Water Quality

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Lead In Drinking Water

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Maximum Contaminant Level (MCL) for Lead - 0.015 mg/l or 15 ppb

Lead Sources

Exposure to lead comes from a variety of sources. Lead is present in the air we breathe, the food we eat and the water we drink. City dwellers are exposed to higher lead levels in the air mainly due to the greater automobile and industrial emissions. Lead rarely occurs naturally in drinking water sources, but results from the corrosive action of water on the materials used in the distribution and plumbing systems. The U.S. Environmental Protection Agency estimates that 20 percent of our total exposure comes from drinking water. The exposure of lead from these three sources has a cumulative effect.

Effects of Lead on Human Health

Lead is a toxic heavy metal. It reacts with enzymes in the body to slow or stop essential physiological reactions. Exposure over an extended period of time to even low levels of lead (less than 1 mg) can have serious effects, since lead is accumulated and stored in the bone. When concentrations saturate the storage in the bone, blood lead levels rise affecting nerve function.

Lead interferes with the formation of red blood cells, reduces birth weight, causes premature birth, delays physical and mental development in babies and young children, and impairs mental abilities in children in general. Children who accumulate high levels of lead in their blood—by drinking contaminated water, inhaling car exhaust or eating old paint chips containing lead pigment—may have learning difficulties and stunted growth. In adults, lead can increase blood pressure and interfere with hearing. At high levels of exposure, lead can cause anemia, kidney damage and nerve damage. Health effects from lead generally depend upon total exposure to all sources, with young children and pregnant women at the most risk.

Regulations

Effective December 1992, the EPA set new standards for lead in drinking water. The new standards of .015 mg/l (milligrams/liter) or 15 ppb (parts per billion) reduces the allowable level of lead from the previous .050 mg/l or 50 ppb. The goal of the standard is for at least 90 percent of the monitored household drinking water taps to have lead levels of 15 ppb or less.

Lead in drinking water and from other sources poses the greatest threat to infants and young children.

The new EPA standards require public water suppliers to monitor tap water in thousands of homes across the country. Based on this monitoring, water suppliers may have to adjust their treatment techniques. Water suppliers with elevated lead levels must periodically send their customers information on easy, interim steps they can take to reduce lead in their drinking water.

Lead in Drinking Water

Drinking water contributes an estimated 15 to 20 percent of the exposure to lead in humans. In addition, lead ingested from water is absorbed more completely than lead from food. In adults, 10 to 15 percent of lead in food is absorbed but 35 to 50 percent or more of lead in water is absorbed.

Lead in home drinking water usually comes from solder used to join plumbing pipes or from lead pipes used in some older homes. Water is generally lead-free as it leaves the treatment plant, but by the time it comes out of the faucet, it may have dissolved lead from pipes or solder.

Reducing exposure to lead from household drinking water starts with testing the water. Water samples can be analyzed at many laboratories in Indiana. (For a listing of laboratories that test for lead, contact your Cooperative Extension Office and request a copy of WQ 1, Water Testing Laboratories).

To evaluate the highest levels of lead exposure, the sample should be taken from the tap after water has been held in the pipes for several hours or overnight. A second sample, obtained after letting the water flow for three to five minutes, demonstrates if flushing the lines decreases lead content. Leaching of lead depends on water corrosivity and temperature as well as the time in contact with lead sources.

If lead in the drinking water exceeds the .015 mg/l standard, the potential risk must be reduced, especially if young children drink the water. The highest concentrations from lead leaching occur in new homes where tin/lead solder has been used. Leaching decreases after about five years because natural reactions in the water create an insulating layer inside the pipes. In 1986 the EPA banned the use of lead in pipes and solder in public systems and household plumbing. Old homes may still have lead plumbing systems and are susceptible to the corrosive effects of soft or acidic water.

Drinking water from water coolers is another possible source of lead. The Lead Contamination Act of 1988 required the repair or recall of coolers with lead-lined tanks, and prohibited the manufacture and sale of coolers with lead in their plumbing.

