

# Radionuclides:

## Frequently Asked Questions

### What are radionuclides and how do they get into drinking water?

**Radionuclides** are naturally occurring or man-made radioactive substances that can be found in trace amounts in rocks and soil.

As radionuclides decay, they continually release energy into the environment until a stable, nonradioactive substance is formed. This energy becomes part of the natural background radiation to which all living creatures are exposed. Many radionuclides readily dissolve in groundwater where acidic conditions (low pH levels) are found.

Most drinking water sources have very low levels of radionuclides that are not considered to be a public health concern. Of the small percentage of drinking water systems with radioactive contaminant levels high enough to be of concern, most of the radioactivity is naturally occurring.

Naturally occurring radionuclides have been found in concentrations that exceed federal guidelines in several aquifers in Maryland.

A list of common radionuclides can be found at <http://www.epa.gov/radiation/radionuclides/index.html>

### What is radioactivity and how is it measured?

Radioactivity is a natural decay process. Radionuclides emit energy in the form of alpha and beta particles to reach a more stable condition. Scientists are able to identify the amount of radioactive substances in water by measuring the type and duration of the radiation emitted. The unit typically used to describe the amount of radioactivity present in drinking water is the picocurie per liter (pCi/l).

*Short term gross alpha* and *short term gross beta* tests are used to detect the presence of radionuclides in drinking water.

Naturally occurring radium is one of several radioactive substances found in groundwater, and the most likely one to be contributing to elevated gross alpha particles in groundwater in the Pearce Creek area, according to a 2000 Maryland Geological Survey report.

### What is the drinking water standard for radionuclides?

A drinking water standard, or maximum contaminant level (MCL), is the maximum permissible level of a contaminant that is allowed in drinking water. This level is based on protection of human health but also takes into consideration feasible treatment technologies and monitoring capabilities. A value above the MCL does not indicate that harmful effects will occur, but that a risk exists and should be evaluated.

The MCL for gross alpha particles is 15 pCi/l. Radium, the likely source of elevated alpha particles in the Pearce Creek Area, has an MCL of 5 pCi/l. **If your well water test result for gross alpha is over 5 pCi/l, the Cecil County Health Department recommends that water treatment be installed to reduce gross alpha particles.**

Maryland Department of the Environment has a drinking water standard for public water systems of 50 pCi/l gross beta particles. There are no regulations that require owners of existing private wells to meet the MCLs for water quality.



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## How can radionuclides affect my health?

Radionuclides may release alpha or beta particles. Alpha particles do not penetrate the skin but enter the body when alpha-emitters are in food, water, or air. Some beta particles are capable of penetrating the skin, however, as with alpha emitters, beta emitters are more hazardous when they enter the body through food and water. Most of these particles are naturally excreted in feces or urine, but consuming water with alpha or beta particles exceeding the Environmental Protection Agency (EPA) drinking water standard over many years may increase the risk of getting cancer. The relationship between the amount of water you drink with radionuclides and its potential for causing cancer is not well documented.

Risk studies conducted by the EPA and the Maryland Department of the Environment (MDE) estimate that if 10,000 people were to consume 2 liters of drinking water containing 5 pCi/l of radium every day over a 50 year period, one additional fatal cancer might occur in that group. It is also assumed that as the level of radium increases, so does the risk (see *MDE: Radium and Your Drinking Water*, under "additional resources"). For every 5 pCi/l increase in radium levels an estimated one additional fatality may occur. The risk associated with drinking water containing 5 pCi/l of radium for one year is comparable to one chest X-ray or five round trip flights from Maryland to California.

It is important to note that the EPA regulates radionuclides in public water supplies; however, it does not regulate private wells.

Detailed information also can be found on the EPA website, <http://water.epa.gov/lawsregs/rulesregs/sdwa/radionuclides/basicinformation.cfm>

## If elevated short-term gross alpha or gross beta levels are found in my drinking water, what can I do?

Cecil County Health Department is available to consult with you on water testing, water treatment and well replacement options at 410-996-5160.

Well owners may choose to install a replacement well or water treatment unit to remove radionuclides. A replacement well must be dug to a depth where acceptable gross alpha and gross beta levels have been found. If well replacement is too costly, a water treatment unit is an alternative.

Radionuclides behave in water similarly to calcium and magnesium, so water softening units, such as ion exchange, lime softening, reverse osmosis or distillation are effective in reducing elevated levels in drinking water. Before choosing a water treatment system, contact a water treatment company listed under water filtration and purification equipment in the Yellow Pages. The Department does not endorse any particular brand or company, but can advise on which type of water treatment is likely to work.

Homeowners using water treatment units to reduce elevated levels of gross alpha particles must maintain the unit according to manufacturer's instructions. After installing a water treatment system, a second gross alpha test is recommended to make sure the unit is removing radionuclides effectively.



## Additional Resources

### MDE: Radium and Your Drinking Water

[http://www.mde.state.md.us/programs/Water/Water\\_Supply/Pages/programs/waterprograms/water\\_supply/radium.aspx](http://www.mde.state.md.us/programs/Water/Water_Supply/Pages/programs/waterprograms/water_supply/radium.aspx)

### EPA Safe Drinking Water Hotline

800.426.4791

### Radionuclides in Drinking Water

<http://water.epa.gov/drink/contaminants/basicinformation/radionuclides.cfm>

### Ionizing Radiation Fact Sheets Series: No 1

<http://www.rst2.edu/ties/radon/ramfordu/pdffiles/whatif1.pdf>