Radioactivity Handling Procedures
Updated July 2019

All personnel handling radioactive materials are required to have completed MGH Radiation Safety Training, GCMI Radioactivity Handling Training with Julia Scotton or Dr. Hushan Yuan, and follow the procedures below for radioactive materials use in all GCMI locations, which are covered under GCMI Radioisotope permits.

1. Receipt of Radioactivity and Packaging

When a user obtains a shipment of radioactive material, first verify shipping papers and check for obvious damage. If undamaged, perform surveys using a survey meter at 3 feet (1 meter) and at the surface of the package; record these numbers on receiving documents. If the package is damaged or leaking, contact the Radiation Safety office right away. Then external and internal wipe tests must be completed to verify the shielded container has no contamination due to transport. Once surveys and wipes are documented and have verified the container is intact, verify the contents, and retain shipping papers (see #2). Wipes and surveys, as well as documentation can be performed by Radiation Safety in CNY and main campus, when prearranged. If the external container is disposable, e.g. cardboard box, users should check for contamination and if not contaminated, obliterate all radioactivity markers/labels before throwing away. Lead containers must be handled in one of the following ways:

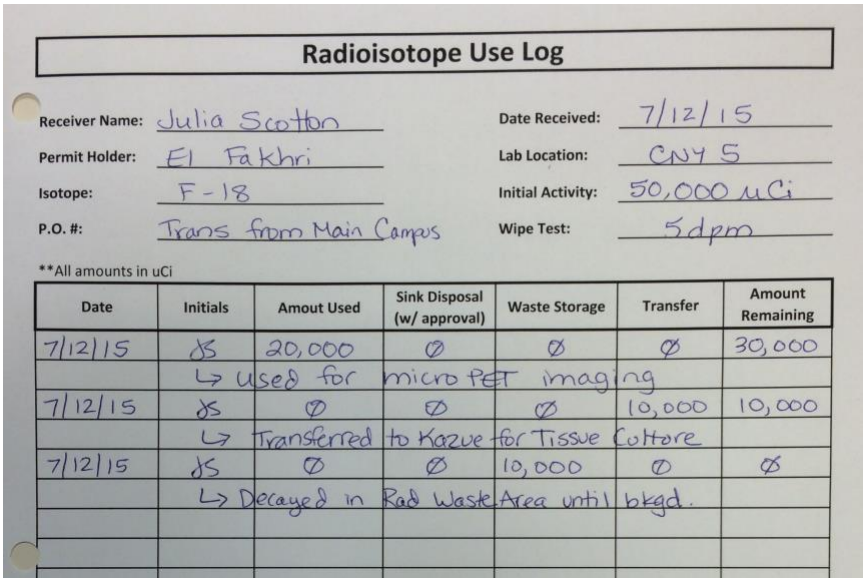
1. Small lead containers can be kept.
2. Containers from IBA, Cardinal Health, etc. should be returned to the shipper.
3. Large shipping containers from manufacturers (e.g. Perkin Elmer) need to be returned to the manufacturer. We return the containers depending on agreement between the manufacturer and the MGH.

Shipments of radioactive materials from Main Campus to CNY should be arranged with Skycom. The transporter should wait until surveys and wipes are performed and then return the empty shipping container back to Main Campus.

Activity received directly from the Cyclotron or Gordon PET Core Production lab (human or non-human) also must be documented. A copy of the Activity/Dose Request form or Dose sticker must be maintained and filed in the RAM binder.

2. Receipt of radioactivity: Forms and Paperwork

All radioactive materials brought into and leaving GCMI spaces must be documented. When isotope arrives, it should be recorded in a Radioisotope Use Log or MGH Short-lived RAM Use Log which is in the Radioactive Materials (RAM) binder, and the shipping paper work, Transfer log, request form OR Dose sticker (attached to the MGH Short-lived RAM Use Log) must be retained and placed in the binder under the appropriate tab. Generally, one page should be used per batch/vial, a sample of which is shown here:



Radioisotope Use Log

Receiver Name: Julia Scotton — Date Received: 7/12/15
Permit Holder: El Fakhri — Lab Location: CNY 5
Isotope: F-18 — Initial Activity: 50,000 uCi
P.O. #: Trans from Main Campus — Wipe Test: 5dpm

**All amounts in uCi

Date	Initials	Amout Used	Sink Disposal (w/ approval)	Waste Storage	Transfer	Amount Remaining
7/12/15	JS	20,000	∅	∅	∅	30,000
	↳ used for	micro PET	imaging			
7/12/15	JS	∅	∅	∅	10,000	10,000
	↳ Transferred	to Kazue	for Tissue	Culture		
7/12/15	JS	∅	∅	10,000	∅	∅
	↳ Decayed in	Rad Waste	Area until	bkgd.		

3. Survey Meters
Users must be familiar with the operation of two types of survey meters:

1) Sodium iodide cylindrical probe, gamma radiation
2) Geiger Muller flat detector probe for beta or gamma radiation.

4. Personnel Monitoring Equipment
All employees and users must wear dosimetry badges supplied by MGH. Rings must be worn when handling high levels of radioactivity (defined by MGH radiation safety office), such as during syntheses, dose splitting, animal injection, and animal dissection. Badges and rings will be collected by Julia Scotton, and analyzed. The radioactivity license as well as the survey results from chest and ring badges is posted on the safety bulletin board in each permitted area.

The badge results are also available online for your review. To see your results: go to www.myldr.com, the username is "mghresearch" and the password is "MGH55fruit", then enter the Account number (152347) and Serial number (located above the barcode on the back of your badge). When the dose summary screen appears, click "View Details" to expand the data; doses are displayed in mrem.

Monthly and bi-monthly dose reports are also kept electronically on Partners Dropbox. Please contact Julia Scotton for access to the Badge Reports shared folder.

5. Designated Radioactivity Work Areas
Radioactivity is only approved for use in rooms included on the Radioactive Use Permit. The doors of these should be closed at all times and kept locked when not in use.

Each of these rooms is marked with a Radioactive sign/sticker and has a "Documentation and Survey Form" placed in plastic sheet protectors on the door. These MUST be filled out BEFORE AND AFTER each use of these rooms to track who has been using the rooms and levels of radioactivity present. You should also survey your hands and feet when finished working with radioactivity to prevent contamination.

If you are working with H_3 (Tridium) or 14C then you must perform daily wipes instead of surveys. These also need to be documented in the RAM binder.

6. Hot Lab Use and Procedures
Sign up for the hot lab and hood prior to use by booking the hood in advance through Google Calendar. Contact Julia Scotton for signup privileges.

Survey the room and record the results BEFORE and AFTER the experiment. The hot lab hood can be radioactive from prior use, or from storage of radioactive vials. If necessary, the hood should be wiped to remove contamination on the interior surfaces. The small storage container inside radioactive hoods is for temporary storage while you are using the hood. This must be emptied when you finish. A dose calibrator is located inside, or near by the hood for measuring activity. You must ensure the right isotope is selected to get a correct measurement in (mCi).

L-Blocks are for working with radioisotopes that do not require using the hood. Vials that are needed for later experiments can be stored behind lead in this area, but MUST be labeled with your name, the isotope and the date. All solid and liquid radioactive waste must be properly bagged and tagged and placed in the Radioactive Waste Disposal area (see #9).

Any radioactive disposal down the sink must be pre-approved by Julia Scotton and the Sink Log must be filled out properly.

Users are expected to incorporate the ALARA principles of time, distance, shielding to minimize their exposure.

7. MicroPET Use and Procedures
Sign up through Google Calendar for the MicroPET rooms. Contact Julia Scotton for signup privileges. Use of the MicroPET scanner must also be scheduled on PET Core calendar located at: https://petmanager-cny.mgh.harvard.edu/pet/calendar, please also email jscotton@partners.org or ejmcdonald@mgh.harvard.edu the protocol number, the radioisotope being used, and a start and end time for reservations.

Survey the room and record the results BEFORE and AFTER the scan/experiment. There is a logbook next to the instrument that must also be filled out. Use blue absorbent pads/chux to reduce contamination of surfaces, and clean the entire area when you are done. Radioactive vials needed for later experiments can be kept behind lead, but they must be labeled with your name, the isotope and the date.

