CHAPTER 6

RADIONUCLIDE LABORATORY TECHNIQUES

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RADIONUCLIDE LABORATORY TECHNIQUES

All laboratories authorized to use radioactive materials require special precautions to minimize the external and internal hazard from radiation and radioactive contamination. This section deals with general regulations and techniques that should be followed in the radionuclide lab.

I. PROTECTIVE CLOTHING

A. Lab coats should be worn when manipulating radioactive materials to prevent contamination of street clothing or skin.

B. Disposable plastic gloves should always be worn when using radioactive materials. Personnel with breaks in the skin should use waterproof tape to seal such breaks or not use radioactive material.

C. Care should be exercised not to transfer contamination from the hands or lab coat by reflex actions.

II. THE WORKPLACE

A. Areas in which radioactive materials are used should be covered with plastic-backed absorbent paper to contain spills and prevent contamination of the working surface.

B. Drip trays can be used to transfer beakers, test tubes, etc. from one location to another.

C. Change absorbent paper at regular intervals to prevent cross contamination.

D. Label all containers used for radioactive materials work. Keep the work areas neat and clean to prevent accidents as well as making it easier to decontaminate if accidental spills do occur.

E. Secure all radioactive materials from unauthorized removal. Close or lock the lab door when materials must be left unattended. Most refrigerator/freezers can be equipped with locks and make an ideal place for storage.

F. There must be no eating, drinking, smoking, application of cosmetics, brushing of teeth or storage of food in areas in which radioactive materials are used.

III. MANIPULATIONS OF RADIOACTIVE MATERIALS

A. No mouth pipetting of anything is allowed in a radionuclide work area. Use a safety pipetting aid for dispensing with standard laboratory pipettes. Eppendorf or other precision pipettes can be used for smaller dispensing. Assume all pipettes and glassware in the work area are contaminated unless labeled otherwise. Contaminated glass pipettes can be placed in a pipette jar for washing. Contaminated Eppendorf tips and disposable pipettes should be placed in radioactive waste containers.

B. Containers used in vortexing, mixing, shaking, or centrifuging operations should be intact and sealed with paraffin or stoppers to prevent spillage.

C. Prepare samples carefully. Heating, drying, distilling, and other operations which could result in volatilization of the material should be performed in a fume hood.

D. Provide proper shielding to reduce exposure, but not so that you hinder the safe execution of the experiment.

E. Whenever possible, rehearse operations with non-radioactive materials to ensure that the technique will be reasonably free of incidents.

F. Accurate records of radioactive material inventory on hand should be maintained. Record withdrawals from the stock vial on utilization forms, including transfers.

IV. RADIOACTIVE MATERIAL SPILLS

All spills of radioactive material must be cleaned promptly. The responsibility for cleaning up the spill rests on the individual working in the area involved and responsible for the spill. Under no circumstances should an untrained person attempt to examine or clean up a spill of radioactive material.

The following general procedures should be followed when dealing with spills of radioactive materials.

A. Minor Spills –(Less than 100 microcuries of activity *and/or* 5 mR/hr at 1 foot)

1. NOTIFY - Notify persons in the area that a radioactive spill has occurred.

2. PREVENT THE SPREAD - Cover the spill with absorbent paper.

3. CALL FOR HELP - Report incident to the Radiation Control Office (2-7359 or 2-1589). If possible have someone not involved in the spill make the report. In the event the Radiation Control Office cannot be reached, utilize Emergency Call List.

4. CLEAN UP - Use disposable gloves (and remote handling tongs for high energy beta's and gammas). Do not spread contamination – use absorbent paper and carefully wipe spill from outside to inside. Insert into a plastic bag and dispose all waste in a radioactive waste container. Include all other contaminated materials such as disposable gloves.

5. SURVEY - If using an isotope other than a low energy beta emitter, use a survey meter and check the area around the spill, your hands, shoes, and clothes for contamination. A swipe survey shall be performed to demonstrate that decontamination results are below the University of Florida limit of 100 dpm/100 cm^2.

