, ORS will send the survey instrument to the manufacturer for calibration.
- If a research group purchases a new instrument, the Office of Radiation Safety must be notified. The Office of Radiation Safety will affix a sealed source to the new instrument (if a source was not purchased with the instrument) to be used for the instrument operational checks. A copy of the manufacturer's calibration certificate must be submitted to the Office of Radiation Safety. If you are unable to locate the calibration certificate, the Office of Radiation Safety will be required to recalibrate the instrument before it can be used in the laboratory.

Survey Instrument Repairs

- Minor repairs of malfunctioning survey instruments can be made by the Office of Radiation Safety for some instruments in wide use.
- Instruments requiring major repairs or instruments for which the Office of Radiation Safety does not maintain parts will be returned to the manufacturer for repair and recalibration.

- Instruments requiring repairs will require recalibration to vary proper function.

Survey Instrument Battery Test

- A battery check must be performed each day an instrument is used as a minimum. However, we recommend the battery test be completed each time the meter is turned on.
- If the battery test falls below the battery condition line, the instrument must be taken out of use until the batteries are replaced.
- Procedure for completing the battery test.
    - Move switch on base to "BAT" position.
    - The indicator needle must deflect to the "BAT TEST" range.
    - If it does not pass, you may not use the instrument! Change the batteries or call ORS for assistance.

Survey Instrument Operational Check

- An instrument operational check must be performed with a dedicated check source each day an instrument is used.
- The reading taken must fall within the range limits stated on the side of the instrument. If the reading falls outside the stated range, the instrument must be taken out of use and the Office of Radiation Safety must be contacted.
- Procedure for completing the operational check.
    - With the meter turned on, hold the probe flush against the check source location (black X) on the side of the meter. The red cap should be removed for G-M probes.
    - The display must read within the range limits on the "Check source Measurement" sticker.
    - Contact ORS if the reading falls outside the range. Do not use this instrument!

Effective Use of a Survey Instrument

The following information is provided to assist the RAM users in the proper procedure for performing contamination surveys with the survey instrument.

- Geiger-Mueller (G-M) Detector
    - After battery check and operational check, set the dial switch to the lowest scale.
    - "Instrument Background" is the highest reading when no radioactive material is present.
    - Average Backgrounds (end window or pancake probe) are: ~ 0.03 mR/hr or 30 – 100 cpm or 0.3 – 1 cps. If your background is too high you must move to another area, re-perform the operational check, and try again. A short in the cable or a contaminated probe can cause elevated backgrounds.
    - Always remove the red cap before surveying.
    - Proper survey distance is 1cm from the surface – don't let the probe make contact with the object you are surveying!
    - Keep the probe face parallel to the area being surveyed.

    - You can never survey too slowly. Recommended survey speeds range from 2-5 cm/second. Keep in mind that the efficiency of your meter varies with the isotope you are trying to detect!
    - Survey with the audio "on"!

- Sodium Iodide (NaI) Scintillation Detector for Detection of gamma radiation from I-125
    - After battery check and operational check, set the dial switch to the lowest scale.
    - "Instrument Background" is the highest reading when no radioactive material is present.
    - Average background 100 to 500 cpm
    - Results in cpm only!
    - 20-30% efficiency
    - Red cover is not removable!
    - Proper survey distance is 1cm from the surface – don't let the probe make contact with the object you are surveying!
    - Keep the probe face parallel to the area being surveyed.
    - You can never survey too slowly. Recommended survey speeds range from 2-5 cm/second. Keep in mind that the efficiency of your meter varies with the isotope you are trying to detect!
    - Survey with the audio "on"!

Liquid Scintillation Counters

The liquid scintillation counter (LSC) is used to detect low energy beta-emitters (H-3). The LSC must be used for analyzing wipe samples for H-3 contamination surveys. The instrument counting results will be in counts per minute (cpm) and the average background is usually less than 50 cpm. The LSC protocols must be programmed for detection of the appropriate isotope energies.

Laboratory Notebooks

Laboratories are required to maintain radiation safety notebooks.
Laboratory notebooks should contain all completed Package Receipt and Disposal Forms (Radionuclide Receipt & Usage Logs), Surveys of Removable Contamination, Radioactive Aqueous Waste Drain Disposal Logs, Training Records and Radioactive Material Inventory Records. Notebooks should be readily accessible for review by Radiation Safety personnel and Regulatory Inspectors.

Security of Radioactive Material

- There is heightened concern across the nation about acts of terrorism, therefore researchers need to be mindful of security procedures regarding the use of radioactive material.
- It is the responsibility of each principal investigator to maintain sources of radiation, (including radioactive material samples and radioactive waste) under constant surveillance and control at all times.
- The following guidelines must be observed:

- Rooms where radioactive material is used or stored must be locked when unattended.
- Eliminate unnecessary quantities of radioactive materials.
- Maintain safe and secure storage of all radioactive material in space you are directly responsible for and space you remotely oversee.
- Be aware of unexpected visitors, make inquires and have a plan to deal with those situations.
- Report to University Police (123 or 773-702-8181) any individuals whose behavior you find threatening or suspicious.
- Maintain accurate contact information at laboratory entrances for use by emergency responders (contact information cards are available from the Safety Office).

- It is also the responsibility of each investigator to promptly report loss, theft, or damage to any source of radioactive material (radioactive waste, stock solution vials, sealed sources, etc.) to the Office of Radiation Safety.

Labeling of Containers Containing Radioactive Materials

- The University policy is to label each container (stock vials, samples, etc.) of radioactive material with a durable, clearly visible label bearing the radiation caution symbol and the words "CAUTION RADIOACTIVE MATERIAL".
- In addition, the container shall bear a label denoting the isotope, activity, and the reference date activity. Vials and samples containing radioactive materials placed in storage (refrigerators, freezers, etc.) must be properly labeled to ensure all staff is aware of their presence.
- Counting vials do not need to be labeled if they are stored in an appropriately posted area and are attended by an individual who takes the necessary precautions to prevent personnel exposure and place the vials in the appropriate waste container.

