

**OFFICE OF ENVIRONMENTAL HEALTH AND RADIATION SAFETY  
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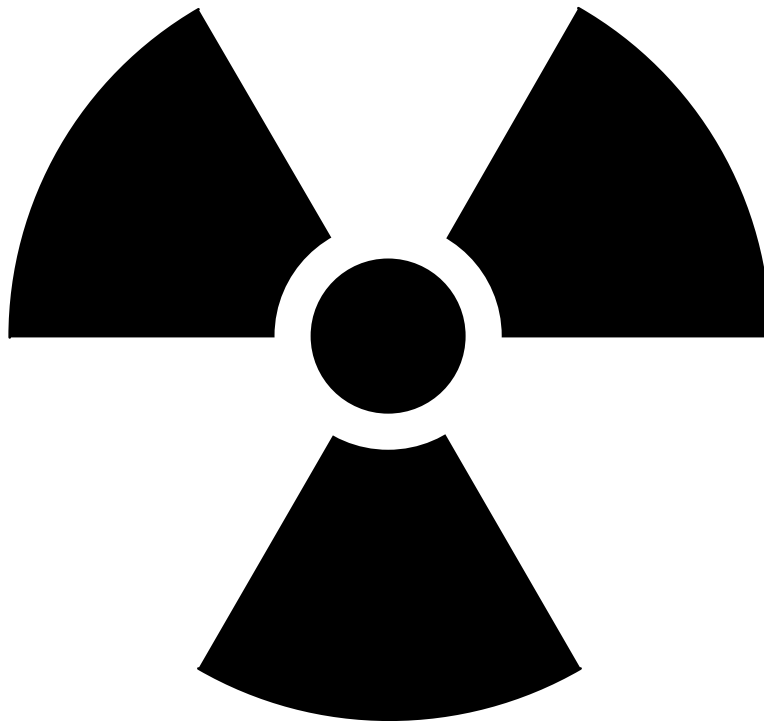
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**RADIATION SAFETY USER'S GUIDE**

**NUCLEAR MEDICINE  
NEW BOLTON CENTER  
UNIVERSITY OF PENNSYLVANIA**



**A COPY OF THIS GUIDE SHOULD BE READILY AVAILABLE IN THE FACILITY.**

**Revised 09/2014**

**Note:** In this guide, **RAM** is used as an abbreviation for Radioactive Materials.

**PART I: SUMMARY OF ROUTINE REQUIREMENTS**

- 1. Summary of Routine Requirements p. 3

**PART II: CONTACTING EHRS AND EMERGENCY RESPONSE**

- 2. Events Requiring EHRS Notification p. 3
- 3. Spill Response p. 3

**PART III: WORKER ISSUES**

- 4. Regulations and Workers' Rights and Responsibilities p. 4
- 5. Radiation Worker Training p. 4
- 6. ALARA Policy, Occupational Doses, and Personnel Monitoring Policy p. 5
- 7. Pregnant Worker Policy p. 6

**PART IV: INSTRUMENTATION AND MONITORING**

- 8. Use of Instrumentation and How to Monitor p. 6

**PART V: CONTROL OF RAM, EXPOSURE, AND CONTAMINATION**

- 9. Security of RAM p. 8
- 10. Posting and Labeling p. 8
- 11. External Exposure Control p. 9
- 12. Personnel Contamination Control and Monitoring p. 9
- 13. Facility Contamination Control and Monitoring p. 9
- 14. Inventory and Leak Testing of Sealed Sources p. 10

**PART VI: PROCEDURES**

- 15. Barns and Stalls p. 10
- 16. Administration of Dosages p. 10
- 17. Imaging Studies p.11
- 18. Holding and Release p.11

**PART VII: WASTE**

- 19. Non-Radioactive Waste p.12
- 20. Radioactive Waste - General Requirements p.12
- 21. Barn Waste p.13

**PART VIII: SHIPMENTS OF RAM**

- 22. DOT/NRC Requirements p.13
- 23. Procedure for Receipt of Incoming Packages p.15
- 24. Outgoing Shipments p.16

## **PART I: SUMMARY OF ROUTINE REQUIREMENTS**

### **1. Summary of Routine Requirements**

- Well counter performance
- Survey meter performance
- Package receipt records
- Personnel surveys
- Room/waste storage areas surveys for contamination/ambient exposure rates
- Cold trash surveys
- Waste decay-in-storage surveys and log

