

Welcome to the 2011 Radiation Safety Refresher Training session for **sealed source** users. As a radiological worker, training concerning the safety aspects related to using radioactive materials must be provided **annually**. All Principal Investigators (PIs) and Associate Investigators (AIs) authorized to use radioactive materials at the University at Buffalo (UB) work under a Radioactive Materials License from the New York State (NYS) Department of Health (DOH). The Radiation Safety Division of Environment, Health & Safety (EH&S) Services oversees this license and presents the Refresher Training.

Topics

Annual Reminders:

- Sealed Source Use at UB
- Authorized Users of Sealed Sources
- Lab Signage Program (New 2011)
- Postings
- Safe Use of Sealed Sources
- EH&S Sealed Sources Rules
- Leak Testing and Inventory
- Emergency Procedures
- Source Disposal (New 2011)



We will try to keep this training as quick as possible while providing radiation safety program refresher reminders. The topics listed above are described in this presentation.

Sealed Source Use

Sealed Source:

- Any radioactive material permanently bonded or fixed in a capsule or matrix designed to **prevent release** of the material under the most severe conditions likely to be encountered in normal use and handling.
- PI must be authorized for the isotope of the source before use.



Sealed sources are encapsulated radioactive materials (in solid, liquid, or gas states) and can take many different forms. All forms share some type of encapsulation (typically inside metal or plastic) that prevents the radioactive contents from leaking or dispersing – barring tampering or a severe accident. In some forms, the radioactive material is an inherent part of the source and cannot be separated. Most "sealed sources" are designed to be handled without concern that the radioactive material will rub-off or be dispersed onto hands or clothing. There is, however, reason to be concerned about exposure to the radiation emitted from some types of sealed sources.

State and federal regulations control the use of radioactive materials at UB. The university has been issued a license by the New York State (NYS) Department of Health (DOH) that allows the use of radioactive materials and also requires UB to control and monitor the use of these materials. The safe use of radioactive materials is best accomplished when the end user and radiation safety personnel act in cooperation.

Types of Sealed Sources

Uses:

- Plated Sources for Mossbauer Effect (Co-57)
- Encapsulated for Calibrations (I-129, Co-60, C-14)
- Electron Capture Devices in Gas Chromatograph (Ni-63)
- Sample Irradiator (Cs-137)
- Ionization Static Eliminators and Neutralizers (Kr-85, Po-210, Am-241)



Sealed sources at UB take many different forms and contain a variety of isotopes:

- Plated radioactive material (various nuclides) coating a disk or planchette. This coating may be covered, depending upon the type of radiation emitted, by mylar, aluminum, steel, or plastic.
- A capsule usually made of metal surrounds the radioactive material. These sources are often placed onto the end of metal or plastic handling rods. Another example of a capsule is when a mixture of radioactive compounds is placed into a container and welded or sealed closed.
- Ni-63 or H-3 electron capture devices found in gas chromatographs with a housing containing the source and an inlet and outlet ventilation to the housing.
- Cs-137 sources of high activity, permanently housed in apparatus intended for irradiating animals or cells or other materials.
- Kr-85 (gas), Po-210, and Am-241 used to eliminate static and dust and neutralize and clean surfaces at remote distances.

Authorized Users of Sealed Sources

Radiation Safety Program

Participants:

- DOH
- Radiation Safety Committee
- EH&S
- Principal Investigator (PI)



In order to possess or use radioactive sealed sources (or devices containing sealed sources) at UB, the Principal Investigator (PI) must have a radioactive materials permit approved by the Radiation Safety Committee (RSC). The PI's permit is an authorization to use radioactive material under DOH License 1049.

To obtain a permit, the PI must meet minimum experience and training requirements. This training is one of those requirements. The PI and everyone in a laboratory must satisfactorily complete the training before they begin to work with sealed sources.