Radiation Safety Precautions

Food and Beverages

The University is committed to maintaining a safe work environment for its employees and the University Radiation Safety Committee is responsible for the control and safe use of radioactive material. Because of the risk of ingesting small amounts of radioactive material over a long period of time, food and beverages for human consumption CANNOT be stored or consumed in radioactive material laboratories or cold rooms.

- General Rules:
  - Smoking in radioactive material laboratories is prohibited.
  - The application of cosmetics (lip gloss, hand cream, etc.) is prohibited in areas where radioactive material is used or stored.
  - Heating or preparing food or drinks for human consumption using microwaves and coffee makers in radioactive material laboratories is strictly prohibited.
- Specific Rules Regarding Food/Beverages in Radioactive Material Laboratories:

- Definition: Use or Storage of Radioactive Material is any lab, cold room, or office door that has a "Caution Radioactive Material" sign posted on it is an area where radioactive material is used or stored.
- In these Areas: Lab personnel are NOT allowed to eat food (e.g lunches, bagels, sweet rolls, or candy, etc.) or drink any type of beverages (e.g. coffee, soda pop, water, tea, etc.) and Lab personnel are NOT allowed to store food or beverages anywhere in these labs, i.e. desk drawers, cold rooms, refrigerators.
- Defined Areas For Eating and Drinking of Beverages: Lab personnel are allowed to eat and drink in areas that are clearly a separate space from the rest of the lab, i.e. an office within the lab with its own door. These areas need to be approved by Radiation Safety.

Protective Clothing

Rubber or plastic gloves and either laboratory coats or coveralls must be worn while working with radioactive material that is not in sealed source form. Gloves used while working with iodine shall be replaced frequently because iodine tends to migrate through glove material. For this reason, double gloves are recommended for iodine work. Such protective clothing must be monitored before removal and, if found to be contaminated, stored for decay in an isolated location or disposed as radioactive waste. Gloves must never be reused. In addition, shorts, skirt, and open toed shoes are prohibited.

Working Surfaces

Working surfaces should be covered with absorbent material that has a waterproof backing. The waterproof backing side must be down on the surface to be covered with the absorbent side up. These covers should be checked after each experiment or use. If contamination is found, discard the absorbent paper as radioactive waste and replace the absorbent material.

Fume Hoods

Work involving volatile liquids, gases, fine powders, boiling, dust, vapors, energetic stirring, or any other operation where radioactive materials are likely to become airborne must be performed in a hood having a minimum face velocity of 100 linear feet per minute at any point of the hood opening. The base of the hood should be covered with absorbent material that has a waterproof backing. Hood exhaust filters should be maintained in good condition in order to exhaust dust and vapors efficiently. The Plant Department should be contacted to make such measurements and to replace the filters if necessary.

Iodinations with I-125 sodium iodide must be performed in a fume hood having a minimum face velocity of 100 linear feet per minute at any point of the hood opening. When using any volatile radioactive materials, the hood should be left running at all times.

Mouth Pipetting

Radioactive solutions shall not be pipetted by mouth.

Release of Equipment Used in Radioactive Material Experiments

Prior to the release of equipment (ice buckets, centrifuges, pipetters, etc.) that were used in radioactive material experiments, the equipment must be surveyed to ensure that no residual contamination is present. All "Caution Radioactive Material" signs must be removed, to certify that no radiological hazards exist. If the equipment is to be released to a vendor for repair or released to movers for packing, the monitoring must be performed by the Office of Radiation Safety.

Labeling Equipment Use in Radioactive Material Experiments

All equipment (centrifuges, pipetters, pens, etc.) used in radioactive material experiments must be labeled with "Caution Radioactive Material' signs to communicate to all lab personnel the potential radiological.

Radionuclide Use Involving Animals

- The principal investigator under whose application the material is obtained is responsible for posting each cage with a sign bearing the standard radiation caution sign, radionuclide, total activity in each animal, date and name of experimenter.
- Animals containing radioactive material must be housed in separate cages segregated from other animals. Animal attendants should monitor themselves before leaving the area, particularly their hands and the soles of their shoes. Lab personnel are responsible for conducting area surveys after experiments as prescribed in the laboratory survey section.
- Principal investigators and authorized personnel must have access to rooms housing animals injected with radioactive material. Animal housing facilities for animals containing radioactive materials must be locked at all times.
- Radiation Safety, when applicable, will assign waste containers for the collection of radioactive waste (excluding carcasses).
- Animal Care Facilities, cages, animal carcasses, waste, bedding/excreta, and related equipment must be held by the investigative staff until surveyed by the Office of Radiation Safety for release to the Animal Resource Staff.
- Investigative staff may be issued additional protection and control instructions from the Animal Resource Committee and/or the Office of Radiation Safety. The Research Group will be required to follow these instructions.

Repair of Hoods and Drains

Researchers are required to notify the Office of Radiation Safety before repairs are made to laboratory drains or hood ventilation systems to determine if special monitoring is required to protect the Physical Plant worker or outside contractor.

Sealed Source Leak Test

- Sealed sources containing either of the following licensed radioactive material must be leak tested.
    - Alpha emitting source (half-life greater than 30 days) having an activity of more than 10 microcuries.
    - Beta or gamma-emitting source (half-life greater than 30 days) having an

activity of more than 100 microcuries.

- Alpha-emitting sources generally require testing at three-month intervals. Beta and gamma-emitting sources require testing at six-month intervals.
- It is the responsibility of the individual under whose application the source is used or stored to ensure that the leak tests are performed. Generally, Radiation Safety conducts the leak tests unless the University Radiation Safety Committee has approved an alternate means of complying with the regulations or license conditions. Access to the location of the source(s) or the device must be made accessible by the principal investigator for such testing.