## **PART II: CONTACTING EHRS AND EMERGENCY RESPONSE**

### **2. Events Requiring EHRS Notification** (EHRS contact information is on the cover of the User's Guide)

Workers are required to notify EHRS promptly in the event of any of the following:

- Emergencies involving RAM/Spills as explained in the next section
- Personnel contamination
- Instrumentation failing constancy tests or otherwise malfunctioning
- Loss of radioactive material
- Contaminated or damaged RAM shipments

### **3. Spill Response**

- A. Notify all persons in the area and limit access to the spill.
- B. Prevent the spread of contamination by covering the spill with absorbent pads (chux) or paper.
- C. A worker who was not in the room where the spill occurred should obtain a survey meter and monitor from the doorway of the room inward toward the spill area to identify the extent of the spill.
- D. Measure the exposure rate from the unshielded RAM. Use an ion chamber, if possible.
- E. Notify EHRS if any of the following occur:
  - the spill cannot be quickly controlled or assistance is needed to complete clean-up
  - the exposure rate exceeds 2 mR/hr at 1 meter from the RAM
  - contamination is identified in an unrestricted area (outside of the department)
  - there is personnel contamination
  - there are any questions
- F. Decontamination
  - All workers in the spill area should wear booties, gloves, a lab coat, and appropriate eye protection.
  - Spills can usually be cleaned using paper towels, water, and commercially available cleansers.
  - Begin cleaning at the edge of the spill and work towards the center.

- Survey the area after cleaning to evaluate the effectiveness of the decontamination.
- Continue cleaning until survey results are below trigger levels for the area.

G. Survey all personnel involved in the spill and spill clean-up.

H. Document what happened and survey results.

### **PART III: WORKER ISSUES**

#### **4. Regulations and Workers' Rights and Responsibilities**

- A. EHRS requirements are based on federal and state regulations, the University's licenses issued by the Nuclear Regulatory Commission (NRC) and the State of Pennsylvania, as well as good work practices. Regulations and the University's licenses are available for review at EHRS.
- B. Workers have both the right and the responsibility to report unsafe work conditions, without fear of penalty. EHRS is always available to evaluate such concerns. Additionally, the NRC and the State of Pennsylvania provide Notices to Employees with instructions to workers on these matters. These notices are posted in all Nuclear Medicine facilities.
- C. Workers' occupational doses are maintained (see below), and are available for review, at EHRS. If applicable, bioassay results are maintained, and are available for review, in the Nuclear Medicine Department.
- D. EHRS must be notified when there is a new employee. Before he/she begins work, the following are required:
- training must be completed as explained in the next section
  - the worker must have whole body and extremity dosimeters
- E. Notify EHRS when an employee ceases working in the department. If requested, EHRS will provide a dose history.

#### **5. Radiation Worker Training**

##### **A. New workers**

New workers must complete Radiation Safety training before beginning unsupervised work with RAM. Training can be completed on-line at the EHRS website ([www.ehrs.upenn.edu](http://www.ehrs.upenn.edu)).

Workers should also receive training from Nuclear Medicine personnel concerning department procedures and potential hazards associated with RAM the employee will work with or around.

##### **B. Annual Radiation Safety Review**

All workers must complete annual radiation safety training. This will be provided as an in-service conducted by EHRS and/or by on-line training on the EHRS website.

#### **6. ALARA Policy, Occupational Doses, and Personnel Monitoring Policies**

A. ALARA

1. The acronym ALARA, "As Low As Reasonably Achievable," means that persons using sources of ionizing radiation should make every reasonable effort to keep radiation exposures to individuals and releases of RAM to unrestricted areas as far below regulatory limits as is practicable.
2. Supervisors and workers should periodically review work habits and available safety equipment for adherence to the ALARA principle.

B. Occupational doses, ALARA trigger levels, and Annual Limits

1. EHRS reviews occupational doses on a monthly basis. Doses are summed for each calendar quarter and compared to trigger levels that are referred to as "ALARA levels." If a dose exceeds an ALARA level, EHRS will investigate and suggest appropriate corrective actions to reduce the worker's future doses. ALARA doses and investigation results are reported to the Radiation Safety Committee.
2. The following table summarizes ALARA trigger levels, as well as annual occupational dose limits. The ALARA levels are a fraction of the annual dose limits.

