

What is uranium?

Uranium is a naturally-occurring, radioactive metal, which is widespread in nature. It is present in certain types of soils, rocks, water, plants, and animals. Uranium levels vary in different areas of the world, and are higher where the underlying rock is predominantly granite. Uranium is also released into the environment from various activities such as mining and combustion from coal and other fuels. Uranium breaks down (decays) very slowly into radium and radon gas.

Who is exposed to uranium?

Most exposure to natural uranium is from food and water, and to a certain extent from air. People ingest about 1-2 micrograms (μg , one microgram is one millionth of a gram) of natural uranium every day through food, and take in about 1.5 μg for every liter of water they drink. Microgram amounts of uranium are also present in beef, poultry, eggs, fish, shellfish, and milk. Root vegetables, such as beets and potatoes, tend to have more uranium than other foods.

How can uranium affect my health?

Because natural uranium produces very little radioactivity, the health effects from exposure are usually attributed to the chemical properties of uranium.

Based on experimental studies, the most likely adverse health effect on humans from ingesting large amounts of uranium occurs in the kidneys. Studies of humans exposed to abnormally high levels of uranium in drinking water (averaging 100-600 micrograms per liter ($\mu\text{g}/\text{L}$)) for many years suggest that there may be minor damage to kidney tissue, including a mild decrease in the kidney's ability to hold onto proteins, sugar, and other compounds. However, this damage is reversible after the exposure to uranium stops. There are no specific symptoms after long-term consumption of drinking water containing high levels of uranium. Studies of workers with occupational exposure to uranium have not shown any evidence of serious kidney disease or other health effects.

How likely is uranium to cause cancer?

Humans and animals exposed to high levels of uranium for long periods of time have not shown higher than expected cancer rates. Some 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, silica dust, and organic solvents. Therefore, they were exposed to other, more likely, cancer causing agents than uranium. Based on theoretical models, the U.S. Environmental Protection Agency (EPA) has estimated that uranium in drinking water at the current standard of 30 $\mu\text{g}/\text{L}$ may increase the lifetime cancer risk of less than one additional case of cancer in a population of ten thousand.

How can uranium affect children?

There is no conclusive evidence that uranium causes birth defects. Children are exposed to uranium in the same ways that adults are exposed. It is possible that if children are exposed to very high amounts of uranium, they might have some effects on their kidneys like that seen in adults. These effects are most likely reversible after the exposure to uranium stops.

Is there a medical test to determine if I have been exposed to uranium?

Urine analysis for uranium is the best test to determine whether you have been exposed to large amounts of uranium. The levels of uranium in the urine decrease gradually after exposure has stopped. Urine can also be tested for any evidence of kidney damage. However, since kidney damage is also caused by several common diseases, such as diabetes, it would not tell if the damage was caused by uranium in your body.

How can I reduce the risk of exposure to uranium?

Some areas have bedrock that is high in uranium, and people with private wells in these areas may have high levels of uranium in their drinking water. People living in areas with uranium-rich bedrock should consider testing their well water for uranium, and use bottled water if levels are high. Avoid eating root vegetables grown in uranium-rich soil, and wash all fruits and vegetables. If you do eat root vegetables grown in uranium-rich soil, discard the peel from the vegetables. If you live near a hazardous waste site with high levels of uranium, make sure your children do not play in soil, and wash their hands often, especially before eating.

What is the drinking water standard for uranium?

EPA sets the standards for public drinking water. These standards or limits are known as Maximum Contaminant Levels (MCLs). The MCL for uranium in public drinking water is 30 µg/L. The drinking water standard was developed based on the assumption that a person drinks 2 liters of water a day for 70 years. Additionally, a safety margin of 100-fold was built into the standard to protect children and those who consume significantly more water. Consuming water with levels of uranium consistently above the MCL over a long period of time (many years) may increase the risk of adverse health effects.

Where can I get more information about uranium?

- If you have concerns about uranium, contact your healthcare provider.
- Call your local health department. A directory of local health departments is located at <https://www.vdh.virginia.gov/local-health-districts>. Contact the Virginia Department of Health at (804) 864-8182 or at toxicology@vdh.virginia.gov.
- Visit the Agency for Toxic Substances and Disease Registry page on uranium at <https://www.atsdr.cdc.gov/toxprofiles/TP.asp?id=440&tid=77>.

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