

Radiation Users Guidelines

Department of Environmental Health & Safety

The University of Southern Mississippi

Important Contact Information

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IN THE EVENT OF AN EMERGENCY CALL 911

Introduction

The purpose of this document is to provide an easy to read and follow guideline for the various persons using radioactivity at The University of Southern Mississippi. The *Radiation Safety Manual* is the document that contains the actual state mandated regulations for radioactive use. This document is also available on the Department of Environmental Health & Safety website at <http://>

Basics of Radiation Safety:

Definition: Radioactivity is defined as the spontaneous emission of radiation, which is usually alpha, beta particles accompanied by gamma rays, from the nucleus of an unstable atom. Emission of particles and rays are a result of decay of the unstable atom.

Radiation Exposure: Radiation can be found in nature as well as in the lab. There is external radiation from cosmic sources and terrestrial sources. Our very bones contain both ^{14}C and ^{40}K . We also inhale radon from the atmosphere and it is deposited in our lung tissue. The average dose of radiation due to background (both natural and man-made) is approximately 3.6 mSv or 360mrem annually. Any additional exposure from working with radioactivity is measured by a dosimeter device worn while performing those experiments. The device is sent to an outside source for analysis and an exposure report is generated. The department of E.H.S. retains a copy of all dosimeter exposure reports.

Time, Distance and Shielding: Radiation exposure can be greatly reduced in the lab by utilizing time, distance and shielding.

1. Reduce the amount of **time** spent near radioactive source.
2. Increase the **distance** from radioactive source.
3. Always use appropriate **shielding** whenever possible.

ALARA: This acronym stands for As Low As Reasonably Achievable. This is the attitude all radiation workers should adapt in consideration of their own personal safety, the safety of their co-workers and the environment. Radioactive contamination from an experiment can only be as large as the amount of the radiation used in the experiment. Therefore only use the smallest quantity absolutely necessary.

Lab Set Up

Before working with radioactivity it is important to consider how the lab is set up to ensure a safe research environment and to limit any additional exposure.

- It is best to perform procedures using radioactivity in a location in the lab that can be easily isolated in the event of a spill or accident. A fume hood or back bench away from any entry doors work well.
- Be sure to cover bench area or hood surface with absorbent bench paper.
- Make sure proper shields have been purchased and are in place prior to experiment.
- Prepare a container to use for the disposal of small waste (pipet tips microfuge tubes and gloves) during the experiment. A large beaker or small bucket with a plastic bag liner works well. The bag can just be removed, sealed and labeled for disposal (pick up) when full.
- Be sure to have the appropriate counting device on hand for procedure
- Be sure to have some radioactive warning tape to use to mark waste bags, containers and any equipment that will be used during radioactive experiment.
- Once the lab is set up for radioactive experiments the P.I. can contact E.H.S. to approve and provide signage for the doors.

Registered Users

All persons working with radioactivity at The University of Southern Mississippi must be registered with the department of Environmental Health & Safety prior to performing the procedure.

- Applicants to become a registered user must take the online Radiation Safety Course available through the E.H. S. website and pass the associated quiz with a score of 70% or better. ***NO** radiation work can be performed until a passing score has been recorded at E.H.S.
- Once a passing grade is recorded a request for a dosimeter device (radiation badge) is made for the new user if using ^{22}Na or ^{32}P . This is handled by Kevin Davis, asst. RSO.

Procurement

All purchases of radioactive material will be made via Purchase Order through Procurement Services (PS). Do not attempt use a procurement card to order radioactivity unless you have special permission from the Procurement Card Administrator and E.H.S.

- Enter an electronic requisition in SOARFIN.
- Email either the RSO (Martha Sparrow or the asst. RSO (Kevin Davis) for approval. The R.S.O or Alt. R.S.O. will notify purchasing agent in PS that the requisition can now be processed into a Purchase Order (P.O.).
- Once the P.O. is final and the order is placed be sure to notify the R.S.O. or Alt. R.S.O. with the PO number and an estimated delivery date.
- All radioactive orders must be delivered to the Fisher Storeroom at 100 Charles Lane Drive. The Storeroom personnel will notify RSO when package has arrived.
- Only the RSO (or Alt. RSO) can pick up and deliver radioactive packages.
- The RSO will deliver the package to the lab and have a registered user sign packing slip to confirm receipt.

Working with Radioactivity

Once the lab and the person using radioactivity have been registered and approved for work experiments can be performed.

