

Radiation Safety Refresher Training for 2010

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Environmental Health & Safety



Training Topics

- A final report on NJ 's Agreement State status
- A review of the one contamination incident reported this year
- The results of findings from lab audits throughout the year
- The outcome of the EHS project to determine solubility for liquid radioactive wastes
- A change in the vendor that provides radiation monitoring badge services
- A review of two UV Exposures
- A review of incident and emergency response
- How and why to inactivate radioisotope authorizations

NJ's Agreement State Status

Effective Sept. 30, 2009, New Jersey became an **Agreement State** and was granted regulatory oversight and licensing authority for all radioactive materials (except reactors) by the Nuclear Regulatory Commission. The NJ Department of Environmental Protection will manage this authority.



STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
RADIATION PROTECTION AND RELEASE PREVENTION PROGRAMS



NOTICE TO EMPLOYEES STANDARDS FOR PROTECTION AGAINST RADIATION

Standards for protection against radiation; Notices, Instructions and Reports to workers; Inspections; Employee Protection

<p>Your Employer's Responsibility 1. Any company that conducts activities regulated by the Department of Environmental Protection (DEP) must comply with the DEP's requirements. If a company violates DEP requirements, it may be penalized or have its license revoked. 2. Your employer must post or otherwise make available to you copies of the New Jersey Administrative Code, Title 7, Chapter 28 (NJAC 7:28), licenses, registrations and operating procedures which apply to work you are engaged in, and explain their provisions to you.</p>	<p>You are Protected From Discrimination (NJSA 17:28.1) Under the "Conscientious Employee Act" an employer cannot discharge, suspend or demote an employee who discloses an activity or practice which he believes to be unlawful.</p>	<p>Reports on Your Radiation Exposure History 1. NJAC 7:28 requires that your employer provide you with a written report if you receive an exposure in excess of any applicable limit as set forth in the regulations or in the license. The basic limits for exposure to employees are set forth in NJAC 7:28-6. This section specifies limits of exposure to radiation and exposure to concentrations of radioactive material in air and water. 2. If you work where personnel monitoring is required, and if you request information on your radiation exposures: (a) Your employer shall advise you annually of your exposure of radiation, and, (b) Your employer shall give you a written report, upon termination of your employment, of your radiation exposures, and any bioassays.</p>	<p>Posting Requirement (Copies of this notice must be posted where employees working in or frequenting any portion of controlled areas can observe a copy on the way to or from their place of employment.) Inquiries Inquiries dealing with the matters outlined above are to be made to the Radiation Protection & Release Prevention Program, New Jersey State Department of Environmental Protection, PO Box 415, Trenton, New Jersey 08625-0415 Radioactive Material: Phone: (609) 984-5462 Fax: (609) 633-2210 Radiological Health (X-ray) Phone: (609) 984-5634 Fax: (609) 984-5811</p>
<p>What is Covered By The New Jersey Administrative Code, Title 7, Chapter 28 (NJAC 7:28-1 et seq.) 1. Limits on exposure to radiation and radioactive material in controlled areas. 2. Measures to be taken after accidental exposure; 3. Personnel monitoring, survey and equipment; 4. Caution signs, labels, and safety interlock equipment; 5. Related matters.</p>	<p>How Do You Report a Violation? You should report violations immediately to your supervisor. If you believe that adequate corrective action is not being taken, you may report this to a DEP inspector or the DEP office listed under "Inquiries."</p>	<p>Inspections: All persons shall afford the Department an opportunity to inspect any source of radiation and the operation associated with the source of radiation as well as the facilities and premises where the source of radiation is being used or stored (NJAC 7:28-2).</p>	<p>Call to report incidents involving radioactive materials: During Business Hours: (609) 984-5462 After Hours: 1-877-WARNDEP 1-877-927-6337</p>

RPP-14 Revision 12/09

Researchers should notice almost no change except that NJ Notice to Employees posters will replace the NRC Notice to Employees posters located near your lab or throughout your building.

