

Radionuclides

What You Need to Know

Radionuclides contaminating water is a developing issue. Radioactivity in ground water formerly was limited to natural causes such as radon, radium, or uranium. But releases from nuclear power plants and medical facilities have added the dimension of man-made radioactivity finding its way into drinking sources. What follows are answers to frequently asked questions about radionuclides:

What is a radionuclide?

It is a radioactive chemical that is found in water. It is usually, but not always, naturally occurring.

What are the different types of radionuclides?

The most common are radon, radium, uranium, gross alpha, and beta and photon emitters. More information about each is below:

- ❖ Radon is a naturally occurring gas that emits ionizing radiation. It can be found in several places. In fact, the U.S. Environmental Protection Agency (EPA) recommends testing for radon in homes and apartments below the third floor.
- ❖ Radium-226 and radium-228 are naturally occurring. They are ground water contaminants that arise at trace levels.
- ❖ Uranium is a naturally occurring contaminant that is found in ground water and surface water.
- ❖ Alpha emitters usually occur naturally, but several can come from man-made sources. They can occur in ground water and surface water.
- ❖ Beta and photon emitters are primarily man-made and associated with nuclear power plants, facilities that use radioactive material for research or manufacturing, or establishments that dispose of radioactive material. They occur primarily in surface water. Some beta emitters can occur naturally.

Why do they occur?

Radionuclides occur naturally as trace elements in rocks and soils as a consequence of the radioactive decay of uranium-238 and thorium-232. It happens because radioactive atoms have too much energy, and they release or transfer that energy. The released energy is called ionizing radiation. It can be alpha particles, beta particles, or gamma rays.

What are the health risks involved with radionuclides?

Exposure to ionizing radiation can lead to several types of cancer, and extremely high doses of radiation can cause death.

Radon can cause lung cancer, and drinking affected water can lead to stomach cancer. High exposure to radium-226 and radium-228 has been known to cause bone, stomach, lung, and other forms of cancer. Uranium is believed to cause bone cancer, and the EPA has stated it can be toxic to kidneys too. Gross alpha, beta, and photon emitters are considered carcinogens as well.

How can radionuclides be treated and/or removed?

Among the different types of technologies that treat radionuclides are co-precipitation with barium sulfate, greensand filtration, ion exchange, lime softening, preformed hydrous manganese oxide filtration, and reverse osmosis.

But whether or not a particular treatment removes radionuclides from drinking water effectively depends on the contaminant's chemical and physical characteristics, as well as the water system's characteristics such as water quality and size.

Descriptions of the treatment technologies are below:

- ❖ Co-precipitation with a barium sulfate is the process of adding a soluble barium salt to radium-contaminated water. It is mainly used in waste water. Data have shown success in removing 95% of the radium.
- ❖ Greensand filtration consists of a filter box with manganese greensand replacing the traditional filtration medium. Studies have indicated the sand removes up to 56% of the radium.
- ❖ Ion exchange can be used on small systems. It removes 90% of the radionuclides it encounters. The water flow must be regularly monitored, and the resin must be regenerated frequently.
- ❖ Lime softening can be used to remove radium. It has an efficiency of 80% to 95%. Adding lime to water also increases its pH, and can also be a method for treating hard water.
- ❖ Preformed hydrous manganese oxide filtration is a method for radium-contaminated water. It is fairly inexpensive if filters are already in place. It requires proper dosages, and if water quality varies, the dosage must be recalibrated.
- ❖ Reverse osmosis removes multiple radionuclides, including radium and uranium. It can have a success rate up to 98%. Similar elimination totals can be achieved for alpha, beta, and photon emitters.

Where can I get more information?

For more information on your private water well, contact your local contractor. Also, visit the Web site of the National Ground Water Association, www.ngwa.org, and its site just for well owners, www.wellowner.org.

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