

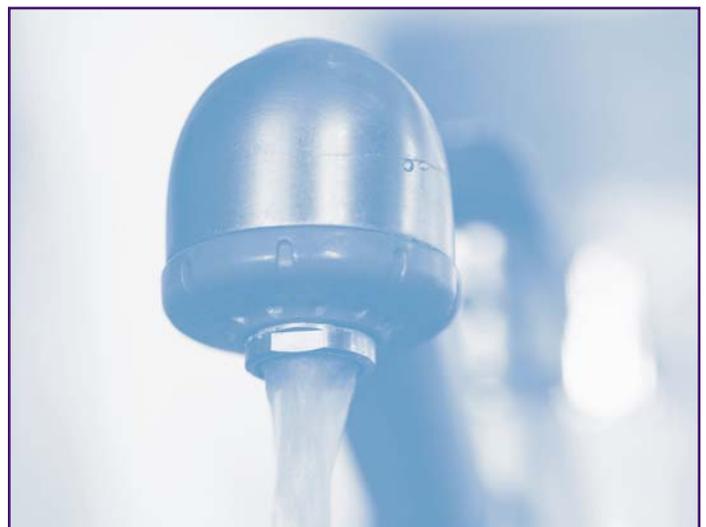


# Water Talk

## Minimizing Exposure to Lead from Drinking Water Distribution Systems

The objective of this document is to provide guidance for individual Canadians who are concerned with lead exposure. It also provides guidance to drinking water authorities on actions that can be taken to reduce exposure to lead from drinking water, including advice on how to reduce corrosion in drinking water distribution systems.

A guidance document on Corrosion Control in Drinking Water Distribution Systems, designed for decision-makers and water utilities, has been developed by the Federal-Provincial-Territorial Committee on Drinking Water and will be published on Health Canada's Web site in 2008. It will provide decision makers/operators with a tool to identify and address corrosion issues, with an objective to reduce the levels of some contaminants at the tap, and complement the existing guideline for lead by providing additional guidance on how the drinking water treatment process can be optimized to reduce the potential for corrosion in the distribution system.



### The Issue

Lead is a metal that has many industrial uses. Everyone is exposed to trace amounts of lead through air, soil, household dust, food, drinking water and various consumer products. Human activities release more lead in the environment than natural processes such as soil weathering, erosion and volcanic activity.

Lead can be a significant environmental contaminant because it is toxic, persists in the environment, and is taken up by the body and stored in bone and other biological tissues for many years. Drinking water is not generally the most significant source of exposure to lead in Canada, however, under certain conditions, lead can leach into drinking water through a process called corrosion.

**For more information on drinking and recreational water quality issues:**

Visit Health Canada's Water Quality Web site at:  
[www.healthcanada.gc.ca/waterquality](http://www.healthcanada.gc.ca/waterquality)

E-mail:  
[water\\_eau@hc-sc.gc.ca](mailto:water_eau@hc-sc.gc.ca)

Fax:  
613-952-2574

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### Health Concerns from Lead

Research has shown that exposure to even small amounts of lead can be harmful to human health, especially for young children, infants and pregnant women. Lead exposure is most serious for young children because they absorb lead more easily than adults and are more susceptible to its harmful effects. Even low level exposure may harm the intellectual development, behaviour, size and hearing of infants. Lead can cross the placenta during pregnancy to affect the unborn child, and can be released into breast milk. Potential effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced growth in young children. Further research is underway regarding the effects of lead on human health.

People who are exposed to lead for an extended period of time are at a risk of developing certain adverse health effects. Symptoms of adverse effects to the nervous system, the primary target organ for lead, include forgetfulness, tiredness, headache, changes in mood and behaviour, lower IQ, decreased hand dexterity and weakness of arms, legs, wrists, fingers or ankles.

Low-level effects could include increased risk of developing: kidney damage and disease; increases in blood pressure; anemia; reduced sperm count and fertility; and future risk of osteoporosis in exposed children.