Additional Requirements

The University Radiation Safety Committee or Radiation Safety Officer may specify additional requirements, procedures, or medical examinations, and may grant exemptions to the requirements herein specified.

Chapter VII: Recharge Services

Policy

All principal investigators, departments or individuals using or requiring radiation services from the Office of Radiation Safety shall be recharged for these services. Account numbers provided to the Office of Radiation Safety shall be charged.

Authority and Responsibility

Office of Radiation Safety is responsible for:

1. Obtaining active account numbers from principal investigator, account administrator or department.
2. Recharging accounts only for the radiation safety services used by or provided to the principal investigator or department.
3. Notifying principal investigator or account administrator prior to the account expiration date to obtain a new active account number.
4. Conducting the recharge process at the end of each month using the electronic billing process.
5. Providing billing statements to the principal investigator, account administrator and/or delegated department staff monthly.

Principal Investigator, Account Administrators and Department Staff are responsible for:

1. Ensuring active account numbers are provided to the Office of Radiation Safety.
2. Updating account numbers with the Office of Radiation Safety as necessary.
3. Providing proper account information (e.g. Account name, account number, start date for use, expiration date and percent for each account, if charges will be split among more than one account number).
4. Submit updates to accounts using the Account Authorization Request (ORS Form A5).

Scope

The Radiation Safety Fee Structure for the Office of Radiation Safety is designed to provide sufficient funds in support of the University of Chicago and Medical Center radiation safety programs, license conditions and requirements of the Illinois Emergency Management Agency (IEMA), Division of Nuclear Safety regulations. These fees along with financial assistance from the University's Budget Office provide the Office of Radiation Safety with funds to ensure that the University of Chicago is a safe environment to work and visit.

The fee structure is based on estimated projections provided by the Office of Radiation Safety each year. The radiation safety rates may be adjusted each year to cover any deficit or surplus occurring during previous fiscal years. The current rates are listed on the following fee schedules (located on the Office of Research Safety website):

University Fee Schedule
Medical Center Fee Schedule

Account Authorization Request Form

The Principal Investigator, account administrator or delegated department administrative staff must submit the Account Authorization Form (ORS Form A5) with a new application for non-human use of radioactive material and whenever the previously submitted account is to expire or change.

You can choose to indicate one or more accounts to be charged; however, the total percentage over the accounts must equal 100 percent. The principal investigator or account administrators are the authorized signers when grants will be recharged. The appropriate approved administrative staff should sign for department accounts. When the form is completed submit the form to the Office of Radiation Safety via fax (773-702-4008), inter-office mail (MC 2106) or email to radsafety@uchicago.edu.

Explanation of University Radiation Safety Service Fees:

1 Personnel Monitoring (Radiation Badges) – Since the majority of personnel monitoring dosimeters for the research community have a bimonthly wear period they will be charged at the bimonthly rate. However, if monthly monitoring badges are issued to your staff, a monthly rate will be charged for each monitor (e.g. fetal monitors have a monthly wear period). Please note that the Principal Investigator or department will be assessed an addition regulatory fee for delinquent or late badge returns or lost or unreturned badges.

2 Bioassay Procedures – The Office of Radiation Safety does not charge for bioassay monitoring and/or analysis for Iodine or Tritium uptakes. However, if ORS is required to perform an analysis for another isotope a fee will be assessed and if a commercial lab is needed the cost of assay will be charged to the Principal Investigator.

3 Research Laboratory Surveys – The Office of Radiation Safety will survey all research labs on a quarterly basis. These surveys will be charged at the "Routine Survey" rate. Any lab survey that yields a violation will be placed on a monthly survey schedule until there are 3 consecutive surveys without a violation. These monthly surveys will be charged at the "Routine Survey" rate. When a violation is found during a monthly or quarterly survey the Office of Radiation Safety will complete a follow-up survey within 3 to 6 days to ensure the violation has been corrected. This follow-up survey will be charged at the "Special Survey" rate. The Office of Radiation Safety will conduct a closeout survey when a laboratory is moving and/or leaving campus. The closeout survey will be charged at the "Special Survey" rate.

4 Leak Testing of Sealed Sources – The Office of Radiation Safety will conduct leak testing on sealed sources on a semi-annual or quarterly frequency. The leak test frequency is depended on the isotope and the source design. In most instances one test will be used for one source, unless a unit/device has two sealed sources mounted in the same source holder. In this case one test would be used and charged for the two sealed sources.

5 Radioactive Material Procurement Services – The Office of Radiation Safety has developed an inventory tracking system to ensure all radioactive material sources delivered to the University are accounted for. This radioactive material package handling fee covers the ORS staffing time to place the radioactive material orders,

survey packages delivered to the University, entering the inventory into the database system, managing the inventory database and costs associated with radioactive waste disposal.

6 Radioactive Material Inventory – The radioactive material package handling & waste fee covers the time for ORS staff to manage the required quarterly inventory program. However, since the quarterly inventory is a regulatory requirement, a deadline is provided for the Principal Investigator to complete this inventory. A delinquent or late inventory surcharge will be assessed to the Principal Investigator that fails to return their inventory record by the deadline. In addition, if there is failure by the laboratory to return the inventory after the deadline, ORS staff will conduct the inventory and the Principal Investigator will be charged for this service at the hourly rate.

7 X-ray Inspection/IEMA Registration – The X-ray producing machines are inspected on an annual frequency. The IEMA, Division of Nuclear Safety charges an annual registration fee for each X-ray producing machine. This annual fee will be passed along to the researcher or department.

8 Radiation Safety Training – A cancellation fee will be assessed to the Principal Investigator or Department whose staff is registered for an ORS training course and fail to attend the scheduled course without a 24 hour cancellation notice to ORS.

9 Survey Instrument Calibration and Repair – Survey instruments must be calibrated annually and after repair or adjustment. The Office of Radiation Safety charges a fee for the calibration service; however there is no extra charge for staff time for on-site repairs. However, any parts needed for repair or replacement will be charged at cost. Manufacturer calibrations and repairs will be charged at the invoice amount.

