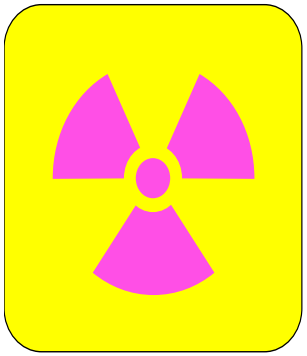
# RADIATION SAFETY REFRESHER TRAINING FOR AUGUSTA UNIVERSITY USERS OF RADIOACTIVE MATERIAL

Radiation Safety Office

*Environmental Health and Safety Division*

# Course Content

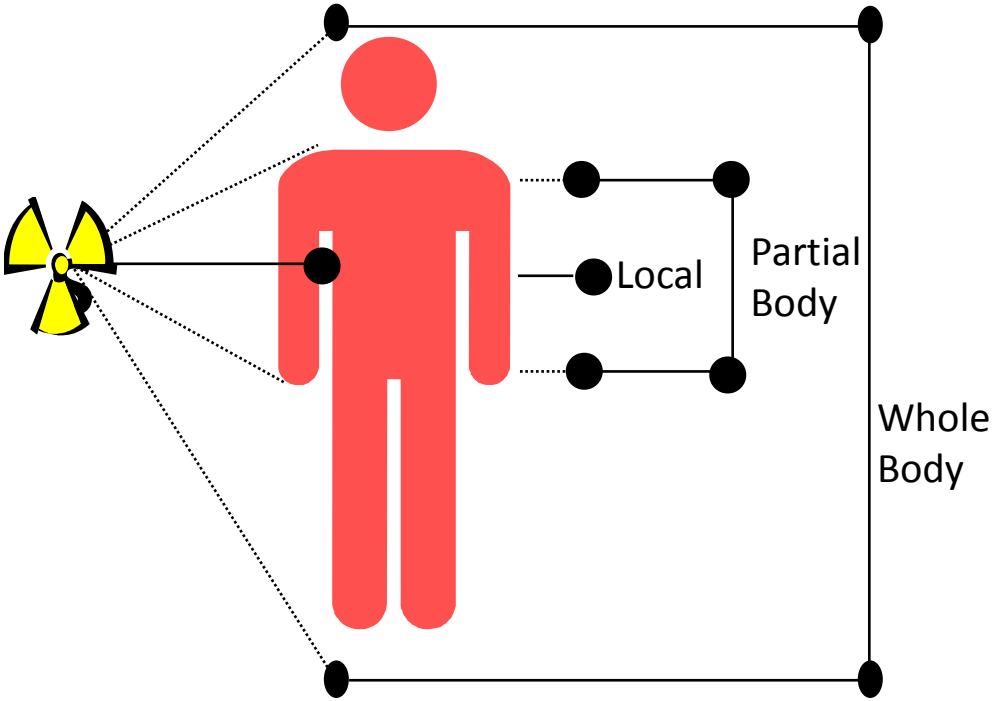
- Radiation Safety
- Radiation Dose Limits and Dosimetry
- Postings for Laboratories Using Radioactive Materials
- Laboratory Surveys
- Other Topics



