

Lead in Groundwater

Lead is a naturally occurring element that can be found in natural deposits in some areas and can leach into the groundwater. Lead can also combine with groundwater from private wells due to lead pipes, lead-based paint, lead soldering, and industrial contamination (Matta & Gjyli, 2016).

Lead was once a common material used in pipes for carrying water. Lead can contaminate groundwater:

- In older homes with plumbing systems that still have lead pipes
- Through runoff water from chipping or peeling paint in homes built before 1978, before lead was banned in paint
- From lead soldered corroded join pipes in plumbing systems
- From leaks or spills from industries that use lead in their processes

Lead can also be toxic to wildlife and can accumulate in the food chain, leading to toxic concentrations in animals at the top of the food chain.



Health Impacts

Lead is a toxic metal. Lead in groundwater can contaminate drinking water, which can lead to profound negative health outcomes (Levallois et al., 2018).

Ingesting even small amounts of lead over a long period of time can result in lead toxicity. Chronic exposure to lead can result in developmental and behavioral problems, and high levels can cause damage to the brain, kidneys, and reproductive system:

- **Neurological effects:** Lead can damage the brain and nervous system, especially in young children and pregnant individuals. Chronic exposure to lead can result in developmental and behavioral problems, as well as reduced IQ and learning difficulties.
- **Cardiovascular disease:** Long-term exposure to lead has been linked to an increased risk of cardiovascular disease, including high blood pressure and heart attacks.
- **Kidney damage:** Lead can accumulate in the kidneys and cause damage over time, leading to reduced function and, in severe cases, kidney failure.
- **Reproductive effects:** Lead can harm the reproductive system, reducing fertility and increasing the risk of miscarriage and stillbirth.
- **Anemia:** Lead can interfere with the body's ability to produce red blood cells, leading to anemia.

It is important to be aware of the potential for lead contamination in groundwater and to have your water tested if you have concerns. If lead is found, a water treatment specialist can advise you on the best course of action to remove it and ensure the safety of your drinking water.

Treating Lead in Groundwater

There are several methods that can be used to treat lead in groundwater:

- **Reverse osmosis:** This process uses physical filtration to remove lead from water by forcing it through a semipermeable membrane. Reverse osmosis is very effective at removing lead, but it can also remove beneficial minerals and should be used in conjunction with a mineral recovery system.
- **Activated carbon filtration:** Uses a filter filled with activated carbon to absorb lead and other contaminants from the water. Activated carbon filtration is a highly effective method of removing lead, but filters must be replaced regularly to maintain effectiveness.
- **Ion exchange:** This process uses an ion exchange resin to remove lead from water by exchanging it with ions of another substance, typically sodium. Ion exchange is a highly effective method of removing lead, but it can be expensive and requires regular maintenance.
- **Distillation:** This method removes lead by heating water to its boiling point, causing it to evaporate and leaving the lead and other contaminants behind. Distillation is effective at removing lead, but it can be expensive and requires a significant amount of energy.

It is important to note that the most effective method of treatment will depend on the specific groundwater conditions, including the concentration of lead, the presence of other contaminants, and the desired outcome. It is best to consult with a water treatment specialist to determine the best course of action.

Recommended Resources

- Basic Information About Lead in Drinking Water | U.S. Environmental Protection Agency
- Lead in Drinking Water | Centers for Disease Control and Prevention
- Lead in Private Well Water | Virginia Department of Health

Tips to Maintain a Healthy Well

- **Know** your private well and take pictures of the following to reference later if there is damage:
 - Storage or pressure tanks
 - Pump
 - Treatment system, including filters
 - Electrical components
- **Know** your well depth and pump setting if using a submersible pump.
- **Test** your water annually for coliform and nitrate, and every 3–5 years for a complete analysis to determine if there have been any changes to the water quality.
- **Check** your private well periodically for any damage or maintenance problems. Always hire a qualified professional well contractor to service your well.
- **Keep** the contact information for a licensed well contractor, local health department, university extension service, licensed electrician, and water testing laboratory handy.

References

- Levallois P, Barn P, Valcke M, Gauvin D, Kosatsky T. Public Health Consequences of Lead in Drinking Water. *Curr Environ Health Rep.* 2018 Jun;5(2):255-262. doi: 10.1007/s40572-018-0193-0. PMID: 29556976.
- Matta, G., & Gjyli, L. (2016). Mercury, lead, and arsenic: impact on environment and human health. *Journal of Chemical and Pharmaceutical Sciences*, 9(2), 718–725.