THE UNIVERSITY OF TENNESSEE
HEALTH SCIENCE CENTER

UT Health Science Center: RSP03 - Laboratory Handling and Survey Procedure	
Version 2	**Publication Date: 09/17/2024**

Objective

This procedure establishes the survey requirements for laboratories using radioactive materials.

Scope

This procedure has been developed and implemented by UTHSC Research Safety Affairs. The policy applies to personnel in all UTHSC laboratories using radioactive materials.

Roles

Laboratory personnel handling radioactive material must conduct contamination surveys required by this policy each time radioactive materials are used or handled.

Research Safety Affairs personnel will review the survey documentation at least semiannually during laboratory inspections.

Definitions

Surface Scan – A radiation survey of a surface or an object using a suitable, functional, and calibrated portable radiation detector to locate fixed and removeable surface contamination.

Fixed contamination – radioactive contamination that adheres to a surface or object and cannot be removed using normal cleaning methods nor readily transfers to another surface upon contact with the contaminated area.

Removeable contamination – radioactive contamination on a surface or object that is readily removed or transferred upon contact with another surface (such as a glove or skin)

Wipe – A radiation survey of a surface or object conducted by wiping an area of approximately 100 cm^2 (or the entire surface of a smaller object) with a dry filter paper (or swab) using moderate hand pressure, then counting the filter paper (or swab) in a liquid scintillation counter (or other approved counter) to detect any radioactive material transfer to the filter paper.

Laboratory Equipment and Supplies Required

Suitable portable survey meter (reference table 1)
Disposable gloves
Wipe Test media
Dry paper filter (recommended)
Dry cotton swab
LSC counting media.
Vials
LSC cocktail
Laboratory Radiation Safety Manual binder

Procedure

I. Laboratory personnel responsibilities-

a. Prior to each time radioactive materials are used or handled in the lab-
   i. Ensure personnel that will be using radioactive materials or that are in the area where radioactive materials are being handled wear proper attire and appropriate personal protective equipment including the following:
      1. Closed toe shoes
      2. Long pants
      3. Lab coat
      4. Safety glasses (when eye contamination potential exists)
      5. Disposable gloves
      6. Radiation dosimeter (if assigned)

   ii. Ensure an appropriate, calibrated survey meter (reference table 1) is available and operable before work begins. Position the meter so that it is readily accessible and background radiation levels are low. The meter should be positioned to allow workers to check gloves without touching the meter or detector.
   iii. Ensure the work area is prepared to minimize risk of contamination including the following:

1. Absorbent bench paper (plastic backed) is placed in locations where the radiation materials procedures will be conducted.
2. Floor mats are on the floor in radioactive material handling areas.
3. Equipment such as pipettes, stirrers, centrifuges, etc. are labeled with radioactive materials tape if used with radioactive solutions or other materials.
4. Lab personnel not directly involved in the radiation work should remain outside the immediate work area.

b. While radiation work is underway –
   i. Routinely check your gloves for contamination.
   ii. If glove contamination is detected, remove the contaminated gloves, properly discard them in the radioactive waste container, and survey your ungloved hands.
   iii. If contamination is detected on the hands, wash with room temperature water and soap. Report the hand contamination immediately to Research Safety.

c. When radiation work is underway and lab workers must temporarily leave the work area –
   i. Check your gloves for contamination. If glove contamination is detected, remove the contaminated gloves, properly discard them, and survey your ungloved hands.
      1. If contamination is detected on the hands, wash with warm water and soap. Report the hand contamination immediately to Research Safety.
   ii. Survey the top and bottoms of your shoes. Contact Research safety before leaving the work area if contamination is found.
   iii. Remove your lab coat before exiting the work area.
   iv. Remove your gloves and dispose of as appropriate before leaving the work area.

d. When radiation work is completed for the day –

i. Check your gloves for contamination.
   1. If glove contamination is detected, remove the contaminated gloves, properly discard them, and survey your ungloved hands.
      a. If contamination is detected on the hands, wash with warm water and soap. Report the hand contamination immediately to Research Safety.

