



## RADIOISOTOPE BRIEF

### Plutonium-238 (Pu-238), Plutonium-239 (Pu-239), and Plutonium-240 (Pu-240)

#### Half-life:

- **Pu-238** 87.7 years
- **Pu-239** 24,110 years
- **Pu-240** 6,564 years

**Mode of decay:** Alpha particles

**Chemical properties:** Solid under normal conditions, plutonium can form compounds with other elements.

#### What is it used for?

Plutonium-238 generates significant heat through its radioactive decay process, which makes it useful as a heat source for sensitive electrical components in satellites, as a well as a power source (for example, battery power) for satellites. Plutonium-239 is used to make nuclear weapons. Pu-239 and Pu-240 are byproducts of nuclear reactor operations and nuclear bomb explosions.

#### Where does it come from?

Plutonium is created from uranium in nuclear reactors. It is a by-product of nuclear weapons production and nuclear power operations.

#### What form is it in?

Plutonium is a solid material that is fashioned into rods for use in nuclear reactors and into ceramic "buttons" for use in satellite systems.

#### What does it look like?

Plutonium is a silvery-gray metal that becomes yellowish when exposed to air. Most plutonium in the environment is in the form of microscopic particles that are the remnants of nuclear weapons testing and nuclear reactor accidents.

#### How can it hurt me?

Because it emits alpha particles, plutonium is most dangerous when inhaled. When plutonium particles are inhaled, they lodge in the lung tissue. The alpha particles can kill lung cells, which causes scarring of the

**Alpha particles:** the nucleus of a helium atom, made up of two neutrons and two protons with a charge of +2. Certain radioactive nuclei emit alpha particles. Alpha particles generally carry more energy than gamma or beta particles, and deposit that energy very quickly while passing through tissue. Alpha particles can be stopped by a thin layer of light material, such as a sheet of paper, and cannot penetrate the outer, dead layer of skin. Therefore, they do not damage living tissue when outside the body. When alpha-emitting atoms are inhaled or swallowed, however, they are especially damaging because they transfer relatively large amounts of ionizing energy to living cells.

## Plutonium

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lungs, leading to further lung disease and cancer. Plutonium can enter the blood stream from the lungs and travel to the kidneys, meaning that the blood and the kidneys will be exposed to alpha particles. Once plutonium circulates through the body, it concentrates in the bones, liver, and spleen, exposing these organs to alpha particles. Plutonium that is ingested from contaminated food or water does not pose a serious threat to humans because the stomach does not absorb plutonium easily and so it passes out of the body in the feces.

For more information about Plutonium, see the Public Health Statement by the Agency for Toxic Substances and Disease Registry at: <http://www.atsdr.cdc.gov/toxprofiles>, or visit the Environmental Protection Agency at <http://www.epa.gov/radiation/radionuclides/plutonium.htm>.

For more information about health effects related to radiation exposure, see CDC's fact sheet on "Radiation and Health Effects," at <http://www.bt.cdc.gov/radiation/healthfacts.asp>.

For more information on protecting yourself before or during a radiologic emergency, see CDC's fact sheet titled "Frequently Asked Questions (FAQs) About a Radiation Emergency" at <http://www.bt.cdc.gov/radiation/emergencyfaq.asp>, and "Sheltering in Place During a Radiation Emergency," at <http://www.bt.cdc.gov/radiation/shelter.asp>.

*The Centers for Disease Control and Prevention (CDC) protects people's health and safety by preventing and controlling diseases and injuries; enhances health decisions by providing credible information on critical health issues; and promotes healthy living through strong partnerships with local, national, and international organizations.*

For information on other radiation emergency topics, visit [www.bt.cdc.gov/radiation](http://www.bt.cdc.gov/radiation), or call the CDC public response hotline at (888) 246-2675 (English), (888) 246-2857 (Español), or (866) 874-2646 (TTY)