# Radiation Safety

Radiation Safety Office

# 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.

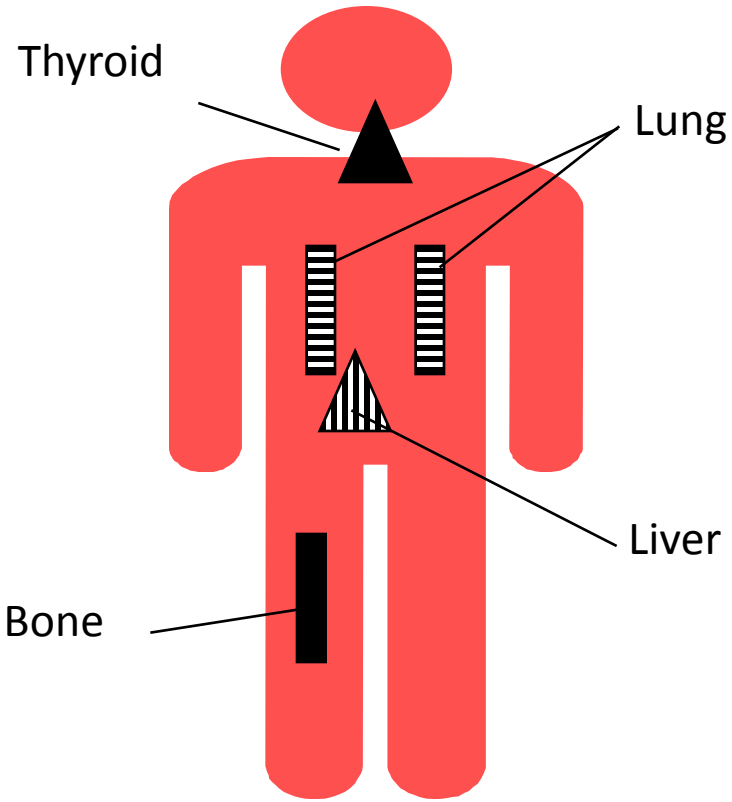
# Protection from External Radiation

- Time – less time, less dose.


- Distance – more distance, less dose.

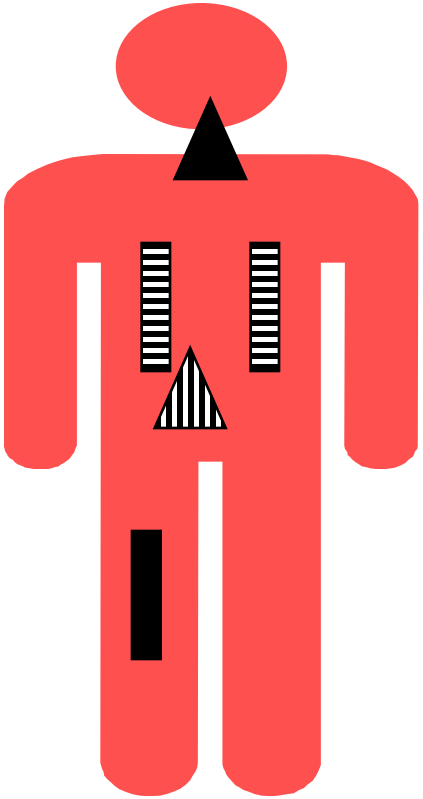
- Shielding – more shielding, less dose.

# 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

# Internal Exposure



- 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 Dose Limits and Dosimetry

Radiation Safety Office

# 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

# ALARA

- "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.

Quarterly ALARA Action Levels

| | ALARA 1 (mrem) | ALARA 2 (mrem) |
|---|---|---|
| Whole Body | 125 | 375 |
| Extremity | 1250 | 3750 |
| Eye | 375 | 1125 |
| Action | Notification | Investigation |