10 General Radiation Safety Services – The University of Chicago license requires that ORS conducted annual audits of the research laboratories. The fee per audit is a flat rate (not an hourly rate). There is no fee for a promptly reported spill or incident; however, if a spill or incident is not reported in a timely fashion a fee may be assessed per incident to cover ORS staff time.

11 General Supplies – The Office of Radiation Safety will charge for lead foil, batteries and instrument parts; however, there is no charge for waste management supplies or warning signs/tape. However, an instrument check source must be returned to ORS when an instrument is taken out of service or prior to a researcher leaving the campus. A researcher that does not return the instrument check source to ORS when leaving the University or looses an instrument check source will be charged a fee to replace the check source.

Explanation of Medical Center Radiation Safety Service Fees:

1 Personnel Monitoring (Radiation Badges) – The wear period for personnel radiation monitoring dosimeters for Medical Center staff working with radioactive materials is monthly; therefore, the monitors will be charged at a monthly rate. (e.g. fetal monitors have a monthly wear period). Please note that the department will be assessed an additional regulatory fee for delinquent or late badge returns or lost or unreturned badges.

2 Laboratory Surveys – The Office of Radiation Safety will survey all clinical laboratories on a monthly basis. These surveys will be charged at the "Routine Survey" rate. The Office of Radiation Safety will conduct a follow-up survey within 3 to 6 days for any lab survey that yields a violation to ensure the violation has been corrected. This follow-up survey will be charged at the "Special Survey" rate. The Office of Radiation Safety will conduct a closeout survey when a laboratory is moving, renovating or discontinuing the use of radioactive material in a laboratory. The closeout survey will be charged at the "Special Survey" rate.

3 Leak Testing of Sealed Sources – The Office of Radiation Safety will conduct leak testing on sealed sources on a semi-annual frequency. In most instances one test will be used for one source, unless a unit/device has two sealed sources mounted in the same source holder. In this case one test would be used and charged for the two sealed sources.

4 Radioactive Material Procurement Services – The radioactive material package handling fee supports ORS to maintain the Medical Center radioactive material program and radioactive waste disposal.

5 Radioactive Material Inventory – Since the quarterly inventory is a regulatory requirement, a deadline is provided for the authorized user/department to complete their inventory. A delinquent or late inventory surcharge will be assessed to the authorized user/department that fails to return their inventory record by the deadline. In addition, if there is failure by the laboratory to return the inventory after the deadline, ORS staff will conduct the inventory and the authorized user/department will be charged for this service at the hourly rate.

6 Radiation Safety Training – A training class cancellation fee will be assessed to the authorized user or department whose laboratory staff are registered for an ORS training course and fail to attend the scheduled course without a 24 hour cancellation notice to ORS.

7 Survey Instrument Calibration and Repair – Survey instruments must be calibrated annually and after repair or adjustment. The Office of Radiation Safety charges a fee for the calibration service; however there is no extra charge for staff time for on-site repairs. However, any parts needed for repair or replacement will be charged at cost. Manufacturer calibrations and repairs will be charged at the invoice amount.

8 General Radiation Safety Services – The Office of Radiation Safety will provide general radiation safety services for consultations, regulatory affairs, project management, facilities design, and program review at an hourly rate or other prearranged rate. There is no fee a promptly reported spill or incident; however, if a spill or incident is not reported in a timely fashion a fee may be assessed per hour to cover ORS staff time. A fee will be assessed to a department for ORS staff providing services for patient care procedures.

9 General Supplies – The Office of Radiation Safety will charge for lead foil, batteries and instrument parts; however, there is no charge for waste management supplies or warning signs/tape. However, an instrument check source must be returned to ORS when an instrument is taken out of service or prior to an instrument leaving campus. An authorized user or department that does not return

the instrument check source to ORS when leaving the Medical Center or losses an instrument check source will be charged a fee to replace the check source.

If you should have any specific questions regarding the cost of our radiation safety program, please feel free to contact our office at 773-702-6299.

Chapter VIII: Radioactive Waste Management Program

Policy

All radioactive waste shall be managed in accordance with the University radioactive material license and all state, federal, and local regulations.

Authority and Responsibility

Office of Radiation Safety is responsible for:

1 Managing the radioactive waste program;
2 Maintaining a centralized waste management facility;
3 Providing waste containers to the researchers;
4 Tracking and maintaining records of radioactive waste; and
5 Picking up radioactive waste from laboratories.

Principal Investigators, Employees, Students and Departments are responsible for:

1 Complying with all aspects of the radioactive waste management program;
2 Scheduling waste pickup from laboratory and delivery of waste containers; and
3 Properly recording waste placed in the container on the container manifest.

Radioactive Waste Management Procedures

The Office of Radiation Safety manages the University's centralized waste management program following these procedures:

- This program only allows for short term storage of radioactive waste within the research laboratories.
- The Office of Radiation Safety will assign the appropriate waste containers to each research group.
- It is the responsibility of each research group to utilize the appropriate shielding material for the storage of radioactive waste within their research lab.
- Radioactive material users are required to complete the manifest affixed to each waste container with the date the radioactive waste was placed in the waste container and the activity. * Contact the Office of Radiation Safety at 2-6299 for pick-up when a waste container is full. Radioactive waste pick-ups are conducted on Tuesdays and Fridays. When contacting the ORS for a waste pick up, the following information must be provided:
    - Principal Investigator's name;
    - Caller's name and phone number;
    - Isotope of waste;
    - Physical form of waste;
    - Waste container manifest number to be picked up; and
    - Room number for pickup/delivery of containers
- The Office of Radiation Safety will manage, track, and perform final disposal of radioactive waste removed from the research laboratories.

