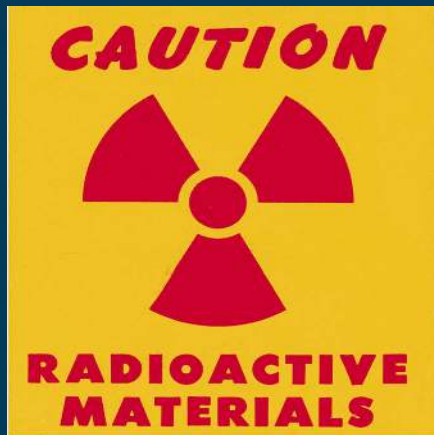

THE GEORGE
WASHINGTON
UNIVERSITY

WASHINGTON, DC



Radiation Awareness Training

Presented by the Office of Laboratory Safety

Email: labsafety@gwu.edu

Tel # 202-994-8258

(Special thanks to The Department of Environmental Health and Safety at Cornell University for resources for this training)

"A safe, healthful, and secure environment for scholarship and research."

Purpose of this Instruction

- **The instruction will teach you the basics of radiation safety and the radiological risks associated with the use of radioactive material at GWU.**
- **This training is required workers whose job duties may require them to be in areas where radioactive materials are used or stored.**
- **This training does not authorize you to directly handle radioactive materials (including receipt of packages) but only serves as awareness training.**

Big Picture

Small quantities of radioactive materials are used at GWU. Only very small radiation doses are expected for the users of radiation/radioactive material. No doses are expected for any other personnel. No biological effects are expected at these low dose levels.

Layers of Radiation Safety at George Washington University

**U.S. Nuclear Regulatory Commission
(License)**

**Radiation Safety Committee
(Authorizes Principal Investigators
and Use of Radioactive Material)**

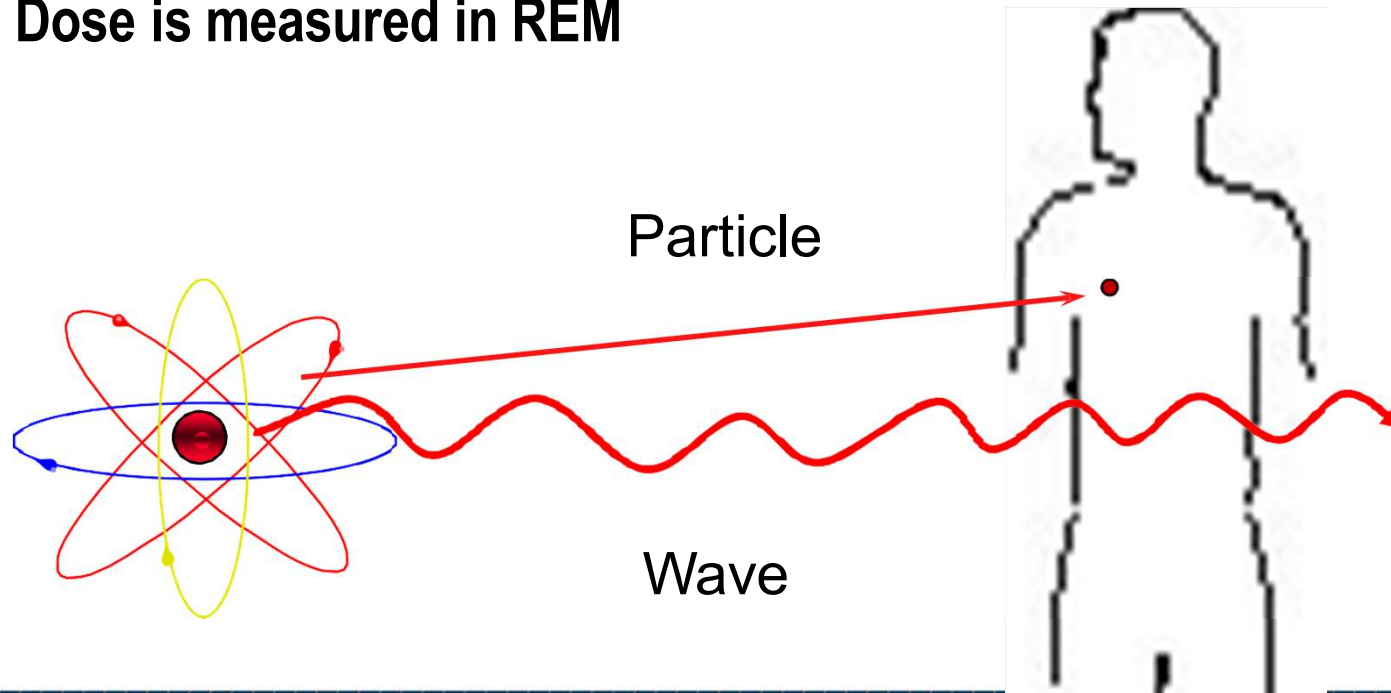
Radiation Safety Officer

Principal Investigator - Authorized User

Radioactive dose

Radioactive molecules give off energy as particles or waves and radiation dose is the energy absorbed by the cells in your body