B. Major Spills –(More than 100 microcuries of activity *and/or* 5 mR/hr at 1 foot)

1. CLEAR THE AREA - Notify all persons not involved in the spill to vacate the room. These people shall remain near the room to be checked for contamination.

2. PREVENT THE SPREAD - Cover the spill with absorbent material, but do not attempt to clean it up. Confine the movement of all potentially contaminated personnel to prevent the spread.

3. CALL FOR HELP - Notify the Radiation Control Office (2-7359 or 2-1589) immediately. If possible have someone not involved in the spill make the notification. In the event the Radiation Control Office cannot be reached, utilize Emergency Call List.

4. SHIELD THE SOURCE - If possible shield the spill, but only if it can be done without further contamination or without significantly increasing your radiation exposure.

5. CLOSE THE ROOM - Leave the room and lock the door(s) to prevent entry. Post a sign "Contamination DO NOT enter until cleared by Radiation Control."

6. PERSONNEL DECONTAMINATION – Contaminated clothing should be removed and stored separately in a contained box or bag for further evaluation by the Radiation Control Office. If the spill is on the skin, flush thoroughly and then wash with mild soap and lukewarm water. Then, proceed to call Radiation Control and decontaminate and survey under the direction of a Radiation Control Representative.

7. FACILITY DECONTAMINATION
   - Upon direction of the Radiation Control Office, proceed to clean up spill and survey as in I.d. and I.e. above.
   - Shoe covers should be used to prevent personal contamination.
   - Both body and extremity badges may be required.

Other emergencies such as fire, lost or stolen radioactive material, accidental uptake of radioactive material, radiation injury, etc. require the same basic responses as described above: Containment - Notification - Corrective Action - Monitoring. The Radiation Control authorities should be notified at once of such incidents and will act with other authorities to control emergencies of this nature.

V. RADIOACTIVE CONTAMINATION LIMITS

The limits in the table below set the maximum allowable quantity of radioactive contamination on surface and areas. Following good radionuclide laboratory techniques should keep contamination levels to less than these values. Contamination greater than the maximum values should be reported to the lab supervisor and Principal Investigator and cleaned up right away. Corrective steps should be taken to prevent reoccurrences.

RADIOACTIVE SURFACE CONTAMINATION LIMITS

ALPHA	BETTA/GAMMA
Removable (dpm/100 cm^2)	Removable (DPM/100 cm^2)
50	100

A. Decontamination Procedures

1. PREPARATION

   a) Assemble a Spill Kit:
   - radiation warning tags, signs and tape
   - disposable gloves and shoe covers
   - masking tape
   - grease pencil or marker
   - large plastic bags
   - small plastic bags
   - tongs or forceps
   - paper bags for glass or sharps
   - gauze sponges
   - paper towels
   - decontaminating detergent
   - scouring powder
   - swipes and survey forms
   - disposable diapers

   b) Establish a Clean Up Procedure and Post

2. DECONTAMINATION PROCEDURE (Don't panic - initiate action!)
   - notify others in the lab
   - stay in room until monitored, unless radioactivity is volatile
   - cover area of spill, unless radioactivity is volatile
   - if radioactivity is volatile, vacate the lab and proceed as noted in Section IV, B, MAJOR SPILLS. Decontamination of the spill will take place only under the direct supervision of Radiation Control personnel.
   - call for help - Radiation Control and supervisor
   - monitor for personnel contamination
   - have a non-contaminated person post warning sign on door to lab
   - have a non-contaminated person get spill kit
   - one person shall decon while another person remains clean
   - use gloves and shoe covers
   - work from edges of spill to the center
   - apply detergent and wipe up area
   - take swipes and count
   - cover spill area until results are known

3. FOLLOW UP
   - make record of spill
   - replenish spill kit
   - dispose of wastes properly

4. SUMMARY
   - protect personnel
   - determine extent of spill
   - confine spill
   - notify Radiation Control
   - get help to clean up
   - document events

