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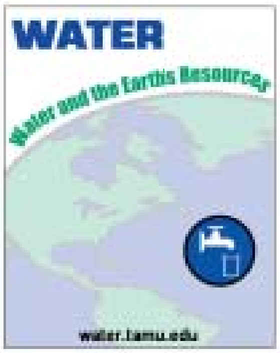

Drinking Water Problems: Copper

Monty C. Dozier, Assistant Professor and Extension Specialist,
Mark McFarland, Professor and Extension Soil Fertlity Specialist,
Bruce J. Lesikar, Professor and Extension Agricultural Engineer, Texas Cooperative Extension,
The Texas A&M University System

Copper has proven to be a metal of great benefit to people throughout history. Copper has been molded into many instruments such as pots, weapons and jewelry. In recent history, copper and its alloys have been fashioned into plumbing pipes and fixtures. Although these applications of copper to water distribution systems have been extremely beneficial to people, water can react with copper to dissolve small amounts of copper into the water supply. Individuals who ingest this water can be exposed to elevated levels of copper.

What are the health effects of copper?

Even though we require 1,000 micrograms of copper daily in our diet, elevated levels of ingested copper can be harmful. Elevated levels of copper for 14 days or more can lead to health problems such as permanent kidney and liver damage in infants under the age of 1 year. In adults, high levels of copper can cause digestive disorders such as nausea, vomiting, diarrhea and stomach cramps.

People affected with Wilson's disease, a rare genetic disorder that affects approximately one in 30,000 people worldwide, cannot excrete excess copper. Copper can accumulate in these individuals to dangerous levels and, if not detected and treated, can cause death.

What is the maximum allowable level of copper in drinking water?

The U.S. Environmental Protection Agency (EPA) has set the maximum contaminant level (MCL) for copper at 1.3 milligrams per liter (mg/L), which also may be reported as parts per million (ppm). The MCL represents the level at which the U.S. EPA believes a person can ingest a particular contaminant over an entire life span with no significant increase in health risks.

How does copper enter the water supply?

Unlike other water contaminants, elevated copper levels usually do not occur naturally in ground or surface water supplies.

When high levels of copper are detected in water, a household plumbing system usually is the source. Water can react with copper pipes, fittings and fixtures (a process called corrosion) to release copper into the water supply. As water sits in the system over time, such as overnight or while residents are away from home, copper can be released into the water. When a faucet is first turned on after such a period of non-use, copper levels may be highest.

Corrosion of plumbing to release copper can be caused by several factors. These include water quality conditions related to pH, salinity, dissolved oxygen and the presence of electrical currents. Proper testing of the water and diagnosis of the cause of elevated copper concentrations in the water are essential to identify a treatment system that will control or correct the problem.

What are the indications of copper present in your water?

Elevated concentrations of copper can give water a metallic taste. In addition, blue-green stains on plumbing fixtures and other surfaces the water contacts may be an indication of the corrosion or leaching of copper into the water. As mentioned earlier, high levels of copper also can cause adverse health effects that indicate a problem.

How can I test my water for copper?

Testing by an approved water-testing laboratory is required to determine the copper concentrations in water. To determine the highest level of copper present in water, take a sample after the system has not been used for at least 6 hours. Be prepared to collect the sample in a lab-approved sample bottle as soon as you turn on the water. Do not allow the water to run from the faucet for any period of time before you collect the sample.

A sample collected by this method is called a "first-flush" sample; it is important to use this method, given the fact that copper may be dissolving into the water over time. Water drawn from the distribution system after an extended period of non-use will have the highest concentrations of copper present. Properly label this sample as "first-flush."

Another sample, referred to as the "purged" sample, should be collected in a separate bottle after allowing the water to run for 5 minutes. Label this sample as "purged." This sample will indicate copper levels in water that has not been in contact with the plumbing system for an extended period.

For a list of approved water-testing laboratories in your area, contact your local health department or county office of Texas Cooperative Extension (TCE).

How should I interpret water-analysis results?

To interpret the results from your water analysis, you must review copper concentrations from both the "first flush" and the "purged" samples. If the cooper concentration in the "first-flush" sample is greater than the copper concentration in the "purged" sample, copper most likely is coming from plumbing components of your household water distribution system, such as copper pipes, fixtures or fittings. If concentrations of copper for both the "first-flush" and the "purged" samples are nearly equal, the copper is probably coming from a source outside your home.

What management options are available?

If your water-test results indicate that copper is present in drinking water at concentrations above the MCL, first identify the source of the copper. Then, if possible, eliminate the source.

However, because in many cases the source is a household plumbing system, its elimination may not be practical. Therefore, you should take management steps to reduce exposure to elevated levels of copper.

Management of copper coming from a home plumbing system sometimes can be achieved by flushing the copper from the system before using the water for drinking, cooking or other activities involving ingestion. Flushing the system requires—every time a particular faucet has not been used for 6 or more hours—allowing water to run from the faucet until the water seems as cool as it will get.

Water run during the flushing period can be collected and used for non-ingestion purposes, such as watering plants, cleaning, or washing clothes. Avoid using hot water for any cooking or drinking needs because hot water dissolves copper more readily than does cold water.

If flushing your water distribution system does not reduce copper concentrations to acceptable levels or is not an acceptable management strategy, consider treating your water or seeking an alternative drinking-water supply such as bottled water. Treatment options for reducing copper concentrations in water include (1) reverse osmosis, (2) distillation or (3) ion exchange. Reverse osmosis and distillation treatment options typically are point-of-use, single-faucet treatments. Refer to TCE publication L-5450, *Solving Water Quality Problems in the Home*.

Summary

Copper seldom occurs naturally in ground or surface water. Most often, it enters a household water supply through dissolution of copper from plumbing fixtures, pipes and fittings. Too much copper can cause adverse health effects such as stomach cramps, nausea and diarrhea. The U.S. EPA has set the MCL for copper at 1.3 mg/L or ppm.

To determine the concentration of copper in your water supply, follow proper sample collection procedures and use an approved testing laboratory. Once you know the concentration of copper in your water supply, you can select an appropriate management strategy based on your situation.

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