PRIVATE DRINKING WATER IN CONNECTICUT

Publication Date: April 2009

Publication No. 12: Lead 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, public drinking water standards can be used as guidelines to evaluate the water quality in private wells. Refer to Publication #23 *Drinking Water Standards* for more information.

Although there are no federal private well water quality standards, most states utilize the standards identified for Public Water Systems. The Maximum Contaminant Level Goal (MCLG) for lead is zero milligrams per liter (mg/l) or parts per million (ppm) for Public Water Systems and it stands to reason this is a desirable goal for private wells. This is also true for the Action Level at which Public Water Systems are required to take actions to treat for lead i.e.; when 10 per cent of their public tap water samples exceed 0.015 milligrams per liter or 0.015 parts per million.

Keep in mind this Action Level is <u>not</u> an MCL. The same Action Level should also be used for private wells since zero is not realistically obtainable. Lead poisoning can be a serious threat to children. Children are easily susceptible to lead poisoning from multiple sources such as lead paint chips, drinking water, etc. Children are at a higher degree of vulnerability due to their young developing bodies. Elevated lead levels may trigger learning disabilities, decreased growth, hyperactivity, impaired hearing and even brain damage. Pregnant women are also susceptible because lead exposure before or during pregnancy can alter fetal development and cause miscarriages.

<u>Introduction</u>

Lead rarely occurs naturally in drinking water. It is more common for lead contamination to occur as a result of corrosion of water piping, fittings, fixtures, and solder. Lead in the human body can cause serious damage to the brain, kidneys, nervous system and red blood cells. Young children, infants and fetuses are especially vulnerable to lead poisoning. When a child has been identified with an elevated blood lead level, the drinking water should be tested for lead. Test for lead in drinking water by following instructions and procedures provided by a state certified laboratory. If test results indicate the presence of lead, take appropriate steps to identify and eliminate the sources. Options for treating lead in drinking water include:

- Managing the water supply used for drinking and cooking through proper flushing of the pipes.
- Removing the lead source by replacing old lead pipes, the well pump or other plumbing components that contain lead-based solder or brass.

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- Installing a home treatment system.
- Using an alternative water source, such as bottled water from an approved source.

The treatment option (s) you select must be based on the specific situation, and consideration of factors such as what part of the plumbing system is contributing to the problem, how feasible it is to replace those plumbing components, the concentration of the lead in the drinking water, whether children are living in the house, etc. Home treatment systems that are available for treating lead include Ion Exchange, Reverse Osmosis, Distillation, and Activated Carbon.

Potential Health Effects

It has been demonstrated that lead provides no benefit to humans or animals and in fact, produces profound negative health effects. Lead can be absorbed through the digestive tract and is carried by the blood throughout the body. The severity of the effects of lead poisoning varies depending upon the concentration of lead in the body and the stage of development at the time of exposure. The blood lead concentration can be determined with a blood test.

Although lead has long been recognized as poisonous at high dosages, recent studies show it is damaging at lower levels than previously believed. As a result, maximum lead exposure levels have been lowered. Excess lead in the human body can cause serious damage to the brain, kidneys, nervous system, and red blood cells. Young children, infants and fetuses are particularly vulnerable to lead poisoning. Growing children absorb lead more readily and their developing body systems are more susceptible to lead's harmful impact. Lead exposure can stunt a child's mental and physical development.

Lead in drinking water is usually not a primary source of lead poisoning, but it can increase total lead exposure, particularly the exposure of infants who drink baby formulas and juices mixed with lead tainted water.

Indications of Lead

Lead does not alter the taste, color, or smell of water. The effects of low levels of lead toxicity in humans may not be obvious. There may be no discernable symptoms or symptoms may be mistaken for flu or other illnesses, therefore blood testing is the only reliable means for assessing lead exposure.

Sources of Lead in Drinking Water

Lead rarely occurs naturally in water. Most lead contamination in water takes place at some point in the water pipes and plumbing system. This occurs as a result of corrosion, the reaction between the water and lead in parts of the water delivery system. Materials in the water delivery system that may contain lead include old lead pipes, lead-based solder and some brass components in well pumps, faucets, valves, etc.

Corrosivity

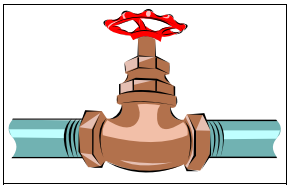
Some water sources are naturally more corrosive than others. Several factors cause water to be corrosive including: acidity (low pH), high temperature, low total dissolved solids (TDS) content, low alkalinity & hardness, and high levels of dissolved oxygen, carbon dioxide, sodium chloride, hydrogen sulfide and sulfate. Generally, naturally soft water is more corrosive than hard water, because it is more acidic and has low TDS. Softening naturally hard water with an ion exchange unit will increase the corrosivity of the water resulting in an increase in the water's ability to dissolve lead.