In addition to these health effects, people who are exposed to moderate levels of lead for an extended period of time may be at a greater risk of experiencing changes in hearing ability, digestive issues (abdominal pain, cramps, nausea, vomiting, etc.), altered immune systems and changes in levels of certain hormones.

People exposed to extremely high levels of lead, either through their work or as a result of hobbies such as welding or soldering, could also develop a lack of coordination, convulsions, inability to control hands and feet, chronic kidney failure, and be a greater risk of miscarriage and stillbirth.

Exposure to lead over a lifetime may also increase the risk of developing cancer. The International Agency for Research on Cancer (IARC) has recently re-classified lead as probably carcinogenic to humans (Group 2A), based on sufficient evidence of carcinogenicity in experimental animals and some limited evidence of carcinogenicity in human studies.

### Addressing Concerns from Lead

Health effects from lead are related to the level of lead in the body (i.e. body burden), particularly in bone and blood. However, there is not a direct relationship between the body burden of lead and the concentration of lead that a person is exposed to in the environment. Levels of lead in the body will depend on a number of different sources over time, and it is not possible to predict blood lead levels looking only at current exposure from drinking water.

If you are concerned about having been exposed to lead, your doctor can conduct a blood test to measure your blood lead level. This is the most useful screening and diagnostic test for lead exposure. If high lead levels are found in your blood, your doctor will work in consultation with you to identify the potential source of lead and offer recommendations for reducing exposure. You should contact your health professional if you want more information.

In Canada, the *Guidelines for Canadian Drinking Water Quality* limit the lead content of drinking water to a maximum acceptable concentration (MAC) of 0.010 mg/L in drinking water (10 parts per billion), measured at the tap. The guideline for drinking water was established to be protective of the most vulnerable population, children. Consuming water over the course of a lifetime (i.e., 70 years) with lead levels at or near the guideline value is considered to be protective of human health.

### Sources of Lead in Drinking Water

For the most part, the amount of lead in natural water sources in Canada is very low; however, lead can be leached into the drinking water supply from lead service lines (water pipes that link the house to the main water supply), lead solder in plumbing, or brass fittings such as faucets. This corrosion process is affected by a number of factors, including the age of the plumbing system, the chemistry of the water, and the amount of lead leached will also depend on the length of time the water sits in the pipes.

Lead was a common component of distribution systems for many years. Older neighbourhoods in Canada may be serviced by lead service lines. The National Plumbing Code allowed lead as an acceptable material for pipes until 1975 and in solder until 1986. All provinces and territories use the National Plumbing Code as a basis for their own regulations. Regulations regarding lead used in plumbing materials were phased in across the country, therefore the timing of when lead service lines and other lead-based plumbing materials stopped being used may differ depending on where you live.

Lead levels in drinking water also depend on the chemistry of the water supply. Lead-based pipes and other plumbing materials are more likely to corrode if the water has a low pH (is very acidic) or if the alkalinity (the ability of the water to stabilize the pH) is too low. These factors are generally controlled by the utility that supplies your drinking water.

Lead levels in the water coming out of your taps will also increase as it sits, or stagnates, in the pipes when the water is not used for several hours, such as overnight or during working hours.

### Reducing Exposure to Lead in Drinking Water

#### What Individuals Can Do

If you are concerned about the possibility of lead in your drinking water, first you should consider the age of your home and neighbourhood. You can check with your municipality or water utility to see if there are lead service lines in your area. In most communities, the municipality or water utility is only responsible for the service line up to the curb. The portion of the service line from the curb to the house falls under the responsibility of the homeowner, but the municipality may be able to tell you whether it is made of lead. Alternatively, a plumber can identify whether your service line is made of lead, or you can look at the line entering your home. If it is soft or easily dented when scraped with a knife, or if it is greyish-black, it is most likely made of lead or contains lead.

If there are lead service lines or other lead-based materials in your plumbing system, you can look into having your tap water tested for lead content. Some municipalities have an established sampling program while others may do it upon request. In some cases, you may have to arrange for your own sampling and analysis by an accredited laboratory.

