

Radiation Area Supervisors: Responsibilities and Guidelines

Definitions:

1. A **Principal Investigator (PI)** is the person who is directly responsible for a specific project under an approved radiation program issued in writing by the NCI-Frederick Radiation Safety Committee. The PI has complete authority over all radiation workers (individuals authorized to work with sources of ionizing radiation) in his/her program, regardless of company affiliation or supervisory status.
The PI may request Radiation Safety Officer approval for the appointment of a Radiation Area Supervisor (RAS) to assist the PI in performing the responsibilities mentioned in this text.
2. A **Radiation Area Supervisor (RAS)** is an additional person(s) designated by the PI to assist in the monitoring, training, and record-keeping requirements of the radiation program. The RAS generally has extensive experience and familiarity with the specific procedures being used by a particular lab.
3. A **Radiation worker** is a person who voluntarily performs work involving sources of ionizing radiation. Such a person shall know that the work involves the use of ionizing radiation before the work commences. A radiation worker works under the supervision of the PI and/or RAS, regardless of company affiliation or supervisory status.

The PI is ultimately responsible for a radiation program. The RAS may help with these responsibilities as the PI sees fit. The PI may choose whether or not to assign a RAS. Radiation Area Supervisors and their respective PI's should have an agreement as to what functions the RAS may delegate without prior approval of the Radiation PI. Please be aware that certain documentation (Radiation Program Application Form and Individual Radiation Worker Training and Experience Forms) will require the PI's signature. The RAS may sign all other documents, including program amendments, 6 Month Inventory and Program Reviews.

Each approved Radiation Program will receive a Radiation Program Application Packet and a four digit number assigned to it. Know your radiation program's four digit number! This number will be used to reference your radiation program on all documentation. The Radiation Program Application should be kept on file for future reference and radiation program renewals.

The following outline lists various functions that a RAS may be requested to oversee or perform for a radiation program.

- A. **Addition of Radiation workers to the program**: All prospective new radiation workers must complete the following BEFORE they are authorized to work with radioactive materials at NCI-Frederick.
1. All radiation workers must successfully complete the “Radiation Safety Training for New Users” course. This course is located on the EHS website under the online training link. One must click on "I need an account", which takes them to an email where they will send out a request for a username and password. Usernames and passwords are generally sent within 24 hours. The training course takes approximately 2 hours to complete.
 2. A “Training and Experience Form” or “Application Form” must be completed for the respective radiation program type. These forms are located on the EHS website under useful documents in the Radiation Safety section. Be sure to choose the correct form for your program. Isotope programs should fill-out the Isotope Training and Experience Form, X-ray programs should fill-out the X-Ray Program User Application Form, and Electron microscope programs should fill-out the Electron Microscope User Application Form. These forms must be signed by the prospective radiation worker as well as the Principal Investigator. Radiation Area Supervisors cannot sign these forms.
 3. All prospective radiation workers must read and sign the program’s “Protocol Specific Training Document”, usually located within a dark blue folder titled “Working Safely with Radioactivity”. This document must be thoroughly reviewed with each new radiation worker, regardless of prior radiation training or experience.
 4. For all isotope programs an individual must provide a baseline urine bioassay and thyroid scan (if applicable – radioactive iodine users) to Radiation Safety prior to becoming a radiation worker. Prospective radiation workers will be contacted by Radiation Safety for bioassays. Urine specimen cups may be picked up at the Radiation Safety Office located in building 426, room 135.
 5. Once the above steps have been completed, send the signed Training and Experience or Application Form along with a copy of the signature sheet (with worker’s signature on it!) from the Protocol Specific Training Document to the Radiation Safety Office - building 426. Radiation Safety will verify each person’s completion of the Radiation Safety Training for New Users course. After Radiation Safety has entered the information into the Radiation Information System (RIS), a confirmatory memo will be sent to the PI thru the RAS stating that the worker has been formally added to the radiation program. A radiation dosimeter(s), if applicable, will be

issued and the radiation worker may begin working with radioactive materials.

A six-month supervisory period is assigned to most new radiation workers. Please make sure that these workers are properly supervised during radioactive material manipulation.

