ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

PLUTONIUM
CAS # 7440-07-5

This fact sheet answers the most frequently asked health questions (FAQs) about plutonium. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Plutonium is a radioactive material that does not occur naturally to any extent, but is produced in nuclear reactors. It has been found to cause lung, liver, and bone cancer in animals. This chemical has been found in at least 5 of the 1,177 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is plutonium?

(Pronounced plo͞o-to͞ʹne-əm)

Plutonium is a silvery white metal that exists as a solid under normal conditions. It is produced when uranium absorbs an atomic particle. Trace amounts of plutonium occur naturally, but large amounts have been produced in nuclear reactors. Trace levels of plutonium can be found in the environment, from past nuclear bomb tests, in several forms called isotopes. The most common plutonium isotopes are plutonium-238 and plutonium-239.

Plutonium undergoes radioactive decay. In this decay process, energy is released and a new product is formed. The energy released is called radiation. When plutonium decays, it divides into two parts—a small part that is called "alpha" radiation and a large part called a daughter. The daughter is also radioactive, and it, too, continues to decay until a nonradioactive daughter is formed. During these decay processes, three types of radiation are released—alpha, beta, and gamma. Alpha particles can travel only a short distance and cannot travel through your skin. Beta particles can penetrate through your skin, but they cannot go all the way through your body. Gamma radiation can go all the way through your body.

What happens to plutonium when it enters the environment?

- Trace amounts of plutonium are found naturally in uranium-rich ores. Most is made in special nuclear reactors.
- It may also enter the environment from releases from nuclear reactors, weapons production plants, and research facilities.
- A major source of plutonium is releases from nuclear weapons testing.
- Plutonium may enter surface water from accidental releases and disposal of radioactive wastes.
- Soil may become contaminated with plutonium from fallout from nuclear weapons testing.
- Plutonium can move slowly from soil into the groundwater.
- Low levels may be absorbed by plants.

How might I be exposed to plutonium?

- Everyone is exposed to very low levels of plutonium in air.
- Very low levels may be found in drinking water and food.
- Exposure to higher levels could occur from an accidental release during its use, transport, or disposal.

ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html

- Workers at nuclear facilities using plutonium may be exposed to higher levels of it.
- People who live near facilities that use plutonium in their operations may be exposed to it from releases to the air.
- It may also be found at radioactive waste disposal sites.

How can plutonium affect my health?

Plutonium has not been shown to cause adverse health effects in people. Animal studies have shown lung diseases from short-term exposure to high concentrations of plutonium. Animal studies have also shown effects on the blood, liver, bone, and immune system from plutonium exposure.

How likely is plutonium to cause cancer?

Studies in people have found no cancer from plutonium. Animal studies have reported an increase in lung, liver, and bone cancers from exposure to plutonium. The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have not classified plutonium for carcinogenicity.

Is there a medical test to show whether I've been exposed to plutonium?

There are tests available that can measure the amount of plutonium in a urine sample, even at very low levels. These measurements can be used to estimate the total amount of plutonium that is in the body. However, these measurements cannot be used to determine the levels to which the person was exposed or to predict the potential for health effects. There are also tests to measure plutonium in body organs, feces, bones, and milk. These tests require special equipment and cannot be routinely done in a doctor's office.

Has the federal government made recommendations to protect human health?

The EPA has set a drinking water limit of 15 picocuries per liter (15 pCi/L) for gross alpha particle activity.

The EPA has also set a drinking water limit of 4 millirems per year (4 mrem/yr) for beta and gamma radiation.

The Nuclear Regulatory Commission (NRC) has set a radiation dose limit for individual members of the public for all sources of radiation of 0.5 rem per year (0.5 rem/yr).

The federal recommendations have been updated as of July 1999.

Glossary

Carcinogenicity: Ability to cause cancer.
CAS: Chemical Abstracts Service.
Millirem (mrem): A unit used to measure radiation dose (one thousandth of a rem).
National Priorities List: A list of the nation's worst hazardous waste sites.
Picocurie (pCi): A unit used to measure the amount of radioactive material.
rem: A unit used to measure radiation dose.
Short-term: Lasting 14 days or less.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1990. Toxicological profile for plutonium. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.