



RADIATION FROM PLUTONIUM (Pu)

(*Treatment also applies to yttrium, americium, curium, and californium)

- Agent information:** Plutonium radioisotopes are a class of highly toxic and unstable (radioactive) atoms that give off radiation as they decay. Plutonium radioisotopes emit ionizing radiation primarily as alpha particles. This ionizing radiation can disrupt cell molecules and cause damage. Plutonium-238 is useful as a heat and power source 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
- Route of exposure:** Because plutonium decays by alpha particles, external exposure to plutonium is not as dangerous as exposure to other radioactive elements because the skin will block the alpha particles. Inhalation and ingestion are the most likely routes for internal contamination from plutonium radioisotopes. 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 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.
- Signs and symptoms:** Exposure to ionizing radiation from plutonium causes immediate or delayed health effects. Observable effects occurring soon after receiving very large doses include hair loss, skin burns, nausea, gastrointestinal distress, or death (Acute Radiation Syndrome). The main health effect from exposure to plutonium is cancer, which may occur years after exposure. The types of cancers you would most likely develop are cancers of the lung, bones, and liver. These types of cancers have occurred in workers who were exposed to plutonium in air at much higher levels than is in the air that most people breathe.

Emergency Medical Services and Preparedness Section
24/7 Emergency Contact Number: 1-888-295-5156
Contact Number: 302-223-2999



- Protective measures:** Emergency medical care to save lives is the first priority. Effective patient decontamination is important to limit the spread of radioactive materials in the hospital, and to prevent exposure to other patients and staff. Achieve dose reduction by limiting the time people are exposed, avoiding direct contact, maintaining distance from the source, and using shielding. Use respiratory protection to prevent ingesting or inhaling airborne contamination.
- Since deceased victims from a radiological event involving release of airborne Plutonium radioisotopes could be contaminated both internally and externally, they should be handled using reverse isolation.
- Evaluation:** CBC with absolute lymphocyte count. Repeat measurements for at least 48 hours.
- Prophylaxis:** Appropriate PPE to avoid secondary contamination.
- Treatment:** Emergency medical care to save lives is the first priority. Supportive care and decontamination are indicated. Treatment to reduce internal dose is indicated for known uptake of plutonium, yttrium, and other transuranic radioisotopes such as americium, californium, and curium. Treatment is to administer zinc-DTPA or calcium-DTPA (diethylenetriaminepentaacetate) to induce chelation, increase elimination, and reduce radioisotope body burden. Expert guidance on medical treatment is available from REAC/TS at: 1-865-576-1005 (24/7 coverage).
- Reporting:** Immediately report suspect cases to the Division of Public Health, 1-888-295-5156 (24/7 coverage).
- Additional information:** Visit the Centers for Disease Control and Prevention website: <https://www.cdc.gov/nceh/radiation/emergencies/isotopes/plutonium.htm> and the Agency for Toxic Substances and Disease Registry: <http://www.atsdr.cdc.gov/toxfaqs/index.asp>.