Healthy Drinking Waters

for

MASSACHUSETTS

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Copper in Private Drinking Water Wells

Private well owners are responsible for the quality of their drinking water. The U.S. Environmental Protection Agency (EPA) does not regulate Private wells. Homeowners with private wells are generally not required to test their drinking water, although local Boards of Health or mortgage lenders may require well water testing. While there is also no state requirement to have your well water tested, the Massachusetts Department of Environmental Protection (MassDEP) recommends that all homeowners with private wells do so, and use a state certified testing laboratory. Homeowners can use the public drinking water standards as guidelines to ensure drinking water quality.

The Secondary Maximum Contaminant Level (SMCL) for copper in public drinking water supplies is 1.0 milligrams per liter (parts per million) as established by the EPA.

Summary

Copper rarely occurs naturally in drinking water, but can often occur as a result of corrosion from the plumbing system. Too much copper in the human body can cause stomach and intestinal distress such as nausea, vomiting, diarrhea, and stomach cramps. If test results indicate the presence 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 elevated levels of copper are present in your drinking water and 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 micronutrient. The body requires copper in very small amounts. However, very large single or long-term intakes of copper may be harmful to your health. Excess copper in the human body can cause stomach and intestinal distress such as nausea, vomiting, diarrhea and stomach cramps. You may find that there is a metallic taste in your drinking water before copper levels are high enough to cause adverse health effects. The lowest level at which these adverse effects occur has not

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been defined. For additional information on the potential health effects of excess copper in the human body, consult your physician.

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. At high levels, copper in drinking water may cause symptoms easily mistaken for flu or other illnesses. However, at low levels, copper in drinking water may cause no health symptoms.

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 or fittings.

The physical and chemical characteristics of water vary, including its corrosive properties. Private well owners should be concerned with the pH of their groundwater 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 at the site. The optimal pH range for drinking water is 6.5 – 8.5 as established by the EPA.

With some exceptions, Massachusetts' groundwater is typically acidic. In addition, water that is naturally soft is generally more corrosive than hard water because it is lower in pH and therefore, more acidic.

When treated with an ion exchange water softener, naturally occurring hard water containing calcium and magnesium minerals can become lower in pH. Water softening units are also used to treat iron and manganese. These treatment units increase acidity and the potential for increased corrosion of copper plumbing.

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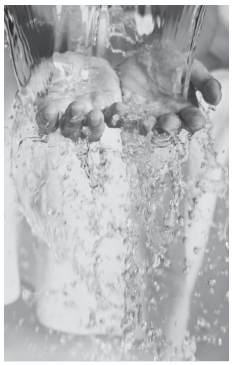

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Testing for Copper in Private Drinking Water Wells

To determine if copper is present, arrange to test your drinking water at a state certified laboratory. Follow laboratory 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 faucet. 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.

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. If you are experiencing elevated copper levels in the first draw sample, it may be likely that lead levels are also elevated. This is especially true if the plumbing system in your home or apartment contains lead solder joints, lead service lines, or brass fixtures. Since lead and copper enter drinking water under similar conditions, it is advisable to test for lead when testing for copper. 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, or the well water, itself.

Reducing Copper in Your Drinking Water

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; or 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 or pH adjustment.

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. Water used for showering or washing also helps flush the system, but each faucet where water is drawn for drinking or cooking purposes should be flushed separately. 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.

Another option for reducing your exposure to copper is to purchase bottled water. This may be a useful option, particularly if it will be used by young children for drinking water, or for making infant formula.

Regardless of the quality of the 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.

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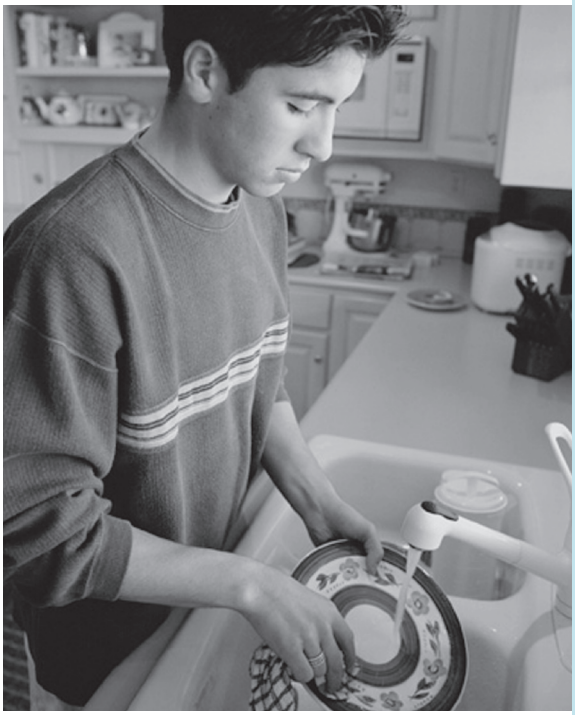
Equipment maintenance may include periodic cleaning and replacement of some components. Also consider any special installation requirements that may add to the equipment cost. For more information, refer to the fact sheet: *Questions to Ask When Purchasing Water Treatment Equipment.*



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.

Resources

UMass Extension

This fact sheet is one in a series on drinking water wells, testing, protection, common contaminants, and home water treatment methods available on-line at the University of Massachusetts website: http://www.umass.edu/nrec/watershed_water_quality/watershed_online_docs.html and Cape Cod Cooperative Extension: 508-375-6699 http://www.capecodextension.org

MA Department of Environmental Protection, Division of Environmental Analysis

Offers assistance, information on testing and state certified laboratories: 617-292-5770 For a listing of MassDEP certified private laboratories in Massachusetts: http://www.mass.gov/dep/service/compliance/wespub02.htm

U.S. Environmental Protection Agency, New England Office

Information and education on where drinking water comes from; drinking water testing and national laws; and how to prevent contamination: 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

MA Department of Conservation and Recreation, Division of Water Supply Protection

Maintains listing of registered well drillers, information on well location and construction: 617-626-1409 http://www.mass.gov/dcr/waterSupply/welldril/index.htm

NSF International

The NSF International has tested and certified treatment systems since 1965. For information on water treatment systems: 800-NSF-MARK (800-673-6275) http://www.nsf.org/consumer/

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: http://www.wqa.org

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EPA United States Environmental Protection Agency New England

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