PERSONNEL DECONTAMINATION

Method*	Surface	Action	Technique	Advantages	Disadvantages
Soap and water	Skin and hands	Emulsifies and dissolves contaminate	Wash 2-3 minutes and monitor. Do not wash more than 3-4 times.	Readily available and effective for most radioactive contamination.	Continued washing will defat the skin. Indiscriminate washing of other than affected parts may spread contamination.
Soap and water	Hair	Same as above.	Wash several times.		
Lava soap, soft brush, and water	Skin and hands	Emulsifies, dissolves, and erodes.	Use light pressure with heavy lather. Wash for 2 minutes, 3 times. Rinse and monitor. Use care not to scratch or erode the skin. Apply lanolin or hand cream to prevent chapping.	Same as above.	Continued washing will abrade the skin.
Tide or other detergent (plain)	Same as above.	Same as above.	Make into a paste. Use with additional water with a mild scrubbing action. Use care not to erode the skin.	Slightly more effective than washing with soap.	Will defat and abrade skin and must be used with care.

*Begin with the first listed method and then proceed step by step to the more severe methods, as necessary.

PERSONNEL DECONTAMINATION -- Continued

Method*	Surface	Action	Technique	Advantages	Disadvantages
Mixture of 50% Tide and 50% cornmeal	Skin and hands	Emulsifies, dissolves, and erodes.	Make into a paste. Use with additional water with a mild scrubbing action. Use care not to erode the skin.	Slightly more effective than washing with soap.	Will defat and abrade skin and must be used with care
5% water solution of a mixture of 30% Tide, 65% Calgon, 5% Carbose (carboxymethyl cellulose)	Same as above.	Same as above.	Use with water. Rub for a minute and rinse.	Same as above.	Same as above.
A preparation of 8% Carbose, 3% Tide, 1% Versene, and 88% water homogenized into a cream.	Same as above.	Same as above.	Use with additional water. Rub for 1 minute and wipe off. Follow with lanolin or hand cream.	Same as above.	Same as above.
Titanium dioxide paste. Prepare paste by mixing precipitated titanium dioxide (a very thick slurry, never permitted to dry) with a small amount of lanolin. If not successful, go on to next step.	Skin, hands, and extremities. Do not use near face or other body openings.	Same as above.	Work the paste into the affected area for 2 minutes. Rinse and wash with soap and warm water. Monitor.	Removes contamination lodged under scaly surface of skin. Good for heavy surface contamination of skin.	If left on too long will damage skin.

*Begin with the first listed method and then proceed step by step to the more severe methods, as necessary.

PERSONNEL DECONTAMINATION -- Continued

Method*	Surface	Action	Technique	Advantages	Disadvantages
Mix equal volumes of a saturated solution of potassium permanganate and 0.2 N sulfuric acid. (Saturated solution $KMnO_4$ is 6.4 grams per 100 ml of H_2O.) Continue with next step.	Skin, hands, and extremities. Do not use near face or other body openings.	Dissolves contaminant absorbed in the epidermis.	Pour over wet hands, rubbing the surface and using hand brush for not more than 2 minutes. Rinse with water.	Superior for skin contamination. May be used in conjunction with titanium oxide.	Will damage a layer of skin if in contact with the skin for more than 2 minutes.
Apply a freshly prepared 5% solution of sodium acid sulfite. (Solution made by dissolving 5 gm of $NaHSO_3$ crystals in 100 ml distilled water.)	Same as above.	Removes the permanganate stain.	Apply in the same manner as above. Apply for not more than 2 minutes. The above procedure may be repeated. Apply lanolin or hand cream when completed.		Same as above.
Flushing	Eyes, ears, nose, and mouth.	Physical removal by flushing.	Roll back the eyelid as far as possible, flush with large amounts of water. If isotonic irrigants are available, obtain them without delay. Apply to eye continually and then flush with large amounts of water.	If used immediately will remove contamination. May also be used for ears, nose, and throat.	When using for nose and mouth, contaminated individual should be warned not to swallow the rinses.

*Begin with the first listed method and then proceed step by step to the more severe methods, as necessary.

