Plutonium

FACT SHEET 26-015-0617

Plutonium (Pu) is a radioactive element which exists in multiple forms called isotopes. The common isotopes of plutonium are: Pu-238, Pu-239, Pu-240, Pu-241, and Pu-242. Plutonium rarely occurs in nature so the vast majority is manmade by particle interactions with uranium in nuclear reactors.

How is it used?

Plutonium can be used as nuclear reactor fuel, material for a nuclear weapon, neutron sources, and as fuel for nuclear or atomic batteries, also called radioisotope thermoelectric generators (RTGs). Currently, a few countries use plutonium as fuel in nuclear reactors, but those in the United States do not; however, plutonium is a byproduct created in nuclear reactors that use uranium as fuel.

In an RTG the heat produced by Pu-238 is converted into electricity; for example, RTGs were used on the two Viking Mars Landers and the Mars Science Laboratory Rover. Plutonium-238 was also used for a number of years to power cardiac pacemakers but has been discontinued. Plutonium is not used in consumer products due to the scarcity and expense of the material.

What are the primary health effects?

Outside the body, plutonium poses little to no risk. Plutonium emits radioactive particles that travel through the air as alpha, beta, and gamma radiation. Alpha radiation travels very short distances in air and can be stopped by thin sheets of paper or the dead layer of skin on our bodies. Beta radiation can travel farther in air, and all but the high energy beta radiation will be stopped by the skin; plutonium emits only low energy beta radiation. Gamma radiation could be an external hazard, as it can travel very far and penetrate through the body; however, plutonium emits very little gamma radiation.

Plutonium inhalation is the primary health concern. Depending on how much is inhaled the alpha and beta particles from plutonium can be a significant health hazard, possibly causing acute radiation sickness and other long term health risks, like cancer. The health hazard is much lower if ingested compared to inhalation because plutonium is not easily absorbed into the body through the digestive system.

Studies on animals have shown that large amounts of plutonium can shorten life, cause diseases of the respiratory tract, and cancers. These effects have not been seen in humans who have been exposed to lower amounts of plutonium.

Anything else I need to know?

Media accounts that overstate otherwise factual information about the effects of plutonium are often not medically or scientifically based. There is ample research and clinical evidence showing that people who have inhaled small but measureable amounts of plutonium many years ago have shown no adverse health effects. This should not be interpreted as meaning that the dangers of plutonium are not real, and that improper or unsafe handling, storage, and use would be of no consequence. Misuse of plutonium has the potential to cause significant adverse health effects.

Exposure to plutonium while associated with the Army or the Department of Defense is not likely. Personnel who work occupationally with plutonium and believe they have become exposed should notify their Radiation Safety Officer. The levels of plutonium found in the environment from natural and manmade sources are very low and pose very little risk to the public. If exposure is suspected contact the Nuclear Regulatory Commission (www.nrc.gov).

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Additional information

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