- B. **Training**: In addition to the “Radiation Safety Training for New Users” and the “Protocol Specific Training”, a “Radiation Refresher Training” course must be completed by all radiation workers every two years. A memo will be sent to individual radiation workers when the training is due. Failure to complete the refresher training before the deadline date on the memo may result in suspension of the user’s radiation privileges until the training is completed.
- C. **Inventory**: Isotope programs must keep accurate inventory of all the radioisotopes on hand at any given time. All radioisotopes are delivered to the labs by Radiation Safety Staff. ***If you receive an isotope without an accompanying yellow sheet (Radioactive Material Accounting Record), please call Radiation Safety at extension 5730!***
1. Accompanying each isotope is a “Radioactive Material Accounting Record (RMAR)”, or simply the ‘yellow sheet’. This represents the lab record of active inventory.
 2. ‘Yellow sheets’ must be properly filled-out each time an aliquot is removed from the stock vial.
 3. After the stock vial is empty or no longer useful, the vial is disposed of as radioactive waste and the yellow sheet is marked as disposed or used (showing a volume of zero). The sheet is sent back to the Radiation Safety Office (RSO).
 4. Log sheets (dry and liquid) on waste containers must accurately reflect container contents and represent the record of radioactive material disposed from inventory.
 5. Periodic checks of inventory should be made to eliminate outdated stock vials.
- D. **Six-Month Inventory**: Bi-annual radioactive material inventory is performed in January and July by the RSO.
1. An email will be sent to all PIs/RASs two weeks prior to the inventory start date. Use this time to properly dispose of old stocks and send back any yellow sheets or RMAR that are no longer in use.
 2. Once you receive the “Radioisotope Inventory Questionnaire”, compare this information against your own.
 3. You will be required to fill-out the questionnaire with the proper information regarding all radioactive inventory on hand. Please note that the questionnaire asks for the radioisotope **volume**, not activity.

4. The completed questionnaire must be signed by the PI or RAS and sent back within the proper time-frame.
5. Physical Inventory will be performed by the RSO for a percentage of radiation programs. If your program is selected, the RSO will schedule a time to meet with you and physically inspect your radioisotope inventory and compare it to the questionnaire sheet.

E. **Transfers/Shipment of Radioactive Materials:** Transfers of radioactive material to another radiation program must be recorded on the accompanying RMAR or yellow sheet and approved by the RSO in advance. Any shipment of radioactive material off-site must be done through the RSO.

F. **Radioactive Waste Disposal:** Radioactive waste is described as any waste or discarded material that contains or is contaminated with radioactivity. The majority of radioactive waste generated at NCI-Frederick falls into one of the following categories: solid radioactive dry waste (includes sharps); radioactive biologicals; stocks; radioactive liquids; and scintillation vials (including survey vials which are background).

1. All solid radioactive waste, including sharps, must be segregated and packaged based upon the isotopic half-life as follows:
Class 1: Isotopes with a half-life of less than 15 days (³²P)
Class 2: Isotopes with a half-life of 15 to 100 days (³³P, ⁵¹CR, ³⁵S, ¹²⁵I, ¹¹¹In)
Class 3: Isotopes with a half-life greater than 100 days (³H, ¹⁴C)
All sharps must be stored in a sharps container or a sturdy cardboard box to prevent any exposures or sticks and kept separate from other dry wastes. Each class of waste must be placed into separate, properly labeled and sealed, clear plastic bags. Each properly labeled and sealed plastic bag may contain only "solid waste," which means no scintillation vials, no liquid, no stock containers, and no sharps. Each sealed bag must be individually labeled with the following information: program number, user name, isotope, and activity. The Drum/Container Log (Radioactive Dry Waste Log Sheet) must also be completed.
2. All radioactive biologicals, including items such as bodies, excrement, organs, contaminated bedding, and tissue samples containing radioactivity, should be segregated according to the isotopic half-lives listed above. Each class of radioactive biological waste must be placed into separate, properly labeled and sealed, clear plastic bags. If the waste is frozen, keep it frozen and the Waste Management Department will pick it up in that condition. Each sealed bag must be individually labeled with the following information: program number, user name, isotope, and activity. If there are multiple bags inside a storage container or box, please use a Drum/Container Log (Radioactive Dry Waste Log Sheet) to track each sealed bag.
3. All stocks vials are picked up on Tuesday with the radioactive dry waste. Please keep all stocks separate from the other items for pick up. If there

- are multiple stocks, please consolidate them by isotope in a clear, sealed bag. Each stock or sealed bag must be individually labeled with the following information: program number, user name, isotope, and activity.
4. Radioactive liquids: Carboys are used to collect bulk aqueous radioactive liquid. This generally consists of buffers, salts, and water. No hazardous compounds should be placed into these containers. The pH of each carboy should be between 5 and 9, and the carboy must not exhibit any characteristic hazards such as flammability, toxicity, or corrosivity. The Waste Management Office recommends that each carboy remain isotope specific. All radioactive liquid waste must be stored and transported in sealed containers. Preferably, all containers used to store radioactive liquids should have some form of secondary containment. Each time an entry is made to the storage container, the Radioactive Waste Log (Liquid Radioactive Waste Disposal Sheet) must be filled out and signed. The Radioactive Waste Log contains the following information: program number, user name, isotope, and activity.
 5. The Waste Management Department will pick up all scintillation vials, whether or not they contain any radioactivity. If radioactivity is used, please try to use a nonhazardous scintillation cocktail to avoid generating mixed waste.