Dry Solid Waste

- Radioactive waste containing radioisotopes with half-lives less than 90 days must be packaged into one of the approved waste containers issued by the Office of Radiation Safety.
- Radioactive waste containing radioisotopes with half-lives greater than 90 days must be packaged into one of the approved waste containers issued by the Office of Radiation Safety. In addition, the waste must be sorted into one of the following content categories: incinerable, compactable, and noncompactible.

Please Note: Laboratory personnel must properly package and manifest the waste by recording the date waste was placed into the container and its activity. If the manifest is not properly completed the container cannot be removed from the lab until the information is added to the waste manifest.

- Once dry solid radioactive waste containers are full, laboratories must call the Office of Radiation Safety for pickup of the container. Replacement containers will be issued to the research laboratory upon their request.

Manufacturer's Stock Solution Vials

Stock solution vials regardless of half-life must be segregated from all other waste streams and placed into a container issued by Radiation Safety. Laboratories are required to properly package and manifest these vials. The Office of Radiation Safety will pick-up these vials for subsequent storage and disposal.

Aqueous Liquid Waste

- Laboratories are prohibited from discharging liquids into laboratory sinks beyond the current applicable limits:
    - One microcurie (1 μCi) per day of any radioisotope having a half-life greater than thirty (30) days.
    - Ten microcuries (10 μCi) per day of any radioisotope having a half-life less than thirty (30) days.

The applicable limits are noted on the Radioactive Aqueous Waste Drain Disposal Log

- Laboratories are allowed to discharge aqueous liquid waste daily at the limits listed above. These limits are daily discharges per sink drain.
- Lab personnel conducting drain disposal must record discharges on their Aqueous Drain Disposal Log. The record must list the date, isotope, volume, activity and the initials of the individual conducting the disposal. In addition, the Office of Radiation Safety will require labs to submit their drain disposal logs each quarter.
- The sink must be labeled as a sink used for Drain Disposal. These signs can be obtained from the Office of Radiation Safety.
- Aqueous liquid in excess of these limits must be collected in an approved carboy and must also be properly manifested. Carboys must be transferred to the Office of Radiation Safety for disposal. Replacement containers will be issued to the research laboratory upon their request.

Scintillation Media

- Scintillation vials containing activities of 0.05 μCi/ml or less of H-3, C-14, or I-125 may be disposed of as chemical hazardous waste. Laboratories within the medical complex are to contact the Medical Center Safety Office (2-1733) for disposal details. Laboratories outside the medical center are to contact the University Environmental Health & Safety Office (2-9999) for disposal details.
- Scintillation vials containing regulated isotopes (all isotopes except 0.05 μCi/ml or less of H-3, C-14 or I-125) must be disposed by the users via the Office of Radiation Safety. Contact Radiation Safety for waste disposal consultation.
- Bulk scintillation cocktail (all isotopes) must be disposed by the users via the Office of Radiation Safety. Contact Radiation Safety for waste disposal consultation.

Biological Waste

- Each researcher must be approved to perform animal experiments involving the administration of radioactive material to animals. In addition, each researcher must consult with the Office of * Radiation Safety concerning the generation of animal carcass waste, feces, bedding, etc. to ensure proper disposal.
- The following are guidelines to follow:
    - Radioactive animal carcasses may not be stored in the Carlson Animal Resource Facility (CARF) without permission from the Office of Radiation Safety.
    - Laboratories must be able to provide sufficient freezer space for carcasses containing radioisotopes with half-lives of less than ninety days. These carcasses must remain in storage for decay to background radiation levels (minimum storage period of 10 half-lives).
    - Laboratories must label the animal waste prior to storage in the freezer. The waste must be labeled with "Caution Radioactive Material" tape, isotope, date of storage and activity.
    - Laboratories must contact the Office of Radiation Safety for monitoring of this waste prior to its release for disposal to ensure proper documentation is maintained for the release survey.
    - Contaminated animal waste, such as feces, bedding, etc. must be transferred to the Office of Radiation Safety for decay-in-storage or off-site disposal.
    - The use of isotopes of H-3, C-14 or I-125 with a specific concentration of 0.05 μCi/gram or less of animal tissue, averaged over the weight of the entire animal may be disposed of as if it were not radioactive.
    - The use of H-3, C-14 or I-125 with a specific activity of greater than 0.05 μCi/gram averaged over the weight of the entire animal MUST be disposed of as radioactive waste via the Office of Radiation Safety.
    - The waste generated from all other isotopes administered to animals MUST be disposed of as radioactive waste via the Office of Radiation Safety.

Organic Liquids

Please contact the Office of Radiation Safety to discuss the use of organic solvents for your radioactive experiments prior to its use.

Chapter IX: Bioassay Guidelines

Policy

It is the policy of the University of Chicago to conduct bioassays to measure internal exposure to personnel by direct (in vivo) measurement or by analysis and evaluation of radioactive material excreted or removed from the human body (in-vitro).

Purpose

The purpose of the Bioassay Policy is to establish guidelines to ensure internal monitoring is conducted in a timely manner, ensure internal exposures exceeding limits are investigated in a timely manner and corrective actions are taken to avoid further exposures.

Authority and Responsibilities

Office of Radiation Safety is responsible for:

1 Ensuring the monitoring equipment is maintained.
2 Conducting bioassays on personnel requiring internal monitoring.
3 Conducting quality control on equipment to ensure proper operation.
4 Maintaining record of internal monitoring.
5 Investigating exposures exceeding the investigational limits.

Principal Investigator and Research Staff are responsible for:

1 Scheduling appointment with the Office of Radiation Safety for routine bioassay.
2 Notify the Office of Radiation Safety if an accidental uptake of radioactive material may have occurred and schedule a bioassay.
3 Work being conducted with volatile radioactive material is conducting in an operating fume hood with a minimum flow rate of 100 linear feet per minute at the sash height.