Exposure type	Quarterly ALARA trigger (mrem)	Annual Dose limit (mrem)
Whole body	250	5,000
Lens of eye	250	15,000
Extremity	2,500	50,000

3. Worker doses are summarized in a report that is stored at EHRS. A copy of the report is provided to the Nuclear Medicine department for posting.
4. Worker dose histories are available from EHRS upon request.

C. External Exposure Monitoring Policy

1. All Nuclear Medicine personnel who handle licensed material must wear both whole body and extremity dosimeters and exchange them on a monthly basis.
2. Proper wearing of dosimeters
  - a. Whole body dosimeters must be worn between the collar and the waist. The side of the dosimeter with information printed on it should face away from the worker's body.
  - b. The whole body dosimeter also estimates the worker's dose to the lens of the eye, so workers may wish to wear it closer to the collar than the waist.
  - c. Extremity dosimeters (rings) should be worn whenever handling RAM. The face of the ring with information printed on it should be positioned to measure the highest exposure that fingers will receive (ie, finger tip side of the index finger).

3. Dosimeters should be stored in a low background area to prevent inaccurate exposure readings.

D. Internal Exposure Monitoring Policy

No work is authorized at New Bolton Center which requires performance of bioassays.

**7. Pregnant Worker Policy (10 CFR 20.1003)**

A. Declaring pregnancy

A declared pregnancy is when an employee voluntarily informs the licensee (EHRS) in writing of her pregnancy and estimated date of conception. This typically occurs during a counseling session with an EHRS employee.

It is entirely the choice of the worker whether or not to declare a pregnancy. A worker may also choose to rescind her written pregnancy declaration at any time.

If a pregnancy is declared, the NRC and PA State dose limit to the embryo/fetus is 500 mrem for the entire pregnancy (10% of the annual occupational dose limits for adults). If a worker chooses to not declare her pregnancy, the lower dose limit does not apply.

B. If you are pregnant or have questions concerning working with or around radiation during pregnancy, please contact EHRS. All inquiries will be kept in confidence. We will take the following steps:

- Provide an opportunity to declare your pregnancy.
- Evaluate your dose history and exposure potential.
- Provide you with information concerning risk.
- Provide suggestions for reducing exposure.
- Monitor your radiation dose with respect to the NRC/State limits.

**PART IV: INSTRUMENTATION AND MONITORING**

**8. Use of Instrumentation and How to Monitor**

A. Well counters

1. Each day, before the first use:

- a. Perform a Daily Test.
- b. If the Daily Test is off by more than 5%, run an Auto Calibration and repeat the Daily Test. If it still does not pass, notify EHRS.
- c. Enter Daily Test results in the log.
- d. Measure the background. If it is within normal range, enter the background in the well computer.

2. EHRS performs annual calibrations of the instruments.

B. Dose calibrators

Dose calibrators are not required to be used at New Bolton Center.

C. How to monitor: wipe tests (wipe tests are used to determine the amount of removable contamination, but will likely not detect all of the contamination that is present)

1. Put on gloves.
2. Applying moderate pressure, drag a filter paper or swab across the area being surveyed. Use of dry wipes is preferable.
3. Count a background sample along with the test samples in the well counter.
4. Compare readings to the applicable trigger levels (see sections 13 and 22-24).
  - For package surveys, results should be per 300 cm<sup>2</sup>.
  - For area surveys, results should be per 100 cm<sup>2</sup>.

D. How to use GM survey meters (eg, pancake probes)

1. Each day, before the first use:
  - a. Verify the battery level is ok.
  - b. Check that the check source reading falls within range indicated on the sticker on the meter.
  - c. In a low background area, verify the background level is within normal levels. If not, the meter may be contaminated or malfunctioning and should not be used.
2. Use the meter's lowest scale (typically "x 0.1").
3. The "F/S" switch should be in the Fast position.
4. Hold the face of the probe parallel to the surface being scanned and as close to the surface as possible without touching it (to avoid contaminating the meter).
5. Move the probe slowly when surveying - approximately the width of the probe face per second.
6. Compare readings to the applicable trigger levels (see section 13).