Reducing Exposure to Lead in Drinking Water

Since lead levels seem to be highest after water has sat in the pipes for several hours (overnight or other long periods) avoid that water for drinking or cooking. In the morning, or after returning from work, run the cold-water faucet until it has become noticeably colder, usually several minutes. The water following the flushing will not have been in extended contact with lead pipes or solder, and can be used safely for drinking or cooking. If more than one tap is used for drinking or cooking water, flush the water in each of the taps.

If you suspect lead contamination do not use water from the hot-water tap for cooking or drinking. Hot water dissolves lead more quickly than cold. This is especially important for making baby formula. Use the cold-tap only after extended flushing.

Quick Facts on Lead in Drinking Water

- The allowable level of lead in drinking water is .015 mg/l (milligrams/liter).
- Lead has no known beneficial effects on human health.
- Soft, acidic water can dissolve the lead in pipes or solder of residential systems.
- The highest concentrations of lead occur in new plumbing installations using tin/lead solder. Lead levels decrease after about five years.
- To measure the highest level of lead in the drinking water, take samples after water has stood in the pipes for several hours or overnight.
- Flush the tap for several minutes before drinking or cooking with the water first thing in the morning or after several hours of non-use.
- Hot tap water dissolves lead more easily than does cold water. High or persistent levels of lead may be removed from water by reverse osmosis or distillation. **Boiling does not remove lead from water.**

Treatment Methods

Treatments for removing high or persistent lead levels in water include reverse osmosis and distillation. Neutralizing units, such as calcite filters, can be installed to reduce corrosivity.

Do not boil water to remove lead. Boiling concentrates lead in the water.

Reverse osmosis forces water under pressure through a membrane formulated to reject certain substances. Essentially, this process removes the water from the contaminant.

Distillation leaves behind many impurities resulting in nearly contaminant-free water. Many home distillation units have small capacities, from one quart to one half gallon per hour.

The National Sanitation Foundation (NSF) and the Water Quality Association (WQA) test water treatment products. Look for their seal of approval on the unit.

For more information about water treatment methods contact your Cooperative Extension Office and request a copy of WQ 6, Water Treatment Methods.

Summary

Humans are exposed to lead from a variety of sources, with water being an important one. The U.S. EPA estimates that drinking water accounts for approximately 20 percent of our total lead exposure. Any level of lead does not benefit human health. High levels of lead in blood contribute to a variety of health problems. Children are at more risk due to their smaller size and immature nervous system.

You can reduce the risk of lead exposure by: 1) running the tap for a few minutes each morning, or after extended periods of non-use; and 2) using only cold water for drinking and cooking.

The EPA standards will reduce lead in drinking water for people who get their water from public sources, However, if your water comes from a private well you're responsible for having your water tested.

References

Lead in Drinking Water, Linda Wagenet and Ann Lemley. Cornell Cooperative Extension Service, Cornell University. 1987.

Lead, Faye T. Plowman. Cooperative Extension Service, University of New Hampshire. 1989.

Drinking Water and Health, Suzanne Fundingsland and Darnell Lundstrom. Cooperative Extension Service, North Dakota State University. 1988.

EPA Tightens Standards for Lead in Drinking Water, Sean McElheny. U.S. Environmental Protection Agency. May 7, 1991.

Fact Sheet: National Primary Drinking Water Regulations for Lead and Copper, U.S. Environmental Protection Agency. May 1991.

Lead: Still Poison After All These Years, In-Health. September/October 1991.

Getting the Lead Out: Risks and Costs of Lead in Drinking Water, S.C. Richardson. Virginia Water Resources Research Center. June 1991.

Get the Lead Out! Lead in Drinking Water: A Guide for Pregnant Women and Families. U.S. EPA Office Of Water. January 1989.

The Nature and Extent of Lead Poisoning in Children in the United States: A Report to Congress. Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services. 1988.

For Further Information:

The following publications are available from your Purdue Cooperative Extension office. You may also access the National Water Quality Database for additional information at:

http://hermes.ecn.purdue.edu:8001/server/water/water.html

WQ-1 Water Testing Laboratories

WQ-2 What is Ground Water?

WQ-3 How to Take a Water Sample

WQ-4 Why Test Your Water?

WQ-5 Interpreting Water Test Reports

WQ-6 Buying Home Water Treatment Equipment

WQ-12 Distillation for Home Water Treatment

WQ-14 Reverse Osmosis for Home Treatment of Drinking Water

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