# Personnel Dosimetry Requirements

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

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

# 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.

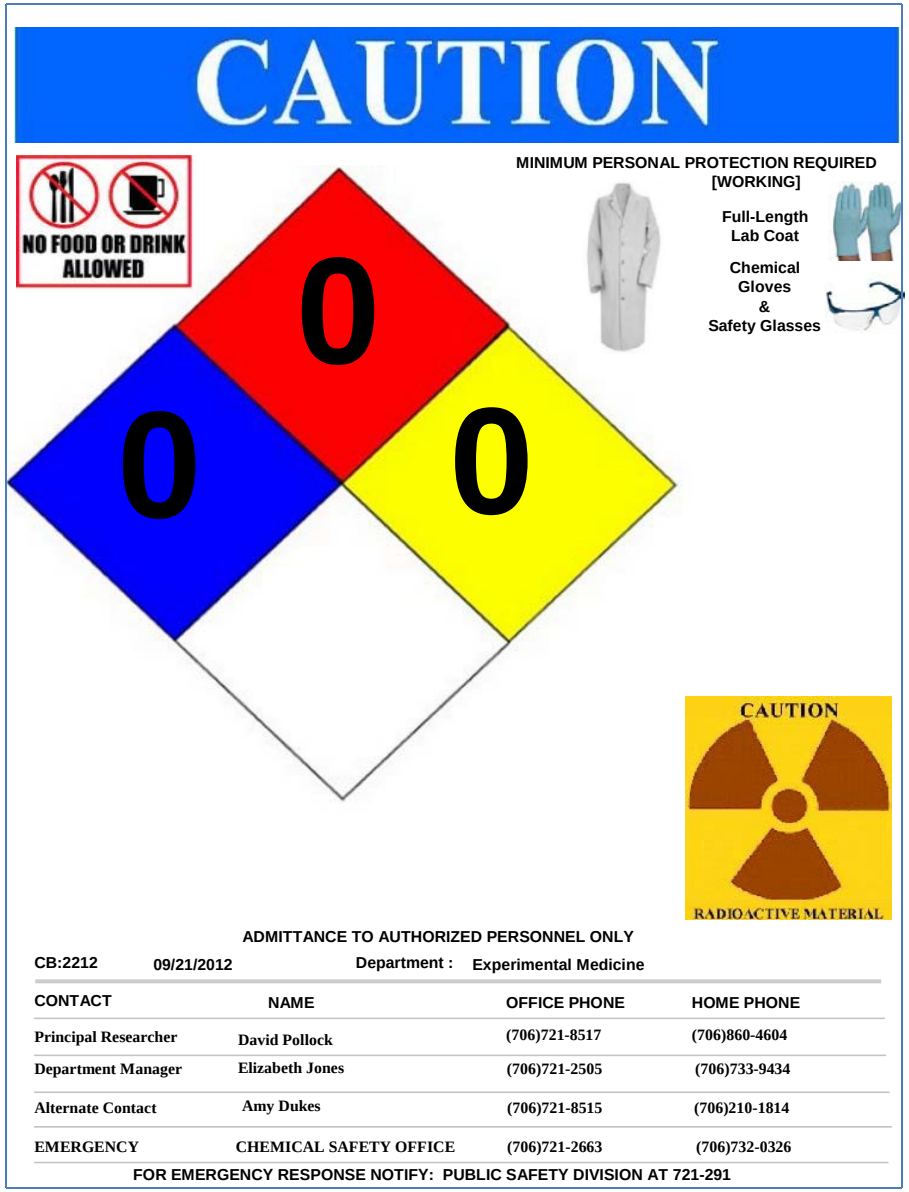
# Postings for Laboratories Using Radioactive Materials

Radiation Safety Office

# Postings

## Laboratory Posting

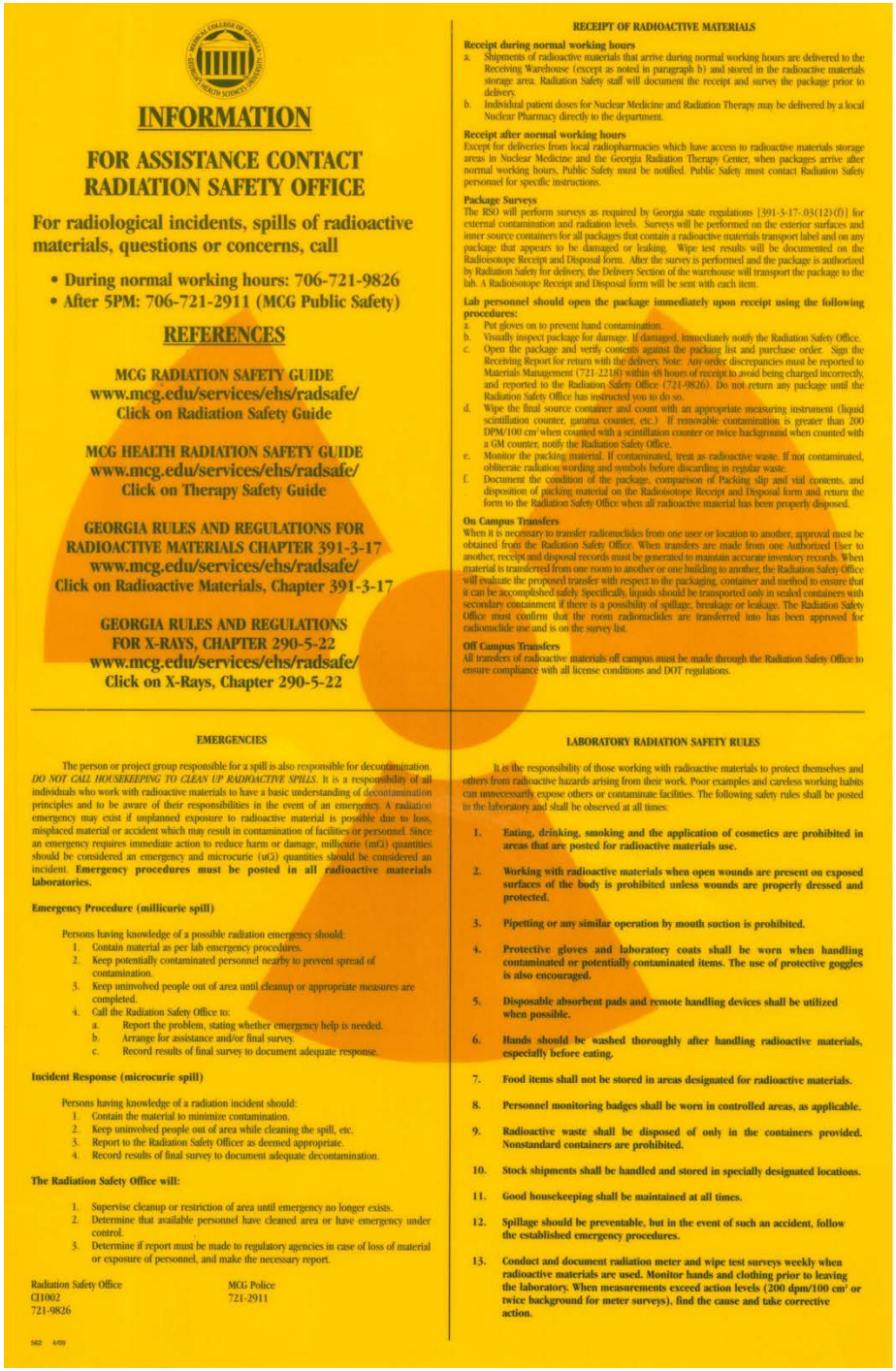
- Used to inform workers of the radiological conditions and dangers present in the laboratory



