

# Spotlight On Safety

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## RADIATION EXPOSURE

**Ionizing radiation changes the physical state of atoms it strikes causing them to become electrically charged or "ionized." Unstable atoms (radioisotopes) decay and emit radiation. We are all exposed to natural background radiation from the sun and atmosphere. Naturally occurring radioactive materials are present in the earth, houses, food, air, and our bodies. Radioactive materials are used in medical diagnosis and treatment and in biomedical research.**

### *Main Types of Ionizing Radiation*

- **Alpha** Particles consist of heavy, positively-charged particles emitted by atoms of heavy elements (naturally occurring uranium and radium and some human-made sources) that are completely absorbed by the outer dead layer of skin and is therefore not a hazard. Outside the body, alpha particles taken into the body by inhalation can directly expose internal tissues and can be a hazard. Alpha particles are stopped by paper.
- **Beta** Particles (positively or negatively charged electrons), emitted from the nucleus during decay, are more penetrating than alpha particles and can sometimes penetrate the skin, but like alpha particles, are generally more hazardous when inhaled or ingested. Beta particles are stopped by wood or plexiglass.
- **Gamma** (photons) and X-rays are forms of electromagnetic radiations frequently used in medicine because they can easily penetrate the human body. Gamma rays come from the nucleus when materials decay. X-rays result from electron removal or rearrangement in atoms. Gamma particles and x-rays are stopped by lead or concrete.
- **Neutrons** are heavy, uncharged particles that cause the atoms that they strike to become ionized. Neutrons are absorbed by hydrogen-rich materials.

### *Radiation Exposure Routes*

Radioactive material can enter the body by four methods:

- **Inhalation**—Gaseous or airborne particles, dust particulates, and matter with radioactive material may enter the body through the lungs.
- **Ingestion**—Radioactive materials may enter the body through the gastrointestinal tract by way of contaminated food, drink, and swallowing contaminated mucous from the nasal area.
- **Absorption**—Radioactive material may be absorbed through the skin or mucous membranes.
- **Puncture or injection**—Radioactive material can penetrate the body through cuts, wounds, and punctures in the skin.

*In order to protect yourself from radiation exposure, follow these tips:*

1. Design the activity to minimize exposure time in the radiation field
2. Radiation intensity falls quickly with distance, so maintain the maximum distance from the source at all times
3. Wear a lab coat, disposable gloves, pants, and close toed shoes and safety glasses while working with open sources of radioactivity
4. Change gloves frequently, monitor work area, wash your hands, and remove lab coat when leaving the laboratory
5. Do not assume co-workers have not contaminated the lab - routinely check yourself with a survey meter
6. Work in a fume hood when using volatile sources of radioactivity
7. Don't smoke, eat, or drink in the lab
8. Don't store your food in refrigerators or freezers designated for chemical/ radioactive storage

For more information visit [www.ehs.ucr.edu](http://www.ehs.ucr.edu) or call 951-827-5528 if you have questions.