- Dose is measured in REM



Interaction of Radiation With Living Cells

Low Doses

- Potential Long Term Effect of Radiation
- Risk to a person depends on how much dose and which tissues receive the dose

High Doses of Radiation

- Acute effect or Short Term effect

Short Term Effects of Radiation

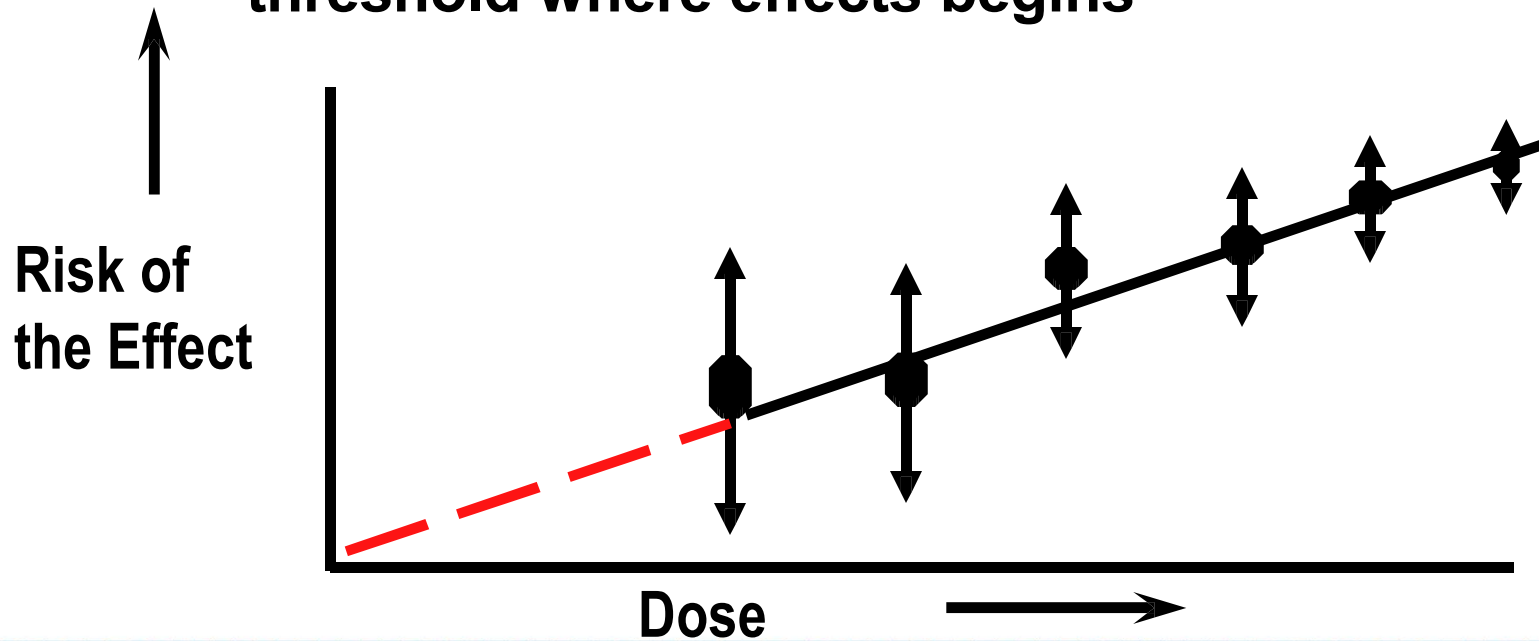
- **Only very high levels of radiation cause short term effects; this is virtually impossible on our campus**
- **Symptoms appear quickly (hours to days) and can only result from very high radiation doses that occur only around large radiation sources (not used by GWU)**
- **Examples:**
 - **skin irritation or skin burn, hair loss, injury to body systems**

Long Term Effects of Radiation

- **The primary concern for GWU**
- **Result from damage to DNA**
- **Effects do not appear for many years**
- **Examples: cancer, genetic effects**

