RADIATION SAFETY REFRESHER TRAINING FOR AUGUSTA UNIVERSITY USERS OF RADIOACTIVE MATERIAL

Radiation Safety Office

Environmental Health and Safety Division
Course Content

• Radiation Safety
• Radiation Dose Limits and Dosimetry
• Postings for Laboratories Using Radioactive Materials
• Laboratory Surveys
• Other Topics
Radiation Safety
External Exposure / Irradiation

- External irradiation occurs when all or part of the body is exposed to penetrating radiation from an external source.
- During exposure, some of this radiation is absorbed by the body and some passes completely through.
- Following external exposure, an individual is not radioactive.
Protection from External Radiation

• Time – less time, less dose.

• Distance – more distance, less dose.

• Shielding – more shielding, less dose.

Radiation Safety Office
Internal Exposure

- Internal exposure is from radioactive materials that have been taken into the body.
- Radioactive material can enter the body through:
  - Injection
  - Inhalation
  - Ingestion
  - Absorption
- Once radioactive materials are in the body, they irradiate body tissues as long as they remain in the body.
There are two ways for radioactive materials to be removed from the body:

- Biological clearance
- Radiological decay

The term “committed dose” refers to the fact that the radioactive dose will continue as long as the radioactive material is in the body.

The amount of radioactivity in the body can be assessed by Bioassay.

Radiation Safety Office
How to Remove Gloves (1)

- Grasp outside edge near wrist
- Peel away from hand, turning glove inside-out
- Hold in opposite gloved hand

Radiation Safety Office
How to Remove Gloves (2)

- Slide ungloved finger under the wrist of the remaining glove
- Peel off from inside, creating a bag for both gloves
- Discard
Radiation Dose Limits and Dosimetry
Worker Dose Limits

• Regulatory limits:
  – Whole body: 5000 mrem per year
  – Extremity: 50000 mrem per year
  – Lens of eye: 15000 mrem per year
  – Fetus: 500 mrem/gestation period
“As Low As Reasonably Achievable”
Augusta University policy is to reduce individual doses to staff, patients, public as far below regulatory limits as practicable
This is a management commitment.

<table>
<thead>
<tr>
<th>Quarterly ALARA Action Levels</th>
<th>ALARA 1 (mrem)</th>
<th>ALARA 2 (mrem)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole Body</td>
<td>125</td>
<td>375</td>
</tr>
<tr>
<td>Extremity</td>
<td>1250</td>
<td>3750</td>
</tr>
<tr>
<td>Eye</td>
<td>375</td>
<td>1125</td>
</tr>
<tr>
<td>Action</td>
<td>Notification</td>
<td>Investigation</td>
</tr>
</tbody>
</table>
Personnel Dosimetry Requirements

- Used to measure occupational radiation dose to workers.
- Only required by some research personnel.

<table>
<thead>
<tr>
<th>Radioisotope Use</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low energy beta (e.g., $^3$H, $^{14}$C, $^{35}$S, $^{45}$Ca)</td>
<td>None</td>
</tr>
<tr>
<td>RIA kits ($^{125}$I)</td>
<td>None</td>
</tr>
<tr>
<td>High energy beta, all gamma $\geq$ 1 mCi (e.g., $^{32}$P, $^{125}$I, $^{131}$I)</td>
<td>Area Monitor</td>
</tr>
<tr>
<td>High energy beta, all gamma $\geq$ 5 mCi (e.g., $^{32}$P, $^{51}$Cr, $^{125}$I, $^{131}$I)</td>
<td>Individual whole body and ring dosimeters</td>
</tr>
</tbody>
</table>
Personnel Dosimetry

- Wear whole body dosimeter on front of body, between neck and waist.
- Wear finger dosimeter on dominant hand, facing source of radiation.
- Store in designated area.
- Badges exchanged monthly.
Personnel Dosimetry

- Dosimetry coordinator will receive monthly reports.
- You will receive an annual report.
- ALARA investigation if you exceed ALARA limits.
Pregnant Radiation Workers

• May declare pregnancy (voluntary).
• For declared pregnant rad workers:
  – Dose history review.
  – 500 mrem limit (to protect fetus).
  – Fetal monitoring badge.
  – Possible work limitations.
  – Monthly review by the Radiation Safety Office.
Postings for Laboratories Using Radioactive Materials

Radiation Safety Office
Postings

Laboratory Posting

- Used to inform workers of the radiological conditions and dangers present in the laboratory
Four-Part Information Poster

- Provides Augusta University-specific information on:
  - Receipt of Radioactive Materials
  - Emergencies
  - Laboratory Radiation Safety Rules
GDNR Notice to Employees

NOTICE TO EMPLOYEES
STANDARDS FOR PROTECTION AGAINST RADIATION

YOUR EMPLOYER'S RESPONSIBILITY

Your Employer is required to:

1. Apply the Rules of this Chapter (391-3-17) and the conditions of the Employer's Radioactive Materials license to all work under the license.
2. Post or otherwise make available to you a copy of the Georgia Department of Natural Resources rules entitled, "Radioactive Materials," licenses, and operating procedures that apply to work you are engaged in, and explain the provisions to you.
3. Post any Notices of Violation and Orders involving radiological working conditions.

