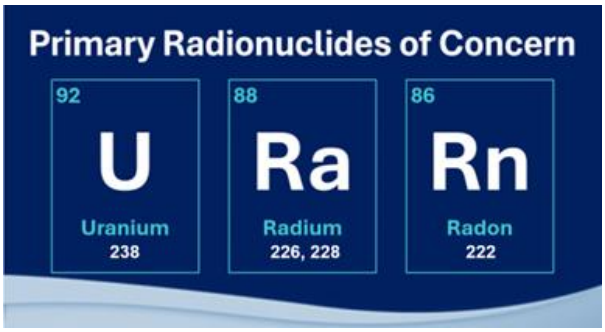
Know the Facts, Protect Your Health

Naturally Occurring Radionuclides in Missouri Groundwater

A radionuclide is a type of unstable atom that releases radiation as it breaks down into a more stable form. Radionuclides may be found in the environment due to human activity, or more commonly by occurring naturally in rocks and soil. They may contaminate groundwater, drinking water and air. The most common natural radionuclides in drinking water are isotopes of uranium, radium and radon.

Occurrence of Radionuclides in Groundwater



Uranium is found in small amounts in most rocks and soil. As uranium breaks down, radium is formed and when radium decays, it creates radon gas. Surface water is usually low in radionuclides. In some situations, groundwater may contain higher levels if radionuclides are naturally present within the aquifer rocks, or if water chemistry is optimal for dissolving the uranium or radium.

Radionuclides cannot be seen, tasted, or smelled in drinking water. If the presence of radionuclides is a concern, the water should be tested to confirm if elevated levels exist. All Missouri community water systems are tested regularly and treated, if necessary, for uranium, gross alpha particle activity and radium in compliance with the U.S. Environmental Protection Agency's (EPA) Maximum Contaminant Levels (MCLs) under the Safe Drinking Water Act. Private well owners are responsible for the safety of their own water; therefore, testing for radionuclides should be considered once every three years or more frequently if detected. Recommendations for treatment can be found on the next page.

Health Information

The health effects of radionuclides depend on which ones a person is exposed to, as well as the dose or amount they are exposed to. To protect public health, EPA has set MCLs for specific radionuclides. The MCL for uranium in drinking water is 30 µg/L, and the combined MCL for radium 226 and 228 is 5 pCi/L. Gross alpha particle activity has a MCL of 15 pCi/L, which includes radium-226 but excludes uranium and radon. Radon does not currently have an MCL for water.

Drinking water with elevated levels of radionuclides at sufficient dose and duration may cause an increased risk for adverse health effects, including certain types of cancer.

- Naturally occurring uranium is a heavy metal, and the primary health concern is the chemical toxicity of uranium at elevated levels, not its radioactivity. Exposure to elevated radioactivity levels may increase the risk of developing cancer.
- Radium's primary health effects stem from its radioactivity. Exposure to elevated levels may increase the risk of cancer, primarily bone cancer.
- Exposure to radioactive decay from radon increases the risk of developing cancer. Exposure to elevated levels in drinking water may increase the risk for stomach cancer, and exposure to elevated levels in indoor air may increase the risk for lung cancer.

Private Well Water Testing

Few labs in Missouri offer radiological services, and testing water for radionuclides may be costly. If uranium or radium is a concern, a screening test for gross Alpha activity would be recommended. Screening water samples for gross Alpha activity may cost $150 per test. If gross Alpha results above 15 pCi/L are found, water treatment is recommended, and additional testing may be suggested. Missourians may contact the St. Louis County Environmental Health Laboratory at 314-615-8324 for additional water testing information.

The Missouri Department of Health and Senior Services (DHSS) does not offer radionuclide testing for private wells but does provide testing for metals. More information can be found on the DHSS Private Drinking Water Program website.

Radon water testing kits can be purchased online from certified radon laboratories for about $30. Indoor air testing for radon is also recommended. Free radon test kits for indoor air can be requested from the Missouri Radon Program or may be purchased online or at local hardware stores for about $25.

Treatment Options

For any type of treatment system, it is important to closely follow the manufacturer's recommendations for use and maintenance to ensure the device is working properly to limit exposures. The table below lists general recommendations for treatment options and the estimated costs to install a system to treat water for an entire home. While not all exposures result in public health concerns, reducing exposure through water treatment may be recommended in some situations, such as when the testing results exceed the MCL.

Contaminant	Recommended Water Treatment System	Estimated Cost of a Whole-House System*
Uranium, Radium, and/or gross Alpha	Reverse Osmosis (RO) System	$1,000 to $4,000
Uranium and/or Radium	Ion exchange (softening) system**	$500 to $3,000
Radon	Point of Entry (POE) Granular Activated Carbon (GAC) and aeration systems	$800 to $2,500

* Based on 2024 EPA and industry estimates that do not include system maintenance costs.

**Different ion exchange units are needed for uranium and radium.

The following websites offer additional information on water testing, treatment and health effects.

St. Louis County Environmental Health Laboratory

314-615-8324

DHSS Private Drinking Water Program

573-751-6102

DNR Groundwater website

800-361-4827

MISSOURI DEPARTMENT OF HEALTH & SENIOR SERVICES

Bureau of Environmental Epidemiology

573-751-6102 | health.mo.gov