

Fluorene and Groundwater

Fluorene

Fluorene belongs to a class of compounds known as polycyclic aromatic hydrocarbons (PAHs). Fluorene naturally occurs as a component of fossil fuels (coal tar, oil, and gas) and is formed and released during incomplete combustion and processing of coal, oil, gas and plant materials such as wood. Many old industrial sites in Minnesota where fossil fuels were refined, stored, or used have had soil or groundwater contaminated with PAHs.

People are exposed by smoking cigarettes, by breathing in air polluted by combustion processes and processes involving coal tar (e.g. asphalt paving, diesel exhaust, burning garbage, smoking meats, etc.), and by drinking contaminated water.

Fluorene in Minnesota Waters

Most of the environmental monitoring data on the occurrence of PAHs in groundwater and drinking water, including for fluorene, comes from investigation and cleanup activities at contaminated sites. Fluorene has been observed in groundwater, moving away from known contamination sites and affecting nearby drinking water wells.¹ The Minnesota Pollution Control Agency (MPCA) has detected fluorene in groundwater at 16 percent of contaminated sites they investigated.

Fluorene has only been detected in monitoring wells and drinking water wells near known contamination sites. It is not commonly tested for outside of these sites. The maximum level detected in drinking water in Minnesota is 356 µg/L.¹

*One microgram per liter (µg/L) is the same as one part per billion (ppb).

MDH Guidance Value

Based on available information, MDH developed a guidance value of 80 ppb for fluorene 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

In animal studies, exposure to fluorene affected the blood system and spleen.² There are no human or animal studies that suggest fluorene causes cancer.

Potential Exposure to Fluorene

Most people are exposed to fluorene when they breathe in contaminated air or cigarette smoke or when they drink contaminated water.²

Fluorene in the Environment

Fluorene is naturally occurring in fossil fuels, including coal tar.³ It can also be found in the air as both a vapor and particulate matter when it is released during combustion processes. Fluorene in vapor form breaks down within a few days. Fluorene in particulate form can either fall to the ground immediately or travel a long way through the air before falling to the ground.³ Fluorene in the soil is more persistent than fluorene in the air because it binds to soil particles, and it has been found in groundwater by MPCA.^{1,3}

Potential Environment Impacts of Fluorene

Fluorene is toxic to aquatic organisms though surface water monitoring data show that concentrations are quite low. Fluorene can build up in aquatic sediments, which could pose a risk to those organisms that dwell in or near the bottom of lakes and rivers. Most concentrations of concern are associated with past waste disposal practices.

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

1. Minnesota Pollution Control Agency. (2018). 2018 Health Risk Limits Nominations.
2. U.S. Environmental Protection Agency (EPA). (2002). Provisional Peer Reviewed Toxicity Values for Fluorene (CASRN 86-73-7). Washington, DC. Retrieved from <https://cfpub.epa.gov/ncea/pprtv/recordisplay.cfm?deid=338946>.
3. NLM, National Library of Medicine. (2018). Hazardous Substances Data Bank. Retrieved from <https://toxnet.nlm.nih.gov>

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