Authorized Labs for Sealed Sources

Approved Sealed Source Storage Locations:

- Must be posted with Proper Signage
- Rooms with **Only** Sealed Sources Posted as a "Sealed Source" Lab

Lab Signage Program
www.ehs.buffalo.edu

CAUTION

The Following Hazards May be Present

Sealed Source Flammable

2 1

WARNINGS
No Food or Drink in Lab
Radioactive Ni-63 Sealed Source in Use

EMERGENCY RESPONSE INFORMATION

514 Hochstetler Hall - Fung Research Group

EMERGENCY CONTACTS

Primary: Dr. H.L. Fung	645-4843
Alternate: Sun-Mi Fung	645-4832
Alternate: David Soda	645-4830

24 Hour Emergency Lab Contact Number: 716-688-8127

Updated 7/2009/07
If no response from the Emergency Contacts above at after normal business hours, call UB Police at 645-2222

All labs with radioactive material must be posted with proper signage. Rooms with only sealed source radioactive material are posted as a “Sealed Source Only” lab. Labs that manipulate un-encapsulated radioactive materials are posted as Open Source labs.

The type (nuclide) and amount (activity) of radioactive material in the sealed source determines the safety requirements for using the source. Under normal conditions, sealed sources present an external radiation hazard as opposed to a contamination hazard. When working with any radioactive materials, the main concern is controlling exposure to radiation. Since any radiation exposure presumably involves some risk to the individual involved, the level of exposure received should be worth the result that is achieved. In principle, the objective of radiation protection is to balance the risks versus the benefits from activities that involve radiation. Different uses of ionizing radiation warrant consideration of different exposure guidelines or means to reduce exposure.

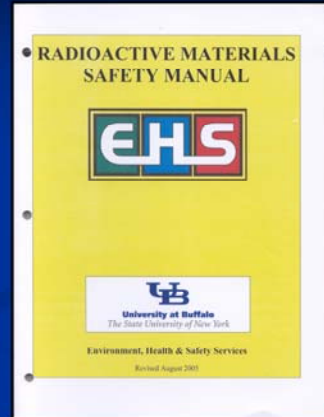
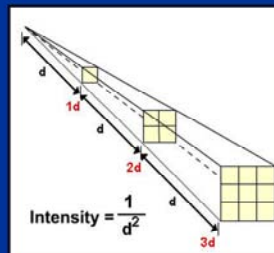
EH&S has instituted a university wide Lab Signage Program. An example of the new sign is seen in the slide. Signage should contain information about all the hazards present within the laboratory. If your lab does not have up-to-date signage, please refer to the EHS website at www.ehs.buffalo.edu for information and to obtain the Lab Signage forms. Click the link for Lab Signage. Download and complete a form for each lab and then fax or mail to EH&S.

Safe Use of Sealed Sources

When Working with Sources

Maintain **ALARA** Controls:

- Minimize **Time** with Source
- Maximize **Distance** from Source
- Use Appropriate **Shielding**



Sealed sources can emit any type of ionizing radiation, including alpha particles, beta particles, gamma rays, x-rays, or neutrons. An essential facet of radiation protection practice is the ALARA (As Low As Reasonably Achievable) philosophy. The ALARA concept gives primary importance to the principle that ionizing radiation exposure should always be kept as low as practicable.

When working with radiation, be aware that exposure is directly proportional to the time spent in the field. Minimize the amount of time exposed to the source to reduce dose. The dose received is inversely proportional to the **SQUARE** of the distance of separation. Thus, the distance of separation between a person and a source has a greater relative influence on dose than does the time factor. Use controls and tools to keep your body as far away as possible from the exposed source at all times.

A simple, yet effective, way of reducing radiation exposure in conjunction with or when the previous methods cannot be used, is by placing appropriate shielding between the user and the source. To properly utilize this method, it is necessary to understand what shield material works best for which types of radiation. Contact EH&S for help in designing necessary shielding for your source.

Postings

STATE OF NEW YORK
NOTICE TO EMPLOYEES
STANDARDS FOR PROTECTION AGAINST RADIATION

YOUR EMPLOYER'S RESPONSIBILITY
 The transfer, receipt, possession or use of all sources of ionizing radiation in the State of New York is controlled by the appropriate rules, regulations and orders of either the New York State Department of Labor or Health or the New York City Department of Health. These agencies report under the regulation or handling of all significant radiation sources, and they require your employer to post an appropriate notice in each of the restricted areas of the applicable regulations, license and regulation and the operating procedures applying to the area in which you are engaged and to explain relevant provisions to you. The applicable regulation in this instance is Part 161 of the New York State Sanitary Code.