PERSONNEL DECONTAMINATION -- Continued

Method*	Surface	Action	Technique	Advantages	Disadvantages
Flushing (Cont'd)			(Isotonic irrigant [0.9% NaCl solution]: 9 grams NaCl in beaker, fill to 1000 cc with water.) Can be purchased from drug suppliers, etc. Further decontamination should be done under medical supervision.		
Flushing	Wounds	Physical removal by flushing.	Wash wound with large amounts of water and spread edges to stimulate bleeding, if not profuse. If profuse, stop bleeding first, clean edges of wound, bandage, and if any contamination remains, it may be removed by normal cleaning methods, as above.	Quick and efficient if wound not severe.	May spread contamination to other areas of body if not done carefully.
Sweating	Skin of hands and feet	Physical removal by sweating.	Place hand or foot in plastic glove or booty. Tape shut. Place near source of heat for 10-15 minutes or	Cleansing action is from inside out. Hand does not dry out.	If glove or booty is not removed shortly after profuse sweating starts and part washed with soap

*Begin with the first listed method and then proceed step by step to the more severe methods, as necessary.

PERSONNEL DECONTAMINATION -- Continued

Method*	Surface	Action	Technique	Advantages	Disadvantages
Sweating (Cont'd)			until hand or foot is sweating profusely. Remove glove and then wash using standard techniques. Or gloves can be worn for several hours using only body heat.		and water immediately, contamination may seep into the pores.

AREA AND MATERIAL DECONTAMINATION

Method*	Surface	Action	Technique	Advantages	Disadvantages
Vacuum cleaning	Dry surfaces	Removes contaminated dust by suction.	Use conventional vacuum technique with efficient filter.	Good on dry, porous surfaces. Avoids water reactions.	All dust must be filtered out of exhaust. Machine is contaminated.
Water	All nonporous surfaces (metal, painted, plastic, etc.).	Dissolves and erodes.	<u>For large surfaces</u> Hose with high-pressure water at an optimum distance of 15 to 20 feet. Spray vertical surfaces at an angle of incidence of 30° to 40°; work from top	All water equipment may be utilized. Allows operation to be carried out from a distance. Contamination may be reduced by 50%. Water equipment may be used for	Drainage must be controlled. Not suitable for porous materials. Oiled surfaces cannot be decontaminated. Not applicable on dry contaminated surfaces (use vacu-

*Begin with the first listed method and then proceed step by step to the more severe methods, as necessary.

AREA AND MATERIAL DECONTAMINATION

Method*	Surface	Action	Technique	Advantages	Disadvantages
Water (Cont'd)			to bottom to avoid recontamination. Work upwind to avoid spray. Determine cleaning rate experimentally, if possible; otherwise, use a rate of 4 square feet per minute.	solutions of other decontaminating agents.	um); not applicable on porous surfaces such as wood, concrete, canvas, etc. Spray will be contaminated.
	All surfaces	Dissolves and erodes.	For small surfaces Blot up liquid and handwipe with water and appropriate commercial detergent.	Extremely effective if done immediately after spill and on nonporous surfaces.	Of little value in the decontamination of large areas, longstanding contaminants and porous surfaces.
Steam	Nonporous surfaces (especially painted or oiled surfaces).	Dissolves and erodes.	Work from top to bottom and from upwind. Clean surface at a rate 4 square feet per minute. The cleaning efficiency of steam will be greatly increased by using detergents.	Contamination may be reduced approximately 90% on painted surfaces.	Steam subject to same limitations as water. Spray hazard makes the wearing of waterproof outfits necessary.
Detergents	Nonporous surfaces (metal, painted, glass, plastic, etc.).	Emulsifies contaminant and increases wetting power of water and cleaning	Rub surface 1 minute with a rag moistened with detergent solution	Dissolves industrial film and other materials which hold contam-	May require personal contact with surface. May not be efficient

*Begin with the first listed method and then proceed step by step to the more severe methods, as necessary.