For more information on radiation waste disposal please visit the EHS website.

- G. Radiation Surveys/Laboratory Monitoring Tests: Contamination monitoring (radiation surveys) should be conducted after each manipulation of radioactive material. At a minimum, contamination monitoring for the majority of Radiation Programs must be performed and documented on a monthly basis.
1. Authorized radiation programs must document the performance of a contamination survey **at least once a month** regardless of the quantities of radioactive material utilized within the month. All authorized use areas within the radiation program must be included in the survey.
 2. Surveys are normally performed by wiping a surface of the known area with Parafilm M or paper swabs and then determining the activity on the film/paper with a liquid scintillation counter (LSC). A GM counter may aid in performing the survey for high-energy beta emitters such as ^{32}P or ^{51}Cr . Radioactive contamination must be cleaned to ALARA levels. After decontamination, the area should be re-swiped, and the re-swipe data should be documented with initial survey results. The decontamination action level for NCI-Frederick is 500 dpm/100 cm² removable contaminations for beta/gamma and 10 dpm/100 cm² for alphas.
 3. All documented surveys must include:
 - a. A way of indicating swipe/survey points (such as a diagram/map showing the location of benches, desks, sinks, and hoods) within all authorized use areas belonging to the program. Each swipe/survey point taken should be numbered

on the diagram/map so that any contaminated areas in need of decontamination can be readily identified. Areas tested should represent areas where contamination might be expected as well as some areas where contamination would not be expected.

- b. A positive (sealed source ^3H and/or ^{14}C standards) and negative (background standard) control shall be run along with the swipes to determine efficiency for counts per minute (cpm) to disintegrations per minute (dpm) conversion. The positive and negative controls must be included on the LSC survey printout each month.
- c. Records are to be kept on both positive and negative results. All positive contamination must be properly cleaned, re-swiped, and re-read on the LSC with a printout attached to the original results.
- d. Diagrams/maps and swipe results are to be properly dated and kept on file in the laboratory for review by the RSO. It is recommended that all authorized radiation workers know where this file is kept.

H. **Radiation Safety Monthly Surveys**: Monthly radiation surveys performed by the Radiation Safety Office are done for the purpose of maintaining a broad surveillance program at the facility level, and to alert the individual programs to potential problem areas if a contamination or deficiency is found.

1. Contamination swipe tests, as well as survey meter tests where appropriate, will be performed and documented by the Radiation Safety Staff (RSS) for each radiation program at NCI-Frederick on a monthly basis. Radiation Safety will check for:
 - a. Labeling—Entrance to room
 - b. Labeling—Refrigerator/freezer/storage area
 - c. Labeling—Waste containers
 - d. Labeling—Radioactive materials
 - e. Labeling—Hoods
 - f. Labeling—Contaminated equipment
 - g. Use of absorbent paper as needed
 - h. Routine use of shielding as needed
 - i. Routine use of PPE (lab coat, gloves, eyewear)
 - j. Use of dosimeter (radiation badge) as needed
 - k. No food or drinks in lab
 - l. Survey meter available/current calibration/batteries ok
 - m. Security of RAM
 - n. Sink contamination
 - o. Other problems
2. Maximum permissible removable contamination level is 500dpm/100cm² or 10dpm/100cm² for beta/gamma and alphas respectively. If any swipe results meet or exceed these levels, they will be re-read to check for

- accuracy by the RSS. The staff, via phone message as well as survey report, will report contaminations to the respective laboratory personnel.
3. All contaminations found by the RSS must be cleaned and re-swiped by laboratory personnel belonging to the radiation program in which the contamination was found. The radiation program PI/RAS is then responsible for making sure that the Contamination Clean-up Sheet that is attached to the Monthly Survey Report is properly filled out with post clean-up dpm results. The Contamination Clean-up Sheet must be forwarded back to the RSO within 72 hours (3 business days) of receipt.
 4. Any deficiencies noted by the RSS will be addressed in the Monthly Survey Report as well. All deficiencies will be noted on a Deficiency Memo. A written response to the Deficiency Memo, indicating corrective actions taken, must be forwarded back to the RSO within 5 business days of receipt.
 5. Approximately four times per year, records checks will be performed by the RSS during routine surveys. RSS will check all documented monthly surveys performed by the program and the program's radioactive material inventory.
 - a. RSS will verify that the program is documenting a contamination survey for all authorized areas on the program at a minimum of once each month. RSS will also verify that any contaminations found by the program are appropriately decontaminated and that positive and negative controls are documented with each survey.
 - b. Radioactive Material Accounting Records (yellow sheets) will be checked to ensure the use of licensed material is being accurately recorded

I. **Radiation Program Renewal Application/Six-Month Program Review:** To ensure accurate and updated program information, a Six-Month Program Review will be performed bi-annually in January and July as well as a more intensive Program Renewal Application that must be submitted on a periodic basis.

