

INSTRUCTIONS FOR THE COMPLETION OF THE QUARTERLY REPORT

The following section contains a detailed description on how the Quarterly Reports should be completed and submitted to the Radiation Protection Division (RPD). It is a condition of the University's Nuclear Regulatory Commission Broadscope License that radioactive material permit holders submit a complete and accurate report to the RPD at the end of each calendar quarter. The person responsible for maintaining the radiation protection records in your laboratories should follow this guide to assure compliance with this license condition.

The All University Radiation Protection Advisory Committee (AURPAC) has ruled that no radioactive material may be ordered or received by a Permit Holder until the report is received by the RPD. Continued delay, or repeated late submittal of the report could result in the suspension or revocation of the radioactive material use permit.

Due Dates: Your report should reach the RPD at W-140, Boynton Health Service by the dates indicated following each calendar quarter.

First Quarter (Jan, Feb, Mar) due by: **April 1st**

Second Quarter (Apr, May, Jun) due by: **July 1st**

Third Quarter (Jul, Aug, Sep) due by: **October 1st**

Fourth Quarter (Oct, Nov, Dec) due by: **January 1st**

INVENTORY

An inventory of all radioactive materials under the use permit must be submitted to the RPD at the end of each calendar quarter. This inventory must include the total, decay corrected activity of each radioisotope in stock form as of the end of the quarter, plus the total, decay corrected activity of each radioisotope in waste form as of the end of the quarter. The procedure to follow for determining these inventories is listed below.

NOTE : Decay correction will not be necessary for the following:

- 1) Radioisotope with half-life greater than 2 years, if stock vial has been in possession for < 90 days.
- 2) Radioisotope with half-life greater than 4 years, if stock vial has been in possession for <180 days.
- 3) Radioisotope with half-life greater than 8 years, if stock vial has been in possession for < 1 year.
- 4) Radioisotope with half-life greater than 100 years, no decay correction will be required.

1. Stock Vial Inventory

Use Appendix X (Radioisotope Receipt and Use Record) for quantities of radioisotopes currently on hand in stock form. You should use a separate Appendix X form for each radioisotope, and record the use of each stock vial that you have in your lab. Use the following procedure to determine total stock activity for a radioisotope:

- Take the activity remaining in the stock vial as of the last entry on Appendix X (disregard entries that indicate zero remaining activity).
- Determine the number of days from date of receipt of the stock vial to the end of the calendar quarter (note: if your activity remaining in the stock vial has already been decay corrected to the last date of stock withdrawal, determine the number of days between *this* date and the end of the quarter to determine the fractional decay below).
- Determine the fractional decay for this number of days. Use the decay chart provided with Appendix CC or contact the RPD for an Excel spreadsheet program.

1. Stock Vial Inventory (continued)

- Multiply this fractional decay times the activity remaining in the stock vial to get the activity in the stock vial as of end of quarter.
- Repeat this process for each stock vial of this radioisotope that has residual activity, and add these decay corrected activities to obtain the activity of this radioisotope remaining as of the end of the quarter.
- Record the decay corrected total for this radioisotope on the quarterly report form under the section for stock vial inventory.
- Repeat the above process for each radioisotope in your inventory. If a stock vial has been subdivided into smaller stock quantities, a separate Appendix X form must be maintained to record utilization of this subdivided stock material, and the same procedure above used to determine remaining activity in this stock material at the end of the calendar quarter.
- If you are approved for a radioisotope, but have no stock vial or waste inventory on hand as of the end of the quarter, be sure to enter a "0" for this radioisotope inventory on the quarterly report form.