Lead Pipes

Through the early 1900's it was common in some areas of the country to use lead pipes for interior plumbing. Lead piping was also used in the service connections that join the residences to public water systems (goosenecks). Lead piping is most likely to be found in homes that were built before 1930. Copper piping has replaced lead piping but lead based solder/fluxes may have been used to join the copper piping. Plumbing systems installed in homes built before 1988 may contain lead-based solder.

Brass

Today, brass materials are used in nearly 100 percent of all residential, commercial and municipal water distribution systems. Many household faucets, some older pipes, plumbing fittings, check valves and well pumps contain brass parts. Brass contains some lead to make casting easier and to make the machining process more efficient. However, the lead content of brass plumbing components is now restricted to a maximum of 8 percent. Even at this level, lead can leach from new brass faucets and fittings. Some private wells may have submersible pumps that contain brass or bronze parts capable of leaching lead. You may want to check with the manufacturer as to whether your well pump has leaded components.



Lead Solder

Solder for potable fixtures should utilize lead-free solder and flux only. Tin/antimony or some other approved lead-free solder should be utilized. Check the labels on solder/flux packages to ensure that you are using a lead-free product for all potable water plumbing.

Well Construction

Some well screens also may contain lead or a "lead packing collar". Some older wells may have been installed with a lead drive shoe. Potential lead contamination exists if the well is a driven point well and has been "shot" to clear the screen. Lead shot was sometimes poured into a well to keep out sand. Alternately, lead wool was also used. These procedures are no longer common practice.

Testing for Lead in Private Drinking Water Wells

To determine if lead is present and a possible source of lead exposure, arrange to test your water at a state certified laboratory. Carefully follow the laboratory's instructions to avoid contamination and obtain a true representative sample of your well water. Make sure any water treatment device is taken off-line or bypassed. Home test kits may not provide accurate results. Refer to Publication # 24 R*esidential Well Water Testing* for more information.

First-draw Sample

To evaluate the household's highest level of lead concentration, collect a sample when water has remained stagnant in the plumbing system for six or more hours. This would be first thing in the morning or in the evening upon coming home from work or school. When collecting the sample, collect the first draw water from the faucet. Collect the water sample at the kitchen **cold-water** tap or the **cold-water** faucet used for drinking/cooking purposes. Do not allow any water to run before the sample is collected. This is commonly referred to as the "first-draw sample". Because lead will continually dissolve in the water as the water sits in the pipes, the lead concentration in water will increase with time. This is why water drawn after any extended period of non-use will contain the highest lead levels in the vast majority of situations.

Flushed Sample

Collect a second flushed sample from the same faucet after the water has been run until a distinct temperature change is noted, usually after 1-2 minutes. This is called the "flushed sample". The lead

concentration in the “flushed sample” will likely be lower than the “first-draw sample” because there has been less contact time in the distribution system.

Other Testing

You may want to consider testing the "flushed sample" for pH, alkalinity and hardness. These results may help in determining future treatment options if necessary.

Interpreting Test Results

Interpreting water test results for lead involves considering both the magnitude of the lead concentration in the samples and comparing the “first-draw” and “flushed samples”. As discussed earlier, if results show higher levels of lead in the “first-draw sample “compared to the “flushed sample”, the lead is likely coming from corrosion of the household plumbing components (lead piping, lead-based solder or brass fixtures/fittings). On the other hand, if test results show nearly equal amounts of lead in both the “first-draw” and “flushed samples”, or a higher amount in the “flushed sample”, then the lead is probably coming from a source outside the house, such as the well pump or the well casing material.

Corrective Action

When the “first-draw sample” is significantly higher than the “flushed sample” then the water test results indicate the source of lead to be within the household plumbing system. When feasible, attempt to identify and eliminate the lead source (s). In the meantime, allow the cold-water tap to run (flush) for at least one minute before using it for cooking or drinking. Do not use the hot-water tap for cooking or consumption, especially for making baby formula. Hot water dissolves lead more readily than cold water.

Treat for Corrosivity

In addition to identifying potential lead sources, consider the corrosivity and pH of the water. Raising the pH to a more neutral range of 6.5-8.5 can reduce the leaching of metals, including lead, from the plumbing system. Refer to Publication # 18 *pH-Acidity of Private Drinking Water Wells* for more information.

Electrical Grounds

Another practice, which may contribute to increased corrosion, is the grounding of electrical equipment, including telephones, to metallic water pipes. Electric current traveling through the ground wire may accelerate the corrosion of different metals that are present in the water pipes and fixtures. This accelerated corrosion may result in higher lead levels.

