

Healthy Drinking Waters for Rhode Islanders

SAFE AND HEALTHY LIVES IN SAFE AND HEALTHY COMMUNITIES

Arsenic in Private Drinking Water Wells

PRIVATE WELLS CURRENTLY ARE NOT REGULATED BY THE U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA). Private well owners are responsible for the quality of their drinking water. Homeowners with private wells are generally not required to test their drinking water. However, they can use the public drinking water standards as guidelines to ensure drinking water quality. Refer to the factsheet *Drinking Water Standards* for more information.

Until now, the Maximum Contaminant Level (MCL) for arsenic in drinking water in the U.S. has been set at 0.050 milligrams per liter (equivalent to 50 parts per billion). Recently, the MCL was lowered to 0.010 milligrams per liter or 10 parts per billion as established by the EPA. This revised standard goes into effect in 2006 for public drinking water supplies.



Summary

Arsenic occurs naturally in the soil and bedrock throughout many parts of the United States, including New Hampshire and Maine. In Rhode Island, naturally occurring arsenic is not a major concern in groundwater supplies.



- ◆ Arsenic also occurs in the environment as a result of industrial land use activities and arsenic's use as both a wood preservative and a pesticide.
- ◆ Arsenic is a health concern in drinking water and a known human carcinogen.
- ◆ A water test is the only way to determine the presence and amount of arsenic in well water.

If arsenic is present in well water, several types of home treatment systems are available for removing or reducing the amount of arsenic in water, which includes: reverse osmosis, ion exchange, distillation, and activated alumina.

Potential Health Effects

Arsenic is a toxic heavy metal and is also classified by EPA as a human carcinogen (cancer causing agent). Signs of arsenic

poisoning include thickening and discoloration of the skin, stomach pain, nausea, vomiting, diarrhea, numbness in the hands and feet, partial paralysis, and blindness. Most exposure to arsenic occurs through eating or drinking arsenic-contaminated food or water.

Chronic arsenic ingestion from elevated levels in drinking water may cause skin cancer and an increase risk for cancers of the bladder, lung, kidney, liver, colon, and prostate. It may also be associated with cardiovascular, pulmonary and other



diseases and disorders. Various high-risk groups such as people suffering from malnutrition, protein deficiency, and hepatitis B infection may be more sensitive to the effects of arsenic. Other factors such as genetics, age, metabolism, diet, and health status may also affect health risks due to arsenic exposure.

Indications of Arsenic

It is difficult to predict the presence of arsenic in well water. Arsenic is odorless, tasteless, and colorless. The only way to determine its presence is through a water test.

Sources of Arsenic in Drinking Water

Arsenic is common in areas where there are metallic ore mining operations. Arsenic has also been used as a pesticide, a wood preservative, and in paints, dyes, metals, drugs, soaps, and semi-conductors. Generally, naturally occurring arsenic has not been identified as a major concern in Rhode Island's groundwater as it has in other New England states such as New Hampshire and Maine.

Arsenic has been widely used throughout the United States and the Northeast as a pesticide on fruit orchards and on some other crops. Though use of arsenic as a pesticide has been widely discontinued, it is possible that a buildup of arsenic in the soil has occurred over the years. There are other industrial sites that historically or presently could result in release of arsenic to the environment including: manufacturing of metals and alloys, pharmaceuticals, pesticides, and chemicals, and petroleum refining and waste incineration.

Testing for Arsenic in Private Drinking Water Wells

To determine if arsenic is present, arrange to test your drinking water at a state certified laboratory. Carefully follow laboratory instructions to avoid contamination and to obtain a representative sample. If testing indicates that arsenic is present and

treatment is required, other water quality characteristics can effect arsenic treatment and should be tested for, including pH, hardness, iron, manganese, nitrate, nitrite, and sulfate. If any of these are present, pre-treatment may be required. Refer to factsheet *Home Water Testing* for more information.

Generally, naturally occurring arsenic is not a problem in Rhode Island soils and bedrock. If you suspect your property may have been located in or adjacent to an existing or former fruit orchard, it is recommended that private well water be tested for arsenic. This may also apply for those living near existing or former industrial manufacturing operations that have used or currently use arsenic in their processes. Depending on the levels found, water treatment for arsenic removal is generally feasible. Soil testing for arsenic levels is also recommended in these areas.

Corrective Action

Several types of treatment systems are available, including reverse osmosis, ion exchange, distillation, and activated alumina. Before choosing a treatment system, it is important to compare the amount of arsenic present in your water supply with the levels each system can effectively treat.

If arsenic concentrations in well water are elevated, arsenic absorption through skin contact (bathing, dishwashing, etc.) may be a concern and whole house treatment (point-of-entry) may be recommended. If your water tests positive for arsenic, consult with RI Department of Health, (HEALTH), Office of Drinking Water Quality and your physician.

For more information on these treatment options, please see factsheets entitled:

- ◆ *Reverse Osmosis Treatment of Drinking Water Supplies*
- ◆ *Ion Exchange Treatment of Drinking Water Supplies*
- ◆ *Distillation Treatment of Drinking Water Supplies*

In addition to those treatment methods listed above, Activated Alumina is another treatment option available for arsenic in drinking water.