# Postings

## Four-Part Information Poster

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



**INFORMATION**

**FOR ASSISTANCE CONTACT RADIATION SAFETY OFFICE**

**For radiological incidents, spills of radioactive materials, questions or concerns, call**

- **During normal working hours: 706-721-9826**
- **After 5PM: 706-721-2911 (MCG Public Safety)**

**REFERENCES**

**MCG RADIATION SAFETY GUIDE**
**www.mcg.edu/services/ehs/radsafe/**
**Click on Radiation Safety Guide**

**MCG HEALTH RADIATION SAFETY GUIDE**
**www.mcg.edu/services/ehs/radsafe/**
**Click on Therapy Safety Guide**

**GEORGIA RULES AND REGULATIONS FOR RADIOACTIVE MATERIALS CHAPTER 391-3-17**
**www.mcg.edu/services/ehs/radsafe/**
**Click on Radioactive Materials, Chapter 391-3-17**

**GEORGIA RULES AND REGULATIONS FOR X-RAYS, CHAPTER 290-5-22**
**www.mcg.edu/services/ehs/radsafe/**
**Click on X-Rays, Chapter 290-5-22**

**RECEIPT OF RADIOACTIVE MATERIALS**

**Receipt during normal working hours**

a. Shipments of radioactive materials that arrive during normal working hours are delivered to the Receiving Warehouse (except as noted in paragraph b) and stored in the radioactive materials storage area. Radiation Safety staff will document the receipt and survey the package prior to delivery.
b. Individual patient doses for Nuclear Medicine and Radiation Therapy may be delivered by a local Nuclear Pharmacy directly to the department.

**Receipt after normal working hours**

Except for deliveries from local radiopharmacies which have access to radioactive materials storage areas in Nuclear Medicine and the Georgia Radiation Therapy Center, when packages arrive after normal working hours, Public Safety must be notified. Public Safety must contact Radiation Safety personnel for specific instructions.

**Package Surveys**

The RSO will perform surveys as required by Georgia state regulations [391-3-17-.03(12)(f)] for external contamination and radiation levels. Surveys will be performed on the exterior surfaces and inner source containers for all packages that contain a radioactive materials transport label and on any package that appears to be damaged or leaking. Wipe test results will be documented on the Radioisotope Receipt and Disposal form. After the survey is performed and the package is authorized by Radiation Safety for delivery, the Delivery Section of the warehouse will transport the package to the lab. A Radioisotope Receipt and Disposal form will be sent with each item.