Agreement State Notes

- If the Nuclear Regulatory Commission adopts new regulations, an Agreement State is required to adopt an equivalent version of the NRC's regulations, in most cases. EHS will still need to monitor NRC regulatory activity.
- The NRC will be monitoring NJ's performance as an Agreement State to make sure that NJ conducts inspections and acts on licensing requests in a timely way and responds to incidents appropriately. If necessary, the NRC can revoke Agreement State status.

A Minor Contamination Incident



- A hybridization tube containing P-32 in a hybridization oven leaked because a new grad student forgot to place an O-ring in the tube.
- Since hybridization tubes are known to occasionally leak, there are a variety of techniques to prevent leakage or to contain the contamination. Even when tubes do contain O-rings, over time the O-rings will age and be less effective at preventing leakage.
- The grad student immediately recruited more experienced lab members to assist her with the survey and clean-up.
- As required, the PI notified EHS since some fixed contamination remained on the floor. EHS did its own survey and found that the only remaining contamination was limited to small areas on the front of the oven, the floor immediately in front of the oven, and the survey meter.

Contamination Incident (cont'd)

- We understand that occasional contamination incidents are likely to happen. The important thing is that lab members promptly follow up by taking the appropriate actions as soon as the contamination is discovered.
- This lab's follow-up actions were comprehensive and thorough. No personnel contamination occurred, and the clean-up was effective.
- As lab members cleaned, they ensured that they did not spread contamination beyond the area already contaminated.
- The PI appropriately notified EHS the next day because fixed floor contamination was present.



Annual Audits by the Radiation Safety Committee

- Each year the Committee conducts an intensive audit of operations in some of its radioisotope labs.
- This helps the University to identify problems and to prepare for regulatory inspections.
- This year we found problems related to security, the use of unauthorized rooms for radioisotope work, labeling of equipment, and waste labeling and recordkeeping.

The Audit - Security

Freezers containing radioactive stock vials that researchers forget to lock



- Stock vials must be secured when not immediately in use. Unsecured stock vials are a surefire path to regulatory citations during inspections.
- If EHS finds repeated violations of security policy, we will require that you find alternate methods of securing your radioactive materials.

The Audit - Unauthorized Locations of Radioisotope Use

Case 1: A lab with several rooms used for rad work requested that one of those rooms be removed from the list of authorized rad work locations. EHS performed a closeout survey of the lab and removed all rad labeling. But several months later, the lab began rad work again in that room without notifying EHS. This situation was discovered during the audit of the lab.

☞ Radioactive materials can only be used and stored in locations listed in the PI's radioisotope authorization. This ensures that EHS knows where it must perform its monthly contamination surveys and ensures that rooms are properly labeled.

The Audit – Unauthorized Locations of Radioisotope Use

Case 2: Stock vials were found to be stored in a large freezer in the main room of a lab, although the main room was not authorized as a Radioisotope Use Area (only a small room off of the main lab was authorized for radioisotope work).

- Radioactive materials can only be stored and used in locations listed in the PI's radioisotope authorization.
- Any room in which radioactive materials are stored or used must be labeled with Caution Radioactive Materials signs.

The Audit - Inappropriate Labeling of Work Areas & Equipment



Previous rad work took place in a biosafety cabinet and an incubator, but the rad work had ended. At the time of the audit, both the cabinet and incubator and pipettors within the cabinet were still labeled with *Radioactive* labeling, although the cabinet and pipettors were currently only being used for non-radioisotope work.

A lab member explained that lab personnel knew that C-14 work was no longer being performed and that the area had been surveyed by the C-14 user, with no contamination found. (Continued on next slide)

The Audit - Inappropriate Labeling of Work Areas & Equipment



- The problem was that people were working in the cabinet and using labeled equipment without taking any precautions. The presence of *Radioactive* labeling should always be construed to mean that radioactive material or contamination may be present and that appropriate precautions must be taken.
- Remove *Radioactive* labeling when you are done working with radioactive materials and after you have thoroughly surveyed to confirm that there is no remaining contamination.

The Audit - Waste Shielding

During the audit in one lab, part of a P-32 radioisotope procedure was observed. The radiation level reaching the front of the hood from the sides of the working shield was quite high, mainly due to pipette tips ejected into an unshielded plastic beaker further back behind the shield.

