

Radium in Drinking Water

FREQUENTLY ASKED QUESTIONS (FAQS) ABOUT HEALTH

What is radium?

Radium is an element that occurs naturally in Minnesota and can be found in Minnesota's groundwater. Radium is a radioactive material, also called a radionuclide. When radium breaks down, it creates radiation.

Radium is a natural part of our environment, and small amounts of radiation are common in the air, water, and soil around us. Coming in contact with too much radiation can cause health problems.

What are the health effects of radium exposure?

Drinking water that has radium levels near the federal drinking water standards puts you in contact with very low doses of radiation every day.

Exposure to radium above the drinking water standards, when combined with other sources of radiation exposure, can slightly increase your lifetime risk of developing cancer or kidney problems.

Exposure to radiation can cause different types of health effects depending on the source of radioactivity, how much radiation you are exposed to (total dose), and how long you are exposed to the radiation.

What are radium standards?

Under the Safe Drinking Water Act, radium levels are evaluated using a running annual average (RAA). Radium is generally tested 4 times a year, or quarterly. The 4 quarterly samples are averaged to evaluate compliance with the federal drinking water standard, or Maximum Contaminant Level (MCL). The MCL for combined radium 226/228 is 5 pCi/L.

What is the rounding for radium results?

Radium sampling results between 5.0 and 5.4 are rounded to 5 pCi/L consistent with procedures established by the U.S. Environmental Protection Agency.¹

¹ [Title 40 Code of Federal Regulations 141.25\(d\): Analytical methods for radioactivity](#), and [U.S. EPA Memo: Procedures for Rounding-Off Analytical Data to Determine Compliance with Maximum Contaminant Levels Present in NIPDWR](#)

What are the risks of drinking water with radium near the MCL?

Drinking water with radium levels near the drinking water standard for a few months or even a few years does not measurably increase someone's risk of getting cancer from the water.

The MCL for radium is extremely protective of public health.

The federal drinking water standard for combined radium 226/228, or Maximum Contaminant Level (MCL), is 5 pCi/L. A person drinking 2L of water a day for 70 years with radium levels at or below the MCL would not have an increased risk of health effects (namely cancer). Drinking water that is just above the MCL would only pose a minimal and largely theoretical increased health risk, again, if consumed at the rate of 2L/day for a lifetime (70 years).

One would need to drink water with concentrations of radium many times greater than the MCL for a long time before there would be the potential of harm to someone's health.

The current situation does not represent an immediate health risk, but it is one the city needs to address, as it is important to keep everyone's exposure to radium as low as reasonably achievable.

The radium MCL is intentionally calculated to result in very low risks

The MCL is based on data that the EPA has gathered and analyzed from human studies at very high concentrations then used with health protective assumptions to reflect the risk that is possible at much lower concentrations.

When cancer is the health concern, the MCLs are intentionally calculated to be low enough to result in very low risks. The risks are on the order of not more than a 1 in 10,000 chance to probably much less, like a 1 in 1,000,000 chance of an excess cancer occurring in a population consuming the water regularly for a lifetime.

One would need to drink water with concentrations of radium many times greater than the MCL for a long time before there would be the potential of harm to someone's health.

What steps can I take to reduce my exposure?

Certain types of home water softeners and reverse osmosis treatment units can be effective at removing radium from drinking water. Carbon-based drinking water filters are not effective at removing radium.

Testing your home for radon (a radionuclide in gas form) and taking steps to reduce the radon level is one of the most important things you can do to lower your overall radiation dose. See [Radon in Homes](#) for more information.

What are other sources of radiation exposure?

Natural and human-made radiation surround you every day. About half of the radiation you come in contact with each year is from natural sources, like the sun, soil, and rocks. The other

half comes from human-made sources, like medical tests (x-rays) and treatments and building and road construction materials.

Each source of radiation gives you a different dose of radiation. For example, a radiation medical treatment has an extremely high dose of radiation compared to the very low dose of radiation you get from drinking water with radionuclides.

Your lifestyle can also affect how much radiation you come in contact with. Flying in airplanes, living at high altitude, living near a coal mine, and some jobs (like underground mining) put you in contact with higher doses of radiation. Learn more about radiation at [Doses in Our Daily Lives](#).

What are communities' options for treatment?

In the long-term, some cities may need to upgrade their aging treatment plant as older equipment cannot efficiently remove radium.

The longest duration for a community public water supply to be out of compliance is typically 3-5 years to fund, design and build a water treatment plant. During this time, the public is provided updates and public education every three months. Historically, communities have not provided bottled water to residents during these times, because, again, the health risk is not acute and the water is safe to drink.

It's important for city residents to be kept informed of developments as these projects move forward and problems are addressed. City officials can provide the most current information on their website. Under the Safe Drinking Water Act, the city is also required to notify the public every three months about the exceedance, until they are back below the MCL for four quarters.

Can you put this radium exposure in context of other exposures?

Here is an example.² Assuming that all of the radium in the drinking water is radium-226, then a 10-year-old child drinking 2 L of water per day at 5.0 pCi/L would receive a dose of 10.9 millirem (mRem) per year. The same child drinking 2 L of water at 6.0 pCi/L a day, would receive a dose of 13 mRem/year.

(This example is a conservative scenario where all radium is assumed to be radium-226. In reality, the water contains a mixture of radium-226 and radium-228, and radium-228 gives a lower dose than radium-226 for that 10-year-old child.)

Comparing that with other sources of radium exposure:

- Minnesotans receive between 200-400 mRem annually from natural sources.
- A chest X-ray gives a dose of 10 mRem.

² Calculator source: [Health Physics Society \(https://hps.org/publicinformation/ate/q9937.html\)](https://hps.org/publicinformation/ate/q9937.html).

RADIUM AND HEALTH FAQS

- A dental panoramic X-ray gives a dose of approximately 2.5 mRem.
- A 3-hour flight gives a dose of roughly 1 mRem.
- People living in Denver receive an annual dose of 80 mRem due to the cosmic radiation at high altitude. In comparison, people living at sea level receive an annual dose of 30 mRem from cosmic radiation.

The difference in drinking 2 liters of water per day at the 5.0 pCi/L concentration versus at 6.0 pCi/L is just over 2 mRem for the whole year. This is similar to the dose a person would receive from taking one round-trip flight (3 hours each way).

Minnesota Department of Health
PO Box 64975
St. Paul, MN 55164-0975
651-201-4700
health.drinkingwater@state.mn.us
www.health.state.mn.us

2/2024

To obtain this information in a different format, call: 651-201-4700. Printed on recycled paper.