Bioassay Requirements

Iodine Thyroid Bioassay Requirements

- All users who work with a vial containing more than 1 mCi of I-125 or 5 mCi of I-131 must have a thyroid bioassay no sooner than 12 hours after each iodination and no later than one week after each iodination.
- All users performing iodination are required to schedule an appointment for a thyroid bioassay before any package containing more than 1 mCi of I-125 or 5 mCi of I-131 will be released by Radiation Safety. Do not schedule a thyroid bioassay for sooner than 12 hours after performing the iodination. If the user is not able to schedule (not sure the date to be used), the user must call the day of use to schedule the bioassay.
- A copy of the Package Receipt & Disposal Record for each iodine package or more than 1 mCi of I-125 and 5 mCi of I-131 must be submitted to the Office of Radiation Safety every week, beginning with the date the material is received by the user. Either fax or deliver a copy to the Office of Radiation Safety to ensure receipt. The Package Receipt & Disposal Record must list the date the material was used, amount removed from the vial, percent of activity placed into waste,

and the user initials. This requirement remains in effect for the length of time the iodine stock vial(s) remains in the laboratory. Vials that will no longer be used by the laboratory must be transferred to Radiation Safety. Once the stock vial(s) is transferred, the laboratory will no longer be required to submit copies of the usage log.

- Users who fail to submit a copy of the usage form within the one week time period will be notified.
- Users not reporting for a scheduled thyroid bioassay appointment will be called to reschedule. If the second appointment is not kept, the worker will be called to reschedule and the principal investigator will be notified. After the third failure to report for a scheduled thyroid bioassay, the principal investigator's license will be suspended from ordering I-125 or I-131.
- In repeated noncompliance situations, the University Radiation Safety Committee has authorized the Office of Radiation Safety to suspend principal investigators from ordering radioactive material.

Investigation Limits for Iodine

- The Radiation Safety Officer (RSO) and/or RSO designee shall be notified whenever the thyroid burden at the time of measurement exceeds 1.0 μCi of I-131 or 0.12 μCi of I-125. The RSO/RSO designee shall perform an investigation into the cause of the exposure and the potential for further exposure, and develop corrective actions to prevent recurrence.
- The RSO/RSO designee shall be notified immediately whenever the thyroid burden at the time of measurement exceeds 5.0 μCi of I-131 or 0.5 μCi of I-125. The RSO/RSO designee must perform an investigation, as described above, and must perform weekly bioassays on the individual until the individual's thyroid burden is less than 1.0 μCi of I-131 or 0.12 μCi of I-125.

Note: Investigation limits are adopted from U.S. Nuclear Regulatory Guide 8.20, "Applications of Bioassay for I-125 and I-131".

Tritium Bioassay Requirements

- Individuals working with more than 100 mCi of H-3 in any unsealed form are required, as a condition of the University's licenses to provide the Office of Radiation Safety with a urine specimen within 4 working days after each use.
- All users working with more than 100 mCi of H-3 are required to schedule an appointment for a bioassay (urine specimen) before the package with 100 mCi of H-3 will be released by the Office of Radiation Safety. If the user is not able to schedule (not sure the date to be used), the user must call the day of use to schedule the bioassay.

Investigational Limits for Tritium

- The Radiation Safety Officer (RSO) and/or RSO designee shall be notified whenever the urinary excretion concentrations exceed 5 μCi/L but are less than 50 μCi/L. The RSO/RSO Designee shall perform an investigation into the cause of the exposure and the potential for further exposure, and develop corrective actions

to prevent recurrence. The RSO/RSO designee will repeat the urine sample bioassay within a week of the previous sample.

- The RSO and/or designee shall be notified immediately whenever the urinary excretion concentrations exceed 50 µCi/L. The RSO/RSO designee must perform an investigation, as described above, and must perform weekly bioassays on the individual until the individual's urine samples show concentrations less than 5 µCi/L.

Note: The University of Chicago referenced the guidance outlined in NRC Regulatory Guide 8.32 "Criteria for Establishing a Tritium Bioassay Program".

Chapter X: Radiation Safety Audit Program

Policy

All laboratories using radioactive material shall be reviewed as required by the Illinois Emergency Management Agency (IEMA), Division of Nuclear Safety regulations, the University radioactive material license, and other relevant safety, health and environmental regulations. Reviews shall be conducted by representatives of the Office of Radiation Safety.

Authority and Responsibility

Office of Radiation Safety is responsible for:

1 Developing a Laboratory Radiation Safety Audit Program;
2 Conduct annual reviews of all radioactive material laboratories;
3 Conducting follow-up reviews of all laboratory areas identified for re-inspection;
4 Immediately stopping any work practices posing an imminent radiation safety hazard to faculty, staff, students and visitors;
5 Suspending a principal investigator radioactive material protocol if conditions or practices warrant such action;
6 Conducting an exit interview with the principal investigator, laboratory designee or other laboratory representative following the review;
7 Providing written reports to the principal investigator and laboratory designee;
8 Reporting audit results to the University Radiation Safety Committee; and
9 Ensuring corrective action is followed through for identified concerns.

Principal Investigators and Laboratory Designee are responsible for:

1 Complying with all aspects of the Radiation Safety Audit Program;
2 Providing access to all areas and rooms under their responsibility;
3 Acting immediately to correct any work practices identified as imminently hazardous which includes taking the appropriate corrective actions;
4 Addressing any concerns discovered during the laboratory radiation safety audit under their responsibility within 90 days unless otherwise established; and
5 Cooperating with outside regulatory agencies.

Purpose

The Office of Radiation Safety periodically conducts laboratory audits for the purpose of reviewing each research group's compliance with the University radiation safety program and the Illinois Emergency Management Agency (IEMA), Division of Nuclear Safety regulations. The audit process involves the review of recordkeeping (e.g. usage log, waste disposal manifest, and lab survey reports) and general radiation safety practices.

Frequency

Initial Review

All principal investigators with a radioactive material protocol and possessing radioactive material during the previous year shall be reviewed annually. Radiation Safety concerns identified during the radiation safety audit shall be corrected within 90

days, unless a shorter period is allowed due to the severity of concerns or a longer period of time is necessary because of operational considerations. Longer periods of time shall be agreed upon by the Office of Radiation Safety.