Dose Response - Long Term Effects

- The risk of the effect is depends on the dose
- Conservative assumption that there is no threshold where effects begins



Cancer Risks

Cancer risk from ionizing radiation varies with type of tissue, age and sex

Simplified risk factor:

- **10,000 individuals receive 1,000 mrem whole body dose while working**
- **Result – 4 additional fatal cancers**

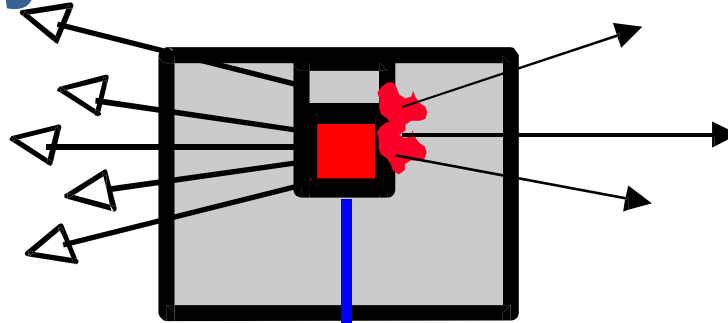
Background cancer risk:

- **10,000 individuals with no radiation exposure at work**
- **Result – 2,500 fatal cancers**

Dose Limits (mrem)

□ Typical annual dose from background (ancillary personnel and non rad workers)	350
□ Range of annual dose from background	130 to 25,000
□ Annual dose limit, public, whole body	100
□ Annual dose <u>limits</u> for radiation worker	
– Whole body	5,000
– Eye	15,000
– Skin, hands, feet or single organ	50,000
– Fetus of “declared pregnant worker”	500 ^{1,2}
□ Chest X-ray - diagnostic	10
□ Thyroid treatment- therapeutic (whole body)	7,000
□ Clinically observable changes in blood	25,000
□ Serious skin burn	200,000
□ Lethal whole body dose (single dose)	300,000

Two Ways to Receive a Dose



EXTERNAL RADIATION

A field of radiant energy that extends beyond the surface of a container of radioactive material.