E. How to monitor with a meter: Using ionization chambers vs. GM meters

1. For measuring contamination, use a GM meter and never an ionization chamber.

GM meters are designed to detect small amounts of contamination. Ion chambers are not sensitive enough to use for contamination monitoring.

2. For measuring exposure rates (mR/hr), use an ionization chamber whenever possible.

Ionization chambers are designed to measure radiation fields so they are more accurate for measuring exposure rates. When measuring exposure rates, GM meters are only accurate for the isotope they are calibrated with (usually Cs-137). Measuring an exposure rate from isotopes emitting lower energies

(Cs-137 = 662 keV) with a GM meter will result in a reading that is greater than the actual exposure rate.

F. How to use an ionization chamber

1. Each day, before the first use:
  - a. Verify the battery level is ok. Digital ion chambers typically have a Low Battery indicator.
  - b. Check that the check source reading falls within range indicated on the sticker on the meter.
  - c. In a low background area, verify the background level is within normal levels. If not, the meter may be contaminated or malfunctioning and should not be used.
2. If the ion chamber has white dots on the side, they should face the radiation source.
3. Digital ion chambers typically are self-scaling.

## **PART V: CONTROL OF RAM, EXPOSURE, AND CONTAMINATION**

### **9. Security of RAM (10 CFR 20.1801-2)**

When in storage, RAM must be secured from unauthorized removal or access. When not in storage, RAM must be maintained under constant surveillance or secured from unauthorized removal or access.

### **10. Posting and Labeling**

A. Posting Requirements (10 CFR 20.1902-3, 35.75)

1. Areas or rooms where RAM is used or stored must be posted with a “*CAUTION RADIOACTIVE MATERIALS*” sign.
2. Pennsylvania Department of Environmental Protection Form ER-BRP-3, “*Notice to Employees.*” must be posted in the Nuclear Medicine department.

B. Labeling Requirements (10 CFR 20.1904, 35.69)

1. All RAM containers must be labeled with a “Caution, Radioactive Materials” label and information necessary for workers in the area to take appropriate precautions, such as nuclide, activity, radiation levels, and kind of materials.
2. Radiopharmaceutical vials, syringes, must be conspicuously labeled to identify the radioactive drug. Syringe and vial shields must also be labeled unless the label on the syringe or vial is visible when shielded.

### **11. External Exposure Control**

- A. Vial shields must be used whenever handling vials of RAM.
- B. Appropriate syringe shields (gamma, beta, PET) should be used unless use is contraindicated.



- C. RAM, storage containers, waste containers, and sealed sources must be shielded to keep exposure levels below trigger levels stated on the daily area monitoring list.
- D. To minimize exposure, maximize distance from exposure sources. From point sources, the exposure rate is proportional to the square of the distance from the source.
- E. To minimize exposure, minimize time spent in proximity to the source.

## **12. Personnel Contamination Control and Monitoring**

### **A. Contamination Control**

- 1. A lab coat and disposable gloves must be worn at all times when handling RAM. Disposable sleeves can also help reduce the risk of skin contamination.
- 2. Eating, drinking, storing food, smoking, or applying cosmetics are prohibited in any area where RAM is used or stored.

### **B. Monitoring**

- 1. Hands, shoes, and clothing should be monitored for contamination throughout the day and before leaving the department.
- 2. In the event of personnel contamination, immediately wash with soap and luke-warm water and contact EHRS. Record contamination readings.

## **13. Facility Contamination Control and Monitoring**

### **A. Contamination Control**

- 1. The dosage preparation areas in the hot labs should be lined with absorbent pads. Preparation areas and areas adjacent to them should be assumed to be contaminated unless they have been surveyed and found to be free of contamination.
- 2. Absorbent pads should be placed on surfaces being used for injection.

