

Drinking Water Lead Abatement Issues in Wisconsin

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So What is Going On?

Wisconsin is at risk with its antiquated and inefficient laws which threaten the water quality throughout the state. Experts in water regulation and lead abatement say existing laws have failed to protect Wisconsinites from harmful exposure to lead in drinking water due to aging plumbing within households. To date there are over 176,000 lead service lines connected to older Wisconsin homes to the iron water mains that deliver municipal water, according to an EPA estimate (Schmidt, S. & Hall, D. J., Feb. 2016). Milwaukee has reported over 70,000 lead service lines with 60 percent of the state's known lead-poisoned children (Schmidt, S. & Hall, D. J., Feb. 2016). However, several other Wisconsin communities also indicated high percentage of lead service lines including Wausau, Wauwatosa and Racine (Schmidt, S. & Hall, D. J., Feb. 2016).

It was estimated in 1990, that the U.S. water infrastructure still had about approximately 3.3 million lead service lines and 6.4 million connections made of lead, many of them installed over 100 years ago (Schmidt, S. & Hall, D. J., Feb. 2016). Due to inconsistent sampling methods, it is likely that the reported lead service lines are underestimated in Wisconsin. A nationwide EPA survey of 153 public water utilities in 1984 found that "30 percent of the respondents could not offer any estimate of the number of lead service lines remaining in their cities"(Schmidt, S. & Hall, D. J., Feb. 2016). It is increasingly evident that the existing sampling methodology and corrosive control laws are inconsistent and failing to protect Wisconsin residents.

Corrosive Control Laws & Plumbing Assoc. and Government Contributions to Issue

The Lead and Copper Rule was established in 1991 and created maximum containment level goals (MCL) and action levels for US potable water (Sandvig, A., Kwan, P., & Kirmeyer, G., 2008). The MCL for lead should be zero, while the action Level (AL) should not exceed 0.015 mg/L measure (Sandvig, A., Kwan, P., & Kirmeyer, G., 2008). However, this now decades old federal law meant to reduce lead pipe leaching and eliminating toxic indoor plumbing fixtures is lacking in efficiency and failing to meet health standards. Minor revisions were added in 2000 and 2007 to improve sample collection methods, water treatment, customer awareness through public service announcements and lead service and line removal programs (Sandvig, A., Kwan, P., & Kirmeyer, G., 2008). Still, these amendments are not enough. Sampling methods continue to fall short when attempting to detect the highest level of lead in a consumer's home. Too few homes are sampled, and at-risk neighborhoods are often not sampled at all or purposefully avoided.

Another contributing factor to the pervasive lead issue in Wisconsin, and throughout the nation, is the continued silent push for lead materials to be used, promoted by lead industries, despite knowing its toxic effects. While most cities restricted or removed lead water pipes by the 1920s, the lead industry continued to carry out an extensive and successful campaign to promote the use of lead (Rabin, R., 2008). Led by the Lead Industries Association (LIA), representatives were

sent to speak, offer advice, and distribute pro-lead material to plumbers' organizations, local water authorities, architects, and federal officials throughout the US (Rabin, R., 2008). Thanks to LIA's activities over several decades, the nation's plumbing codes approved lead into the 1970s and 1980s, and contributed to the present health issues and economic cost of now removing the pipe (Rabin, R., 2008).

Lead 101: What is Lead and How Does it Get Ingested?

Lead is a common metal, widespread in the environment, and absorbed from a variety of sources every day. It was formerly used in construction of household plumbing systems throughout Wisconsin, which is now known to be harmful to residents' health if ingested. Although the intensity of lead depends on water quality and the age of a plumbing system, water going through these pipes will continuously dissolve and distribute the lead it contacts (Wisconsin DNR, 2017). Most water throughout the state, however, is abrasive enough to disintegrate some lead in existing public pipe lines. Of greater concern to health organizations/officials, are long periods of water sitting in lead, such as at nighttime or during work and school, which can cause high concentrations of lead in the water (Wisconsin DNR, 2017).

Often residents engage with lead unknowingly through consumer products such as paints, pigments, soldering, jewelry, toys and in some cosmetics and medicines. Even some food can become contaminated by lead in the air or if the food is containers which has lead-soldered (Wisconsin DNR, 2017). Additionally, soil and dust inside and out of the home contaminated by air and vehicle emissions can have high lead levels. However, it is estimated that drinking water contributes 20% or more of a person's total exposure to lead (Wisconsin DNR, 2017). This makes food (through the process of canning, cleaning, and preparing) the greatest single source of lead for the average adult (Wisconsin DNR, 2017).

Who is Effected?

