URANIUM
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Agency for Toxic Substances and Disease Registry ToxFAQs September 1999

This fact sheet answers the most frequently asked health questions (FAQs) about uranium. 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: Uranium is a naturally occurring chemical substance that is mildly radioactive. Everyone is exposed to low amounts of uranium through food, air, and water. Exposure to high levels of uranium can cause kidney disease. It is not known to cause cancer, but can decay into other radioactive materials that may. Uranium above background levels has been found in at least 54 of the 1,517 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is uranium?

(Pronounced yŏŏ-rā′nē-əm)

Uranium is a common naturally occurring and radioactive substance. It is a normal part of rocks, soil, air, and water, and it occurs in nature in the form of minerals - but never as a metal. Uranium metal is silver-colored with a gray surface and is nearly as strong as steel. Natural uranium is a mixture of three types or isotopes called U-234 (^{234}U), U-235 (^{235}U), and U-238 (^{238}U). All three are the same chemical, but they have different radioactive properties.

Typical concentrations in soil are a few parts per million (ppm). Some rocks contain high enough mineral concentrations of uranium to be mined. The rocks are taken to a chemical plant where the uranium is taken out and made into uranium chemicals or metal. The remaining sand is called mill tailings. Tailings are rich in the chemicals and radioactive materials that were not removed, such as radium and thorium.

One of the radioactive properties of uranium is half-life, or the time it takes for half of the isotope to give off its radiation and change into another substance. The half-lives are very long (around 200,000 years for ^{234}U, 700 million years for ^{235}U, and 5 billion years for ^{238}U. This is why uranium still exists in nature and has not all decayed away.

The isotope ^{235}U is useful as a fuel in power plants and weapons. To make fuel, natural uranium is separated into two portions. The fuel portion has more ^{235}U than normal and is called enriched uranium. The leftover portion with less ^{235}U than normal is called depleted uranium, or DU. Natural, depleted, and enriched uranium are chemically identical. DU is the least radioactive and enriched uranium is the most.

What happens to uranium when it enters the environment?

- ❑ Uranium is already naturally present throughout the environment. Human activities, wind, streams, and volcanoes can move the uranium around and change the levels that you are exposed to.
- ❑ Uranium is found in soil where it may stay for billions of years.
- ❑ It exists as dust in the air and the dust settles onto surface water, soil, and plants.
- ❑ Uranium enters water by dissolving soil, eroding soil and rocks, or in releases from processing plants. Larger particles settle into the bottom of lakes, rivers, and ponds and join uranium that is there naturally.
- ❑ Some plants may absorb uranium or it may stick to the root surface.

How might I be exposed to uranium?

- ❑ Breathing air or drinking water in a place that has higher than background levels of uranium.
- ❑ Eating food grown in areas with higher than background levels of uranium.
- ❑ Working in factories that process uranium or with phosphate fertilizers, or living near any type of mine.
- ❑ Living near a coal-fired power plant.

How can uranium affect my health?

All uranium mixtures (natural, depleted, and enriched) have the same chemical effect on your body. Large amounts of uranium can react with the tissues in your body and damage

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your kidneys. The radiation damage from exposure to high levels of natural or depleted uranium are not known to cause cancer (see next section).

How likely is uranium to cause cancer?

Humans and animals exposed to high levels of uranium did not have higher cancer rates. The Committee on the Biological Effects of Ionizing Radiation (BEIR IV) reported that eating food or drinking water that has normal amounts of uranium will most likely not cause cancer.

Uranium can decay into other radioactive substances, such as radium, which can cause cancer if you are exposed to enough of them for a long enough period of time. Studies have reported lung and other cancers in uranium miners; however, the miners also smoked and were exposed to other substances that cause cancer, such as radon and silica dust.

How can uranium affect children?

Like adults, children are exposed to small amounts of uranium in air, food, and drinking water. If children were exposed to very large amounts of uranium, it is possible that they might have kidney damage like that seen in adults. We do not know whether children differ from adults in their susceptibility to the health effects of uranium exposure.

It is not known if exposure to uranium can affect the developing human fetus. In laboratory animals, high doses of uranium in drinking water resulted in birth defects and an increase in fetal deaths. Measurements of uranium have not been made in pregnant women, so we do not know if uranium can cross the placenta and enter the fetus. In an experiment with pregnant animals, only a small amount of the injected uranium reached the fetus.

How can families reduce the risk of exposure to uranium?

If your doctor finds that you have been exposed to significant amounts of uranium, ask whether your children might also be exposed. Your doctor might need to ask your state health department to investigate.

It is possible that higher-than-normal levels of uranium may be in the soil at a hazardous waste site. If you live near such a hazardous waste site, you should prevent your children from eating dirt and make sure that they wash their hands frequently and before eating. You should also wash fruits and vegetables grown in that soil well, and consider discarding the outside portion of root vegetables.

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

Uranium is in your normal diet, so there will always be some level of uranium in all parts of your body. Uranium is normally measured in a sample of urine collected and sent to a laboratory. Blood, feces, and tissue samples are rarely used. Because most uranium leaves the body within a few days, higher than normal amounts in your urine shows whether you have been exposed to larger-than-normal amounts within the last week or so. Some highly sensitive radiation methods can measure uranium levels for a long time after you take in a large amount. Also, some radiation equipment can tell if uranium is on your skin.

Has the federal government made recommendations to protect human health?

The EPA requires that spills or accidental releases of uranium waste into the environment containing 0.1 curies or more of radioactivity must be reported to the EPA.

The EPA is currently working to develop an appropriate drinking water limit for uranium based on a broad range of human and animal health studies.

The Occupational Safety and Health Administration has set occupational exposure limits for uranium in breathing air over an 8-hour workday, 40-hour workweek. The limits are 0.05 milligrams per cubic meter (0.05 mg/m^3) for soluble uranium dust and 0.25 mg/m^3 for insoluble uranium dust.

Source of information

Agency for Toxic Substances and Disease Registry. 1999. Toxicological profile for uranium. 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 E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-639-6359. 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.