1. Six-Month Program Reviews will be submitted along with the Six-Month Radiation Inventory Questionnaire every January and July. Please take the time to review all information and check for accuracy. Any discrepancies are to be reported to the RSO by making corrections on the Program Review Forms and returning within the appropriate time-frame.
2. Program Renewal Applications will need to be submitted periodically. Renewal packets are sent via email currently to the PI/RAS when a program is due. This packet contains the renewal application and a current program report. Included in the application are:
 - a. Each person on the radiation program must fill out a new Radiation Training and Experience or Application form. It is not the original T&E Form but a modified form for the renewal.
 - b. A copy of the signature sheet from the Protocol Specific Training Document (PST) containing each radiation worker's signature.

- c. For radiation producing machines (EM/X-ray) and irradiator programs, dated documentation of successful completion of equipment-specific training must be included for each person listed on the renewal application.
- d. Appropriate signatures must be obtained as requested on the application forms.
- e. Copies of all current radiation protocols must be included.
- f. The completed renewal application is to be submitted to the RSO within two weeks. Any amendments to the program will be made and a confirmatory memo will be sent back to the PI/RAS indicating that the requested changes have been made for the program.

J. **Amendments to Program:** Any request for amendment to a radiation program must be submitted in writing to the RSO. Emails from the PI/RAS are acceptable for everything except adding new radiation workers. Only the PI or the RAS has the authority to request an amendment. A program must be amended, in writing, when any of the following takes place:

- 1. Radiation workers are added or removed.
- 2. Changes occur to authorized radioisotopes (adding/deleting isotopes).
- 3. Activity usage levels increase or decrease. (for program or individuals)
- 4. Substantial changes are made in the protocol design.
- 5. Rooms are added to or removed from the program.
- 6. Addition/Removal of radiation producing machines.

A confirmatory memo will be sent back from the RSO indicating that the requested program changes have been made.

K. **Personal Monitoring Reports:** Radiation workers who are authorized to manipulate radioisotopes that emit high-energy betas, gamma rays, or x-rays will be issued dosimetry device(s) (radiation badges). These devices are designed to measure radiation exposure.

- 1. Radiation workers authorized to manipulate 10mCi or more of ^{32}P , and workers who perform iodinations will be issued a thermoluminescent dosimeter (TLD) ring badge.
- 2. Radiation Safety Staff will change all badges on a quarterly basis (with the exception of a few radiation programs and fetal monitoring badges, which are changed on a monthly basis). Radiation badges should be kept attached to the lab coat or in the general vicinity of the radiation worker's personal laboratory space, but **away** from any radiation sources.
- 3. It is asked that the location of badges be consistent to assist the RSS in locating them when needed, and to help reduce the number of "lost" badges.
- 4. A Radiation Dosimetry Report from our dosimeter provider will be sent to the radiation program's PI or RAS each quarter. All "badged" radiation workers have access to their personal exposure information listed on these reports. The results from a dosimetry badge report become part of a person's permanent record reflecting lifetime exposure.

L. **Labeling and Signage:** All areas where radioactive materials are used or stored shall be conspicuously posted with a standard "Caution – Radioactive Materials" sign. Below is a list of common areas and equipment that may need labels in a radiation lab:

1. Entrances to Radiation-Use Areas.
2. Radiation storage units such as lock boxes, freezers/refrigerators.
3. Containers for radioactive materials.
4. Hoods used to manipulate radioactive material.
4. Radioactive material itself.
5. Items/equipment that is contaminated.

Please do not label smaller laboratory equipment such as pipettes, scalpels, and other bench top equipment simply because it is used with radioactive material – label ONLY if contaminated.

M. **Security and Storage:** All radioactive material and ionizing radiation sources must be kept secure from unauthorized removal or under constant surveillance at all times!

1. Unless under direct and immediate observation, storage units containing radioactive materials shall REMAIN LOCKED during working hours. This applies to refrigerators/freezers, cabinets or lock boxes containing stock isotopes, as well as waste containers. Otherwise, the room or area must be secured.
2. All waste receptacles and storage units (e.g., freezers) containing radioisotopes or other sources of ionizing radiation that cannot be secured shall be located in areas where access can be controlled (e.g., laboratory rooms, equipment rooms, anterooms).
3. Unattended laboratory rooms containing unsecured radioactive material or other sources of ionizing radiation must be locked, even during daytime hours.
4. Corridors are not secure areas. Using and storing radioactive materials or other sources of ionizing radiation in these areas is prohibited.
5. All radioactive materials must be secure from unauthorized removal before leaving the area at the end of the day.

Violations of radioactive material security policies may result in suspension of radioactive material use privileges for the entire radiation program.