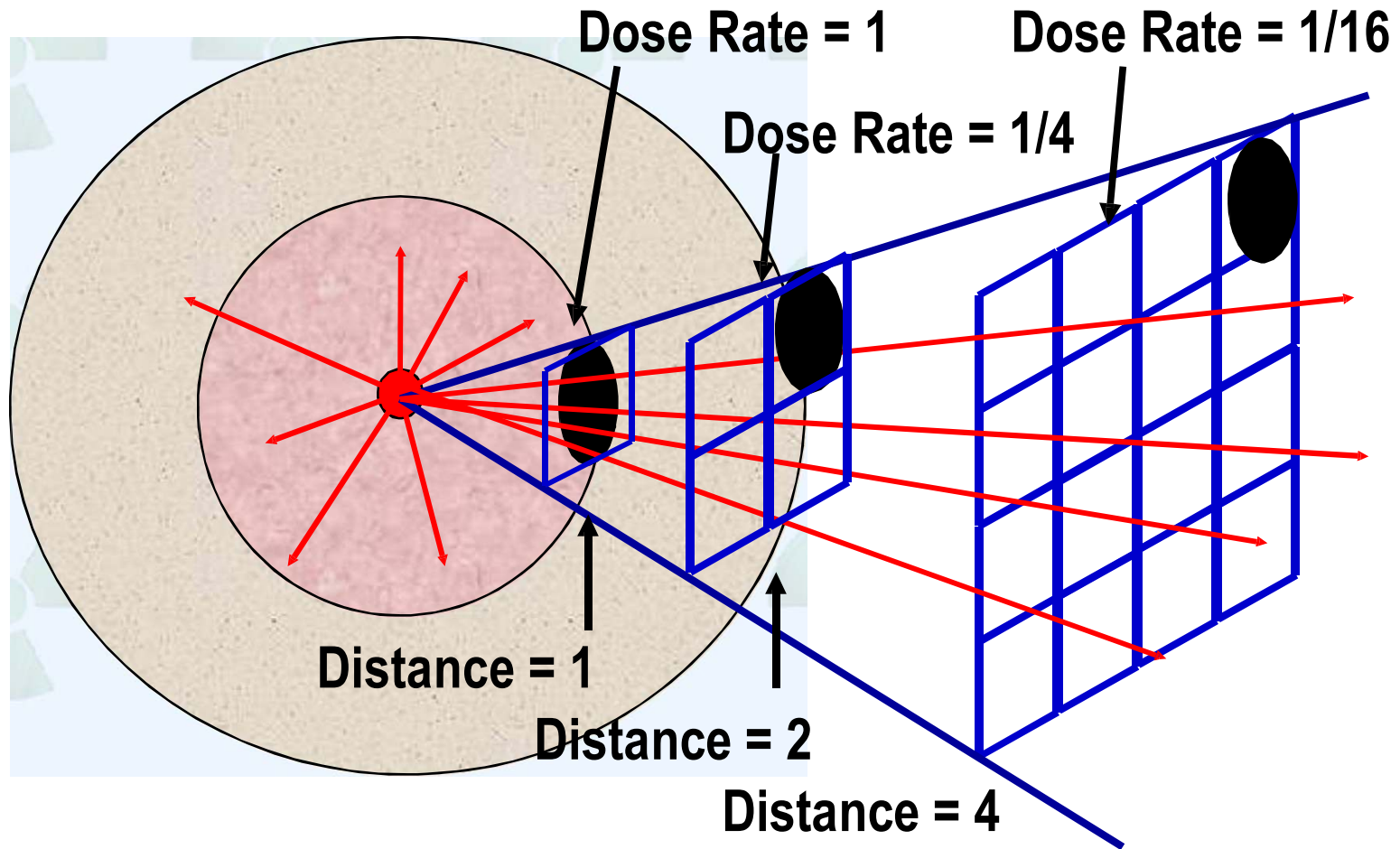
CONTAMINATION

Any amount of radioactive material that is outside of the intended container.

Keep dose as low as possible

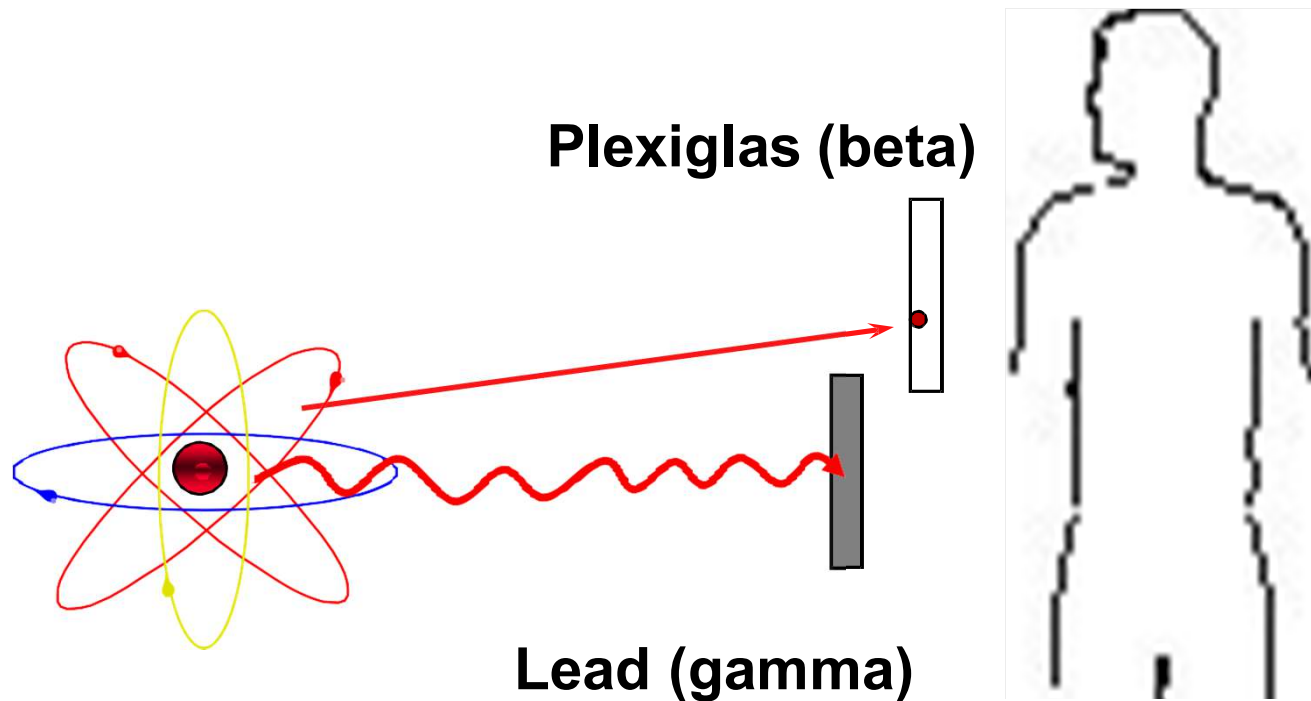
- **Time - Limit the amount of time spent in radiation fields**
- **Distance – maximize your distance from the source**
- **Shielding – Block radiation with a material of appropriate material and thickness. Plexiglas for beta and lead for Gamma/X-rays**