**Lab personnel should open the package immediately upon receipt using the following procedures:**

a. Put gloves on to prevent hand contamination.
b. Visually inspect package for damage. If damaged, immediately notify the Radiation Safety Office.
c. Open the package and verify contents against the packing list and purchase order. Sign the Receiving Report for return with the delivery. Note: Any order discrepancies must be reported to Materials Management (721-2218) within 48 hours of receipt to avoid being charged incorrectly, and reported to the Radiation Safety Office (721-9826). Do not return any package until the Radiation Safety Office has instructed you to do so.
d. Wipe the final source container and count with an appropriate measuring instrument (liquid scintillation counter, gamma counter, etc.). If removable contamination is greater than 200 DPM/100 cm² when counted with a scintillation counter or twice background when counted with a GM counter, notify the Radiation Safety Office.
e. Monitor the packing material. If contaminated, treat as radioactive waste. If not contaminated, obliterate radiation wording and symbols before discarding in regular waste.
f. Document the condition of the package, comparison of Packing slip and vial contents, and disposition of packing material on the Radioisotope Receipt and Disposal form and return the form to the Radiation Safety Office when all radioactive material has been properly disposed.

**On Campus Transfers**

When it is necessary to transfer radionuclides from one user or location to another, approval must be obtained from the Radiation Safety Office. When transfers are made from one Authorized User to another, receipt and disposal records must be generated to maintain accurate inventory records. When material is transferred from one room to another or one building to another, the Radiation Safety Office will evaluate the proposed transfer with respect to the packaging, container and method to ensure that it can be accomplished safely. Specifically, liquids should be transported only in sealed containers with secondary containment if there is a possibility of spillage, breakage or leakage. The Radiation Safety Office must confirm that the room radionuclides are transferred into has been approved for radionuclide use and is on the survey list.

**Off Campus Transfers**

All transfers of radioactive materials off campus must be made through the Radiation Safety Office to ensure compliance with all license conditions and DOT regulations.

**EMERGENCIES**

The person or project group responsible for a spill is also responsible for decontamination. *DO NOT CALL HOUSEKEEPING TO CLEAN UP RADIOACTIVE SPILLS.* It is a responsibility of all individuals who work with radioactive materials to have a basic understanding of decontamination principles and to be aware of their responsibilities in the event of an emergency. A radiation emergency may exist if unplanned exposure to radioactive material is possible due to loss, misplaced material or accident which may result in contamination of facilities or personnel. Since an emergency requires immediate action to reduce harm or damage, millicurie (mCi) quantities should be considered an emergency and microcurie (uCi) quantities should be considered an incident. **Emergency procedures must be posted in all radioactive materials laboratories.**

**Emergency Procedure (millicurie spill)**

Persons having knowledge of a possible radiation emergency should:

1. Contain material as per lab emergency procedures.
2. Keep potentially contaminated personnel nearby to prevent spread of contamination.
3. Keep uninvolved people out of area until cleanup or appropriate measures are completed.
4. Call the Radiation Safety Office to:
   a. Report the problem, stating whether emergency help is needed.
   b. Arrange for assistance and/or final survey.
   c. Record results of final survey to document adequate response.

**Incident Response (microcurie spill)**

Persons having knowledge of a radiation incident should:

1. Contain the material to minimize contamination.
2. Keep uninvolved people out of area while cleaning the spill, etc.
3. Report to the Radiation Safety Officer as deemed appropriate.
4. Record results of final survey to document adequate decontamination.

**The Radiation Safety Office will:**

1. Supervise cleanup or restriction of area until emergency no longer exists.
2. Determine that available personnel have cleaned area or have emergency under control.
3. Determine if report must be made to regulatory agencies in case of loss of material or exposure of personnel, and make the necessary report.

