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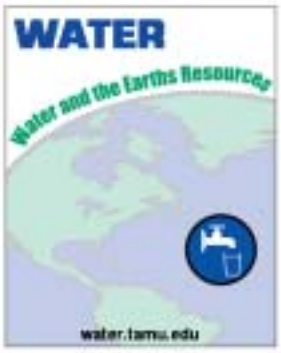

Drinking Water Problems: Lead

Monty C. Dozier, Assistant Professor and Extension Water Resources Specialist
Mark L. McFarland, Associate Professor and Extension Soil Fertility Specialist
The Texas A&M University System

Almost everyone knows that lead-based paint caused serious health problems (especially in children) before it was banned. But not everyone is aware that people can ingest lead from other sources such as contaminated food and drinking water. Imported foods in lead-soldered cans and foods served in lead-glazed ceramics or leaded crystal may contain lead. If your water comes from a public water system there is little cause for concern, because the law requires that public systems eliminate any sources of lead contamination. But if your water comes from a private well, it might contain enough lead to warrant action.

How does lead affect health?

Lead can be absorbed through the digestive tract, the lungs and the skin. It accumulates in the body and can cause lead poisoning. Even at low concentrations, when there are no outward symptoms, lead can damage the brain, kidneys, nervous system and red blood cells. Some effects of lead poisoning may diminish if the source of exposure is removed, but some damage is permanent.

Symptoms of lead poisoning include tiredness, a short attention span, restlessness, poor appetite, constipation, headaches, sudden behavior change, vomiting and hearing loss. Adults with lead poisoning may be irritable and disoriented.

Interestingly, most children with lead poisoning do not show any visible symptoms, even though young children, infants and fetuses absorb lead more quickly than adults and are vulnerable to even small amounts of it. Lead poisoning can cause a child's mental and physical development to be irreversibly stunted.

Lead in drinking water is not a main source of lead poisoning, but it can increase the amount of lead people are exposed to. This is particularly risky for infants who drink baby formulas and juices that are mixed with water containing lead. On average, about 10 to 20 percent of a child's lead exposure might come from drinking water; however, infants who are fed formula could get 40 to 60 percent of their lead intake from water.

The only way to detect lead poisoning is with a blood test. The Centers for Disease Control and Prevention recommend that all children be tested. Your doctor can give you more information.

How does lead enter drinking water?

Though lead rarely occurs naturally in water, lead mining and smelting operations may be a source of contamination. According to the U.S. Environmental Protection Agency (EPA), Texas is among the top ten states in the amount of lead released into the environment. Most lead contamination takes place at some point in the water delivery system as water corrodes service connections, pipes, solder and brass fixtures that contain lead. Some waters are more corrosive than others. Factors that cause water to be corrosive are acidity, high temperature, low dissolved solids content, and high amounts of dissolved oxygen or carbon diox-

ide. Using an ion exchange water softening unit does not change the corrosiveness of water enough to prevent lead contamination.

Lead in drinking water is most often a problem in either very old or very new houses. Lead pipes were once commonly used in plumbing systems and are most likely to be found in homes built before 1930. Copper plumbing eventually replaced lead piping, but lead-based solder was still used until 1986 when Congress passed a law requiring that no pipes, plumbing fixtures, solder or flux contain more than 8 percent lead. Today, brass materials are used in residential, commercial and municipal water distribution systems and fixtures. Brass (also called bronze in some products) contains small amounts of lead to make it malleable. So even though plumbing materials contain less than 8 percent lead, new brass faucets and fittings can leach lead into the water. After a few years, if the water is hard, calcium carbonate deposits will build up inside brass pipes and fittings and keep lead from leaching out. Softening naturally hard water with an ion exchange softening unit keeps these protective deposits from forming.

The ban on lead in water distribution system materials applies to any public water system and to any plumbing (residential or non-residential) attached to a public system. While the ban does not apply to private wells, most manufacturers of well components voluntarily follow the 8 percent limit. However, there are reasons for owners of private wells to be concerned about lead contamination. First, wells constructed before the mid-1980s may contain a lead seal (packer) above the screen and a lead plug at the bottom of the screen. These fittings can contaminate drinking water. In addition, submersible well pumps are made of brass. These pumps are usually 4 inches in diameter and fit into a well pipe or casing. Wells with submersible pumps are usually 40 to 500 feet deep. This type of well may also be used in some very small public water systems. Submersible brass pumps can leach excessive amounts of lead into water because their brass or bronze fittings and casings are in constant contact with water. Non-submersible pumps pose no danger unless they have brass foot valves or other fittings that are in constant contact with water. The Environmental Protection Agency became aware of this problem when it tested about 1,500 private household wells and found that about 4 percent had lead levels higher than 10 micrograms of lead per 1 liter of water, or 10 parts per billion (ppb). The EPA considers water unsafe to drink if it contains more than 15 ppb.