### **B. Monitoring (10 CFR 35.70, 35.2070, 20.1501)**

- 1. All areas where RAM is routinely used or stored must be surveyed at the end of each day for contamination and ambient exposure rates. Rooms used only for waste storage may be surveyed only for exposure rates outside of the room.
- 2. If any results exceed the trigger level:
  - a. Decontaminate and resurvey until the measurement is below the trigger level.
  - b. If levels can not be reduced below the trigger level, notify EHRS.
  - c. Document the initial and final survey results and explanatory notes.
- 4. Survey records must include the following:

- a. the date of the survey
- b. the survey results
- c. the survey instrument used
- d. the name of the individual who performed the survey

**14. Inventory and Leak Testing of Sealed Sources (10 CFR 35.67)**

- A. EHRS must be notified before sealed sources are ordered, disposed, or transferred from the department. New sources will be leak tested before being used.
- B. Inventory and leak testing of sealed sources will be performed semi-annually by EHRS. Procedures for performing inventory and leak testing, along with results, are available at EHRS.

**PART VI: PROCEDURES**

**15. Barns and Stalls**

- A. Horses may only be housed in approved stalls (in barns listed on the department's license).
- B. Stalls must be labeled with "Caution, Radioactive Materials" signs.
- C. Information such as isotope, time administered, scan time and release time must be posted at the stall.
- D. Disposal gloves, shoe covers and a trash container labeled with a "Caution, Radioactive Materials" sign will be available outside the stall.
- E. Drains in stalls must be sealed while used to house radioactive horses.

**16. Administration of Dosages (10 CFR 35.63, 35.2063)**

- A. All horses are administered between 200 - 250 mCi. Dosages are not required to be assayed in a dose calibrator - decay correction of the pharmacy's calibrated activity is a correct method of dosage determination.
- B. Records of all dosage administrations should include the following:
  - isotope and pharmaceutical
  - patient's name or ID
  - dosage (activity)
  - date and time of the dosage determination
  - name of person who determined the dosage
- C. Administrations usually take place in the horse's stall, but may also be performed in the Nuclear Medicine building.

- D. Administrations usually take place between 9:00 and 10:00.
- E. Horses are given a diuretic to promote urination before being taken for imaging studies.

### **17. Imaging Studies**

- A. Horses are walked to the Nuclear Medicine building, where they are scanned.
- B. Horses typically do not urinate during imaging studies, but if they do the urine is collected in a bucket and disposed of down the building's drain to its holding tank. After the scan is finished, the floor is rinsed and surveyed. If the tank needs to be emptied, physical plant contacts nuclear medicine to confirm that no radioactivity has been put to the tank for at least three days.
- C. After the scan is finished, the floor is rinsed (usually mopped) and surveyed.

### **18. Holding and Release**

- A. Following imaging, horses are taken back to the labeled barn stall.
- B. Horses may not be released from NBC for 24 hours post administration, or at least until 8:00 AM the following day.
- C. Before release, owners or caretakers are given written instructions for care of the horse that include a discussion on maintaining their doses as low as reasonably achievable.
- D. Before release, horses must be surveyed to confirm the highest exposure level at their surface is  $\leq 2$  mR/hr.
  - 1. The measurement is taken at the horse's nose using a calibrated GM.
  - 2. The measurement is almost always done the morning following the administration using a release limit of  $\leq 2$  mR/hr. If there may be a problem with performing the survey the next morning, it may be done the afternoon of the administration using a release limit of  $\leq 8$  mR/hr.
  - 3. The release survey for each horse is documented in the department's daily survey records.

## **PART VII: WASTE**

### **19. Non-Radioactive Waste**

- A. All items that may be contaminated must be monitored with a pancake probe and the result found to be indistinguishable from background before being put into non-radioactive trash. This includes RAM shipment boxes, gloves, chux, and items in the hot lab.

- B. Contaminated items may be decontaminated and treated as non-radioactive, if monitoring shows that the decontamination was effective.
- C. "Cold Trash" containers
  - 1. All "cold trash" must be monitored with a pancake probe and the result found to be indistinguishable from background before it may be released as non-radioactive.
  - 2. These surveys must be documented, and records must include: date, meter used, background reading, waste reading, and name of individual performing survey.
  - 3. If the survey level of the trash is greater than the background radiation level, it must be treated as radioactive waste.

