

# Alpha Radiation

## What is alpha radiation?

Alpha radiation is a type of energy released when certain radioactive elements decay or break down. For example, uranium and thorium are two radioactive elements found naturally in the earth's crust. Over billions of years, these two elements slowly change form and produce "decay products" such as radium and radon. During this change process, energy is released. One form of this energy is alpha radiation.

## Why is alpha radiation in drinking water supplies?

Alpha radiation normally exists everywhere: in the soil, in the air, and also in water. Because the earth's bedrock contains varying amounts of radioactive elements, the amount of alpha radiation in water also varies. As the radioactive elements decay, alpha radiation continues to be released into groundwater. Groundwater is a common source of drinking water. The alpha radiation in drinking water can be in the form of dissolved minerals, or in the case of radon, as a gas.

## How would I know if my drinking water contains alpha radiation?

Community public wells are tested for mineral alpha radioactivity by using a test called "gross alpha activity." If the gross alpha results are above public drinking water standards, the water system is notified and a plan is developed to reduce levels. Private well owners can purchase a kit to have their water tested for gross alpha activity at the Vermont Department of Health Laboratory. Kits for measuring radon in drinking water are also available.

## What is Vermont's drinking water standard?

Alpha radiation is measured in picoCuries per liter (pCi/L). If alpha radiation is detected at or above 5 pCi/L in your home well additional testing is needed to pinpoint the source.

The U.S. Environmental Protection Agency has set 15 pCi/L as the maximum contaminant level for public drinking water supplies. This level is calculated as the total alpha radiation minus uranium and radon. For more information, contact the Department of Environmental Conservation, Water Supply Division at 800-823-6500.

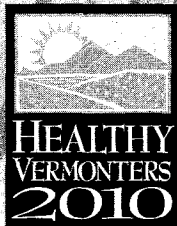
## What are the health concerns associated with alpha radiation?

There are no immediate health risks or symptoms from drinking water that contains alpha radiation. However, it may cause health problems over time. Because alpha radiation loses energy rapidly, it doesn't pass through skin. It is not a hazard outside of the body, however, if an individual eats or drinks something containing alpha radiation or breathes it in, the radiation can be harmful. Over a long period of time, and at elevated levels, radium increases one's risk of bone cancer and uranium increases one's risk of kidney damage.

Well water that contains elevated levels of radioactive minerals sometimes increases the level of radon in the air inside a home. Actions like taking showers, doing laundry or running a dishwasher can release the radon into the air inside your home. Breathing air with elevated levels of radon over a lifetime increases a person's risk of getting lung cancer.

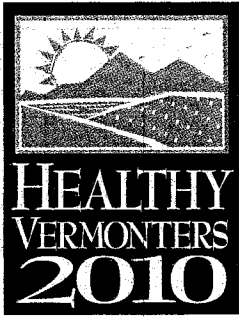
## Can the levels of alpha radiation in my drinking water be reduced?

Yes. There are several treatment options available to help reduce the levels of gross alpha radiation in drinking water. To determine the most effective treatment, the source of the alpha



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**Vermont Department of Health**  
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Public Health Laboratory

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### Gross Alpha Results Interpretation Sheet

Reported results for Gross Alpha are expressed as picoCuries per liter of water. A picoCurie is a standard unit for measuring radioactivity and is one trillionth of a Curie. Both Curies and picoCuries are measurements based on how much of the radioactive substance disintegrates or "decays". Due to the random nature of radioactive decay and the length of time between sampling and analysis, it is never possible to determine the exact level of radioactivity.

**ALPHA RADIATION** in water is due to dissolved, naturally occurring elements such as radium and uranium. Radon is also an alpha emitter but is not measured in this screening test. Because this is a screening test, an elevated gross alpha indicates the necessity for further testing to determine which elements are present and at what levels.

1. If the measured gross alpha result is **less than 5 picoCuries per liter**, no further action is necessary.
2. If the measured gross alpha result is **greater than or equal to 5 picoCuries per liter but less than 15 picoCuries per liter**, radium 226 and radium 228 testing is recommended. Public water systems are required to test for radium 226 at this concentration. The USEPA has set a drinking water limit for radium 226 and radium 228 at 5 picoCuries per liter.
3. If the measured gross alpha result is **greater than or equal to 15 picoCuries per liter**, a test for radium 226, radium 228 and uranium is recommended. Public water systems are required to retest for gross alpha and to test for radium 226, radium 228 and uranium.

If you have a private water supply and desire additional clarification of your report or further information concerning methods of corrective action, please contact the Health Protection Division at 1-800-439-8550 or 802-652-0358.

If you represent a public water supply and desire additional clarification of your report, please contact the Water Supply Division at 1-800-823-6500 or 802-241-3400.

Thank you.

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radiation must be identified. Because alpha radiation can come from a variety of sources, more than a single test may be needed.

- If the gross alpha result is less than 5 pCi/L, no further testing or treatment is necessary.
- If the gross alpha result is 5-15 pCi/L, test for radium 226 and radium 228.
- If the gross alpha result is greater than 15 pCi/L, test for radium 226, radium 228 and uranium.

#### **What are my treatment options?**

Solving an alpha radiation problem can be complex. Radon is not yet regulated and there continues to be discussion among scientists and regulators about the acceptable amount of radon in drinking water supplies. Also under discussion are future government requirements for disposal of radioactive wastes.

**Radium** - Consider treatment when test results show that the total radium 226 and 228 is greater than or equal to 5 pCi/L. A water softener (also called a cation exchanger) can be used to remove radium from drinking water. In this method of treatment, radium is exchanged for sodium or potassium. When the softener is cleaned, the radium is flushed away with the wastewater into a disposal site such as a leachfield or municipal sewer.

Another type of treatment called reverse osmosis has also been shown to remove most radium from drinking water. In this process, water is forced under pressure through a membrane leaving the radium behind. The radium is then flushed away. The process is relatively slow and may be more suitable for a household rather than a public water system.

**Uranium** - The Vermont Department of Environmental Conservation Water Supply Division standard is 20 µg/L (micrograms per liter). This standard is used for public community water systems. For your private water supply you may want to consider treatment when test results show uranium at greater than or equal to 20 pCi/L or 20 µg/L. Anion exchange is a treatment similar to water softening except that in this case uranium is removed and exchanged for chloride. Reverse osmosis also removes uranium. Public systems have additional treatment options not available to homeowners such as lime softening (to reduce radium and uranium) and coagulation and filtration (to reduce uranium).

**Radon** - If radon is present in your drinking water, test the air in your home as well. Consider treatment for your well water if the radon from the water is causing the level of radon in the air in your home to rise above the recommended indoor air action level of 4 pCi/L. It generally takes 10,000 pCi/L in water to increase the radon level in air by 1.0 pCi/L.

Aeration removes radon from water. In this treatment method, large volumes of air are blown through the water or the water is sprayed so that it is exposed to the air. In this way, the radon gas leaves the water and enters the air. The air is vented outside, and the treated water is repressurized and piped to faucets.

#### **Where can I get more information?**

Call the Vermont Department of Health for questions about—

Health, Home Water Treatment or Radon: 800-439-8550 (Health Protection Division)

Testing or Test Kits: 800-660-9997 (Public Health Laboratory)

Call the Vermont Department of Environmental Conservation about—

Public Drinking Water Supplies: 800-823-6500 (Water Supply Division)