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# YOUR HOUSEHOLD WATER QUALITY: LEAD AND COPPER

*Private wells are exclusively supplied by groundwater. The source waters for most public water systems in south Georgia (and some in north Georgia) are also supplied by groundwater. Generally, lead and copper concentrations in the major underground aquifers in Georgia are far below the U.S. Environmental Protection Agency's (EPA) action levels. **They enter the household drinking water system and exceed the action levels almost exclusively via corrosion of plumbing materials.** Many homes built prior to the 1988 still have lead solder connecting copper pipes, unless later on replaced by PVC pipes. Also, indoor plumbing fixtures are often made of lead and copper or their alloys, such as brass. Corrosive water can dissolve small amounts of these metals from plumbing which, upon drinking, may be harmful to your health. In 1992, the lead and copper rule, published by the EPA, became effective and required that municipal water suppliers must treat water to reduce concentrations below action levels of 0.015 milligrams (mg) lead per liter or 15 parts per billion (ppb) and 1.3 mg copper per liter or 1.3 parts per million (ppm). Keep in mind, however, that the EPA does not regulate private water supplies (such as well water), nor can the EPA control the lead and copper contamination that may result from your household pipes.*

## WHAT IS MEANT BY CORROSIVE WATER?

Water becomes corrosive due to acidic pH, low hardness, low alkalinity, and high temperature. Below are some important observations.

- Generally, around 74% of the private well waters in Georgia meet the EPA recommended pH bracket of 6.5 to 8.5. However, the remaining 25% have acidic pH of less than 6.5. Only 1% shows pH higher than 8.5.
- Saturation Index (SI) is the single most useful indicator of the corrosiveness and scale-forming ability of water. It is estimated based on pH, temperature, hardness, and alkalinity. The more negative the SI, the more corrosive the water. Based on the SI number, around 4% of the private well waters in Georgia could be severely corrosive (with SI < -5.0) and around 47% could be moderately corrosive (with SI ranging from -5.0 to -1.0).

For more information about corrosive water, see **UGA Extension Circular 858-9** [\*Your Household Water Quality: Corrosive and Scaling Water\*](#). Overall, 5%–6% of household waters, supplied by private wells, contain lead and copper concentrations higher than their action levels. The exceedance of action levels for lead and copper are more frequently associated with acidic water pH (less than 7.0) and low water hardness (soft water).

## WHAT DO YOU NEED TO KNOW ABOUT LEAD AND COPPER IF YOU ARE ON A PUBLIC WATER SUPPLY?

As in other parts of the United States, some major public water supplies (PWS) in Georgia may still have 100% lead piping bringing water from the utilities to homes and businesses. In accordance with the federal Safe Drinking Water Act, the Georgia statute 391-3-5 under Georgia Rules for safe drinking water requires “any pipe, solder or flux which is used in the installation or repair of any public water distribution system shall be lead free with not more than 8.0% lead in pipes and fittings; and not more than 0.2% lead in solders and flux. However, these requirements do not apply to leaded joints necessary for the repair of cast iron pipes.”

Dissolved oxygen in the water combines with the metals (copper, zinc, or lead) at the inner surface of the pipes in the public water distribution channel (and also in the household plumbing system) to form a metal oxide. This metal oxide layer, naturally develops through the decades, acts as a barrier by coating the inner surfaces of lead piping. Based on the corrosiveness of the source water and treated water, PWS also add potable lime or phosphates to form a further barrier to prevent lead from getting into drinking water from the distribution pipes and joints. Careful control of the corrosiveness of water along with other measures mostly prevents dangerous levels of lead from entering the drinking water system from the pipes and joints. Nevertheless, the PWS, depending on their size, are required to monitor the lead concentration in their waters covering adequate number of sampling sites in the customer's homes at a defined interval as described in Georgia statute 391-3-5-.25, "Treatment Techniques, Lead and Copper Requirements" and document that the lead and copper concentrations are below their action levels.

