Lithium

HRA conducted a thorough review of lithium toxicity data according to MDH risk assessment methodology (SONAR 2008) and was unable to derive health-based guidance for the chemical due to the limitations in health effects assessed and populations studied. HRA will continue to evaluate animal toxicity studies and human epidemiological studies as they are released and will revisit developing health-based water guidance for lithium once usable data become available.

Lithium is a naturally occurring chemical element found in the earth's crust and in the ocean. Various lithium compounds are used in the production of lithium-ion batteries, lithium grease, and other industrial applications. As lithium carbonate or lithium citrate, it is used as a pharmaceutical for psychiatric conditions.

Lithium in Minnesota waters

Historically, lithium has been detected in public water supplies in Minnesota at levels ranging from 9 µg/L to 150 µg/L. In a recent study of 160 community water systems throughout Minnesota, lithium was detected in 70 systems with a maximum concentration of 99.6 µg/L.[1] Lithium has also been frequently detected in Minnesota groundwater (57% of samples) and surface water (66% of samples) since the 1970s.[2] One microgram per liter (µg/L) is the same as one part per billion (ppb).

MDH Guidance value

After a thorough examination of animal and human studies on lithium published through August 2025, MDH was unable to identify studies meeting the requirements for health-based values, as set in state statute. Federal agencies use different methods to determine guidance and are not bound by MDH methods.

The United States Environmental Protection Agency (EPA) lists the Health-Based Screening Level (HBSL) published by the United States Geological Survey (USGS) of 10 µg/L for public water supplies to use when interpreting monitoring results for lithium. This number is based on the lowest therapeutic dose used to treat psychiatric disorders. USGS also published a second HBSL of 60 µg/L based on different exposure assumptions. These screening levels are based on health effects that are associated with lithium concentrations orders of magnitude higher than what has been measured in Minnesota's environment and are much more likely to be associated with direct intentional ingestion (e.g., lithium-based pharmaceuticals).

Potential health effects

The most useful data on adverse health effects are reported with the corresponding lithium concentrations measured in blood serum. Because most animal studies do not report lithium serum concentrations our best data comes from patients prescribed lithium. Renal dysfunction, neurological

and gastrointestinal effects, and decreased thyroid function are all side-effects that occur from lithium ingestion. Lithium ingestion can be fatal at concentrations that are much higher than what is measured in the environment. At this time, there are no well-conducted studies on health effects that may occur at environmental concentrations.

Potential exposure to lithium

Lithium is found in grains, vegetables, dairy products, and meats; this means every Minnesotan is exposed to small amounts of lithium. When lithium is detected in drinking water, it is usually at concentrations higher than found in food. The best available information suggests that dietary and drinking water exposures are magnitudes lower than amounts used to treat psychiatric disorders (therapeutic dose).[3]

Lithium in the environment

As a naturally occurring element, lithium is found in groundwater and surface water throughout the world, with concentrations depending on local geology. Small amounts of lithium can be released to the environment at lithium mining sites, when lithium is used in the manufacturing of batteries and other products, and when these products are disposed of. The use of lithium as a medication results in small releases to rivers and streams through wastewater.

References

1. U.S. EPA (2025). Occurrence data from the Unregulated Contaminant Monitoring Rule. https://www.epa.gov/dwucmr/occurrence-data-unregulated-contaminant-monitoring-rule#5
2. National Water Quality Monitoring Council (2025). Water Quality Portal. https://www.waterqualitydata.us.
3. ATSDR (2018). Health Consultation: Public health evaluation of water data collected in the vicinity of the JKLM natural gas well on the Reese Hollow 118 pad. U.S. Department of Health and Human Services. https://www.atsdr.cdc.gov/HAC/pha/JKLMNaturalGas/JKLM_Energy_Natural_Gas_Well_Coudersport-508.pdf

Minnesota Department of Health
Health Risk Assessment Unit
PO Box 64975, St. Paul MN 55164
651-201-4899
health.risk@state.mn.us
www.health.state.mn.us

November 2025

To obtain this information in a different format, call: 651-201-4899.