ii. Perform a surface scan* on all equipment used when conducting the radioactive materials procedure.
   1. Clean any contaminated equipment until free of removeable surface contamination and then wipe.
   2. Label any equipment that has fixed contamination with radioactive materials tape.

iii. Perform a surface scan* on surfaces in the radiation work area and on all equipment used during the radioactive materials work.
   1. Clean any contaminated bench surfaces until free of all removable contamination, then perform a wipe in areas of fixed contamination.
   2. Label any area of the bench with fixed contamination with radioactive materials tape and notify Research Safety.

iv. Perform a floor scan* if contamination is suspected.
   1. Cover the contaminated area with bench paper.
   2. Keep lab personnel out of the area near the contamination.
   3. Report the contamination to Research Safety immediately.

v. Survey the top and bottom of your shoes.
   1. Contact Research Safety immediately if contamination is found.
   2. Conduct a floor scan* in the area if shoe contamination is found.

vi. Ensure all radioactive materials are secured in accordance with the RSP02 Radioactive Material Security at the conclusion of work for the day.
vii. Update your yellow radioactive materials inventory sheet.
viii. Power off your portable survey meter.
ix. Remove your lab coat and gloves before leaving the lab.
x. Document any contamination and corrective actions in the Laboratory Radiation Safety Manual binder.

e. At the end of the week when radioactive materials have been used –
   i. Perform wipes ~~th~~at select locations in each lab in which radioactive materials have been used during the work. At least three locations (and generally no more than five) should be selected. Locations selected typically include-
      1. Floor near the work area
      2. Bench in the work area
      3. Equipment such as inside a centrifuge, refrigerator handle, pipette, etc.
   ii. Document the locations on a floor plan sketch maintained in the Laboratory Radiation Safety Manual binder.
   iii. Conduct the wipe test.
      1. Count in a liquid scintillation counter (radiation safety office counter recommended) or in another counter approved by the Radiation Safety Office.
         a. Compare the results with Table 3.
f. Document all results, and any corrective actions taken in the Laboratory Radiation Safety Manual binder.

*If tritium (3H) is used, conduct a spot check of select items and locations with wipes rather than using a survey meter.

II. Research Safety Affairs responsibilities-

a. Research Safety personnel will conduct the following audits –
   i. Laboratory Radiation Safety Manual binder quarterly.

ii. Review laboratory survey count data to ensure all contamination events do not exceed the contamination limits specified in Radioactive Materials Laboratory Survey and Contamination Limits Procedures.
iii. Assist counting contamination wipes upon request.

III. Instructions for conducting contamination surveys-

a. Instructions for conducting surface scans.
   i. Select the correct meter for the radionuclide(s) of interest. Reference Table 1.
   ii. Power up the survey meter.
   iii. Use the battery test button to ensure the batteries are OK.
   iv. Set the meter to fast (F) response.
   v. Turn the audio on.
   vi. If the meter is equipped with a check source, verify the meter responds to the check source.
   vii. Select the lowest scale on the meter (X 0.1).
   viii. Position the survey meter away from the work area and obtain a background reading.

1. Determine the detector background by taking a reading in the hallway outside the laboratory.
2. Survey the equipment and items in a systematic survey pattern.
3. Position the detector ¼ - ½ inch (6-12 mm) from the surface to be monitored.
4. Scan slowly at a rate not to exceed 2 inches per second.
5. Listen for an increased “chirp”/beep rate indicating contamination.
6. Stop at any location where contamination is indicated and get an accurate reading. (If the needle goes off-scale, change to a higher scale).
7. Compare contamination readings with those found in Table 2 and take indicated actions.

ix. Note the reading and subtract your background reading to get net count rate.

b. Instructions for conducting wipe tests-

i. Label an envelope or liquid scintillation vial top with the location identification to be wiped. Indicate the location code on the lab sketch.
ii. Don disposable gloves. Use a dry paper filter (or swab) to conduct wipe at the indicated location using moderate hand pressure. (A one-inch diameter filter paper works well.)
iii. Wipe an area approximately 4 inches by 4 inches (~ 100 cm^2).
iv. Count the wipe using liquid scintillation (or another approved counter).
v. Count an unused filter paper (or swab) to determine background.
vi. Subtract background from the wipe results to obtain the net cpm of the monitored area.
vii. Compare the observed net DPM Table 3 to determine the actions that need to be taken.

