

# LEAD CONTAMINATION IN DRINKING WATER

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## **Abstract**

*Lead is a common metal which has been used over the years in many consumer products. It can still be found in lead-based paint, some imported consumer products, and, under some conditions in air, soil, household dust, pottery, food, plumbing pipes and components, and drinking water. If it is inhaled or swallowed, lead can build up in the body over time. If too much lead enters the body, it can damage the brain, nervous system, red blood cells, and kidneys. Lead in drinking water can be a particular problem for infants who drink formula made with tap water. Pregnant women and nursing mothers also need to be concerned about lead levels in drinking water since it can be passed on to unborn children and breast-fed babies .*

**Key Words:** *Lead, Water, Toxic, Formula Milk*

## **Introduction**

Lead are found naturally in the earth, but just because of it is natural chemical element doesn't mean it's harmless. It is heavy metal with a long history of industrial and personal use—and just as long of a history of harming human health. Lead can exist in both organic and inorganic forms however the inorganic forms are usually predominate in food and water. Analysis of lead typically involves the total determination of all forms.

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## **How can Lead Get in Ground Water**

Lead exists throughout our physical environment. We are exposed to very small amounts each day, usually with no bad health effects. Well water in Minnesota usually does not contain detectable levels of lead. Contamination of lead in

ground water origin from the dissolution of lead from soil and earth crust. Lead particulate from the combustion of leaded gasoline, fossil and ore smelting can contaminate local surface water by surface runoff. . Lead itself has minor content in the earth crust. A widely distribution in of lead sedimentary rock and soils are reported an average lead content of 10 mg in 1 kg (10ppm) soil usually found in upper ground soil and lead in a range of 7 to 12.5 ppm is found in sedimentary rock.(U.S..EPA, 1987).<sup>2</sup>

However, the pipes and other components (such as faucets, valves, or fittings) in the household plumbing may contain lead. If they do, lead may dissolve into the water. The longer the water stands idle in the plumbing pipes and components, the more lead that can dissolve into the water.

### **What are some of the things that determine lead levels?**

The pH of the water affects how easily lead dissolves from pipes, solder, or fixtures into the water. Water with a very high or low pH can dissolve lead from the supply pipes, faucets, or solder. So proper water pH is important so lead doesn't find its way into our water as easily. Hot water also do the same thing.

### **How Much Lead is Too Much**

Our bodies accumulate lead from many sources, including air, food, and water. The more we learn about lead, the more we realize that our exposure should be as low as we can reasonably make it. Current state and federal guidelines call for a maximum amount of lead in drinking water of 15 parts per billion.

### **The Most Common Cause for Elevated Lead in Drinking Water are**

- Lead pipes, which are typically the worst contributor to elevated lead levels.
- Lead solder, which was used in the past to join copper pipes, but has been illegal in Minnesota since 1985.
- Brass components such as faucets, coolers, and valves. Although brass usually contains low lead levels of 8 percent or less, it can still dissolve lead into the water, especially during the first few months of use. If you have new brass plumbing components installed in your plumbing system, be sure to flush the water before drinking.

Wells drilled over 20 years ago may contain lead "packers" above the well screen. Some brands of submersible pumps manufactured before 1995 may contain leaded-brass components. Since January of 1995, all submersible pump manufacturers in America have agreed not to use leaded-brass components in submersible pumps.

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## Effect of Lead on Human Health

Long-term exposure to lead can cause neurodevelopment, neurodegenerative, cardiovascular, renal and reproductive effects. Developing infants and young children are most sensitive to the toxic effects of lead as they absorb lead more easily than adults and their nervous systems are particularly susceptible. For children, depending on the extent and duration of exposure, lead may have subtle effects on neurodevelopment outcomes, the most sensitive endpoint being a reduction of intelligence quotient (IQ). For adults, the most sensitive adverse effect associated with chronic lead exposure is considered to be an increase in systolic blood pressure.