Radiation Safety Office
CI1002
721-9826

MCG Police
721-2911

582 4/09

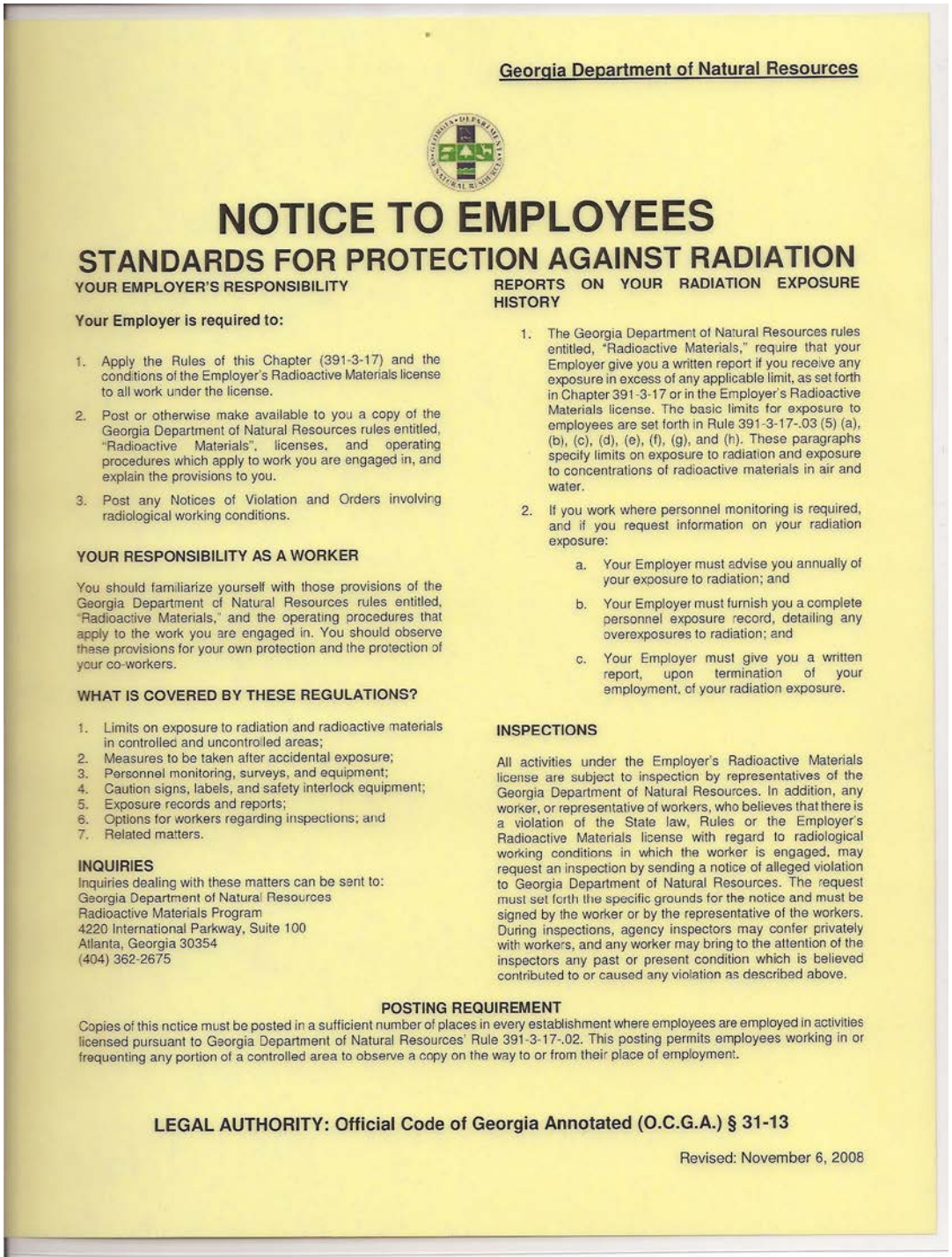
**LABORATORY RADIATION SAFETY RULES**

It is the responsibility of those working with radioactive materials to protect themselves and others from radioactive hazards arising from their work. Poor examples and careless working habits can unnecessarily expose others or contaminate facilities. The following safety rules shall be posted in the laboratory and shall be observed at all times:

1. **Eating, drinking, smoking and the application of cosmetics are prohibited in areas that are posted for radioactive materials use.**
2. **Working with radioactive materials when open wounds are present on exposed surfaces of the body is prohibited unless wounds are properly dressed and protected.**
3. **Pipetting or any similar operation by mouth suction is prohibited.**
4. **Protective gloves and laboratory coats shall be worn when handling contaminated or potentially contaminated items. The use of protective goggles is also encouraged.**
5. **Disposable absorbent pads and remote handling devices shall be utilized when possible.**
6. **Hands should be washed thoroughly after handling radioactive materials, especially before eating.**
7. **Food items shall not be stored in areas designated for radioactive materials.**
8. **Personnel monitoring badges shall be worn in controlled areas, as applicable.**
9. **Radioactive waste shall be disposed of only in the containers provided. Nonstandard containers are prohibited.**
10. **Stock shipments shall be handled and stored in specially designated locations.**
11. **Good housekeeping shall be maintained at all times.**
12. **Spillage should be preventable, but in the event of such an accident, follow the established emergency procedures.**
13. **Conduct and document radiation meter and wipe test surveys weekly when radioactive materials are used. Monitor hands and clothing prior to leaving the laboratory. When measurements exceed action levels (200 dpm/100 cm² or twice background for meter surveys), find the cause and take corrective action.**