YOUR RESPONSIBILITY AS A WORKER
 You should be familiar with the provisions of the New York State Sanitary Code, license and regulation and the operating procedures which apply to the work in which you are engaged. You should observe these provisions for your own protection and the protection of your fellow workers.

WHAT IS COVERED BY THESE REGULATIONS

1. Limits on exposure to radiation and radioactive material in controlled and uncontrolled areas.
2. Measures to be taken after accidental exposure.
3. Personnel monitoring, surveying and equipment.
4. Caution signs, marks and safety interlock equipment.
5. Exposure records and reports, and
6. Related matters.

REPORTS ON YOUR EXPOSURE TO RADIATION
 If you work where personal monitoring equipment is required, the New York State Department of Health requires your employer to provide you, upon request, a written report of your exposure to radiation both annually and at the time that you terminate employment. The New York State Department of Health also requires your employer to give you a written report of the nature and exposure in excess of the limits set for occupational exposure.

INSPECTIONS
 All activities licensed or regulated with the regulatory agencies in the State of New York are subject to inspection by representatives from these agencies.

INQUIRIES
 Inquiries dealing with matters outlined above can be directed to:

Bureau of Environmental Radiation Protection
 New York State Department of Health
 547 River Street, Room 330
 Troy, NY 12180-2218
 (518) 402-7370

POSTING REQUIREMENT
 Copies of this notice must be posted where employees working in or frequenting any portion of restricted areas can observe it, as well as on the way to or from their places of employment. Copies of Part 161 and other applicable documents, if not posted, are available for review at the following location:

University at Buffalo
 Environment, Health & Safety Services
 Radiation Safety Division
 15 Parkton Hall
 (716) 629-3281

SDS-2401 (8/98)
PHS-1 (1/88)

Contact Environment, Health and Safety at **829-3281** for assistance.
 After normal working hours, call University Police at **645-2222**.

Safety and Emergency Procedures for Radioactive Materials Laboratories

General Precautions

- Use of radioactive material is allowed in approved and posted areas by authorized individuals only.
- Label all containers of radioactive material & contaminated items.
- Wear prescribed personal protective equipment (PPE).
- Do not handle clean items with gloved hands.
- Do not store food with radioactive materials. Do not eat, drink, or apply cosmetics in radioactive materials areas.
- Perform a contamination survey after each use of radioactive material using portable survey meter and wipes.
- Wear issued dosimeters.
- Maintain exposure as low as reasonably achievable (ALARA).

Spills

- Stop the spill. Turn the container up right and/or apply absorbent material to minimize spread of contamination.
- Warn others. Notify all other persons in the room to avoid the spill.
- Isolate the spill. Prevent others from entering the area.
- Minimize exposure. For small spills initiate decontamination. Otherwise obtain assistance from EH&S. Begin at the periphery and work towards the center. Place contaminated items in the proper waste containers.
- Survey the area. Perform and document the decontamination.

Personnel Contamination

- Notify all other persons in the area and ask for assistance.
- If contamination is found on skin or personal clothing or internal exposure (inhalation/ingestion) is suspected, immediately notify EH&S.
- Remove contaminated clothing.
- Wash contaminated skin or hair with mild soap and water. Do not irritate the skin.
- Do not leave the area until found free of contamination.

Loss of Radioactive Material or Release to Environment

- Notify EH&S immediately if radioactive material is missing or inadvertently released to the sewer, non-radioactive trash or air.



The “Notice to Employees” sign includes the safety and emergency information and is posted in a conspicuous location inside each lab. Only the radioactive materials posting with emergency contact information will be posted on each lab door. The “Safety and Emergency Procedures” sign provides general written information concerning requirements for maintaining a radioactive material permit and gives the steps to be taken to minimize the spread of contamination during an incident. And the “Notice to Employees” sign is required by the DOH to be displayed “wherever individuals work in or frequent any portion of a restricted area” [Part 161(b)(3)].