All solid and liquid radioactive waste must be bagged/contained and tagged properly and placed in one of the designated Radioactive Waste Area for decay or pick up. If you leave short lived isotope (C-11 or F-18) waste to decay, you MUST label it and it is YOUR responsibility to document it using the Radioactive Waste Disposal In-Lab Disposal Record and then dispose of it properly when it is completely decayed (see #9).

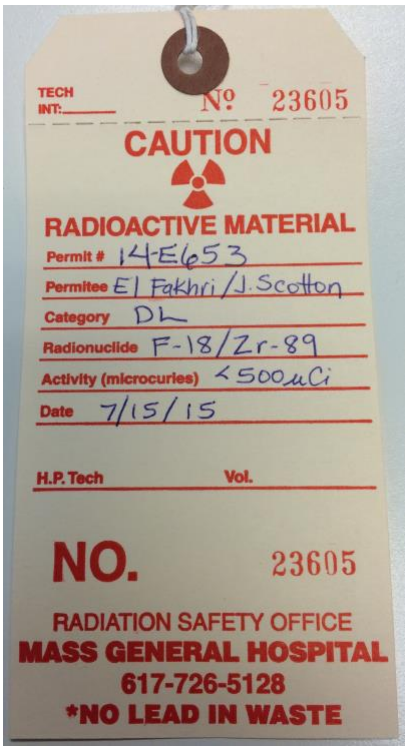
If you have hot live animals they may be left in the MicroPET or procedure room for up to 12 hours, but it is YOUR responsibility to return the animals once the radioactivity has decayed (NOTE: hot mice may be returned to CCM facilities but they must be well labeled so CCM staff knows not to handle them, and you are responsible for ensuring they have food and water.) Hot empty cages may be left for decay in the Waste Disposal area, but YOU must return the cages (bedding disposed of as solid waste) to CCM after they have decayed to background. There is a separate log sheet for hot cages that must be filled out when leaving them to decay.

8. Labeling of non-waste radioactive materials
When you leave the laboratory, ALL containers of radioactive liquids and compounds must be stored in lead/tungsten containers labeled with yellow radioactive tape that includes ***your name (not initials), date, the nature and amount of isotope (as less than)***. These should then be placed in designated shielded areas, aka behind an L-block or shielded storage area. Radioactive materials can only be stored in those refrigerators or incubators with radioactive labels on them. Radioactive pipettes and other instruments used to handle radioactive must be labeled with yellow radioactive tape.

9. Radioactive Waste Disposal:
There are two methods of radioactive waste disposal:

1) Pick up by the RSO from designated Radioactive Waste Area
2) Storage to decay to the background levels and disposed of as Biohazard trash

All radioactive waste materials to be disposed of by Radiation Safety MUST have CAUTION RADIOACTIVE MATERIAL label completely filled out. See example here:

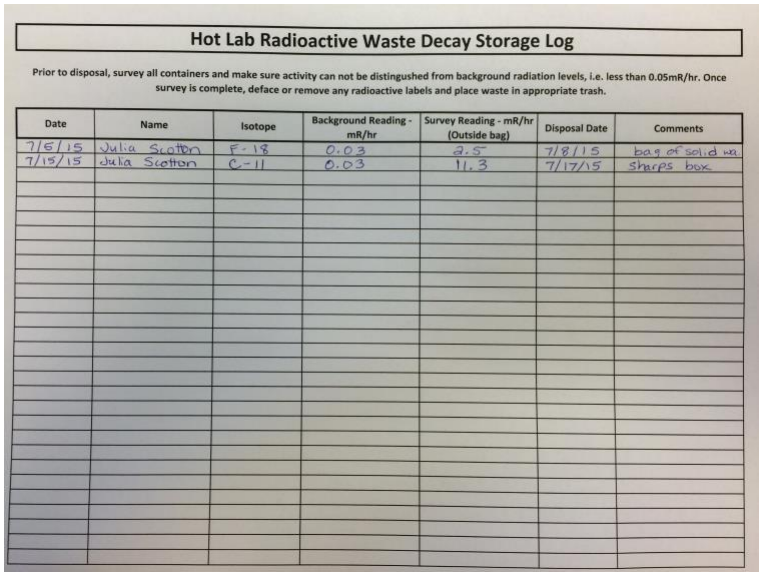


- For **Permittee** put both name of the permit holder and your name.
- For **Category,** enter a waste type which corresponds to those on pages 61-62 of the MGH Radiation Safety Manual (Revision: November 2009). For example:
    - DL= dry waste for decay, half-life less than 65 days.
    - RDS = animals, half-life less than 65 days.

Solid waste (non-sharps): All solid radioactive trash including gloves, plastic tubes, animal bedding, etc. should be put into a **double bagged** transparent plastic bags and bear CAUTION RADIOACTIVE MATERIAL label. The bags are then placed in the designated Radioactive Waste Areas for pickup. Bags and labels are located in the Hot Lab.

Sharps: All the sharps including needles, syringes, glass vials, broken glasses, pipet tips etc. are placed in a sharps container. Separate sharps containers should be used for short and long lived isotopes; it is recommended to use small containers that can be closed after each experiment. When opening a new container, the isotope(s) and the date opened should be written on the container and should have yellow radioactive tape. When a sharps container is ¾ full, or when you are finished with an experiment, it should be given a completely filled out CAUTION RADIOACTIVE MATERIAL label (taped or tied onto it) and placed in the Radioactive Waste Areas for pickup.
Liquids: All liquid waste should be stored in a bottle labeled with yellow radioactive tape, the isotope and the date on it and placed in Radioactive Waste Area. Partially filled bottles must be placed in a second open container in case of leakage. When a bottle is full, it must be **double bagged** and tagged with a completely filled out CAUTION RADIOACTIVE MATERIAL label.

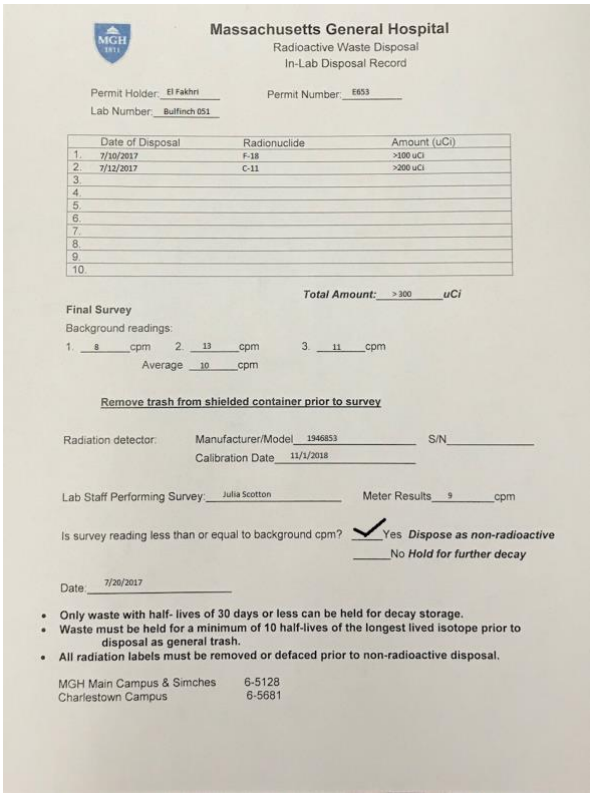
Temporary Waste Storage for Decay: For short half-life isotopes, such as C-11 or F-18, waste can be stored until activity decays to background level, a *minimum of 10 half-lives,* in the Radioactive Waste Areas. These still must be labeled with yellow radioactive tape, your name, the isotope and the date, and be entered into the Radioactive Waste Decay Storage Log as shown here:



Hot Lab Radioactive Waste Decay Storage Log

Prior to disposal, survey all containers and make sure activity can not be distingushed from background radiation levels, i.e. less than 0.05mR/hr. Once survey is complete, deface or remove any radioactive labels and place waste in appropriate trash.