AREA AND MATERIAL DECONTAMINATION

Method*	Surface	Action	Technique	Advantages	Disadvantages
Detergents (Cont'd)		efficiency of steam.	then wipe with dry rag; use clean surface of the rag for each application. Use a power rotary brush with pressure feed for more efficient cleaning. Apply solution from a distance with a pressure proportioner. Do not allow solution to drip onto other surfaces. Mist application is all that is necessary.	ination. Contamination may be reduced by 90%.	on longstanding contamination.
Complexing agents	Nonporous surfaces (especially unweathered surfaces; i.e., no rust or calcareous growth).	Forms soluble complexes with contaminated material.	Complexing agent solution should contain 3% (by weight) of agent. Spray surface with solution. Keep surface moist 30 minutes by spraying with solution periodically. After 30 minutes, flush material off with water. Com-	Holds contamination in solution. Contamination may be reduced by 75% in 4 minutes on unweathered surfaces. Easily stored; carbonates and citrates are nontoxic, noncorrosive.	Requires application for 5 to 30 minutes. Little penetrating power; of small value on weathered surfaces.

*Begin with the first listed method and then proceed step by step to the more severe methods, as necessary.

AREA AND MATERIAL DECONTAMINATION

Method*	Surface	Action	Technique	Advantages	Disadvantages
Complexing agents (Cont'd)			plexing agents may be used on vertical and overhead surfaces by adding chemical foam (sodium carbonate or aluminum sulfate).		
Organic solvents	Nonporous surfaces (greasy or waxed surfaces, paint or plastic finishes, etc.).	Dissolves organic materials (oil, paint, etc.).	Immerse entire unit in solvent or apply by wiping procedure (see Detergents).	Quick dissolving action. Recovery of solvent possible by distillation.	Requires good ventilation and fire precautions. Toxic to personnel. Material bulky.
Inorganic acids	Metal surfaces (especially with porous deposits; i.e., rust or calcareous growth); circulatory pipe systems.	Dissolves porous deposits.	Use dip-bath procedure for movable items. Acid should be kept at a concentration of 1 to 2 normal (9 to 18% hydrochloric, 3 to 6% sulfuric acid). Leave on weathered surfaces for 1 hour. Flush surface with water, scrub with a water-detergent solution, and rinse. Leave in pipe circulatory system 2 to 4 hours; flush with	Corrosive action on metal and porous deposits. Corrosive action may be moderated by addition of corrosion inhibitors to solution.	Personnel hazard. Wear goggles, rubber boots, gloves, and aprons. Good ventilation required because of toxicity and explosive gases. Acid mixtures should not be heated. Possibility of excessive corrosion if used without inhibitors. Sulfuric acid not effective on calcareous deposits.

*Begin with the first listed method and then proceed step by step to the more severe methods, as necessary.

AREA AND MATERIAL DECONTAMINATION

Method*	Surface	Action	Technique	Advantages	Disadvantages
Inorganic acids (Cont'd)			plain water-detergent solution, then again with plain water.		
Acid Mixtures: hydrochloric, sulfuric, acetic, citric acids, acetates, citrates	Nonporous surfaces (especially with porous deposits); circulatory pipe systems.	Dissolves porous deposits.	Same as for inorganic acids. A typical mixture consists of 0.1 gal. hydrochloric acid, 0.2 lb sodium acetate and 1 gal. water.	Contamination may reduced by 90% in 1 hour (unweathered surfaces). More easily handled than inorganic acid	Weathered surfaces may require prolonged treatment. Same safety precautions as required for inorganic acids.
Caustics: lye (sodium hydroxide) calcium hydroxide potassium hydroxide	Painted surfaces (horizontal).	Softens paint (harsh method).	Allow paint-remover solution to remain on surface until paint is softened to the point where it may be washed off with water. Remove remaining paint with long-handled scrapers. Typical paint remover solution: 10 gal. water, 4 lb lye, 6 lb boiler compound, 0.75 lb cornstarch.	Minimum contact with contaminated surfaces. Easily stored.	Personal hazard (will cause burns). Reaction slow; thus, it is not efficient on vertical or overhead surfaces. Should not be used on aluminum or magnesium.
Trisodium phosphate	Painted surfaces (vertical, overhead).	Softens paint (mild method).	Apply hot 10% solution by rubbing and wiping procedure (see Detergent).	Contamination may be reduced to tolerance in one or two applications.	Destructive effect on paint. Should not be used on aluminum or magnesium.