# Postings

GDNR Notice to Employees



Georgia Department of Natural Resources

# 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 which 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
4220 International Parkway, Suite 100
Atlanta, Georgia 30354
(404) 362-2675

### REPORTS ON YOUR RADIATION EXPOSURE HISTORY

1. The Georgia Department of Natural Resources rules entitled, "Radioactive Materials," require that your Employer give you a written report if you receive any exposure in excess of any applicable limit, as set forth in Chapter 391-3-17 or in the Employer's Radioactive Materials license. The basic limits for exposure to employees are set forth in Rule 391-3-17-.03 (5) (a), (b), (c), (d), (e), (f), (g), and (h). These paragraphs specify limits on exposure to radiation and exposure to concentrations of radioactive materials in air and water.
2. If you work where personnel monitoring is required, and if you request information on your radiation exposure:
   a. Your Employer must advise you annually of your exposure to radiation; and
   b. Your Employer must furnish you a complete personnel exposure record, detailing any overexposures to radiation; and
   c. Your Employer must give you a written report, upon termination of your employment, of your radiation exposure.

### INSPECTIONS

All activities under the Employer's Radioactive Materials license are subject to inspection by representatives of the Georgia Department of Natural Resources. In addition, any worker, or representative of workers, who believes that there is a violation of the State law, Rules or the Employer's Radioactive Materials license with regard to radiological working conditions in which the worker is engaged, may request an inspection by sending a notice of alleged violation to Georgia Department of Natural Resources. The request must set forth the specific grounds for the notice and must be signed by the worker or by the representative of the workers. During inspections, agency inspectors may confer privately with workers, and any worker may bring to the attention of the inspectors any past or present condition which is believed contributed to or caused any violation as described above.

### POSTING REQUIREMENT

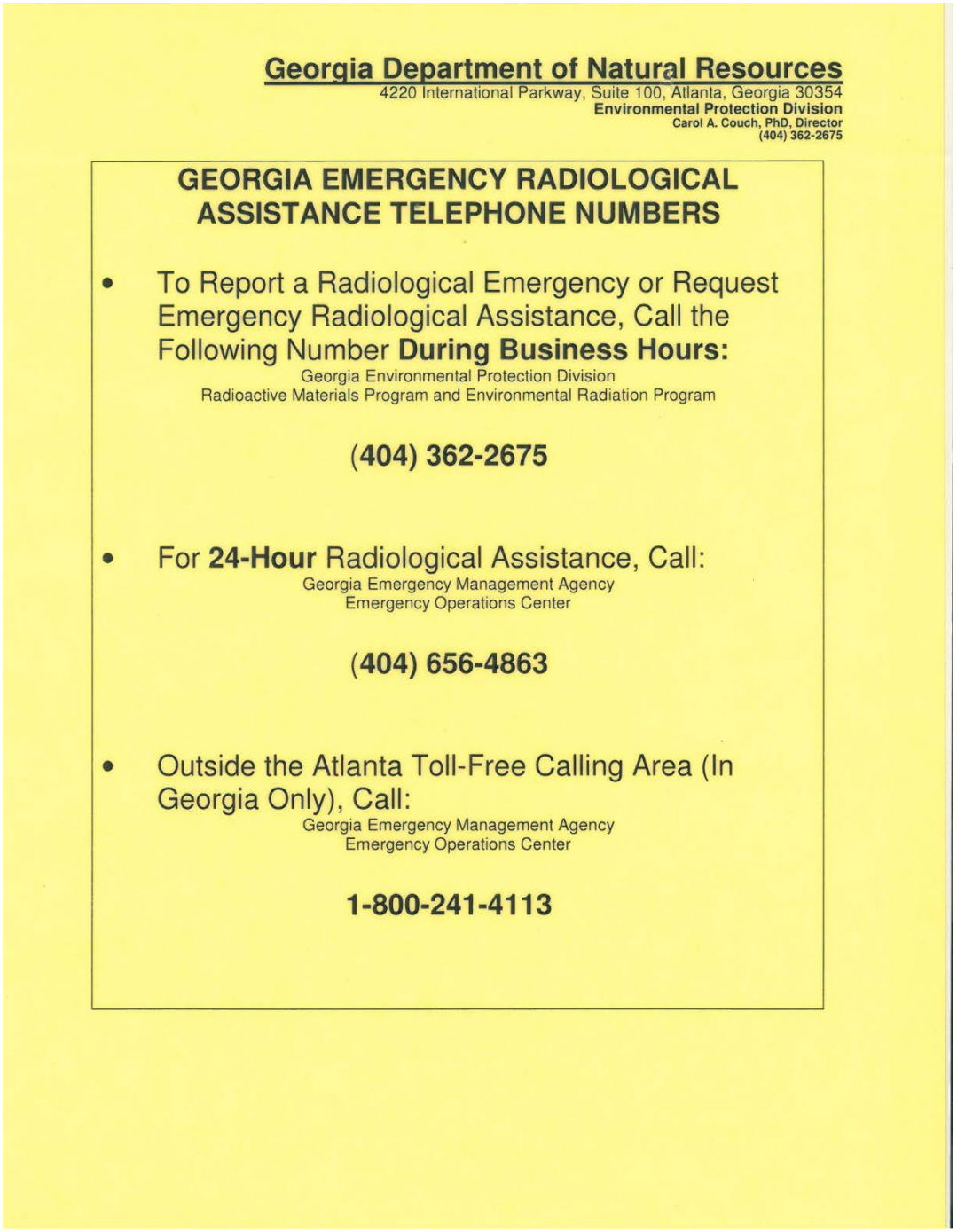
Copies of this notice must be posted in a sufficient number of places in every establishment where employees are employed in activities licensed pursuant to Georgia Department of Natural Resources' Rule 391-3-17-.02. This posting permits employees working in or frequenting any portion of a controlled 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, 2008