## CAN DRINKING WATER THAT CONTAINS LEAD OR COPPER MAKE ME SICK?

Both lead and copper are harmful when too much is ingested, but lead is more toxic because it builds up in the body until it reaches toxic levels. **Lead** damages the brain, nervous system, kidneys, reproductive system, and red blood cells. It is more toxic to children than to adults, and it can harm their mental and physical development. **Copper** is much less toxic than lead; however, elevated levels of copper for 14 days or more can cause permanent kidney and liver damage in infants under the age of one year and it can cause nausea, vomiting, and diarrhea in people of all ages. Persons with Wilson disease (one in 30,000 people worldwide) cannot excrete excess copper and it can accumulate to poisonous levels. If not detected and treated, this disease can be fatal.

## WHAT ARE THE MAXIMUM ALLOWABLE LEVELS OF LEAD AND COPPER?

Element	Health Concern Level	Staining and Bitter Taste Level
Lead (Pb)	> 15 ppb	Not applicable
Copper (Cu)	> 1.3 ppm	> 1.0 ppm

## WHAT CAN I DO IF MY WATER CONTAINS LEAD OR COPPER?

If lead or copper exceed a safe amount in your water supply, there are three general measures that can be taken to correct the problem:

1. Control water corrosiveness so that it does not dissolve as much lead and copper from the plumbing.
2. Remove the sources of the lead or copper in the plumbing.
3. Remove the lead or copper by treating the water before drinking.

*Options 1 and 2 are the preferred alternatives.*

## WHAT IS CORROSION CONTROL?

Low pH, hardness, and alkalinity, and low dissolved solids all increase corrosion of plumbing. To assess the corrosion potential of water, analysis of water using the Georgia Expanded Water Test Package is recommended (at the date of publishing, that is the W2 analysis conducted by the UGA College of Agricultural and Environmental Sciences Agricultural and Environmental Services Laboratories and available from your county Extension office). A saturation index is calculated from the measured values to assess the need for treating the water to reduce corrosion. If required, typical treatment recommendations are to increase the pH by using a commercially available filter bed made of calcite (marble chips), or a blend of calcite and magnesium oxide (corosex). While calcite is a slow acting filter bed, corosex acts rapidly. Use the blend when the actual pH is below 6.0. Corrosion of pipes is greater if grounding wires are connected to them. A professional electrician should be called to correct this problem.

## WHAT IS SOURCE REMOVAL?

The EPA banned the use of lead and lead solder in plumbing systems in 1988, so houses built after this time should be free of lead. The EPA did not ban the use of copper because its concentration in water is also easily controlled by treating water to reduce its corrosiveness. If lead concentrations in water are above the limit, one or more of the following may need to be corrected.

- Replace 50/50 lead/tin solder at plumbing joints. This type of solder is dull gray and appears shiny where scratched; whereas, 95/5 tin/antimony solder remains shiny.
- Replace brass fittings in well pumps.
- Replace well screens and/or packing collars that contain lead.
- Replace lead pipes and service lines in older homes.

## WHAT ARE THE TREATMENT OPTIONS FOR LEAD AND COPPER REMOVAL FROM DRINKING WATER?

Lead and copper can be removed from drinking water by:

- Reverse osmosis
- Distillation
- Ion exchange

For more information on these treatment options see UGA Extension Bulletin 939, [Water Quality and Common Treatments for Private Drinking Water Systems](#).

Some other tips:

- Do not drink water from hot water lines since lead and copper are more soluble at elevated temperatures. Moreover, hot water heaters accumulate various metals over time.
- Water that has stood overnight will have higher levels of lead and copper.
- Allowing the cold water tap to run for one minute before drinking is advisable if your system has a problem with elevated levels of lead and/or copper.

**Need more information about the presence of lead and copper in your pipes?  
Call your local Extension agent.**

### References

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