Penalties/Disciplinary Action for Non-Compliance

License violations are subject to civil penalties up to $5,000 per day per violation. In the event of a threat to public health and safety, the Division has the right to confiscate radiation sources.

References

Tennessee Administrative Code Title 0400 - Environment and Conservation Subtitle 0400-20 - Division of Radiological Health (§§ 0400-20-05-.161 Table III)

Tennessee Administrative Code Title 0400 - Environment and Conservation Subtitle 0400-20 - Division of Radiological Health (§§ 0400-20-05-.122)

Tennessee Administrative Code Title 0400 - Environment and Conservation Subtitle 0400-20 - Division of Radiological Health (§§ 0400-20-05-.123)

Tennessee Administrative Code Title 0400 - Environment and Conservation Subtitle 0400-20 - Division of Radiological Health (§§ 0400-20-05-.125)

Tennessee Administrative Code Title 0400 - Environment and Conservation Subtitle 0400-20 - Division of Radiological Health (§§ 0400-20-05-.126)

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Radionuclide	Wipe	GM Pancake	NaI detector	Other(specify)
^{3}H	X	-	-	-
^{14}C	X	X	-	-
^{35}S	X	X	-	-
^{99m}Tc	X	-	X	-
^{51}Cr	X	-	X	-
^{32}P	X	X	-	-
^{125}I	X	-	X	-
^{131}I	X	X		
Natural Uranium	X	X	-	-

Table 1 – Survey methods by radioisotope

Radionuclide	Probe	Observed net count rate(above background) [cpm]		
		0-25 cpm	25-150 cpm	>150 cpm
^{3}H	NA	NA	NA	NA
^{14}C	GM	No action	Clean area and re-monitor	Report to Research Safety

^{35}S	GM	No action	Clean area and re-monitor	Report to Research Safety
^{99m}Tc	NaI	No action	Clean area and re-monitor	Report to Research Safety
^{51}Cr	NaI	No action	Clean area and re-monitor	Report to Research Safety
^{32}P	GM	No action	Clean area and re-monitor	Report to Research Safety
^{125}I	NaI	No action	Clean area and re-monitor	Report to Research Safety
^{131}I	GM	No action	Clean area and remonitor	Report to Research Services

Table 2 – Surface Scan Results

Radionuclide	Probe	Observed net count rate [DPM]		
		0-25 DPM	25-250 DPM	>250 DPM
^{3}H	NA	No action	Clean area and re-wipe	Report to Research Safety
^{14}C	GM	No action	Clean area and re-wipe	Report to Research Safety
^{35}S	GM	No action	Clean area and re-wipe	Report to Research Safety
^{99m}Tc	NaI	No action	Clean area and re-wipe	Report to Research Safety
^{51}Cr	NaI	No action	Clean area and re-wipe	Report to Research Safety
^{32}P	GM	No action	Clean area and re-wipe	Report to Research Safety

^{125}I	NaI	No action	Clean area and re-wipe	Report to Research Safety
^{131}I	GM	No action	Clean area and re-wipe	Report to Research Safety

Table 3- Wipe Test Results

Responsible Official & Additional Contacts

This Responsible Official and Additional Contacts section contains those who are responsible or share certain policy responsibilities, organized by subject matter, such as monitoring compliance with the policy, providing additional guidance on policy clarifications, organizing policy training, updating the policy, etc.

Subject Matter	Office Name	Telephone Number	Email/Web Address
Policy Clarification and Interpretation	Research Safety Affairs	(901) 448-6114	radsafety@uthsc.edu
Policy Training	Research Safety Affairs	(901) 448-6114	radsafety@uthsc.edu

Related Policies/Guidance Documents

Tennessee Administrative Code Title 0400 - Environment and Conservation Subtitle 0400-20 - Division of Radiological Health (§§ 0400-20-04-.01 — 0400-20-13-.08)

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