YOUR RESPONSIBILITY AS A WORKER

You should familiarize yourself with those provisions of the Georgia Department of Natural Resources rules entitled, "Radioactive Materials," and the operating procedures that apply to the work you are engaged in. You should observe these provisions for your own protection and the protection of your co-workers.

WHAT IS COVERED BY THESE REGULATIONS?

1. Limits on exposure to radiation and radioactive materials in controlled and uncontrolled areas;
2. Measures to be taken after accidental exposure;
3. Personnel monitoring, surveys, and equipment;
4. Caution signs, labels, and safety interlock equipment;
5. Exposure records and reports;
6. Options for workers regarding inspections; and
7. Related matters.

INQUIRIES

Inquiries dealing with these matters can be sent to:
Georgia Department of Natural Resources
Radioactive Materials Program
4225 International Parkway, Suite 100
Atlanta, Georgia 30338
(404) 662-3775

POSTING REQUIREMENT

Copies of this notice must be posted in a sufficient number of places in every establishment where employees are employed in activities licensed pursuant to Georgia Department of Natural Resources Rule 391-3-17-.02. This posting permits employees working in or frequenting any portion of a controlled area to observe a copy on the way to or from their place of employment.

LEGAL AUTHORITY: Official Code of Georgia Annotated (O.C.G.A.) § 31-13

Revised: November 6, 2006
GDNR Phone Numbers

**Georgia Department of Natural Resources**
4220 International Parkway, Suite 100, Atlanta, Georgia 30334
Environmental Protection Division
Carol A. Couch, PhD, Director
(404) 362-2675

**GEORGIA EMERGENCY RADIOLOGICAL ASSISTANCE TELEPHONE NUMBERS**

- To Report a Radiological Emergency or Request Emergency Radiological Assistance, Call the Following Number **During Business Hours:**
  Georgia Environmental Protection Division
  Radioactive Materials Program and Environmental Radiation Program
  (404) 362-2675

- For **24-Hour** Radiological Assistance, Call:
  Georgia Emergency Management Agency
  Emergency Operations Center
  (404) 656-4863

- Outside the Atlanta Toll-Free Calling Area (In Georgia Only), Call:
  Georgia Emergency Management Agency
  Emergency Operations Center
  1-800-241-4113
Laboratory Surveys
Portable Survey Instrument Calibration

- Required annually.
- Performed by Radiation Safety.
- Deliver to Radiation Safety Office.

<table>
<thead>
<tr>
<th>Scale Name</th>
<th>mR/hr</th>
<th>Corr. Factor</th>
<th>mR/hr</th>
<th>Corr. Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>x100</td>
<td>50</td>
<td>1.00</td>
<td>150</td>
<td>1.00</td>
</tr>
<tr>
<td>x10</td>
<td>5</td>
<td>1.00</td>
<td>15</td>
<td>1.00</td>
</tr>
<tr>
<td>x1</td>
<td>0.5</td>
<td>1.00</td>
<td>1.5</td>
<td>1.00</td>
</tr>
<tr>
<td>x.1</td>
<td>0.05</td>
<td>1.00</td>
<td>0.15</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Medical College of Georgia
Radiation Safety Office

Geometry: ± 1/
Cal. Date: 10/2/2012
Cal. Due: 10/2/2013
Calibrated by: R. Browne
Check Source: 2.5 mR/hr
Reading: 

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Surveys

• Recommended after each radioisotope use.
• Required weekly, with documentation in laboratory notebook.
Surveys

• Consist of portable survey instrument check, and swipe tests.
  – Geiger-Mueller (GM) survey instrument most commonly used for gamma-emitting and high-energy beta-emitting radionuclides.

• $^3$H most difficult to detect.
  – GM ineffective. Must rely on swipes and liquid scintillation counting.
Survey Action Levels

• GM - Any detected contamination should be cleaned up.
• Liquid Scintillation Counting: $\geq 200$ dpm/100 cm$^2$ – cleanup required.
• Widespread contamination – consult Radiation Safety.
Other Topics
X-Ray and Laser Systems

• Radiation Safety must be notified when any radiation producing device or system is purchased
  – Registration of the device with the State and shielding evaluations must be completed before using the device or system.

• Certain types of laser systems must also be registered with the State and safety of the laser system must be verified before using the laser system.

• Please call Radiation Safety regarding the training requirements for the users of radiation producing devices and laser systems.
Emergencies

• Lost or stolen radioactive material.
• Major radioactive spills.
• Contact Radiation Safety 706-721-9826 (706-664-8607 after hours), and Public Safety 706-721-2911
• In case of injury, medical treatment takes priority over contamination concerns.
Reporting Non-compliances

Report radiation and radioactive material non-compliances to the Radiation Safety Officer (706) 721-9826 or (706) 664-8607 after hours.
License Location

- The Augusta University Radioactive Material Licenses issued by the State of Georgia are maintained by the Radiation Safety Office.
- These documents are available for examination by Augusta University employees.
- Please call ahead (706-721-9826) to arrange a viewing of these documents.
Radiation Safety Office

• Additional information or assistance.
• CI Building.
  • [http://www.augusta.edu/services/ehs/radsafe/](http://www.augusta.edu/services/ehs/radsafe/)
• (706) 721-9826 normal business hours.
• (706) 664-8607 after hours.
Please complete and submit the Quiz