## **20. Radioactive Waste - General Requirements (10 CFR 35.92)**

- A. Radiation labels must be removed or defaced before being placed into radioactive and non-radioactive waste, unless they are within containers which will be managed as biomedical waste after they have been released from the licensee.
- B. Radioactive waste with half-lives of less than 120 days may be held for decay-in-storage according to the following procedure:
  - 1. Separate waste according to half-life.
  - 2. When the container is full:
    - a. close it and mark the container with the isotope, exposure rate, date, and initials of the worker.
    - b. Record the required information in the decay-in-storage log.
    - c. Transfer the container to storage area in hot lab.
  - 3. Store the container for 10 half-lives of the longest-lived isotope in the container.
  - 4. Prior to disposal as normal trash, each container must be monitored as follows:
    - a. Survey the package in a low-level area with a GM meter.
    - b. Survey all surfaces of each container.
    - c. Discard as normal waste only if the exposure level does not exceed the background level.
    - d. Remove or obliterate any radiation labels before disposal in normal waste.
    - e. Complete all the required information on the decay-in-storage form.

## **21. Barn Waste**

- 1. Following animal release, a technologist notifies barn personnel, who clean out the stall and place hay/waste in a plastic cart.

2. Carts are stored for decay in a locked, labeled shed for three days. Before release, barn staff survey carts to verify they are indistinguishable from background. All carts are documented on a store-for-decay log.
3. Following release, cart waste is dumped on a pile at NBC. It is picked up by a commercial vendor for use in compost once or twice a week.

**PART VIII: SHIPMENTS OF RAM**

**22. DOT/NRC Requirements**

A. Terminology

1. DOT Class and Proper Shipping Name - The DOT has nine classes and hundreds of specific "Proper Shipping Names" for hazardous material shipments. RAM shipments are always Class 7, but there are with several different Proper Shipping Names possible. The Proper Shipping Name includes the UN identification number, such as UN 2910.
2. Package Type - Refers to the activity being shipped. Packages are either Limited Quantity, Type A, or Type B. It is extremely likely that all nuclear medicine packages are Type A or Limited Quantity. Package types are discussed in more detail in section E.
3. Marking - Wording required to be on or in a RAM package (eg, Type 7A, Radioactive).
4. Labeling - Required to be on Type A and B packages. Labels are White I, Yellow II, or Yellow III.
5. Transport Index (TI) - The dimensionless number equal to the package's exposure rate in mrem/hr at 1 meter, rounded to one decimal place. If the exposure rate does not exceed 0.05 mR/hr, the TI = 0.

B. Exposure Level limits (49 CFR 173.441)

<u>Package label</u>	<u>Exposure rate at surface</u>	<u>Exposure rate at 1 meter</u>
Limited Quantity	≤ 0.5 mrem/hr	0
White I	≤ 0.5 mrem/hr	0
Yellow II	> 0.5 to 50 mrem/hr	≤ 1
Yellow III	> 50 to 200 mrem/hr	≤ 10

C. Contamination Limits (49 CFR 173.443)

Packages may not exceed the following limits of removable contamination:

beta and gamma emitters	6,600 DPM per 300 cm <sup>2</sup>	(2,200 DPM per 100 cm <sup>2</sup> )
alpha emitters	600 DPM per 300 cm <sup>2</sup>	(200 DPM per 100 cm <sup>2</sup> )

D. Notifications (10 CFR 20.1906 (d))

If a received package is found to have removable contamination or radiation levels in excess of the limits listed in sections B and C, EHRS, the final delivery carrier, and the NRC must be immediately notified.

E. Types of packages

1. Normal form RAM shipments / Type A Packages

a. Definition

Nuclear Medicine RAM shipments are normal form, Type A packages unless they meet the requirements to be shipped as Limited Quantity.

b. Labeling and marking

Type A packages must be labeled with a labeled White I, Yellow II, or Yellow III label on two, opposite sides of the container (not the bottom). The label type is determined by the package's exposure levels, as listed in section B. The blanks on the label must be completed with legible, durable weather resistant printing.

Type A packages must be marked on the outside of the package with the Proper Shipping Name, and "Type A" in letters at least 0.5 inches high. It must also be marked with the package's gross mass in kg if it exceeds 50 kg (110 pounds).

c. Packaging

Containers used for Type A shipments must be DOT certified. Type A packages must pass a rigorous series of tests designed to measure their durability during shipping, such as water spray and crush tests. These tests take into account the packaging within the container, such as molded styrofoam that surrounds generators and syringe pigs.

Typically, the only containers used for Type A shipments from Nuclear Medicine are generator boxes. EHRS must be contacted if there any other Type A shipments to ensure that any container and packaging used for Type A shipments has been DOT certified.

d. Shipping papers

Shipping papers must be completed for all Type A shipments.

