



Department of Health

**Bureau of Environmental Health and
Radiation Protection**

"To protect and improve the health of all Ohioans."

**Health Assessment
Section**

Radionuclides in Water

Answers to Frequently Asked Questions

What are radionuclides?

Radionuclides (ray-dee-oh-new-klides) are the radioactive forms of chemical elements. Elements are the building blocks of all matter in the universe. An element becomes radioactive when it decays and releases energy.

Some radionuclides can be found naturally in the earth's crust, and others are man-made for military, medical, and business purposes.

How do radionuclides get into drinking water?

Most radionuclides in Ohio's drinking water come from natural sources. They come from certain kinds of rocks in Earth's crust. As these rocks weather over time, the elements in them become radioactive and leak into drinking water.

Radionuclides are more common in underground sources of drinking water, like wells, than in surface water, like lakes. Although most drinking water in the U.S. has no noticeable levels of radionuclides, some areas can have higher levels.

The most common radionuclides in drinking water are radium, radon, and uranium, although many others exist.

What makes radionuclides dangerous?

As different chemical elements decay, they release different kinds of radiation. This includes alpha particles, beta particles, and gamma rays. A chemical element can release one or all of these as it decays.

Some of these kinds of radiation pass through the body more easily than others, but all kinds of radiation can cause damage to your organs and DNA. This damage is what causes tumors and cancer.

Do radionuclides cause health effects?

Yes, radionuclides can cause health problems.

- Radium can make you more likely to get bone, liver, or breast cancer. Fish that live in water with radium may store it in their body, and eating these fish may make you sick.
- Radon can come up from the ground as a gas and enter homes and buildings, or it can be in water. Drinking or breathing radon can cause lung cancer, especially for tobacco smokers.
- Uranium can cause bone or liver cancer. Uranium can also cause kidney damage and failure.

Whether you get sick depends on:

- How much you were exposed to (dose).
- How long you were exposed (duration).
- How often you were exposed (frequency).
- Your general age, health, and lifestyle.

If a pregnant mother is exposed to radionuclides, her unborn baby may have health problems as it develops.

Is there a medical test to show if I've been exposed to radionuclides?

Depending on what radionuclide you were exposed to, doctors may be able to measure radiation levels in your urine, blood, hair, or other body tissue samples.

Keep in mind that these tests can only show you if you've been exposed to radionuclides. They may not be able to tell you how the radionuclides got into your body or whether you will get sick.

How does the federal government protect me from radionuclides in drinking water?

Under the Safe Water Drinking Act, the U.S. Environmental Protection Agency (EPA) sets legal limits on levels of certain radionuclides in drinking water to protect public health.

The goal for all radionuclides in water is zero. The U.S. EPA sets maximum level limits for:

- Alpha particles. The highest level of alpha particles allowed is 15 picocuries for every one liter of water. (**Note:** A curie is a measure of radioactivity. “Pico-” means “one-trillionth”. A planet that was the size of a “pico-Earth” would be smaller than the width of a human hair.)
- Beta particles. The highest level of beta particles allowed is 4 millirems per year. (**Note:** A millirem is a measure of how much radiation a person absorbs. Taking an airplane coast-to-coast across the U.S. would give you a dose of radiation of about 1 millirem. 4 millirems per year is about the same as taking 4 coast-to-coast flights in a year.)
- Radium. The highest level of radium in water allowed is 5 picocuries for every one liter of water.
- Uranium. The highest level of uranium in water allowed is 30 micrograms for every one liter of water. In other words, if you had one million parts of water, only 0.03 parts could be uranium.

How do I know if there are radionuclides in my water?

Ohio’s public water systems are required to test for radionuclides. Although radionuclides in water are generally low across Ohio, certain areas have higher levels because of the types of rocks and soils in that area.

If you are using a private well, radionuclide tests are available. Contact your local health department for help with testing options.

What should I do if I have radionuclides in my well water?

There are treatment systems designed to remove radionuclides from drinking water. Two systems which may remove radionuclides from well water include ion exchange systems and reverse osmosis systems.

Private well owners must use a registered private water system contractor to install water treatment equipment for radionuclides, and a permit is required from the local health department.



(Image source: iStock)

Resources

Division of Drinking and Ground Waters. 2015. Radionuclides in Ohio’s ground water. Ohio Environmental Protection Agency.

Radiation Protection. 2017. Radionuclides. U.S. Environmental Protection Agency, Washington, D.C., USA.

Water Research Foundation. 2014. Radionuclides in drinking water.

Where can I get more information?

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