Distance



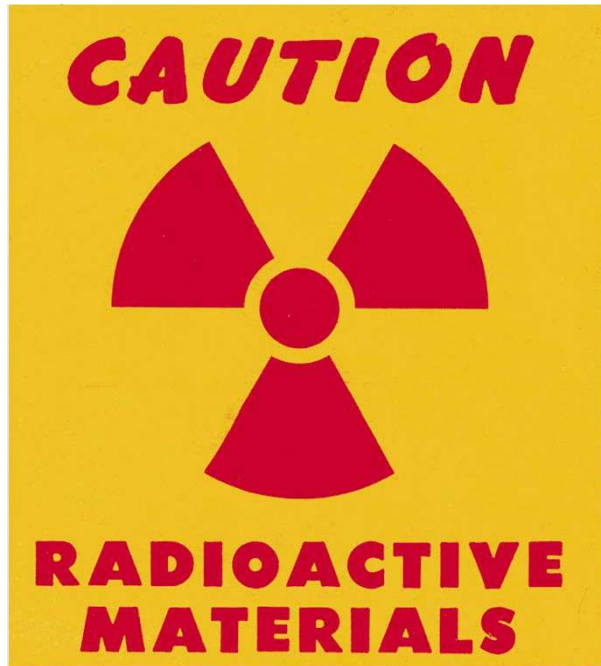
Shielding

Radiation can be stopped or reduced by certain materials



Hall Placard

Door sign



George Washington University • Laboratory Hazard Information Sheet

Room #: _____ Department: _____ BioSafety Level ____ Lab _____
 Principal Investigator: _____ Phone: (____) _____-_____
 24-Hour Emergency Contact Information:
 Home: (____) _____-____ Cell: (____) _____-____ Pager: (____) _____-____

Routine Access Information:

[] Housekeeping and Support Services may enter to clean floors and empty trash only
 [] Housekeeping and Support Services may enter the lab only when escorted
 [] **NO ROUTINE ACCESS**

	<p style="text-align: center;"><u>Special Hazards:</u></p> <table style="width: 100%;"> <tr> <td style="text-align: center;"> IRRITANT <input type="checkbox"/></td> <td style="text-align: center;"> FLAMMABLE <input type="checkbox"/></td> </tr> <tr> <td style="text-align: center;"> CORROSIVE <input type="checkbox"/></td> <td style="text-align: center;"> OXIDIZER <input type="checkbox"/></td> </tr> <tr> <td style="text-align: center;"> RADIATION <input type="checkbox"/></td> <td style="text-align: center;"> TOXIC <input type="checkbox"/></td> </tr> <tr> <td style="text-align: center;"> BIOHAZARD <input type="checkbox"/></td> <td style="text-align: center;">SC <input type="checkbox"/> CARCINOGEN</td> </tr> <tr> <td style="text-align: center;">SM <input type="checkbox"/> MUTAGEN</td> <td style="text-align: center;">ST <input type="checkbox"/> TERATOGEN</td> </tr> </table>	 IRRITANT <input type="checkbox"/>	 FLAMMABLE <input type="checkbox"/>	 CORROSIVE <input type="checkbox"/>	 OXIDIZER <input type="checkbox"/>	 RADIATION <input type="checkbox"/>	 TOXIC <input type="checkbox"/>	 BIOHAZARD <input type="checkbox"/>	SC <input type="checkbox"/> CARCINOGEN	SM <input type="checkbox"/> MUTAGEN	ST <input type="checkbox"/> TERATOGEN
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SM <input type="checkbox"/> MUTAGEN	ST <input type="checkbox"/> TERATOGEN										

Personal Protection:

 LAB COATS REQUIRED <input type="checkbox"/>	 GLASSES <input type="checkbox"/>
 GLOVES <input type="checkbox"/>	 COVERALL <input type="checkbox"/>

The Office of Research Safety, Bio-Security & Emergency Management is responsible for all University research laboratory facilities and is located in Ross Hall, Suite 617 - PHONE: 4.3282, FAX: 4.2522, EMAIL: safety@gwumc.edu, WEB: www.gwumc.edu/research/labsafety.htm. ORSBSEM is on-call 24x7 to respond to emergencies. Employees are entitled to Material Safety Data Sheets (MSDS) or other information on suspect hazards.