Overexposure to lead over time can have severe health effects that can last a lifetime. Lead poisoning can cause damage to your brain, kidneys, nervous system, and red blood cells. In addition, it can stunt growth and has even been linked to crime and anti-social behavior in children.<sup>3</sup>

## How Can We Protect Our Self from Drinking Water

### 1. Flush the system before using water for drinking and cooking.

The simplest method to reduce lead exposure from drinking water is to **turn on the cold water tap each morning, and let it run for a minute or two**, until the water gets cold. This will "flush" the water that is standing in the plumbing pipes and components. You should do this for all faucets used for drinking and cooking. Flushing will remove much of the lead that may have dissolved into the water overnight. Flush the system any time the water has not been used for six hours or longer. After an extended absence, such as a vacation, flush the system for twice as long as you normally do.

### 2. Never use water from the hot-water tap for cooking or drinking.

Hot water dissolves lead from pipes and fixtures faster than cold water. Don't use hot water for drinking or preparing food items such as instant mix cereals, and **especially baby formula**. Draw water from a cold water tap that has been flushed and then heat it.

### 3. Have the Water Tested For Lead

To get a complete picture of how much lead is dissolving into your plumbing system, have a laboratory test your water for lead. Testing your household water for lead will require one or more water samples, depending on how much you want to learn about your situation.

#### First Sample

If you want to learn how much lead dissolves into your water overnight, collect the first water out of the faucet that the family uses most for drinking and

cooking water. This first "unflushed" sample will usually give the highest lead level. If this sample does not indicate more than 15 parts per billion of lead, it is probable that a short morning flushing will remove most of the dissolved lead in your water. A word of caution: your situation may not be typical. For example, if your house has a mix of older and newer plumbing components, the lead levels may not be their highest when you first open the faucet. To be sure of your plumbing system components, take a little time and evaluate the plumbing system in your home.

### **Flushed Sample**

If the laboratory test results show elevated lead levels, flush the faucet for a minute or two and collect another sample for testing. The test results from this sample will tell you if the water was flushed long enough. If the test sample still comes back with elevated lead levels, flush longer and test again.

### **Point-Of-Use Water Treatment Units for Lead**

Two common types of water treatment units effective in removing lead from water are reverse-osmosis (RO) devices and distillation units. An RO unit uses a membrane with pores tiny enough to screen out contaminants. A distillation unit removes contaminants by boiling the water and then condensing the steam, leaving the lead behind in the original vessel.

Effectiveness, efficiency, and cost are considerations in buying a home water treatment unit. Cost considerations should include not just the purchase price but long-term costs of operation and maintenance.

With any type of point-of-use unit, regular maintenance is essential. Failure to properly maintain a unit will reduce its effectiveness and, in some cases, make the water quality worse.<sup>4,5</sup>

### **Other Testing Of Ground Water**

Private Wells should be tested at least once a year for **bacterial safety**. It is also wise to test well water for bacteria any time the water changes in taste, odor, or appearance.

Well water should be checked every two or three years for indications of **nitrate** contamination, more frequently if nitrate has been found before. Water exceeding the state health level for nitrate (10 parts per million as nitrogen) must not be given to infants under six months of age.

**Arsenic** occurs naturally in about half the wells in Minnesota, and about 10 percent of wells produce water which exceeds 10 micrograms per liter (parts per billion), the federal drinking water standard. Arsenic is more prevalent in western Minnesota, but can occur almost anywhere in the state .Long-term

consumption of arsenic above the drinking water standard may increase the risk of health problems of the skin, circulatory system, nervous system, lungs, and bladder, including some forms of cancer. Every private well should be tested at least once or twice to determine if arsenic is present in the water.

Other contaminants sometimes occur in private water systems, but much less frequently than bacteria, nitrate, arsenic, or lead. If the well is located close to fuel tanks or to a commercial or industrial area, a test for "**volatile organic chemicals**" (VOCs) is an idea. **Agricultural chemicals** are sometimes found in wells located near cropped fields or handling areas for agricultural chemicals. Shallow wells are more vulnerable to pesticide contamination than are deep wells. If your well is located in an agricultural area, and especially if it is a shallow well, testing for several of the pesticides most commonly used in the area may be warranted.

If children or adolescents are drinking the water, a test for natural levels of **fluoride** will give your dentist useful information when considering fluoride supplements. A small number of wells in Minnesota (primarily northeastern Minnesota) do have naturally-occurring levels of fluoride that exceed the health standard.

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