# Postings

GDNR Phone Numbers



**Georgia Department of Natural Resources**
4220 International Parkway, Suite 100, Atlanta, Georgia 30354
**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

Radiation Safety Office

# Portable Survey Instrument Calibration

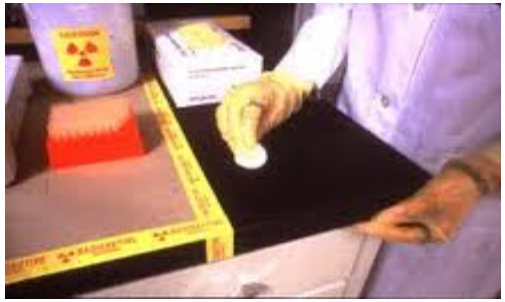
- Required annually.
- Performed by Radiation Safety.
- Deliver to Radiation Safety Office.

| Scale Name | mR/hr | Corr. Factor | mR/hr | Corr. Factor |
|---|---|---|---|---|
| x100 | 50 | 1.00 | 150 | 1.00 |
| x10 | 5 | 1.00 | 15 | 1.00 |
| x1 | 0.5 | 1.00 | 1.5 | 1.00 |
| x.1 | 0.05 | 1.00 | 0.15 | 1.00 |
| | | | | |
| | | | | |

Medical College of Georgia
Radiation Safety Office
Geometry ⊥ //
Cal. Date: 10/2/2012
Cal. Due: 10/2/2013
Calibrated by: R. Browne
Check Source 2.5 mR/hr
Reading

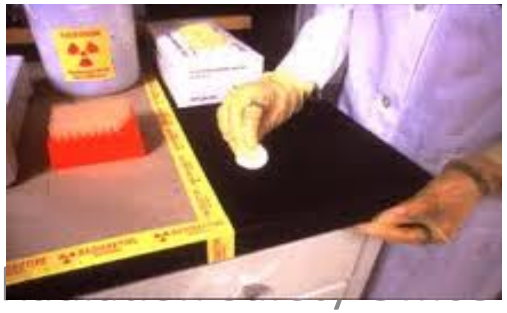
# Surveys

- 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.gru.edu/services/ehs/radsafe/
- (706) 721-9826 normal business hours.
- (706) 664-8607 after hours.


Please complete and submit the

**Quiz**