Whether it is delivered via drinking water or consumerism, digesting lead can have long term negative effects on several body systems and is particularly detrimental to young children, infants and fetuses. (WHO, 2016) Where a lower dose of lead may show no effect in an adult, children can suffer from physical harm and irreversible behavioral issues. Long term exposure to lead can impact a child's central and peripheral nervous system and cause learning disabilities, lower IQ, amnesia and hyperactivity (EPA, 2017). Pregnant women exposed to high levels of lead can cause miscarriages, stillbirth, premature and/or low birth weight, stunted growth as well as minor malformations (WHO, 2016). Lead ingestion by mothers can also affect their fetuses' in the form of impaired hearing and malformed or dysfunctional blood cells (EPA, 2017). As it stands, the World Health Organization (WHO, 2016) and the Environmental Protection Agency (EPA, 2017) knows no level of lead exposure that is considered "safe". However, Wisconsin residents can be reassured by the fact that lead poisoning is entirely preventable and the state is actively working on lead abatement measures.

How Does Lead Get in the Water?

Lead can enter drinking water through the corrosion of plumbing materials. This happens due to numerous factors in which lead enters the water including the chemistry of the water (the amount of acidity and alkalinity of water source), how long the water stays in the plumbing materials, and the presence of protective coatings inside the plumbing materials (EPA, 2017). To begin reducing lead contamination throughout Wisconsin, plumbing solder containing lead was banned in 1984 (GBWU, 2017). Unfortunately, even with these efforts, homes built before 1986 are likely to have lead pipes, fixtures and pipe soldering (GBWU, 2017). Even newer homes, that have legally “lead-free” plumbing, can contain up to eight percent lead in their drinking water (GBWU, 2017).

In 2014, amendments to the Safe Drinking Water Act further reduced the amount of “allowable lead content” possible for new household pipes, fittings, and fixtures to 0.25 percent (EPA, 2017). The most prevalent problem is still chrome-plated brass or copper faucets and fixtures with lead solder, which can have significant amounts of lead, especially when using hot water (EPA, 2017). The DNR notes residents can determine if they have corroded copper pipes if there is a greenish discoloration around the faucet spout and an unpleasant metallic taster of the tap water, but even without visible indicators significant lead levels may be present (Wisconsin DNR, 2017).

Most Wisconsin wells or lake water absorption have little to no measurable lead to effect drinking water. The source of lead contamination is the lead pipe or solder fusing pipes together within households’ plumbing, or lead exposed service lines joining homes to city/public water mains (GBWU, 2017). Usually the lead will simply dissolve into the water with negative health effects. But depending on variables such as: corrosivity of the water, the type and age of the plumbing materials used in the house, and the length of time that the water stands in the pipes, lead levels can become significantly more dangerous (GBWU, 2017). The Department of Natural Resources notes the highest levels of lead can occur when very corrosive water stands stagnant in lead or lead-soldered copper pipe for extensive periods (Wisconsin DNR, 2017).

How Does Lead Affect Wisconsin Residents’ Health?

If lead is absorbed into the bloodstream either through the lungs or digestive tract it will get distributed to all tissues within the body (Wisconsin DNR, 2017). High lead levels can lead to brain damage/cognitive disorders, kidney failure, nervous system deterioration, and malfunctioning or malformed red blood cells and reproductive system (Wisconsin DNR, 2017). The higher the level of lead in the blood (from drinking water consumption, consumerism or inhalation) the more severe the health consequences can be. Lead exposure can begin to show itself subtly and invisibly by slowly altering body chemistry and reducing nervous system functions when exposed to low levels (Wisconsin DNR, 2017). More long-term exposure can cause toxic effects or even death, and can be associated with acute lead poisoning.

Some of the damaging effects can be reversed if exposure is reduced, while other harmful toxins can cause lifelong medical issues. Young children, infants and fetuses remain the most vulnerable to effects of lead. Adult may experience no negative effect from one does of lead exposure, however the same dose could be incredibly harmful to a small child. As children grow, if their water source has lead and they are consuming it daily, their bodies will rapidly absorb

lead they consume. This will affect their overall mental and physical development and could irreversibly stunt their growth (EPA, 2017). Infants risk overexposure to lead due to their diet, which consists of mostly liquids, such as baby formula made at home could contain contaminated water or if they are breast fed and the mother is drinking lead exposed water the child is at risk (EPA, 2017). The Centers for Disease Control and Prevention (CDC) reports infants who consume mostly mixed formula can receive 40 percent to 60 percent of their exposure to lead from drinking water (EPA, 2017). The CDC recommends that city public health organizations must step in if the level of lead in a child's blood reaches 5 micrograms per deciliter ($\mu\text{g}/\text{dL}$) or more (EPA, 2017).

Controlling Corrosion is Key

Water utility are considered compliant with the federal Lead and Copper law if at least 90 percent of household samples are below the action level of 15 parts per billion (ppb) of lead (Wisconsin DNR, 2017). If over 10 percent of samples exceed 15 ppb, a water utility can be asked to provide a form of corrosion control for residents (Wisconsin DNR, 2017). This can include adding chemicals to the water source to make it less likely to dissolve the existing lead pipes. However, determining which water treatment method would work best requires a budget, consistent maintenance and a knowledgeable workforce to tend to the water chemistry. Another issue is corrosion control systems require a population of 50,000 or more customers and water samples that show 10 percent or more of the tested households have a federal action level of lead (Wisconsin DNR, 2017). This leaves several harder hit smaller Wisconsin cities, towns and villages without a solution to improve their drinking water.