2. Radioactive Waste Inventory

Make a copy of the radioactive waste inventory record form (Appendix CC) currently in use for each waste container. On these copies record the date of the end of the calendar quarter in Column #7. To determine the activity in the waste container as of the end of the quarter use the procedure listed below:

- Determine the number of days between the date of receipt of the stock vial (Column #3) and the end of the quarter (note: if the activity recorded on the waste inventory record has already been decay corrected to the date of stock withdrawal, determine the number of days between *this* date and the end of the quarter to determine the fractional decay below). Record days in Column #8.
- Determine the fractional decay for this number of days (see radioisotope decay chart in Appendix CC or use Excel program) and record in Column #9.
- Multiply this fraction times the activity transferred to this waste container (Column #6), and record in Column #10 under the proper radioisotope.
- Repeat this for process for each line on the form and total all of the decay corrected entries to get the activity of each radioisotope in this container.
- Repeat process for each waste container that contains radioactive waste.
- Total the decay corrected activities for each radioisotope from all waste containers and enter under waste inventory on the quarterly report form.

3. Total Inventory

Add the stock vial inventory and the waste inventory for each radioisotope and record under the "Total" heading of the Quarterly Report Form.

PERSONNEL

Record the names of all personnel who are new, have changed their names, or who no longer work under the radioactive materials permit since the last Quarterly Report was submitted. Denote the new names with an 'A', the changes with a 'C', and the deletions with a 'D'.

With an addition, also include the radioisotopes and stock vial quantities (in mCi) that the individual would most likely handle. This will aid in the appropriate assignment of dosimeters if required.

With a deletion, please contact the individual responsible for the distribution and collection of dosimeters within your group and confirm that all dosimeters have been returned to the RPD if the "deleted" person has left the University. If a person is to be "deleted" from your group, but will remain at the University and will continue to use the dosimeters, please provide a forwarding University address and phone number so the appropriate changes can be made to their dosimetry records.

RESTRICTED RADIOISOTOPE AREAS

List all radioisotope use and storage areas which were posted as restricted "Radioactive Materials" areas at any time during the quarter. This includes all laboratories, cold rooms, counting rooms, waste rooms, storage rooms and animal rooms where storage or use of radioactive materials was authorized under your permit by the RPD. Please include the following:

- Building name
- Room number (or room numbers for those areas with multiple entries or doors)
- Status

Only areas where **no handling** of any radioactive material occurred during the entire calendar quarter may be classified as "Storage" areas. All other areas where radioactive materials are handled must be designated as "Active" use areas.

Contact the RPD for a close-out survey if a currently restricted area will no longer be used for radioisotopes.

RESTRICTED RADIOISOTOPE AREA SURVEYS

Contamination survey results, and in some cases exposure rate survey results, must be submitted with the Quarterly Report. All restricted radioisotope areas for which the permit holder is responsible must be accounted for on the Quarterly Report. A diagram of your areas, showing where smears were taken, must also be included with the survey results. Identify the area by using both the building name and room number(s).

1. Frequency of Surveys

- All active, restricted radioisotope areas that are classified as "Low Risk" must have contamination surveys completed each month, and the results submitted with the Quarterly Report. Refer to your copy of the radioisotope use permit for the risk classification of your areas.
- All restricted areas where there was **no handling** of radioactive materials during the entire calendar quarter must have one survey completed **during** that quarter. This survey should be taken in the vicinity of any stored radioisotopes (e.g., refrigerator, freezer, cold room shelf, etc.), or radioactive waste containers.

2. Survey Information Requirements

Surface contamination smear surveys are required for all restricted radioisotope areas. The surveys should be conducted using dry filter paper and analyzed with the appropriate counting instrument (liquid scintillation or auto-gamma counter). All results must be reported in disintegrations per minute (DPM).

- Record on the survey form which radioisotopes were used in the area.
- Record what counting efficiency was used in determining DPM. See **Section 3**.
- Record the make and model of the counting instrument.
- Number the smears and indicate on the survey map where these smears were taken.
- Describe their locations in the **SMEAR SURVEY DATA** column. Locations should include those where radioactive materials are stored, handled, and/or discarded. Examples:
 - * work station bench top (or fume hood working surface)
 - * floor in front of work station
 - * refrigerator/freezer shelves and handles
 - * floor in front of refrigerator/freezer
 - * equipment surfaces, knobs, and handles (centrifuge, incubator, waterbath, etc.)
 - * radioactive waste container lids and handles
 - * floor area around radioactive waste containers
 - * sink basins and faucet controls where lab ware is rinsed
 - * liquid scintillation counter and auto-gamma counter surfaces, knobs and buttons
 - * door handles and floors of access points to all restricted areas
- Record the DPM per 100 square centimeters for each smear.
- $DPM = (\text{smear CPM} - \text{background CPM}) \div (\text{fractional counting efficiency})$

If the result of a smear is > 250 DPM/100 cm², you must decontaminate the area to a level less than 250 DPM, resurvey and submit the new results with the Quarterly Report.

