

Strontium and Groundwater

Strontium

Strontium is a naturally occurring metallic element found throughout the earth's crust. It is in the same chemical family as calcium and is physically and chemically similar to calcium. Strontium was used in the production of cathode ray tube (CRT) television screens, which accounted for the majority of strontium use prior to the development of flat-screen televisions. Currently, it is used in the production of ceramic magnets and fireworks for its red flame.¹

Strontium in Minnesota Waters

Because strontium is naturally occurring throughout the earth, it is nearly always detected in groundwater and surface water. In Minnesota, the levels of strontium in water can vary. In aquifers, lakes, or rivers, average strontium levels are 125 micrograms per liter ($\mu\text{g/L}$)* for surface water (lakes and rivers) and 248 $\mu\text{g/L}$ for groundwater (aquifers).²

Although not routinely tested for, strontium has been found in finished drinking water at concentrations from 'no detect' to 3,670 $\mu\text{g/L}$.³ Strontium was included in the third monitoring cycle of the federal Unregulated Contaminant Monitoring Rule (UCMR3) and was detected in almost all finished drinking water samples collected in Minnesota.

Strontium is not a regulated contaminant under the Safe Drinking Water Act, but the United States Environmental Protection Agency (US EPA) has set non-regulatory health advisory levels for strontium for one-day, ten-day, and lifetime durations. The health advisory level for one-day and ten-day durations is 25,000 $\mu\text{g/L}$ and the health advisory level for lifetime exposure is 4000 $\mu\text{g/L}$.

*One microgram per liter ($\mu\text{g/L}$) is the same as one part per billion (ppb).

MDH Guidance Value

Based on available information, MDH developed risk assessment advice of 3000 parts per billion (ppb) for strontium in water. MDH does not use guidance values to regulate water quality, but they may be useful for situations in which no regulations exist. MDH develops guidance values to protect people who are most vulnerable to the potentially harmful effects of a contaminant. A person drinking water at or below the guidance value would be at little or no risk for harmful health effects.

Potential Health Effects

Strontium is very similar to calcium and can replace calcium in the bone. This disrupts the normal bone structure, leading to skeletal problems and defects. Infants, children, adolescents, and people who do not get enough calcium are at higher risk of harmful health effects related to strontium exposure.

Potential Exposure to Strontium

Almost all people are exposed to strontium through their diet and water because it occurs naturally in the environment. Levels normally found in water and food in Minnesota are below levels expected to cause harmful health effects. Strontium can also be in some toothpastes for sensitive teeth, which use strontium chloride and/or strontium acetate.⁴ Strontium supplements (strontium citrate or strontium chloride) are widely available, but have not been evaluated for safety or effectiveness by the U.S. Food and Drug Administration.⁵ Because calcium and strontium are similar, having a healthy amount of

calcium in your diet may reduce the risk of harmful health effects from strontium exposure.⁶ You should consult with your dentist or doctor before using products containing strontium and about your calcium intake.

Strontium in the Environment

Strontium occurs naturally throughout the environment and is found in soil and water. It does not break down.

Potential Environmental Impacts of Strontium

Strontium is only toxic to aquatic life at high concentrations.⁷ Concentrations of strontium observed in Minnesota surface waters are lower than levels that would negatively impact aquatic life.

Health Risk Assessment Unit

The MDH Health Risk Assessment Unit evaluates the health risks from contaminants in drinking water sources and develops health-based guidance values for groundwater. MDH works in collaboration with the Minnesota Pollution Control Agency and the Minnesota Department of Agriculture to understand the occurrence and environmental effects of contaminants in water.

References

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