



DRINKING WATER

Arsenic in Drinking Water

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This is the fourth in a series of publications on drinking water contaminants.

Arsenic is a naturally occurring toxic element commonly found in groundwater. It needs to be tested for since it is odorless, colorless and tasteless. Although it is generally present through natural means, there are industrial and agricultural practices that can lead to groundwater contamination with arsenic-containing compounds.

The maximum contaminant level (MCL), set by the Environmental Protection Agency (EPA), is 10 parts per billion (ppb). Short-term high doses and low doses over many years both cause health problems. Arsenic can be removed with a reverse osmosis (RO) device or an absorptive media device.

EPA Standard 10 ppb

The EPA lowered the maximum contaminant level in drinking water from 50 ppb to 10 ppb to protect consumer health. The EPA regulates community water systems. Public water systems are required to test for arsenic in drinking water and report those results to the public. The EPA does not regulate private wells. It is the consumers' responsibility to get their wells tested.

Health considerations

Arsenic is a health concern in low long-term exposure and in high short-term expo-

sure. Arsenic competes with phosphorus in the body, causing health problems. Potential health effects include skin damage, circulatory problems and increased cancer risk.

It is important to test for arsenic in order to avoid health impacts. If arsenic is present, bottled water can be used until a filter that can remove arsenic can be installed or possibly a new well can be drilled.

Test for Arsenic

Arsenic must be tested for since it does not give the water a detectable taste, smell or color. Well water consumers must contact a laboratory that is certified for the chemical analysis of drinking water. A local Extension agent will be able to help.

Types of Arsenic

There are two types of arsenic compounds that could be present in drinking water: pentavalent arsenic, commonly called arsenate, and trivalent arsenic, commonly called arsenite. Arsenite is more harmful than arsenate. If water is treated with an effective oxidant such as free chlorine, the trivalent arsenite is converted to the pentavalent arsenate. The arsenate is more easily removed from

drinking water.

Quick Facts about Arsenic

Type Natural toxic element present in Earth's crust

Sources Occurs naturally and from industry and agriculture

EPA MCL 10 parts per billion (ppb)

Health Issues May cause skin damage, circulatory and digestive system problems and cancer

Indications Can't smell, see or taste it. Must test for it.



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Treatment

Water can be treated for arsenic contamination in several ways, or alternate sources of water can be used. Bottled water can be used for drinking and cooking or a new well can be drilled. Arsenic cannot be removed by boiling or countertop filter systems; it can be removed by a variety of processes. Look for an arsenic system that is certified to remove arsenic by NSF International (www.nsf.org).

There are two main types of arsenic removal systems: point-of-use (POU) and point-of-entry (POE). Point-of-use systems are designed to be used at the tap and provide treated water for cooking and drinking. Since the health concerns associated with arsenic are due to ingestion, a point-of-use system is often adequate. This type of system is often less expensive to buy and easier to maintain. The point-of-entry system treats all water as it enters the house.

The two most common and cost-effective methods for arsenic removal are adsorptive media and reverse osmosis. If the arsenic is in the trivalent form then a pretreatment oxidizer will be needed.

Adsorptive media removes arsenic as the water moves through a cartridge. The arsenic sticks to the media and the water passes through. Other dissolved minerals may also stick to the media.

Reverse osmosis removes arsenic when water flows through a membrane that allows water molecules to pass through but not arsenic and other mineral contaminants.

In order to keep your water treatment device functioning, follow the manufacturer's guidelines for changing the filter and performing other maintenance tasks. Properly maintaining the treatment system will help protect the health of the household.

References

U.S. Environmental Protection Agency. 2007. Consumer Fact Sheet: Arsenic in Your Drinking Water.



Arsenic Facts

In nature

1. Arsenic is a natural toxic element found in some groundwater and soils.
2. It occurs in two inorganic forms, arsenate and arsenite.

In water supplies

3. Trivalent arsenic is more harmful and more difficult to remove.
4. Public water systems test for arsenic. If you are on a private well you must test for it.

Amounts

5. The maximum contaminant level (MCL) is set at 10 parts per billion (ppb).

Health

6. Long-term use of drinking water contaminated with arsenic may lead to thickening and discoloration of the skin, stomach pain, nausea, vomiting, diarrhea and liver effects.
7. It may also lead to cancer of the bladder, lungs, nasal passages, liver and prostate.
8. It may also lead to cardiovascular, pulmonary, immunological and endocrine effects.

Treatment

9. A homeowner can use a point-of-entry system to treat the whole house or a point-of-use system to treat just the water used for drinking and cooking.
10. After the installation of a treatment system, the water should be tested and monitored for the first year of use and tested yearly thereafter.

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