

## Contamination Monitoring

### 1. Daily contamination surveys

- a. Daily contamination surveys are required when working with any unsealed forms of radioactive material.
- b. This daily survey should cover the hands, lab coat, work area, floor adjacent to the work area, shoes (top and bottom), and potentially contaminated equipment. Negative results of this survey do not need to be documented
- c. A portable survey meter is acceptable to use as long as the sensitivity of the instrument allows for efficient detection of the radionuclides in question.
- d. When using a portable survey meter, a count rate of more than two times the background typically indicates the presence of contamination.
- e. For low-energy beta emitters, a smear survey is required (with an appropriate counting technique). Portable survey meters are not appropriate, due to their extremely low efficiency.
- f. Recommended Survey Meters

Isotope	Meter
Alpha	Zinc Sulfide (ZnS)
Low Energy Beta	N/A – Liquid Scintillation Counter Required
High Energy Beta	Geiger-Mueller (G-M)
Low Energy Gamma	Sodium Iodide (NaI)
Gamma	Sodium Iodide (NaI)/Geiger-Mueller (G-M)

- g. Contaminated lab equipment that is dedicated for radioactive material work (and likely to be re-contaminated) should be appropriately labeled and left in its contaminated state.
- h. Any area found to be contaminated must be decontaminated immediately and re-surveyed. This survey needs to be documented on F:NAU:RAD:7 – Radiation Survey Report

### 2. Monthly Contamination Surveys

- a. A thorough contamination survey of the entire radioisotope lab/area is required to be performed once each calendar use month.
- b. A minimum of ten locations must be surveyed, including at least two surveys on the floor. Survey locations should include areas and items that have a higher potential for contamination. Locations should be varied from month to month. Some suggested areas to swipe for contamination are:
  - i. Work areas, lab benches, and desks
  - ii. Sinks
  - iii. Lab equipment used with radioactive materials
  - iv. Refrigerators and freezers
  - v. Incubators
  - vi. Floor adjacent to work areas and near hallway entrances
  - vii. Door handles
  - viii. Smears should be counted by an appropriate counting technique (LSC or gamma counter).

- c. Any contamination identified on a monthly survey must be decontaminated and re-surveyed to satisfy the ALARA policy and demonstrate compliance with the removable contamination limits for restricted areas.
- d. Monthly surveys must be documented on F:NAU:RAD:8 – Monthly Radiation Survey Report.
- e. The completed survey must be kept on file in the lab's Radiation Safety Records
- f. If radioactive materials have not been used since the last monthly contamination survey, a note-to-file shall be placed in the radiation safety records stating that a monthly survey was not required due to in activity in the area.

3. Comprehensive Surveys

- a. Routine comprehensive surveys of all posted laboratories will be conducted by the RSO on a quarterly basis.
- b. Like daily and monthly surveys, comprehensive surveys are designed to monitor for contamination. However, these surveys also include the measurement of radiation levels, inspection of lab records, and evaluation of general compliance with the NAU Radiation Safety Program.
- c. Results of this survey will be filed in the Radiation Safety Office.

4. Surveying for Removable Contamination

- a. Removable contamination is defined as the radioactivity that can be transferred from a surface by rubbing with moderate pressure. The level of removable contamination is a primary focus of contamination control at NAU.
- b. The smear (or wipe/swipe test) is the universal method of assessing removable contamination, and the required method for monitoring certain radionuclides.
- c. A small cloth, filter paper, or fiberglass disk is used to "wipe" a sample of removable contamination. Fiberglass disks are preferable for low-energy beta emitters, since they dissolve or become transparent in liquid scintillation fluid.
- d. A smear should cover a minimum surface area of 100 cm<sup>2</sup> (approximately equal to a square measuring 4" by 4"). Smears should be dry, and taken using moderate pressure.
- e. If counting results are reported in counts per minute (cpm), they must be converted to decays per minute (dpm) using the counting efficiency:
- f. The maximum allowable limits for removable contamination are as follows:

<b>Restricted areas</b>	<b>Unrestricted areas</b>
2,200 dpm/100 cm <sup>2</sup> beta/gamma and 220 dpm/100 cm <sup>2</sup> alpha	220 dpm/100 cm <sup>2</sup> beta/gamma and 22 dpm/100 cm <sup>2</sup> alpha

5. Counting Methods

- a. Smears to assess beta contamination must be analyzed with a liquid scintillation counter (LSC). Smears to assess gamma contamination should be analyzed with a gamma counter.
- b. An LSC may be used to assess gamma contamination, but close attention must be given to the efficiency of the counter for the radionuclide in question.
- c. When possible, liquid scintillation samples should be dark adapted before analysis to reduce the effect of chemiluminescence. This can be accomplished by simply leaving the rack in the counter (with the cover closed) for 30 minutes or more.