

This fact sheet answers the most frequently asked health questions (FAQs) about plutonium. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is 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 is produced in nuclear reactors; only trace amounts occur naturally. It has been found to cause lung, liver, and bone cancer in plutonium workers. Plutonium has been found in at least 16 of 1,699 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

## What is plutonium?

Plutonium is a silvery-white radioactive metal. Most plutonium is found combined with other substances. 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. The most common plutonium isotopes are plutonium-238 and plutonium-239.

Plutonium can exist in several forms, called isotopes, based on how it was made. All plutonium isotopes are radioactive. Their atoms eventually change into a different element and give off radiation. This process is called radioactive decay.

The half-life is the time it takes for half of the plutonium to undergo radioactive decay and change forms. The half-life of plutonium-238 is 87.7 years. The half-life of plutonium-239 is 24,100 years.

Plutonium-239 is used to manufacture nuclear weapons. Plutonium-238 is used as a heat source in nuclear batteries to produce electricity in devices such as unmanned spacecraft and interplanetary probes.

## What happens to plutonium when it enters the environment?

- Plutonium released during atmospheric testing of nuclear bombs, which ended in 1980, is the source of most of the plutonium in the environment worldwide.

- Plutonium is also released to the environment from research facilities, waste disposal, nuclear fuel reprocessing facilities, nuclear weapons production facilities, and accidents at facilities where plutonium is used.
- Plutonium can be transported in the atmosphere.
- It can be deposited on land or water by settling or by precipitation.
- Plutonium can stick to particles in soil, sediment, and water.
- Plutonium will undergo radioactive decay in the environment.

## How might I be exposed to plutonium?

- Everyone is exposed to very low levels of plutonium in air, and possibly in drinking water and food.
- Exposure to higher levels could occur from an accidental release during its use.
- Exposure during transport and disposal is unlikely because transport containers are virtually indestructible by accident or fire; disposal sites are deep underground and away from the public.
- 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 accidental releases to the air.

# Plutonium

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## How can plutonium affect my health?

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.

## How likely is plutonium to cause cancer?

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA's Office of Air and Radiation consider plutonium to be a human carcinogen. The likelihood of you developing cancer depends on how much plutonium you were exposed to and how long it remains in your body. The levels which most people are exposed are very low and of little health consequence.

## How can plutonium affect children?

Studies in young animals have shown that a larger amount of the plutonium deposited in the lung will move to growing bones. Therefore, it is possible that the bones of children could be more severely affected by plutonium than the bones of adults; however, this has not been shown in humans or tested in laboratory animals.

Studies in animals have also shown that a larger amount of plutonium that enters the gut of newborn animals is absorbed into the body.

We do not know if plutonium causes birth defects.

## How can families reduce the risks of exposure to plutonium?

- People do not generally live near facilities that use plutonium in their operations. Some people may be slightly more exposed to plutonium due to releases of

plutonium through filtered stack-emissions or waste water. Any releases are to be within regulatory limits. Disposal sites are deep underground and away from the public.

- If you know or suspect that plutonium has been released to the air, you should leave the area immediately.

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

Plutonium can be measured in the urine and feces even at very low levels. These measurements can be used to estimate the total amount of plutonium that has entered the body.

## Has the federal government made recommendations to protect human health?

The U.S. Nuclear Regulatory Commission (USNRC) has established an exposure limit of 0.1 rem/year for the general public.

USNRC also requires a limit of 5 rem/year for workers in industries where exposure to radiation may occur and 0.5 rem for the pregnancy period following the declaration of pregnancy by a woman in an industry where exposure to radiation may occur. These regulations are for all forms of ionizing radiation combined, so they are not only for plutonium.

## References

Agency for Toxic Substances and Disease Registry (ATSDR). 2010. Toxicological Profile for Plutonium (Update). Atlanta, GA: U.S. Department of Public 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 and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636.

ToxFAQs™ Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaqs/index.asp>.

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.