Radon in Drinking Water

FACT SHEET SWP-110 **January 2011**

What is Radon?

Radon is a colorless, tasteless, odorless, radioactive gas. It occurs naturally and is produced by the breakdown of uranium in soil, rock, and water. These other elements are part of a sequence formed through a transformation (decay) process that begins with the most prevalent form of “natural” (unprocessed) uranium (U-238).

Is There Radon in My Well Water?

The amount of radon in well water varies from place to place; without testing, it is not possible to determine if the water can be considered safe for drinking. In fact, most drinking water contains a range of naturally occurring elements and/or compounds. As public awareness about radon in indoor air has increased, interest in radon in water has also increased. Typically, groundwater has much higher levels of radon than surface water. This is because radon in groundwater is "trapped" by being submerged underground and cannot easily escape. If your water is from a surface water source, radon in water probably is not a significant health hazard. If you derive your water from a public system, review the annual consumer confidence report for detailed information on any constituents it may contain.

How Can Radon Affect My Health?

Many scientists believe that the alpha particle radiation dose from long-term exposure to elevated levels of radon and radon progeny (break-down products) in air increases your chance of getting lung cancer. The greater your exposure to airborne radon, the greater your chance of developing lung cancer.

How Can I Make Sure That My Well Water Safe For Drinking?

- **Test your home for radon in air first.** Use a "do-it-yourself" test kit available from most hardware stores or have a certified radon testing and measurement service provider conduct the test for you.
    - **If your radon in air test result is 4 picoCuries/liter (pCi/l) or higher with two successive tests, consider installing a radon mitigation system to reduce the level of indoor radon.** "**Mitigation**" means any solution you use to reduce airborne radon levels in your home and can run from installing a ventilation fan in your crawlspace to a full sub-slab depressurization system. Using a certified radon reduction and mitigation service provider to mitigate radon in indoor air problems is recommended.

- **If installing a radon in air mitigation system fails to reduce the radon in air levels below 4 pCi/l, test your home for radon in water.** A radon in water test kit is inexpensive (less than $50) and includes sample processing/analysis and a report of the results. Radon in water test kits are available from many hardware stores.

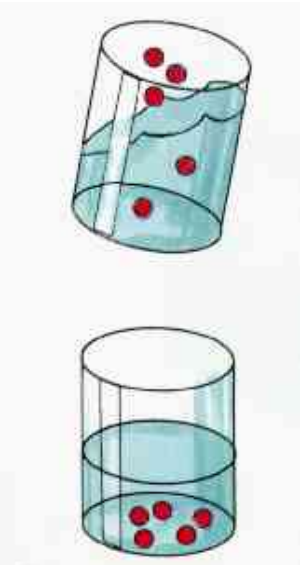
Based on EPA's proposed regulations for community water systems, if your radon in water test result is greater than 4000 pCi/l you should consider modifying your water supply. Treatment or an alternate source may be needed. This step is especially important if you have been able to rule out any contribution to the radon levels in your home from other sources. In other words, *if you have already installed a radon in air mitigation system, and you have radon in water levels higher than 4000 pCi/l, water supply modification may be necessary.* Keep in mind that it takes approximately 10,000 pCi/l in water to produce 1 pCi/l of radon in air.

Should I Consider a Treatment System?

Based on EPA's proposed regulations for community water systems, if your radon in water test result is greater than 4000 pCi/l you should consider modifying your water supply. Treatment or an alternate source may be needed. This is especially important if you have been able to rule out any contribution to the radon levels in your home from other sources. In other words, *if you have already installed a radon in air mitigation system, and you have radon in water levels higher than 4000 pCi/l, water supply modification may be necessary.* Keep in mind that it takes approximately 10,000 pCi/l in water to produce 1 pCi/l of radon in air.

Methods for Removing Radon from Water

The two primary methods for removing radon from water are **aeration** and **granular activated carbon (GAC) absorption**.



Radon escapes from water when it is agitated.

Removing radon from water by **aeration** takes advantage of the fact that radon is readily given off (volatile) from water to air. Radon in water is removed by passing as much air through water as efficiently as possible. By venting the now radon-rich air to the outdoors, aeration can remove up to 99.9% of radon from water. Aeration is practical for central treatment of radon in water (i.e. at a water treatment plant, etc.) but is expensive for individual households or small public water systems. A household aeration system suitable for high efficiency radon removal typically costs $3000 - $5000. Special maintenance is required to ensure that waterborne minerals like iron and manganese do not accumulate and foul the aeration system. Otherwise, radon removal efficiency may be reduced.

A second method for treating radon in water is **granular activated carbon, or GAC, absorption**. Water is filtered through granulated carbon (usually in the form of activated charcoal) and radon is attracted onto the surface of the carbon. Maximizing the carbon's surface area and the length of filtration time are crucial to peak radon removal efficiency. GAC absorption can remove up to 99.9% of radon from water if large amounts of carbon and long contact times are used. Typical removal efficiencies for GAC vary from 50-99%. GAC can be used for central treatment schemes for small systems (several hundred users or less), but becomes more expensive for larger systems. GAC is also fairly cost effective for individual residential wells. If high levels of radon are present, disposing of spent carbon filters may be difficult due to the significant amount of radioactive material present in the filter. Small

carbon filters attached to kitchen faucets or under sinks are inadequate for removing radon from drinking water.

For a more in-depth discussion of these technologies and the associated costs of each, you can see the EPA's Health Risk Reduction and Cost Analysis for Radon in Drinking Water. Section 5 of the *Federal Register Notice*, "Costs of Radon Treatment Measures" is particularly helpful in understanding the different technologies.

Another alternative for some private well owners to consider is to connect to an existing community water system with low radon levels. Drinking bottled water alone will not completely eliminate exposure to radon in water, since this strategy does not prevent radon gas from escaping from well water into indoor air.

Additional Contacts: Where can you get help?

- Montana DEQ Source Water Protection Program. (406) 444-6697
- County Environmental Health Department or Sanitarian's Office under *County Government* listings in the phone book.
- Montana State University Extension Water Quality Program. (406) 994-6589

References:

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