How do I test water for lead?

There are no laws requiring that private water supplies be tested for contamination but it is a good idea to do so, especially if a problem is suspected or there are young children or pregnant/nursing women who use the water. To determine if drinking water contains lead, the water must be tested by a laboratory certified to do these tests. Home test kits are hard to use and may not be accurate. Contact your county Extension office, local water utility or health department for information about water testing laboratories in your area. Carefully follow all directions the laboratory gives you regarding the kind of container to use and how to collect and submit water samples.

It's important to collect two samples.

> Sample #1: Do not use the plumbing system for 6 hours or more, so that water sits motionless in the pipes. Then turn on the water and collect a sample immediately. This is called a first-draw or first-flush sample. Because lead continuously dissolves into water over time, water collected after the system has not been used for awhile will contain the highest concentration of lead.
>
> Sample #2: Collect a second sample of water after the tap has run for at least 5 minutes. This is called a purged-line or flushed sample. It will show the lead content of water that has not been in contact with the plumbing system for a long time.

What do the test results mean?

Interpreting a water test involves not just determining how much lead is in the water, but also comparing the amounts of lead in the two samples.

The EPA has established Maximum Contaminant Level Goals (MCLG) for various chemicals that may be found in water. The MCLG is the highest level of contamination that can exist without causing health concerns. The MCLG for lead in drinking water is set at zero. In other words, the EPA considers any amount of lead to be undesirable. However, the EPA has set the maximum contaminant level or action level at 15 ppb. This is the lead concentration the EPA enforces with public water supplies. When the concentration is greater than this action level the water supplier must eliminate the problem. Users of private water supplies also should set 15 ppb as an action level. If your water contains more lead than this, stop using it immediately and find an alternate source of water until the problem can be resolved.

If the first-draw sample contains more lead than the purged-line sample, lead is leaching from the household plumbing system. If both samples contain nearly equal amounts of lead, the water is being contaminated by a source other than the household plumbing system.

How do I eliminate lead from drinking water?

If tests indicate that lead is leaching from the household plumbing system, try to find and eliminate the source. Sometimes this is neither possible nor cost-effective, in which case "point of use" treatments can be installed (discussed below).

If the source of lead is beyond the household plumbing, the first step is to try to locate and eliminate the source. If your household is served by a public water system, contact the water supplier and ask what steps will be taken to remove the contamination. If the source is a private well, check both the well and the pump for sources of lead. A licensed water well contractor may be able to help you determine whether any of the well components are sources of lead. If they are, eliminate them if at all possible.

In searching for sources of contamination, determine whether any electrical equipment (including telephones) has been grounded to water pipes. Electric current traveling through the ground wire accelerates corrosion in pipes. A qualified electrician will be needed to correct this problem.

When it is not possible to eliminate sources of lead contamination, the only option is to use an alternate source of drinking water (such as bottled water) or install a treatment system on one faucet in the home and draw water for drinking and cooking from that faucet only. This is called a "point of use" treatment system. There are several types of treatment systems, including reverse osmosis, distillation and carbon filter systems. Reverse osmosis units remove about 85 percent of the lead from water. Distillation removes about 99 percent. A water softener can be used with both a reverse osmosis and a distillation unit. Carbon filters that remove lead must have low flow rates, generally not more than 1/2 gallon per minute.

Summary

Water from private wells can be contaminated by lead leaching from pumps, pipes and other system components. To safeguard health, it is important to have water tested and, if there is a problem, eliminate sources of lead contamination. If it is not possible to eliminate the lead entirely, there are treatment systems that can make water safe for drinking and cooking.

This publication was adapted from NebGuide G1333, "Drinking Water: Lead," published by Nebraska Cooperative Extension Service, 1997.

For more information:

Home*A*Syst Handbook, Assessment 3. National Farm*A*Syst/Home*A*Syst, Madison, WI.

"Lead Contamination in Water Wells," L-5096 (Texas Cooperative Extension).

"Preventing Lead Poisoning in Young Children." October 1991. Centers for Disease Control, U.S. Dept. of Health and Human Services, 4770 Buford Highway, Atlanta, GA 30341-3724; (770) 488-7330.

"Lead in Your Drinking Water: Actions You Can Take to Reduce Lead in Drinking Water." Publication EPA/810/F93/001. June 1993. U.S. Environmental Protection Agency. Available from the National Center for Environment: Publications and Information, P.O. Box 42419, Cincinnati, OH 45242-2419.

"Reducing Lead Hazards When Remodeling Your Home." Publication EPA/747/R94/002. April 1994. U.S. Environmental Protection Agency. (Available from National Center for Environment—address above.)

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