If high lead levels are found in your tap water, there are several steps you can take to reduce the lead that you and your family ingest. Running cold water first thing in the morning or any other time the plumbing system hasn't been used for a number of hours flushes out the lead. You should let your water run to get rid of the water that stayed in your plumbing system. You can either let it run for five minutes, or you can flush the toilet, take a shower or start your laundry and then run it until it gets cold (about one minute) before drinking or cooking with any of the water from that tap. Use cold tap water for drinking or cooking, since hot water increases the leaching of lead. Lead from drinking water is not well absorbed by the skin and is not taken in through breathing. As a result, exposure to lead from showering, bathing, dishwashing or cleaning is not a concern.

There are also household water filters and treatment devices available that are certified to remove lead from drinking water at the tap. Typically, these are carbon-based filters but there are also reverse osmosis and distillation treatment devices that can be purchased. For best results, these filters and devices should be installed at the tap that is most commonly used for drinking water, in most cases the kitchen tap. Make sure that any device you purchase is certified to the NSF International standard for the removal of lead and that you install and maintain it according to the instructions provided by the manufacturer.

To more permanently address any lead issues with your drinking water, you can remove some of the sources of lead that are entering your water. If the portion of the lead service line from the curb to your house, is lead-based, you would be responsible for its replacement. Some municipalities that are replacing the main service lines have also established programs where residents can replace their portion of the service line at the same time for a reduced cost. Contact your municipality to find out whether such a program exists in your community. If only a portion of the lead service line is replaced, there may still be a lead issue in the future. In addition, some lead particles may detach from the remaining lead pipe for 2-3 months due to disruption

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from the change. As a result, it is important to monitor the lead levels during this time, or to use a treatment device for that same period.

You can also have any pipes, fittings or faucets in your home containing lead replaced with the appropriate materials certified for contact with drinking water. To avoid any future problems, avoid the use of lead solder and only use plumbing materials, such as piping, certified specifically for use in contact with drinking water for your household plumbing system.



### What Municipalities Can Do

Municipalities, water utilities and regulatory authorities are aware of the issues associated with the corrosion of lead in drinking water distribution systems. They are taking several steps to protect the public from exposure to lead.

The drinking water treatment process can be optimized to reduce the potential for corrosion in the distribution system. In particular, the pH and alkalinity of the water need to be carefully controlled at the treatment plant to both reduce corrosion and ensure effective treatment of the water to eliminate health risks from microbiological organisms. Changes in treatment, primarily pH and alkalinity adjustments, alone or in combination with corrosion inhibitors, can significantly reduce the leaching of lead. Raising the pH remains the most effective method for reducing lead corrosion and minimizing lead levels in drinking water. The optimal pH for lead control falls between 7.5 and 9.5, while the optimal alkalinity ranges between 30 and 75 mg/L as calcium carbonate and is typically adjusted in combination with pH adjustment.

Regulatory authorities or utilities can implement a residential monitoring program to determine whether and where lead in drinking water may be at levels of concern. This program should consist of sampling several litres of tap water in a designated number of homes. Ideally, sampling would take place after water has been sitting in the pipes for several hours. For homes with lead service lines, typically built prior to 1975, the replacement of the entire lead service line (municipal and homeowner's portion) can significantly reduce the amount of lead in drinking water that enters the home. This has cost implications for both the municipality and the homeowner. If only a portion of the lead service line is replaced, then some lead particles may detach from the inside of the lead pipe. As a result, it is important to monitor the lead levels for 2-3 months.

### For More Information

To obtain more information on lead in your province or territory, contact the drinking water authorities in your area. Additional information can also be found on Health Canada's Web site:

Fact Sheet—Lead and Health

([http://www.hc-sc.gc.ca/ewh-semr/pubs/contaminants/fs-fi/lead-plomb\\_e.html](http://www.hc-sc.gc.ca/ewh-semr/pubs/contaminants/fs-fi/lead-plomb_e.html))

It's Your Health—Effects of Lead on Human Health

([http://www.hc-sc.gc.ca/iyh-vsv/environ/lead-plomb\\_e.html](http://www.hc-sc.gc.ca/iyh-vsv/environ/lead-plomb_e.html))

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