How Activated Alumina Works

Activated Alumina is a granulated form of aluminum oxide. It is very porous and has a tremendous surface area for the removal of contaminants. In the treatment process, the water containing arsenic passes through a cartridge or canister of activated alumina. The alumina absorbs the arsenic and treated water continues to the faucet. An activated alumina cartridge combined with an activated carbon filter produces a good, broad-range water treatment.

Maintenance

Always follow the manufacturer's instruction for maintenance, cleaning, and part replacement. The activated alumina cartridge requires periodic maintenance to work properly. Activated alumina devices can accumulate bacteria, so a treatment system following the activated alumina system may be required to inactivate and/or remove bacteria. Keep a log book to record equipment maintenance and repairs.

Other Considerations

Ensure the system you choose is installed and operated according to the manufacturer's instructions. After installation, retest both the raw water (prior to treatment) and the treated water at a state certified laboratory to ensure it is working properly and removing the contaminants. You should continue to test the quality of both the raw and treated water annually or more frequently (quarterly or semi-annually) if high levels of contaminants are present in the raw water. Frequent testing will also help you determine how well your treatment system is working and whether maintenance or replacement of components may be necessary.

Product Certification

Consumers should inquire about the following before purchasing an activated alumina system:

- ◆ First, arrange to test your water to determine the contaminants present.
- ◆ Confirm that activated alumina is an effective treatment method to remove the contaminant(s) present in your water.
- ◆ Has the treatment system been tested and certified by a third party to ensure that it meets manufacturer's claims?

NFS, International is a non-profit organization that sets performance standards for water treatment devices. Because companies can make unsubstantiated statements regarding product effectiveness, the consumer must evaluate test results of the device to determine if claims are realistic. Products that have been tested or evaluated by NSF and meet their minimum requirements are entitled to display the NSF listing mark on the products or in advertising literature for products. Manufacturers and models that meet NSF's standard are included in a listing published twice a year. For more information contact NSF at: 800-NSF-MARK or <http://www.nsf.org/water.html>

When deciding on a treatment system, consider both the initial cost and the operating costs. Operating costs include the energy needed to operate the system, additional water that may be needed for flushing the system, consumable supplies and filters, repairs, and general maintenance.

Regardless of the quality of the equipment purchased, it will not perform satisfactorily unless maintained in accordance with the manufacturer's recommendations. Keep a log book to record equipment maintenance and repairs. Equipment maintenance may include periodic cleaning and replacement of some components. Also consider any special installation requirements that may add to the equipment cost. For more information, refer to factsheet *Questions to Ask When Purchasing Water Treatment Equipment*.

Protection of Private Drinking Water Supplies

You can protect your private well by paying careful attention to what you do in and around your home, as well as your neighbor's activities near your well. Regular testing and adopting practices to prevent contamination can help ensure that your well supplies you and your family with good quality drinking water. For more information on well protection see the factsheet entitled *Drinking Water Wells*.

• • •

For More Information:

This factsheet is one in a series on drinking water wells, testing, protection, common contaminants, and home water treatment methods. Contact the URI Home*A*Syst Program for more information.

University of Rhode Island Cooperative Extension Home*A*Syst Program

Offers assistance, information, and workshops on private well water protection. 401-874-5398 www.uri.edu/ce/wq

RI Department of Health, Office of Drinking Water Quality

Offers assistance, information on testing and state certified laboratories.

401- 222-6867 <http://www.health.ri.gov/environment/dwq/Home.htm>

For a listing of HEALTH's certified private laboratories in Rhode Island <http://www.health.ri.gov/labs/instate.htm>

US EPA New England website: <http://www.epa.gov/ne/eco/drinkwater/>

US Environmental Protection Agency. For a complete list of primary and secondary drinking water standards:

<http://www.epa.gov/safewater>

RI Department of Environmental Management, Office of Water Resources

Maintains listing of registered well drillers, information on well location and construction.

401-222-4700 <http://www.state.ri.us/dem/programs/benviron/water/permits/privwell/index.htm>

NSF International

For information on water treatment systems, NSF International has tested and certified treatment systems since 1965.

800-NSF-MARK <http://www.nsf.org/water.html>

Water Quality Association

The Water Quality Association is a not-for-profit international trade association representing the household, commercial, industrial, and small community water treatment industry. For information on water quality contaminants and treatment systems. www.wqa.org

This project is a collaboration of the staff at the Rhode Island Department of Health: Richard Amirault, Gary Chobanian P.E., Dana McCants, and the University of Rhode Island Cooperative Extension Water Quality Program: Alyson McCann, Holly Burdett, Brienne Neptin.

Issued in furtherance of Cooperative Extension work and Acts of May 8 and June 30, 1914. Jeffrey Seemann, Dean and Director, College of the Environment and Life Sciences. The University of Rhode Island U.S. Department of Agriculture, and local governments cooperating. Cooperative Extension in Rhode Island provides equal opportunities in programs and employment without regard to race, sex, color, national origin, sex, or preference, creed or disability. This is contribution number 3969 of the College of the Environment and Life Sciences, University of Rhode Island.

Funding for this project is supported by HEALTH.

This project is a collaboration of the staff at HEALTH and the University of Rhode Island Cooperative Extension Water Quality Program.