Recognize rooms where radioactive materials are used



Radiation Areas



- Dose rates are between 5 - 100 mrem/h at 1 foot from the source(s).
- Do not enter the area without a trained radiation worker.
- No current rooms at GW are considered a radiation area.

RAM use/storage

Areas and equipment where radioactive materials are used or stored are clearly labeled



Procedure if Individuals are Contaminated

If you find personnel contamination, take the following steps:

1. Have someone call OLS, 4-8258
2. Remove clothing that is contaminated (take measures for modesty if someone must disrobe)
3. Start washing area gently with a mild soap and do not scrub hard
4. Ensure contamination is not spread to other areas (keep people from leaving if they may be contaminated)
5. Complete a GW incident form and submit it to your supervisor



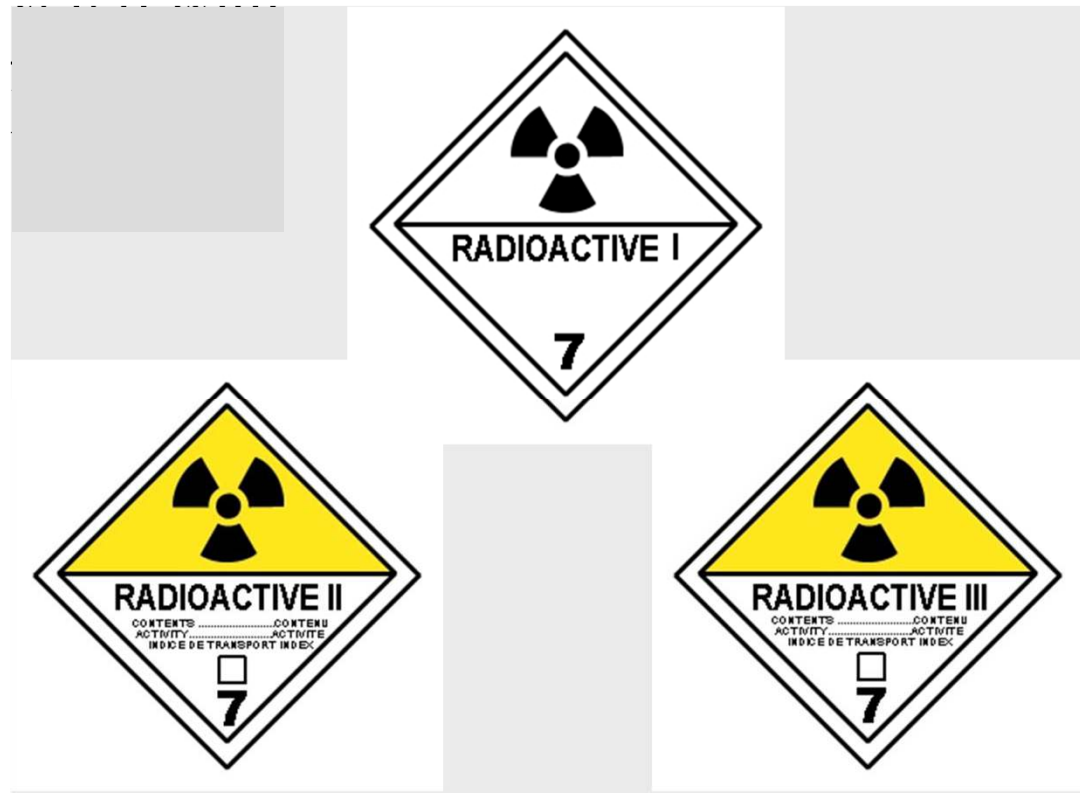
Note: for serious medical emergency, ignore radiation contamination until medical situation is under control.

Security

- **Radiation marked rooms must be locked**
- **All radioactive material must be secured when not in the possession of an authorized person**
- **Do not let unauthorized persons into a radiation lab unattended.**
- **If a sealed radiation shipping package is discovered secure the package and contact OLS at 4-8258**
- **If the package is damaged, leaking or open or if the material is not in a shipping package, do not touch the material and keep people away from the area**

Rad labels

If a package is discovered with the following markings, it may contain radioactivity.



Contacts

Office of Lab Safety

Ross Hall, Room B05
2300 Eye St NW

(202) 994-8258

labsafety@gwu.edu