*Begin with the first listed method and then proceed step by step to the more severe methods, as necessary.

AREA AND MATERIAL DECONTAMINATION

Method*	Surface	Action	Technique	Advantages	Disadvantages
Abrasion	Nonporous surfaces.	Removes surface.	Use conventional procedures, such as sanding, filing, and chipping; keep surface damp to avoid dust hazard.	Contamination may be reduced to as low a level as desired.	Impracticable for porous surfaces because of penetration by moisture.
Sandblasting	Nonporous surfaces.	Removes surfaces.	Keep sand wet to lessen spread of contamination.	Practical for large surface areas.	Contamination spread over area must be removed.

*Begin with the first listed method and then proceed step by step to the more severe methods, as necessary.

B. Laboratory Monitoring

Surveys for radiation and removable radioactive contamination must be performed in all radionuclide laboratories, preferably after each use of radioactive materials. Appropriate radiation survey equipment should be available to users for the type of surveys required for the laboratory. Such survey equipment must be properly calibrated for energy and type of radionuclide in use at least every six months.

To perform a survey, choose sites in the lab where the radioactive materials have been used. Areas or equipment such as benchtops, floors near the waste containers, centrifuges, water baths, storage areas, hoods, etc. are good places to start. Each site chosen should be labeled on a diagram or floor plan of the lab for later referral and interpreting results.

1. Survey for Fixed or Gross Contamination

   In laboratories where gamma or high-energy beta/gamma (greater than 200 keV) radionuclide(s) are in use, an initial survey for fixed or gross contamination with a G-M survey instrument should be performed. In order to prevent contamination of the G-M probe during the survey, take care not to touch the probe to the surface of that which is being examined. Note that results from a G-M survey will be expressed in terms of counts per minute (CPM) which yields an estimate of how much radioactivity may be present or in units of mR/hr which yields the radiation exposure rate. Any gross contamination should then be tested for removable activity as described in the next section.

2. Survey for Removable Contamination

   Contamination not fixed to a surface can be transferred to hands, clothing, notebooks, etc., leading to internal exposure or contamination of clean areas. A "wipe" or "swipe" test is the most practical method of detecting removable contamination, particularly in laboratories where low energy beta emitting isotopes such as H-3, C-14, and S-35 that cannot be detected with a survey meter, are in use. To perform the survey, refer to Radiation Control Technique #1 on page 17.

RADIATION CONTROL TECHNIQUE #1

INSTRUCTIONS FOR OBTAINING SWIPE SAMPLES

I. PURPOSE

To establish a standard technique for obtaining swipe samples from areas and/or items to determine the presence of removable radioactive contamination.

II. PREREQUISITES

A. Appropriate swipe paper such as Whatman #1

B. Sample containers such as scintillation vials

C. Survey forms

D. Disposable gloves

E. Liquid scintillation counter or gas flow proportional.

III. PROCEDURE

NOTE: Observe proper radiation safety techniques to reduce radiation exposures and prevent spread of possible contamination.

A. Swipe Surveys of Radioactive Material Work Areas

1. Gloves should be worn when taking swipes.

2. Swipe approximately 100 square centimeters of surface area unless otherwise specified or physically impossible.

3. Number the swipes or swipe containers and place the swipe number in the approximate corresponding position on the survey form.

4. If use of a survey form is not practical, the swipe number and location should be recorded on a log sheet.

5. During swipe surveys, particular attention should be given to the areas of heaviest use and traffic such as benchtops, centrifuges, walkways and floors.

6. Extreme care should be exercised when obtaining swipes from sharp metal objects to prevent the possibility of a contaminated injury.