Safe Use of Sealed Sources

University at Buffalo
Environment, Health & Safety Services
RADIOACTIVE MATERIALS EXPERIMENTAL PROCEDURES APPLICATION
IN VITRO PROTOCOL

Part 1 Instructions: Complete this form for each new or amended radioactive materials experimental procedure authorization (in vitro protocols only). For in vivo protocols, use Form (RMA-2). Submit this form with an electronic (Microsoft Word preferred) copy of the protocol to EH&S for approval. **Print clearly!**

Name: _____ **PI Number (and required for initial applications)**

Descriptive Title of the Protocol: _____

Building and Room(s) Where Experiment is to be Performed: _____ **Room(s):**

The experiment requires: Biosafety Cabinet Glovebox
 Fume Hood Solid - Powder
 Hot Cell Liquid

Part 2 Instructions: Attach a complete protocol description. Include and check off the following requirements:

List all steps needed to understand the **safety aspects** of the experiment.
 Include the amount of radioactive material used at each step.
 Include equipment and materials that will be used as part of the radioactive procedures.
 Describe potential hazards and radiation safety procedures (survey, PPE, shielding, and detector requirements, etc.) to be used to mitigate the hazards.
 Show calculations to justify the amount of radioactive material requested. Adjust the total amount requested in the lab at any one time to allow ordering of additional material while current material is still in use.
 State the types of waste generated (e.g. aqueous, mixed with hazardous chemical, etc.) and the estimated volumes. Indicate the **waste minimization techniques** to be employed.

Part 3 Instructions: List amount of radioactivity involved and waste generated based on the protocol description.

Maximum activity used per each experiment (mCi): Decay Source (half life less than 90 days)
 Liquid Formulation In Vitro
 Hazardous Chemicals (i.e., toxic, carcinogenic) Mixed with Radioactive Materials
 Contaminated Sharps (i.e., Razor Blades, Pasteur Pipettes, Syringes, etc.) Infectious or Potentially Infectious
 Human Blood
 Tissue or Animal Carcasses

Part 4 Instructions: Sign and fax this completed form to 829-2023 with all required attachments. Name, e-mail address, and phone number of person completing form of either these fill:

PI Signature: _____ Date: _____

EH&S Approval by: _____ Date: _____
 RSC Approval Date: _____ () N/A. Date Change of Status Issued: _____

(RMA-42) (01/05/09)

Experimental Protocols:

- Required by License and RSC
- Must Have Specific Details
- Describe **all** Safety Requirements
- Important Worker Training Tool

Anyone working with radioactive materials must be familiar with the approved safety protocol for the source being used. Use a “Radioactive Materials Experimental Procedures Application” (RMA-42) form to document all of the safety related requirements for the sealed source. The PI should provide these procedures, in written form, to each person involved in the experiment. If you have any questions about proper operating procedures for working with radioactive material, please refer to the UB “Radioactive Materials Safety Manual” that is available in each laboratory or call EH&S at 829-3281.

EH&S Sealed Source Rules

1. All sources must be secured from unauthorized removal
2. Do not touch electroplated sources
3. Sealed Sources shall not be opened under any circumstances
4. Exhaust from gas chromatograph shall be directed into a hood
5. Sources must be leaked tested at designated intervals by EH&S
6. Wear dosimeters, if issued



The UB "Radioactive Materials Safety Manual" lists the following safety requirements for working with sealed sources:

1. All sources must be secured from unauthorized removal. Storage containers must be properly labeled. If a sealed source is missing, notify EH&S promptly at 829-3281. Under some circumstances, UB must notify the DOH when a radioactive source cannot be located. EH&S will make the determination whether notification is necessary and will assist in efforts to locate the source.
2. Do not touch electroplated sources, as this may result in the removal of the active material. Do not use handling tools in such a way as to penetrate the surface of the source. Storage containers should not have material that abrades the surface of the electroplated sources.
3. Sealed sources shall not be opened under any circumstances. Only authorized individuals shall perform the repair and cleaning of sources.
4. The exhaust from gas chromatographs shall be directed into a fume hood whenever detectors are in use. Detectors shall be stored in a well-ventilated and secure location whenever they are not mounted in the chromatograph unit.
5. Sealed and electroplated sources must be leak tested at designated intervals by EH&S. Generally, alpha sources need leak testing every three months while beta sources require leak testing every six months.
6. Sealed source users who are working with sources of higher energies are given dosimeters to monitor any dose the user might receive to insure that ALARA is being practiced. Wear whole body dosimeter on the outside of protective clothing at collar level and ring badges under protective gloves.