- Use shielded waste containers to collect waste during P-32 procedures, especially when working with 100 μCi or more.



The Audit - Insufficient Waste Labeling

The audit found several labs with containers of liquid waste that were labeled with *Radioactive* tape but did not contain any other labeling to indicate chemical composition.

👉 Under EPA regulations, all liquid wastes, no matter whether the waste is radioactive or not, must be labeled to indicate its chemical constituents. Chemicals cannot be listed as chemical formulae but must be described in plain English terms.

If the solution has a well-known name, such as Church's Buffer, you may use that name. Otherwise, you must list the primary chemicals present. Contact Steve Elwood if you need additional guidance.

Liquid Waste Solubility



- By regulation, radioactive liquids disposed of to the sewer must be “readily soluble ... in water.”
- EHS has developed a list of compounds acceptable for sewer release. This list of compounds will be posted near each Radioisotope Disposal Sink, and the list is also posted at http://web.princeton.edu/sites/ehs/radiation/ramwaste_files/solubleramwastes.htm
- If you wish to drain dispose of a compound that does not appear on the approved list, contact Sue or Steve for an evaluation of the compound. Do not dispose of the compound until you have received written approval from EHS.

Radiation Monitoring Badges – Vendor Change

The University will be switching from Landauer, Inc. to Mirion Dosimetry, effective April 1, 2010.



The new body and ring badges will be TLD badges with a minimum reported dose of 10 mrem for the body badge and 20 mrem for the ring badge.

Badge Vendor Change (cont'd)

The most significant impacts of the vendor change are:

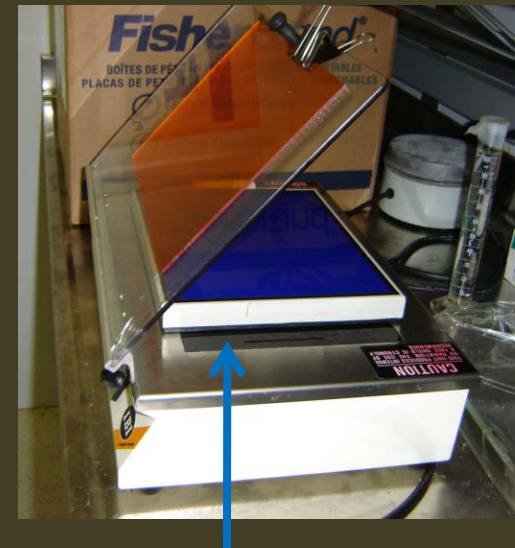
- **Dose Report Notification.** After your badges are processed, Mirion will send you an email directly to let you know that your dose results are available online.
- **Charges for Missing Badges.** We will be charged for lost or missing badges (badges missing more than 180 days after their expected return date). EHS will pass those charges back to the labs.
- **Quarterly Billing.** Labs will be charged on a quarterly basis, rather than annually. Under the new contract, badging will be about \$1 less per year per person, so don't expect any significant changes in costs.

UV Burn Incidents – Case I

A grad student developed burns to arms resulting from exposure of 10 minutes or less to UV emitted by a transilluminator.



- Most, but not all, of the surface of the transilluminator was covered with a blue converter plate, used to convert shorter UV wavelengths to longer, less-damaging wavelengths.
- There was a 2” section open on each side of the converter plate, which allowed full exposure of the researcher’s forearms to the UV emitted by the transilluminator.



See exposed surface of the transilluminator on each side of the blue converter plate.

UV Burn Incidents – Case I

The incident was reported to EHS, and EHS used a UV radiometer to measure the UV intensity at the position where the researcher's arms had rested.

- The measured intensity was $200 \mu\text{W}/\text{cm}^2$.
- Although there are no regulations which specify permissible UV exposure times, there are recommended guidelines.
- At $200 \mu\text{W}/\text{cm}^2$, the recommended maximum permissible daily exposure is **20** seconds!
- When working with transilluminators, keep in mind that the emitted UV is very intense and can cause burns to skin and eyes in very short periods of time.