7. Place swipes in separate containers carefully so a minimum of contamination is lost and to prevent cross contamination of samples

8. Count swipes in a liquid scintillation counter if low energy radiations are suspected. Otherwise, count swipes in a gas flow proportional counter.

B. Special Swipe Surveys

Special swipe surveys will be necessary at times to determine if radioactive contamination is present on such items as containers, sources and personal items. When small items are swiped, such as hand tools or sources, the entire surface area of the object should be swiped.

1. Gloves should be worn when swipes are taken.

2. These swipes should be clearly marked for identification.

3. Swipes should be placed in separate sample containers.

   Note: Wet swipes should be dried prior to counting.

4. Be cautious of possible high radiation levels from sealed sources while taking leak test smears.

5. Taking swipes for loose surface contamination on a person's skin or clothing is not usually done since swiping may embed radioactive particles.

IV. RECORDING

A. All swipe results should be recorded as dpm/100 sq. cm. or dpm/object.

B. A follow-up survey should be performed after decontamination if swipe results exceed 100 dpm/100 sq. cm. Beta/Gamma or 50 dpm/100 sq. cm. Alpha.

Principal Investigator_____**Lab(s)**_____

SAFETY CHECKLIST		YES	NO	N/A
1. Caution Signs:				
a.	Doors			
b..	Hoods			
c.	Hardware			
d.	Work Areas			
e.	Refrigerators/Freezers			
f.	Waste Facilities			
2. Information Signs:				
a.	Emergency Spill Procedures			
b.	Notice to Employees			
c.	Emergency Notification			
d.	Laboratory Safety Rules			
3. Survey Instrument(s):				
a.	Batter check			
b.	Response check with dedicated check source prior to use			
c.	Calibrated and date			
d.	Proper meter for isotopes in use			
4. Waste Facilities:				
a.	Shielded			
b.	Segregated			
c.	Stored properly			
d.	Catch trays/appropriate size under lids			
5. Protective Clothing:				
a.	Lab coat			
b.	Rubber glovers			
6. Lab Survey/Documentation:				
a.	RC-1 Statement of Training and Experience forms maintained			
b.	Radionuclide utilization form maintained			
c.	Radioisotope transfer forms maintained			
d.	Adequate contamination survey frequency/documentation			
e.	Spills involving personnel or amount over 100 μCi			
f.	Follow-up surveys on contamination areas > 100 dpm			
g.	Adequate area radiation surveys < 2mR/hr			
h.	Waste disposal receipts maintained			
i.	Package receipt surveys for off campus facilities			
7. General Lab Safety:				
a.	Fume hood inspection up-to-date			
b.	Absorbent paper in radioactive work areas			
c.	Work/Storage areas free of food/beverages			
d.	Proper shielding available for nuclides in use			
e.	Radioactive material secure from unauthorized removal or access			
f.	Survey of hands and feet performed after each use			
8. Personnel Monitoring:				
a.	Whole body dosimetry/TLD badge worn			
b.	Extremity TLD badge worn			
c.	Monthly exposure reports available			
d.	Radioiodination performed with stock solution of ≥ 1.0 mCi If yes, name of individuals _____			
e.	Tritium processed in quantities of ≥ 25.0 mCi during any one month If yes, name of individuals_____			

Inspector: _____

Date: _____

RADIONUCLIDE UTILIZATION FORM

PRINCIPAL INVESTIGATOR:_____ROOM NO.:_____

RADIONUCLIDE:_____CHEMICAL/PHYSICAL FORM:_____

INITIAL ACTIVITY RECEIVED (uCi or mCi):_____DATE RECEIVED: mm/dd/yr ____/____/____

Transferred from PI:_____Transfer Approval Date: mm/dd/yr ____/____/____

(USE A SEPARATE FORM FOR EACH RADIONUCLIDE RECEIVED PER SHIPMENT)

Date	Activity Removed µCi-mCi	Activity Remaining µCi-mCi	Use	Final Disposal	Users Initials

NOTE: When this particular shipment of radioactive material has been completely utilized, decayed or disposed of, maintain this form in laboratory files for review by State and University Radiation Control inspectors.