Sealed Source Leak Testing

Leak Test:

- Every 6 Months for **Beta** Sources > 100 μCi
- Every 3 Months for **Alpha** Sources > 10 μCi
- Performed and Documented by EH&S



A Leak Test is a survey for removable contamination performed in accordance with the instructions provided with the source or by using safe handling practices. Leak tests are accomplished by wiping a piece of filter paper ("wipe smear") across a source or source housing. Radioactive contamination leaking from the source can then be measured by analyzing the filter paper using an appropriate detection system. Leak test and inventory requirements are stipulated in the DOH License 1049. EH&S follows all required schedules and limits, and performs the leak tests and analysis of wipes.

The following limits are used for leak tests at UB:

- No action is taken if a leak test on a source reveals removable contamination below 0.001 μCi per wipe.
- If source wipes reveal contamination above 0.001 μCi per wipe, but below 0.005 μCi per wipe, EH&S recommends the source be removed from use.
- If the leak test reveals contamination above 0.005 μCi per wipe, the source is required to be removed from use and either repaired or disposed of appropriately. This level of contamination requires notification of state regulatory agencies.

Sealed Source Inventory

Inventory:

- Conducted Quarterly
- Performed and Documented by EH&S



Inventory is a verification of the presence and proper storage of the sources listed in the EH&S sealed source database. Sealed sources are inventoried every three months. **If a source is found to be missing, EH&S must be notified as soon as possible.** Leak test and inventory documentation are maintained by EH&S. The PI also receives a copy of the current leak test certificate. For more information pertaining to leak testing or inventory, please contact EH&S.

Irradiators

Security Plan:

- Authorized Access Only
- Contact EH&S for Escorted Access



The US Nuclear Regulatory Agency (NRC) requires restrictions on certain quantities and types of radioactive materials. These regulations apply to the irradiators owned by UB. UB has implemented enhanced security, including background investigations for unescorted access. The specific actions taken to meet the requirements are protected from unauthorized disclosure. EH&S will continue to require the cooperation of all radioactive materials users to minimize the risk of malevolent use of radioactive materials.

Access to UB's irradiators is restricted to authorized individuals only. Arrangements for escorted access can be made by contacting EH&S Radiation Safety Division at (716) 829-3281.

Emergency Procedures



Contact EH&S:

- Radioactive Contamination of a Lab
- Loss of a Radioactive Source
- Overexposure of a Person to Radiation

If a situation representing a life-threatening emergency occurs in the lab, personnel should call University Police at 645-2222 from a safe telephone. If the situation is not a life-threatening emergency, EH&S should be contacted at 829-3281.

EH&S should be notified of any emergency involving radioactive materials, including but not limited to: radioactive contamination of a laboratory, loss of a radioactive source, or overexposure of a person to radiation. After normal business hours, EH&S personnel can be reached by calling the UB Police Department at 645-2222.

Sealed Source Disposal



**Contact EH&S
to discuss
disposal
options**



Radioactive material can not be disposed through the regular waste stream. All radioactive material must be disposed in accordance with State and Federal regulation. If your lab does not want to hold on to a radioactive sealed source, it must be disposed through the appropriate channels. Most sealed sources contain nuclides with a very long half-life. This makes disposal of a source a bit more complicated. Please contact EH&S Radiation Safety if you are planning on disposing of a sealed source.

Conclusion

Thanks for Participating:

- Please Fill Out a Required Reading Form.
- Submit the form to EH&S
- Visit our Website at www.ehs.buffalo.edu



Thanks for reviewing this Sealed Source Refresher Training information. Remember the EH&S website (www.ehs.buffalo.edu) has links to guidance documents and forms that can be downloaded.

Work Cited:

Thanks to the University of Colorado
(<http://www.colorado.edu/EHandS/hpl/training/sspkt.html>).