2. Limited Quantity Shipments (49 CFR 173.421, .422, .425)

a. Definition

Packages may be shipped as Limited Quantity if they meet the exposure level and contamination limits listed in sections B and C and contain less than the following quantities:

<u>Isotope</u>	<u>Max. Act. - Liquid form</u>	<u>Max. Act. - Solid form</u>
	(mCi)	(mCi)
Mo-99 (for domestic use)	2.0	20
Tc-99m	11.0	110
Co-57	27.0	270

b. Exemptions

Limited Quantity packages are excepted from packaging, marking, labeling, shipping paper, and certification requirements of normal form RAM shipments, but must be marked as follows:

- The UN identification number must be marked on the outside of the packaging. It is UN2910 for Limited Quantity Radioactive Materials.
- The outside of the packaging or the inner packaging must be marked "Radioactive".

c. Container requirements

Containers used for Limited Quantity shipments must be able to withstand normal conditions encountered during shipment, such as surviving intact after being dropped from 3 feet. Ammo boxes are acceptable for Limited Quantity shipments.

3. "Non-radioactive shipments"

It is possible for a shipment (ie. blood sample) to have an activity that is low enough that it may be shipped as non-radioactive. Permission to ship this way must be given by EHRS on a case by case basis.

**23. Procedure for Receipt of Incoming Packages (10 CFR20.1906)**

- A. Put on gloves.
- B. Visually inspect the package for any sign of damage (e.g., wet or crushed). If damaged, stop the procedure and notify EHRS.
- C. Measure the exposure rate at 1 meter and then at the surface. If exposure rates are substantially different than the Transport Index on the shipping label, or exceed the limits listed above, stop and contact EHRS. If possible, use an ion chamber. A pancake probe will over-respond for most isotopes.
- D. Wipe test the outside of the package over an area of 300 cm<sup>2</sup>. If the result is greater than the posted trigger level, contact EHRS. Packages containing only RAM in gaseous form are not required to be wipe tested.
- E. Remove the packing slip.
- F. Open the package according to the manufacturer's instructions, if provided.
- G. Open the inner package and verify that the contents agree with the packing slip.
- H. Check the integrity of the final source container. Look for broken seals or vials, loss of liquid, condensation, or discoloration of the packing material.
- I. If anything is other than expected, stop and contact EHRS.
- J. Monitor the packing material and the empty packages for contamination with a survey meter before discarding them.
  - a. If contaminated, treat as radioactive waste.
  - b. If not contaminated, remove or obliterate the radiation labels before discarding in normal trash.

- c. Ammo boxes and Generator boxes should be handled for return shipment as described below.

#### K. Inventory Records

1. Log each package, it's contents, and survey results into the hot lab computer.
2. Generators must also be logged into the Generator Log.

### 24. Outgoing Shipments

- A. Nuclear Medicine staff may not ship radioactive materials unless they are current in DOT training. A copy of the DOT training certificate must be available upon request.
- B. Packages that **may be** contaminated or contain contaminated items
  1. Survey the package and items to determine if anything is contaminated.
  2. If nothing is contaminated and no RAM is contained within the package, the package is not a RAM shipment. Remove the Radiation Label from the side of the box and place it within the box before shipping.
  3. If anything is contaminated, use a survey meter and wipe test to determine the isotope and amount of activity and ship as described in B.
- C. Packages that contain RAM or contamination
  1. Notify EHRS if any Type A shipments must be made other than generator return shipments.
  2. Classify the package as either Limited Quantity or one of the three types of labeled package types (White I, Yellow II, or Yellow III), based on the isotope, physical form of the RAM, and activity being shipped.
    - a. Measure and record the exposure rate at 1 m and at the package's surface. If the exposure rate exceeds the limit for the package type, the package must be reclassified.
    - b. Wipe test the package over 300 cm<sup>2</sup>. If the wipe test result exceeds three times background, the packaging should be treated as radioactive and not used for shipment and the RAM should be repackaged.
  3. Marking and labeling

Prepare the package as appropriate for the shipment type as described above.
  4. Records
    - a. Record all measurements and information in the appropriate log.
    - b. Complete the shipping paper. A copy must be maintained at Nuclear Medicine.