If high energy beta emitters or gamma emitters are used in a radioisotope area, a monthly exposure rate survey is also required. A portable Geiger-Mueller (GM) survey meter is often used to meet this requirement. Complete the right-hand column of the survey form. Only the RPD may grant exemptions from this requirement.

- Record the make and model of the instrument.
- Record the background counts per minute (CPM) or exposure rate (mR/hr).
- Record the CPM or mR/hr for the locations you have indicated on the survey map. Locations should include those where radioactive materials are stored, routinely handled and discarded. Measurements should be taken at normal working or occupancy positions. Examples:
 - * Work station, chest level at normal standing distance
 - * Refrigerator/freezer (or other storage area) at normal working distance
 - * Radioactive waste containers at normal working distance

If an exposure rate reading exceeds 2.5 mR/hr at a normal working distance, you must take immediate action to reduce the exposure (e.g., modify shielding). The RPD recommends that exposure rates remain below 0.25 mR/hr at normal working distances.

3. Determination of DPM/100 cm²

As stated in the previous sections, the results of all radioisotope smear surveys must be reported in disintegrations per minute for an area of 100 square centimeters (DPM/100 cm²). One hundred square centimeters is approximately equal to the area covered by a Whatman 1™ filter paper which smears approximately 20 inches of a surface. Initial smear surveys may cover areas greater than this, but if contamination is found an area must be decontaminated to a level below the 250 DPM/100 cm² limit.

Use one of the following options to determine DPM for your smear survey results.

Beta Emitters

- **Default Option.** The default method for converting counts per minute (CPM) to DPM is to use the open window (0-2 MeV) setting on the liquid scintillation counter and to use the conservative counting efficiency of 25%. Therefore:

$$\text{DPM} = (\text{Gross smear CPM} - \text{Background CPM}) \div (0.25)$$

- **Three Window Option.** If radioisotopes with differing beta energies are used and analyzed (e.g., H-3, C-14, S-35, P-32, P-33) and the liquid scintillation counter can be programmed to establish three distinct counting windows, the conservative counting efficiencies to use are:

25% for Window 1 (0.0 - 0.016 MeV)
50% for Window 2 (0.016 - 0.17 MeV)
80% for Window 3 (0.17 - 2.0 MeV)

Therefore:

$$\begin{aligned} & (\text{Gross Window 1 CPM} - \text{Background Window 1 CPM}) \div (0.25) = \text{DPM 1} \\ & (\text{Gross Window 2 CPM} - \text{Background Window 2 CPM}) \div (0.50) = \text{DPM 2} \\ & + (\text{Gross Window 3 CPM} - \text{Background Window 3 CPM}) \div (0.80) = \text{DPM 3} \\ \text{Total DPM} = & \quad \quad \quad (\text{Sum of three windows' DPM}) \end{aligned}$$

Gamma emitters and Beta/Gamma Emitters

- **Auto-gamma counters.** For radioisotopes that are gamma emitters or beta/gamma emitters, the default fractional counting efficiencies to use for auto-gamma analysis are:

<u>Radioisotope</u>	<u>Efficiency*</u>
Cr-51	0.04
I-131	0.40
Tc-99m	0.50
I-125	0.60
In-111	0.80

* Efficiency values assume the use of a 2" well-type NaI(TL) crystal with an energy window adjusted for the gamma photon peak of the radioisotope listed.

Therefore:

$$\text{DPM} = (\text{Gross smear CPM} - \text{Background CPM}) \div (\text{Efficiency})$$

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