After the incident, a piece of cardboard was carefully cut to shield the box. No UV is detectable with the shield in place.

UV Burn Incidents – Case 2









- A researcher viewed gels with a transilluminator for a 10 minute period. Lab protocol required the use of a face shield but the face shield was dirty, so the researcher wore goggles only.
- Discomfort began 2-3 hours after the exposure. The researcher reported to McCosh Health Center the following day. The researcher received 1st and 2nd degree burns to the neck and exposed skin of the face.
- ☞ Always use a face shield when working with an unshielded transilluminator.
- ☞ Clean face shields after use and replace face shields when they become scratched or unusable.

Note: EHS currently has a small supply of faceshields available and will donate a faceshield to any lab upon request, while our supply lasts.

Review of Incident Procedures

Princeton University
Environmental Health & Safety

**EMERGENCY RESPONSE GUIDELINES
FOR LABORATORY WORKERS**


Departmental Safety Information

Department Safety Manager

Chemical Hygiene Officer

Evacuation Assembly Area
If the evacuation alarm sounds, proceed to the following area and
remain there until you are accounted for:

Emergency Phone Numbers

 Public Safety: 911
Environmental Health & Safety: 8-6284

Incidents include:

- Spill of radioactive materials
- Widespread or unusual contamination
- Any case of contamination on skin or non-labcoat clothing
- Missing radioactive materials
- Exposure to an x-ray machine

Radiation Incident Notification

Radiation Incident



A radiation incident includes a spill of radioactive material, the discovery of widespread contamination, contamination of skin or clothing or possible overexposure to an X-ray source.



Notification

- During normal working hours call EHS at 8-5294
- Outside normal working hours call Public Safety at 8-3134. Public Safety will contact EHS personnel.
- For an emergency involving fire, explosion or serious injury, call 911.

You **must** notify EHS immediately in the event of body or skin contamination, widespread contamination, or any spill that you cannot readily manage.

- Call EHS at 8-5294 during work hours
- Call Public Safety (PS) at 8-1000 after work hours. If you dial 8-3134 (the old PS number), your call will be still be routed to 8-1000. PS has home and cellphone numbers for EHS responders.

Dialing 9-1-1 in an Emergency

An emergency is any situation involving fire, explosion, serious injury or any other situation for which you need immediate emergency response.

In an emergency on campus:

- If you're using a campus phone, dial 9-1-1.
- If you're using a cell phone, dial 258-3333.
- Do **NOT** dial 9-1-1 from your cell phone.



Calling 9-1-1 from a campus phone or dialing 258-3333 from a cell phone will route your call to Public Safety's emergency number. But if you call 9-1-1 from your cell phone, your call will be routed to a regional answering center to people who are not familiar with campus, so emergency response is likely to be delayed slightly.

Inactivating Radioisotope Authorizations

If you reasonably anticipate that you will not need to use radioactive materials for a year or more, consider applying to inactivate your authorization.

- While your authorization is inactivated, there is no requirement for quarterly inventory reviews, monthly sewer reports, refresher training, initial training, instrument calibrations, and no other routine radiation-related emails from EHS.
- If you currently have an inventory of radioactive materials, EHS will hold your inventory in a secure location.
- To reactivate authorizations:
 - Simply notify EHS to reactivate the authorizations.
 - EHS will present a special refresher training session for your lab.





Inactivating Radioisotope Authorizations

We are encouraging the inactivation of authorizations for those labs with no short-term anticipated radioisotope use plans because:

- The use of radioactive materials has declined substantially on campus.
- We recognize that radioisotope use is no longer a significant tool in many labs, and we want to minimize the impact of maintaining radioisotope authorizations in those labs.

If you develop a sudden need to use radioactive materials, we expect that we could have you ready to start work within 2-3 days.

Don't hesitate to call Sue Dupre (8-6252) or Steve Elwood (8-6271) to discuss the implications and impacts of inactivating your radioisotope authorizations.



Radiation Safety Program Feedback

Your questions, comments, suggestions
and feedback are welcome.

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