Follow-up Review

Follow-up reviews are based on risk which is determined by the number and severity of deficiencies. Twenty-five percent of laboratories scheduled shall be re-evaluated 90 days after the initial review. Laboratories selected for re-inspections shall be based on those laboratories with the highest number of concerns noted during the initial inspection. All laboratories with serious concerns shall be reviewed in accordance with the time frame identified on the report. All concerns shall be tracked until corrective action plans have been completed.

Procedure

To prepare each Principal Investigators laboratory for a state inspection the health physicists from the Office of Radiation Safety will conduct unannounced laboratory audits to simulate the state inspection process.

Your lab will be evaluated on four categories:

1 Radioactive Material Usage and Storage
2 Laboratory Surveys
3 Radioactive Waste Management
4 General Radiation Safety Practices

Listed below is a breakdown of the four categories and examples of deficiencies for each category.

Once the final review of the audit results is conducted, a report will be submitted to the principle investigator and the laboratory designee. If deficiencies are noted during the laboratory audit a written corrective action plan will be required from the principal investigator. The correction action plan must describe what actions/procedures have been implemented to ensure future compliance with each non-compliance item noted in the audit report. Please note that all audit results will be reviewed by the University Radiation Safety Committee.

If you should have any questions regarding the radiation safety audit program, feel free to contact the Office of Radiation Safety at 773-702-6299.

Radioactive Material Usage and Storage

- Receipt and usage logs accessible – Inaccessible logs (Lab staff do not know where the active or completed logs are located)
- All receipt and usage logs on file in lab – Missing logs (some logs have been lost or misplaced)
- Receipt and usage logs properly completed – Incomplete or improperly completed logs (missing usage, user initials or waste information)
- Radioactive material properly stored and secured against inadvertent entry and theft – Improper storage or unlocked radioactive material lab with no one present or use of radioactive material in unauthorized area(s)

- All items listed on inventory are present and accessible (Conduct a physical inventory of material currently listed on the PI inventory.) – Items listed on radioactive material inventory cannot be located
- Storage units containing radioactive material are properly labeled – Units used for storage of radioactive materials (e.g. stock vials, samples) do not have proper markings
- Radioactive material labels on required areas/items of use – Labels not posted on required areas/items (e.g. work benches, centrifuge, fume hood, incubator, pipettes, etc.) used for radioactive material experiments.

Laboratory Surveys

- Lab survey records accessible – Survey records inaccessible (Lab staff do not know where the survey records are located)
- Lab survey records on file in lab – Missing survey records. Survey records are not available for every week with active inventory (e.g. stock material, samples or waste present in the lab)
- Lab survey records properly completed – Incomplete or improperly completed survey records (e.g. results of survey not recorded properly, survey instrument identification missing, not surveying all use and storage areas)
- Lab survey records reflective of use or active inventory – Surveys not reflective of use or items listed on inventory and therefore, not using proper probe or survey technique to identify all radioisotopes in lab (e.g. wipe test to identify H-3, crystal probe to identify I-125, etc.)
- Appropriate corrective action taken for sites of contamination, including adequate documentation – Action level exceeded with no documented corrective action of cleanup and/or shielding of the area, if needed.

Radioactive Waste Management

- Proper segregation of radioactive waste – Improper segregation of waste (e.g. mixing biohazard waste and radioactive waste without approval, mixing H-3 with P-32 without approval; placing stock vial in dry solid waste container rather than in stock vial box)
- Proper packaging of radioactive waste – Improper packaging of waste (e.g. not using Radiation Safety approved waste containers, using glass jars for liquid waste rather than Radiation Safety approved carboy)
- Storage of radioactive waste in authorized area(s) – Storage in an unauthorized area (e.g. lab is not listed on the PI protocol)
- Drain disposal records properly completed – Improperly completed records of drain disposal
- Radioactive waste manifest properly completed – Incomplete or improperly completed manifest on waste container(s).

General Radiation Safety Practices

- No evidence of food or beverage being stored or consumed in a radioactive material area of use and/or storage – Evidence of storage or consumption of

food/beverage in radioactive material area (e.g. coffee cup in waste basket in lab, eating lunch at desk in lab, storing food or drink in refrigerator inside lab.)

- Laboratory personnel listed on application working with radioactive material – Lab personnel found working with radioactive material, but have not attended radioactive material user training and submitted the New User Amendment and Training Certification form to be listed on the PI protocol
- Up to date Training Certification Form with all active users of radioactive material with current training dates on file with Office of Radiation Safety and posted in the lab – Training certification form not on file in Office of Radiation Safety and/or posted in the lab
- Lab personnel using radioactive material are listed on the PI protocol, have current training (initial or annual refresher training) and have submitted the New User Amendment and Training Certification form for new users. – Radioactive material user in lab does not have up-to-date radiation safety training
- Emergency Procedure Posting posted in at least one laboratory – Procedure not posted in lab
- IEMA Notice to Employees posted in at least one laboratory – Notice not posted in lab
- Proper laboratory attire worn while working with radioactive material (gloves, protective clothing, no shorts/skirts allowed, close toed shoes, and/or film badge/ring badge when applicable) – Radioactive material user found not wearing proper laboratory attire while working with radioactive material
- No evidence of unreported spill, loss, theft, or damage to sources of radioactive material – Evidence of unreported spill, etc.
- Laboratory survey instruments operational – Inoperative survey instrument (e.g. low battery, operational check reading outside of range limits)
- Laboratory survey instruments operational check performed properly by lab personnel – Radioactive material user not able to perform operational check to standard

Imminent Hazards

Any work practices (e.g. handling or storage of materials, shielding) or facility deficiencies (improper fume hood operation when using volatile radioactive materials) posing an imminent hazard to faculty, staff, students and visitors identified during laboratory reviews shall be stopped and corrected immediately. The representative from the Office of Radiation Safety discovering any imminent hazard shall immediately notify the principal investigator who is responsible for appropriate follow-up corrective actions. All imminent hazards shall also be noted in the inspection report.