Date	Name	Isotope	Background Reading - mR/hr	Survey Reading - mR/hr (Outside bag)	Disposal Date	Comments
7/6/15	Julia Scotton	F-18	0.03	2.5	7/8/15	bag of solid wa
7/15/15	Julia Scotton	C-11	0.03	11.3	7/17/15	Sharps box



Massachusetts General Hospital
Radioactive Waste Disposal
In-Lab Disposal Record

Permit Holder: El Fakhri Permit Number: E653
Lab Number: Bulfinch 051

	Date of Disposal	Radionuclide	Amount (uCi)
1.	7/10/2017	F-18	>100 uCi
2.	7/12/2017	C-11	>200 uCi
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Total Amount: >300 *uCi*

Final Survey
Background readings:
1. 8 cpm 2. 13 cpm 3. 11 cpm
Average 10 cpm

Remove trash from shielded container prior to survey

Radiation detector: Manufacturer/Model 1946853 S/N
Calibration Date 11/1/2018

Lab Staff Performing Survey: Julia Scotton Meter Results 9 cpm

Is survey reading less than or equal to background cpm? ✓ Yes ***Dispose as non-radioactive***
No ***Hold for further decay***

Date: 7/20/2017

- **Only waste with half- lives of 30 days or less can be held for decay storage.**
- **Waste must be held for a minimum of 10 half-lives of the longest lived isotope prior to disposal as general trash.**
- **All radiation labels must be removed or defaced prior to non-radioactive disposal.**

MGH Main Campus & Simches 6-5128
Charlestown Campus 6-5681

It is YOUR responsibility to properly dispose of the waste as biohazard trash. Every bag of radioactive waste must be documented on the Decay Storage Log AND when completely decayed, disposal is documented using the **In-Lab Disposal Record**.

10. Working with living Radioactive Animals
Radioactive animals are the responsibility of the investigator/researcher including feeding, water, and changing bedding or cages. YOU are responsible for disposing of radioactive waste from the cages of radioactive animals properly as solid waste (see #9 above). All radioactive animals returning to CCM facilities MUST be placed in cages with white Alpha-dri bedding and have a “Radioactive – Do not touch” cage card placed on the cage in addition to a yellow procedure card.

11. Disposing of Radioactive Animal Carcasses:
All radioactive animal carcasses must be handled as follows:

1) Taken to and stored by the RSO (for long half-life isotopes)
2) Stored to decay to the background levels within the lab (for short half-life isotopes) and disposed of as biohazard waste in the CCM animal freezers in CCM Facilities

Radioactive animals bearing long-half-life isotopes (89Zr, 111In) are taken to the RSO. If the office is not open, they can be stored in a freezer designated for animal carcasses and moved to the RSO at the first opportunity.

The CAUTION RADIOACTIVE MATERIAL label should be properly filled and attached to the bags before taking animal to the RSO.

With short-lived isotopes (18F, 11C, 68Ga) animals can be stored until they decay to background level and then disposed of as biohazard waste. Radioactive carcasses are double bagged and labeled and can be stored in a freezer designated for the storage of radioactive animals until they have decayed to background. It is YOUR responsibility to dispose of them properly (see # 9 above) once they have decayed.

12. Radioactive Spills:
ALL SPILLS need to be reported to Julia Scotton (office: 617- 643-1967, cell: 617-653-2930). If she cannot be reached, please contact Radiation Safety at 6-5128 for Main Campus and 6-5681 for CNY. If you have not been properly trained in radioactive spills please see Julia or RSO for training.

When a spill occurs, follow the steps below:

1) Cover the spill with absorbent material and notify anyone in the immediate area to prevent further spread of contamination
2) Notify Julia Scotton or RSO
3) Survey the area to determine edges of contaminated area
4) Use Radioactive spill cleaning solution and proper clean-up technique to contain contamination to smallest area possible
5) Perform wipe test to determine if all removable contamination is gone
6) Repeat steps 3 through 5 until no more removable contamination exists
7) Cover contaminated area with absorbent material and lead to reduce exposure until all radioactivity had decayed to background