- Never work alone while using radioactivity. It is not a good idea to work alone in any case, but especially when using radioactivity. There should be someone else available to assist in the event of a spill or accident.
- Review the protocol before using radioactivity to ensure you are using least amount possible to get results. (ALARA).
- It is a good practice to perform a dry run first to make sure that everything is in place and ready for actual experiment. This helps prevent walking around lab looking for that “special pipet” while wearing gloves that may have radioactive contamination.
- Make sure to wear appropriate Personal Protective Equipment (PPE). This includes a lab coat, eye protection, and appropriate gloves. You will also need to wear your dosimeter device.
- Do NOT wear short, sleeveless shirts or open-toed shoes.
- It is a good idea to keep a set of clothes and shoes available in lab in the event of a spill. This way clothes can be bagged and held for proper decay period. Scrubs and workout gear work well for this purpose.
- Place counting device near radioactive work area to monitor counts. Check hands periodically to prevent spreading radioactivity around other areas of the lab.

- Perform as much work as possible behind shield. Use shield when moving sample from one work area to another i.e. to centrifuge, waterbath or scintillation counter.
- Once procedure is complete spot check lab for radioactive contamination with counter. Remove gloves and place in small radioactive waste bag.
- Tape bag of waste shut (when full) with radioactive warning tape and label with another piece tape with P.I.'s name, lab location, isotope, the date and users initials.
- Wash hands well after removing gloves to rad. waste bag.

Dealing with Spills

When you work with any reagent there is always the chance of a spill. It is no different when working with radioactive material. In the event of any radioactive spill the first thing to remember is *do not panic* and move around lab erratically, doing this will only spread the contamination making clean up much more difficult.

If you followed the guidelines at the beginning of this document dealing with a spill will be much easier. If you used the principle of **ALARA** then you only incorporated the minimum amount of radiation needed for the experiment, which means there is less radiation to contaminate the area.

If you wore the appropriate PPE (lab coat, safety glasses and gloves) you should be protected sufficiently and only have minimum contamination. It may mean simply removing lab coat and storing in a plastic bag behind a shield for a few months or throwing away gloves in solid radioactive waste. If your personal clothing is involved stay where you are and ask lab co-worker to bring you the extra clothing and shoes you keep on hand. Change clothing in lab to eliminate spreading radioactive contamination. Simply bag clothing, label and store behind shield until counter indicates contamination has decayed. You can also have EHS pick up for decay and disposal.

If you get some radioactive material on your skin, again, do not panic because your skin is a very effective barrier. In most cases the area most likely to catch some spill is the area between lab coat sleeve and glove. Wearing proper PPE and working with shielding protects most of your

body and face. Several successive washings will reduce and eventually eliminate contamination. Check area with counting device after every few washing cycles. You want the final washing to bring area back to background readings.

When the spill affects the lab bench having it covered with absorbent bench paper is very helpful. If it is a small spill you can simply find the area with counter, mark it, cut it out and dispose of it with the other solid radioactive waste. If a large area of bench paper is contaminated simply remove the entire piece, fold up, place it in plastic bag and label with isotope, PI, date and initials.

A spill/splash on an uncovered bench surface or floor can be cleaned with a good household cleaner such as 409. Make sure to dispose of all cleaning items (paper towels, wipes, gloves, etc.) in the solid radioactive waste. It may be necessary to isolate area by covering with absorbent bench paper, label with tape by placing an X of tape and let decay. Once the area has decayed to background level it is safe to remove cover and label tape.

Occasionally there are spills/breakages that involve equipment. Make sure that any equipment used in radioactive experiments is marked with radioactive label tape before experiment even starts. It is best to have dedicated equipment for radioactive experiments. If there is a spill or a tube breaks clean out equipment making sure to dispose of all items (paper towels, kimwipes and gloves) in the solid radioactive waste. Check equipment with counting device and continue to clean with a good household cleaner like 409. It may be necessary to simply store equipment in hood until radioactive material decays.

Disposing of Radioactive Waste

When the experiments are complete and the results are being analyzed the radioactive waste can be disposed. Here are the guidelines for radioactive material disposal.

- Collect all liquid radioactive waste in an empty 4 liter bottle. Make sure to label bottle as Radioactive Waste and include the isotope, P.I., the lab location, the date and your initials.
- When the bottle is full contact E.H.S. for pick up.
- NEVER dispose of radioactive liquids down the drains.
- Collect all solid radioactive waste in an appropriate size plastic bag. Make sure to close bag with tape and label as radioactive waste, include the isotope, P.I., lab location, the date and your initials.
- When you are ready to dispose of the waste or have a full bag contact E.H.S. for pick up.
- NEVER dispose of any solid radioactive waste in the common garbage containers collected by the custodians.

*Remember to plan your experiments in such a way that the least amount of waste is generated. Less is best!