Progressive Resolution Process

Laboratories failing to correct concerns identified on any inspection report shall be subject to the progressive resolution process. Each identified concern shall be corrected prior to the corrective action date. For concerns not corrected, the following action shall take place:

- Stage One of Non-Compliance: A letter identifying the concerns is sent to the principal investigator and laboratory designee.

- Stage Two of Non-Compliance: If non-compliance is not addressed a letter identifying the concerns is sent to the principal investigator with a copy sent to the chairperson of the University Radiation Safety Committee.
- Stage Three of Non-Compliance: If corrective actions are not implemented the principal investigator protocol is suspended until appropriate corrective action has been implemented. The University Radiation Safety Committee is noted of suspension and may require principal investigator to attend committee meeting prior to reinstating protocol.

Outside Regulatory Agencies

The IEMA regulations in 32 Illinois Administrative Code II, Section 400 indicate that each licensee or registrant shall afford the Department at all reasonable times the opportunity to inspect such materials, machines, activities, facilities, premises and records as Department determines are necessary to establish compliance with the requirements of the license and provisions of the regulations. Reasonable times shall be any time the facility is operational.

Other outside regulatory agencies may request inspection of the University properties or review components of the radiation safety program in order to determine compliance with regulations pertaining to radioactive material and radiation safety issues.

Chapter XI: Radiation Badge Fact Sheet

Badge Distribution Stations

Badges are distributed and picked-up in designated areas within the medical center complex and university buildings. The Badge Distribution Locations document will assist you in locating your radiation monitoring badge(s).

Badge Exchange Frequencies and Wear Periods

Listed below are the badge exchange periods for the University and Medical Center laboratories/departments:

Bimonthly Badge Exchange Frequency

Listed below are the dates the badges will be distributed, their bimonthly wear periods, and the dates the badges must be returned to the badge coordinator or distribution stations for pick-up.

1. Monitoring badges for the January – February wear period are delivered by end of December 31st. Monitoring badges from the previous wear period November – December must be returned to the drop-off location by the end of day on January 10th.
2. Monitoring badges for the March – April wear period are delivered by end of February 28th. Monitoring badges from the previous wear period January – February must be returned to the drop-off location by the end of day on March 10th.
3. Monitoring badges for the May – June wear period are delivered by end of April 30th. Monitoring badges from the previous wear period March – April must be returned to the drop-off location by the end of day on May 10th.
4. Monitoring badges for the July – August wear period are delivered by end of June 30th. Monitoring badges from the previous wear period May – June must be returned to the drop-off location by the end of day on July 10th.
5. Monitoring badges for the September – October wear period are delivered by end of August 31st. Monitoring badges from the previous wear period July – August must be returned to the drop-off location by the end of day on September 10th.
6. Monitoring badges for the November – December wear period are delivered by end of October 31st. Monitoring badges from the previous wear period September – October must be returned to the drop-off location by the end of day on November 10th.

Monthly Badge Exchange Frequency

The monthly badges will be available at the distribution stations on the last day of the month and the Office of Radiation Safety will pick-up old badges by the 10th of the following month.

Badge Service Fees

The radiation safety badge service fees are listed on the University Fee Schedule list and the Medical Center Fee Schedule list. If you should have questions regarding badge service fees or badge charges, please contact the Office of Radiation Safety at 2-6299.

Deadline for Badge Service Changes

- A "green" badge card must be completed to issue a badge to a user and to delete a badge for a user. A temporary badge can be issued to a new user until permanent film badge service begins. Complete the film badge card, have the user and PI (research labs) or supervisor (hospital departments) sign it, and submit it to the Office of Radiation Safety M031A.
- Badge cards are available at all of the distribution stations or you may obtain them from our administrative office at M031A.
- If you wish to make changes in your badge service, changes must be submitted to the Office of Radiation Safety no later than the 15th of the month prior to the next wear period. Please Note: Changes received after the 15th will not be processed until the following month. If the 15th lands on a Saturday or Sunday the request for changes shall be submitted no later than the Friday prior to the 15th. Temporary badges are available for the individual until their permanent badge is issued. There will be a fee for temporary badges.

Radiation Monitor (Dosimetry) Report

The radiation monitoring badge exposure reports are mailed directly to PI or department administrator. Copies of the reports are available upon request from the Office of Radiation Safety. Every April/May, the Office of Radiation Safety forwards each badge wearer a copy of their annual report.

If a user should have a question regarding their radiation exposures, please contact the Office of Radiation Safety at 773-702-6299.

Reporting a Lost Radiation Monitoring Badge

If you should lose your radiation badge, please report the lost badge to the Office of Radiation Safety at 773-702-6299. Our office will assign a temporary badge for the rest of the badge wear period.

General Radiation Monitoring Badge Information

- The badge can be reread to confirm the accuracy of a radiation dose.
- The badge has an increased sensitivity allowing for minimal reporting of radiation dose as low as 1 mRem. (The minimal reporting for film badge is 1 mRem)
- The badge can be worn for an extended wear period. This will allow many radiation users to wear the badge for two months.
- The badge is packaged in a durable holder and will not be affected by heat, moisture, or pressure.
- The badge offers more qualitative information about conditions during exposure.
- Personal identification (name, lab or department, and wear period) is printed on the front of each dosimeter and laser etched on each ring badge. The back of the badge lists the wear date, account number, series, badge number, and badge type.
- The badge will be wrapped in a plastic bag. At the end of the wear period, snap the Luxel badge out of the holder and return the badge portion ONLY to the lock box at the distribution stations or to the badge coordinator.
- Unused holders should be clipped to the distribution station holder or returned to the badge coordinator for your area.