Milwaukee Water Works found that lead lines remain in place throughout the state. Racine officials have noted 10,437 lead pipes, West Allis reported 8,133, Manitowoc counted 6,579, and Kenosha have 7,326 lead arterials (Behm, D. 2016). Green Bay has an estimated 1,900 and Shorewood reported 95% of its 3,500 laterals were lead pipes (Behm, D. 2016). Only Madison is at zero lead lines thanks largely to its 2001 replacement program (Behm, D. 2016).

First Wisconsin Cities to Show Lead in Drinking Water

81 Wisconsin water systems were tested from 2012 to 2015 by the EPA showing an above average action level at least once, with at least 10 percent of the locations throughout the state tested during this span exceeded the designated limit of 15 parts per billion (Litke, E., 2016). Twelve systems topped the action level in two or more and on a per-capita basis, that makes Wisconsin the 12th-highest number of failed systems in the nation (Litke, E., 2016).

Despite Milwaukee dominating the news with persistent lead issues, it was actually two schools tested for lead annually in 2012 to 2015 that triggered the actions of the DNR and got the attention of public work officials across the state (Litke, E., 2016). One was the THINK Academy in the Wisconsin Rapids District and the other is Lake Mills located west of Milwaukee in Jefferson County. THINK Academy's lead levels topped above the allowed amount of lead in more than two testing periods since 2012 (Litke, E., 2016). After reviewing this data, state and city officials begin questioning the quality of local water supplies and, once

those sources were identified as safe, eventually began inspecting the interior plumbing and drinking water of students' homes (Litke, E., 2016).

Three other water systems were soon identified and lead abatement measures were enforced in Genoa City, Mosinee and the Fox Lake Correctional Institution in Dodge County (Litke, E., 2016). Each were required to perform public education and treat the water supply with phosphates to cease lead from continuing to leaching into drinking water. Genoa and Mosinee were ordered to remove lead service lines and issue consumer notices, while Fox Lake is required to close and rehabilitate certain wells (Litke, E., 2016).

However, sample methodology for lead in drinking water is under scrutiny. The in question water systems only test a fraction of households, which are assumed to represent the entire affected area. For instance, Lake Mills tested 40 homes in older neighborhoods with a higher likelihood of lead plumbing (Litke, E., 2016). Although tests have come back high, this method is not predictable.

Wisconsin Cities Leading the Way in Lead Abatement and Removal

Madison has spent at least \$19 million since 2001 to replace 8,000 lead lines between the water main and households, including city and residential sections (Schmidt, S. & Hall, D. J., Feb. 2016). The city covered half the cost of replacement, up to \$1,000, for the 5,600 property owners who participated (Schmidt, S. & Hall, D. J., Feb. 2016). This effort made the drinking water safe and did not pollute Madison's lakes with orthophosphate, an anti-corrosive, which Madison could have chosen for preventing lead from leaching into water but saw it as short sighted. This mindful long-term approach is now considered the model of how to remove harmful lead from municipal water systems.

Replacing all of Madison's 70,000 lead pipes has been estimated at between \$511 million and \$756 million. However, cost wasn't the only challenge initially (Schmidt, S., 2016). Getting Madison's lead service replacement programs approved by lawmakers and overseeing agencies took years, not counting the pipe replacement itself, which took another full decade indicated Amy Barrilleaux, spokeswoman for the Madison Water Utility (Schmidt, S., 2016).

Meanwhile in **Green Bay**, the water utility has replaced about 1,700 remaining lead service lines, representing about 5 percent of the system (Litke, E., 2016). In 2011, Green Bay Water Utility found lead levels in some household to be above the EPA's action limit of 15 parts per billion (ppb), or 0.015 milligrams of lead per liter of water (mg/L) (Litke, E., 2016). This was the first time Green Bay Water Utility exceeded the action level for lead since the EPA established testing requirements in 1992 (EPA, 2017). After conducting a corrosion study, Green Bay Water Utility discovered that the high lead levels were due to particulate matter, and worked with the DNR to create an action plan to reduce lead levels that continues to be implemented (GBWU, 2017).

Green Bay's water department is now working with the city to provide grants and zero percent interest loans to help homeowners cover these costs (GBWU, 2017).

Additional Content on Wisconsin Cities Falling Behind in Lead Abatement

Milwaukee

[Millions Needed for Milwaukee Regions Water Sewer System](#)

[Milwaukee Facing Daunting Costs with Lead Pipes](#)

[Milwaukee Public Schools Find Excessive Lead in 183 Water Sources](#)

Racine

[Investigation: Racine Ranks 5th in Lead Poisoning](#)

Manitowoc

[Child Lead Testing Erratic in Wisconsin](#)

Marathon County

[Wausau Finds Funds to Remove Lead Pipes](#)

[Additional Content on Private Wells](#)

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