Have a licensed electrician check your home’s plumbing for any electrical grounds, including appliances, computers and telephone grounds. If these grounds are present, have the electrician test the piping for any continuous or intermittent current. There should be none. If there is current present ask the electrician if the source of the current (fault) can be found and eliminated or, if the ground (s) can be safely removed and replaced with an external ground rod with less resistance than the building’s plumbing. This practice should eliminate any possible pipe corrosion and shock hazards.

Treatment and Bottled Water

If at all possible and cost-effective, eliminate the source of lead in your home’s drinking water piping. If that is not possible, and flushing the pipes is not an effective management option, consider home treatment systems or an alternative drinking water source such as approved bottled water.

Home Treatment Systems

There are several treatment methods that are suitable for removing lead from drinking water including; reverse osmosis, distillation, activated carbon filters and ion exchange media specifically designed to remove lead. Keep in mind that ion exchange may increase the corrosivity of the water. Typically these methods are used to treat water at only one faucet (point of use). Reverse osmosis units can remove up to 85 percent of lead from water. Distillation can remove up to 99 percent. Using lead selective carbon filters may require low flow rates. Typically they have flow controllers that limit the filter to 0.25 to 0.5 gallons per minute (gpm). For more information on these treatment options, refer to the following Publications:

#1 Activated Carbon Treatment of Drinking Water Systems
#7 Distillation Treatment of Drinking water Systems
#10 Ion Exchange of Private Drinking Water Systems
#21 Reverse Osmosis Treatment of Drinking water Systems

When choosing a treatment method, consider both the initial cost and the operating costs. Operating costs include the energy needed to operate the system (electricity), additional water flows that may he needed to periodically flush the system, replaceable supplies/filters and repairs and maintenance. All treatment units that are used should be listed/approved by the National Sanitation Foundation (NSF).

Regardless of the quality of the equipment purchased, it will not perform satisfactorily unless it is maintained according to the manufacturer's recommendations. Keep a logbook to record equipment maintenance and repairs. Equipment maintenance may include periodic cleaning/flushing and replacement of some components. Also consider any special installation requirements (e.g., repiping) that may add to the equipment costs. For more information refer to Publication # 19 *Questions to Ask When Purchasing Water Treatment Equipment.*

Protection of Private Drinking Water Wells

You can protect your well by paying careful attention to what you do in and around your home as well as your neighbor's activities near your well. Additionally, it is important to select fixtures with low lead content and to ensure that proper plumbing materials are used, such as lead free solder/flux. Regular testing and adopting practices to prevent contamination can help ensure that your private well supplies you and your family with good quality drinking water. For more information on well protection refer to Publication # 26 *Private Drinking Water Wells.*

Interpretation of Lead Water Quality Results

Result is equal to or exceeds 0.015 mg/l or 15 micrograms per liter (ug/l)
This result requires that immediate action be taken, such as using bottled water for drinking and cooking, until the source of lead is identified and corrected.

Result is less than 15 µg/l but greater than 5 µg/l –
A confirmation sample is **always** suggested. Routine quarterly testing is also suggested to ensure that results do not change.

Results less than 5µg/l –
Relatively lead- free; annual monitoring is suggested to ensure that this level does not change significantly.

Water Sampling Instructions for Lead

It is very important that you follow the instructions listed below when collecting samples of drinking water for lead analysis. Test results should accurately represent the lead levels to which occupants may be exposed when using the water for consumption. Two samples should be taken:

- The first sample is collected after the water has been standing within the plumbing system for at least six (6) hours. (NO WATER USE)
- The second sample is collected after the water has been flushed for two (2) minutes.

Collection Process

1. Collect both samples from the **cold-water** kitchen tap that is typically used for drinking water.
   - These samples are not to be collected from a tap that is equipped with a treatment device.
   - If the kitchen tap is equipped with a treatment device, the device should be removed or bypassed before sampling, or another tap should be selected for sampling.

2. The samples must be collected from the tap after water has remained unused for at least (6) hours (Note: leaking faucets and toilets may influence the test).
   - Collecting the samples first thing in the morning before using the water is the easiest way to do this.
   - The night before the samples are collected, remove the faucet strainer (aerator) from the tap that is to be sampled and run cold water to flush the tap.
   - Clean any debris from the strainer and then replace the strainer.

3. The first sample must be collected without pre-flushing the tap. This sample is known as the **"FIRST-DRAW"** sample.
   - Fill the sample container, which was provided by the local health department or certified laboratory to a level just below the rim of the container.
   - Turn off the faucet. Replace the cap on the container tightly and mark the bottle "**sample #1**."

4. Turn the tap back on and flush the tap at a moderate rate for two minutes or until you recognize a distinct temperature change. This is known as the "**FLUSHED**" sample.
   - Fill the second bottle to just below the rim and then cap it tightly.
   - Mark the bottle "**sample #2**."

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*.