

PRIVATE DRINKING WATER IN CONNECTICUT

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Publication No. 6: Copper in Private Drinking Water Wells



The U.S. Environmental Protection Agency (EPA) does not regulate private wells. 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 Publication #23 *Private Drinking Water Standards Publication* for more information.

The Maximum Contaminant Level Goal (MCLG) for copper in public drinking water supplies is 1.3 milligrams per liter (mg/l) as established by the EPA. An MCLG is a non-enforceable, health-based level. At copper levels below 1.3 mg/l, health problems are not likely. The MCLG of 1.3 mg/l is also the level at which public water systems are required to take actions to treat their water for copper.

Introduction

Copper rarely occurs naturally in drinking water, but can often occur as a result of corrosion from the plumbing system. If drinking water test results indicate an excess of copper, removal options include: replacing copper pipes and fixtures; managing the water used for drinking and cooking by flushing water from the system before use, treating the water with home treatment equipment, or using an alternative water source. If home treatment is necessary, treatment options include: raising the water's pH, ion exchange, reverse osmosis, and distillation.

Potential Health Effects

Copper is an essential nutrient that the body requires in very small amounts. However, drinking very high levels of copper can cause nausea, vomiting and diarrhea, and can damage your liver and kidneys. People with Wilson's disease (a rare inherited disease that causes the body to accumulate copper) may be more sensitive to the harmful effects of copper and should consult their health care provider if their drinking water is contaminated with copper.

Indications of Copper

At very high levels, copper can cause a bitter metallic taste in water and result in blue-green stains on plumbing fixtures.

Sources of Copper in Drinking Water

Copper piping and fittings are widely used in household plumbing. Most copper contamination in drinking water occurs through the plumbing system, as a result of corrosion of the copper pipes and/or fittings.



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The physical and chemical characteristics of water vary, including its corrosive properties. Private well owners should be concerned with the pH of their water supply. pH is an indicator of the acid or alkaline condition of water. The pH scale ranges from 0-14; 7 indicates the theoretical neutral point. Water with a pH value less than 7 indicates acidity and tends to be corrosive, while water with a value greater than 7 indicates alkalinity and tends to affect the taste of the water. Acidity or low pH is caused by natural geological conditions in the area. The optimal pH range for drinking water is 6.5 – 8.5 as established by the EPA. For more information, see Publication #18 *pH – Acidity of Private Drinking Water Wells*.



Connecticut's groundwater is typically acidic. In addition, water that is naturally soft (i.e., has a low concentration of dissolved minerals, especially calcium and magnesium) is generally more corrosive than hard water because it is lower in alkalinity.

Naturally occurring hard water containing calcium and magnesium minerals that has been treated with an ion exchange water softener can result in the water being made more corrosive. Water softening units are sometimes used to treat iron and manganese. These treatment units can decrease alkalinity and hardness and consequently the potential for increased corrosion of copper plumbing.

Testing for Copper in Private Drinking Water Wells



If you notice a metallic taste in your water or have blue/blue-green stains in sinks or plumbing fixtures, you should test your water for copper. To determine if copper is present, arrange to test your drinking water at a state certified laboratory. Follow the laboratory's instructions carefully to avoid contamination and to obtain a good sample. To evaluate the household's highest level of copper exposure, collect a sample when water has remained motionless or stagnant in the plumbing system for at least six hours. When collecting the sample, collect the first flush of water from the cold water faucet with the aerator removed. Do not allow any water to run before collecting the sample. This is called a first-draw or first-flush sample. This first-flush will contain the highest copper levels.

After the tap has run for one minute, collect a second sample. This is called a flushed sample. The flushed sample provides a water sample that has not been in contact with the plumbing system for an extended period of time. For more information, refer to Publication #24 *Residential Well Water Testing*.

Interpreting Test Results

To interpret the test results, consider both the copper concentrations and the comparison between the first-draw and flushed samples. If results show higher levels of copper in the first-draw sample than the flushed sample, the copper is most likely coming from corrosion of household plumbing components, such as copper pipes or fittings. On the other hand, if test results show nearly equal amounts of copper in both the first-draw and flushed samples, the copper is probably coming from a plumbing source outside the house, such as the well pump.



Corrective Action

If water test results indicate copper is present in drinking water, the first course of action is to identify the source. Where possible and cost-effective, eliminate the source by replacing the copper plumbing component (s) with approved plastic options. In most cases, this will be impractical and cost prohibitive, unless household plumbing components are already old and in need of replacement.



In most cases, the following options will be more realistic: treating for low pH and/or high corrosivity, (which can result from one or a combination of low pH, low dissolved solids, and high sulfate levels), thoroughly flushing the water from the pipes before use if water test results show this to be effective, for home water treatment systems such as reverse osmosis, distillation, or ion exchange treatment at point-of-use, which can remove 20 – 90% of the copper. For point-of-entry or whole house-treatment, you can consider a calcite treatment system for pH adjustment.

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

Publication# 7 *Distillation Treatment Systems for Private Drinking Water Systems*

Publication# 10 *Ion Exchange Treatment of Private Drinking Water Wells*

Publication# 18 *pH – Acidity of Private Drinking Water Wells*

Publication # 21 *Reverse Osmosis Treatment of Private Drinking Water Systems*

Regardless of the quality of any equipment purchased, it will not operate well unless maintained in accordance with the manufacturer's recommendations. Keep a logbook 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. Refer to the Publication # 19 *Questions to Ask When Purchasing Home Water Treatment Equipment* for more information.

Flushing the Pipes

One simple way to remove copper from tap water is to let the water run before using it for cooking or drinking whenever the household water remains unused for more than six (6) hours. This would include the times when you first get up in the morning or when you come home from work. The longer the water sits in your household pipes, the more copper it may contain. Flushing the tap means running the cold-water faucet until the water feels as cold as it can get or for a period of about 1 minute. Also, avoid cooking, drinking or preparing baby formula with water from the hot water faucet; hot water dissolves copper more easily than cold water. If you need hot water, draw water from the cold-water faucet and heat it on the stove or in the microwave. **IMPORTANT NOTE:** Flushing is only a valid treatment option when test results from flushed water samples show little to no copper concentrations compared to the first flush or first draw samples.



Protection of Private Drinking Water Systems

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 Publication #26 *Private Drinking Water Wells Types & Construction of Wells*.

For more information please click on the following links:

EPA Office of Groundwater and Drinking Water

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

EPA New England

<http://www.epa.gov/region01/>

Adapted from *Healthy Drinking Waters for Rhode Islanders*, University of Rhode Island Cooperative Extension, April 2003.