EH&S-RC-UTILFORM rev11/95

SURFACE CONTAMINATION SURVEY FREQUENCY REQUIREMENT

I. **WEEKLY:** In all areas where radionuclides are being used on a weekly or more frequent basis

OR

FOLLOWING EACH EXPERIMENTAL SET: In all areas where radionuclides are being used less than weekly.

AND

II. **MONTHLY:** In all areas where radionuclides are stored (waste areas and raw material storage) regardless of experiment frequency.

NOTE: Surface contamination surveys must be recorded on the Contamination Survey form.

VI. PROCEDURE FOR OPENING PACKAGES CONTAINING RADIONUCLIDES

Laboratory personnel should open and inspect packages immediately upon receipt. Claims for damaged or incorrect material must be submitted as soon as possible to the vendor.

Procedure:

1. Place package in a hood on absorbent paper. Wear gloves.

2. Open package and verify that contents agree in name and quantity with packing slip and with what was ordered.

3. If outer shipping package has Yellow II or Yellow III transportation label, place the contents behind suitable shielding.

4. Check for breakage of seals or containers, loss of liquid or change in color of absorbing material.

5. The inner package which includes the liner, shield, absorbent materials and isotope container may be contaminated; they are to be discarded in the radioactive waste container unless shown to be uncontaminated by suitable monitoring techniques. NOTE: Any container placed in regular trash must have all radioactive labels removed or defaced.

6. Record isotope, quantity and date of receipt in the radionuclide inventory log and Radionuclide Utilization Form.

7. Follow any special handling or opening procedures that are supplied by the vendor.

8. Use extreme caution when opening the inner vial containing the radionuclide. Monitor yourself and hood area after completion of procedure.

9. Report any problems to the Radiation Control Office.

NOTE: These procedures are general guidelines for opening packages containing millicurie quantities of radionuclides. The precautions which must be taken will depend on the quantities involved. Consult with Radiation Control before opening any non-routine package or if you have any questions.

Radiation Control personnel will perform external radiation and swipe surveys on the package, as per transport regulations.

VII. HOW TO HANDLE RADIONUCLIDE SHIPMENTS

An outline of recommended procedures to be followed when receiving radioactive shipments. (For institutions that do not have a system for processing radioactive shipments.)

INTRODUCTION: ALWAYS OPEN AND INSPECT PACKAGES IMMEDIATELY UPON RECEIPT. Radioactive solutions inadvertently stored upside down may gradually leak and cause contamination problems. Furthermore, vendors often will not accept claims for shipments not inspected within 15 days after delivery.

PROCEDURES: MONITOR PACKAGE FOR RADIATION FIELD (Plastic gloves should be worn while processing the received package.)

TO PROCESS SOFT BETA, HARD BETA AND GAMMA EMITTERS

1. Wipe test package for removable contamination.

2. Note radiation units stated on package, verify and record in receipt log. (HARD BETA and GAMMA ONLY)

3. Place package in vented hood.

4. Open outer package and remove packing slip. Open inner package and verify that the contents agree in name and quantity with the packing slip.

5. Measure radiation field of unshielded container - if necessary place container behind shielding to reduce field to allowable limits and proceed with remote handling devices. (HARD BETA and GAMMA ONLY)

6. Check for possible breakage of seals or containers, loss of liquid or change in color of absorbing material.

7. Wipe test inner contents and document any pertinent findings on packing slip. Note: the liner, shield and isotope container may have surface contamination and should be discarded in radioactive waste disposal containers.

8. Record type of activity, quantity present and location of delivery in receiving log.

9. Deliver processed package to proper laboratory and record. If delivery is delayed, notify recipient of its arrival and clearance.

10. If material has been packaged in dry ice, refrigerate or deliver immediately to user.

11. If contamination, leakage or shortages are observed, notify the vendor's Customer Service Department immediately by collect telephone call and request instructions.