Minnesota Department of Health

Pyrene and Drinking Water

Pyrene is a contaminant that has been found in drinking water sources in Minnesota. The Minnesota Department of Health (MDH) developed a health-based guidance value for pyrene in drinking water and, based on this value, does not expect levels in drinking water to harm Minnesotans.

Summary

Pyrene is one of a group of chemicals called polycyclic aromatic hydrocarbon (PAHs). PAHs are a group of naturally occurring pollutants. Pyrene is a natural component of coal tar, crude oil, and fossil fuels. Pyrene has been detected in Minnesota waters. Public water systems are monitored for pyrene, but private well owners should have their wells tested if they are concerned about pyrene in their drinking water.

Pyrene

Pyrene is released naturally from the burning of wood, gasoline exhaust, and cigarette smoke. Pyrene is a natural component of coal tar and asphalt. Other sources of pyrene can include brightening agents and dyes, plastics, and pesticides.

Pyrene in Minnesota Waters

The Minnesota Pollution Control Agency (MPCA) does not regularly monitor public water supplies for pyrene, but does test waters near sites with known PAH contamination. MPCA has detected pyrene in public drinking water wells at a maximum concentration of 0.410 parts per billion (ppb).[1] Pyrene has been reported in ambient groundwater in Anoka, Beltrami, Dakota, Hennepin, and Stearns counties at concentrations from 0.009 to 0.044 ppb.[2] Many of the detections were near the Mississippi River basin.

MDH Guidance Value

Based on available information, MDH developed a guidance value of 50 ppb for pyrene in drinking water. A person drinking water at or below the guidance value would have little or no risk of health effects.

Potential Health Effects

The health effects of brief exposures to pyrene are unknown. Longer-term animal studies show that pyrene can cause nephropathy (kidney disease) and decreased kidney weight.

Potential Exposure to Pyrene

People are exposed to pyrene because it is often found in air, water, food, and soil. One of the most common ways people are exposed to pyrene is through inhaling it from car exhaust, cigarette smoke, or fires. Pyrene can also be ingested through eating contaminated food or drinking contaminated water. Grilling food is another way to be exposed, as the cooking process can release pyrene. Some people are exposed to pyrene at work, especially if they work with petroleum refining or coal tar products.

Pyrene in the Environment

Pyrene is formed when a material, such as gasoline or wood, burns incompletely. Pyrene sticks to very small particles that go into the air. People and animals may breathe in the particles that contain pyrene and other PAHs. The particles and pyrene eventually settle back onto the ground or into ponds, lakes, or rivers. Pyrene can also be washed into water by rain. Pyrene may settle into sediment or soil. When pyrene is attached to particles in soil or water it can be swallowed by animals, including fish or taken up by plants.

When pyrene enters the environment, it can remain in the soil, water, or air. Eventually, PAHs are broken down into less harmful molecules by the action of microbes, chemical interactions, or sunlight.

Potential Environmental Impacts of Pyrene

Based on limited studies, pyrene is toxic to aquatic organisms at concentrations lower than the reported values in surface water. Pyrene damages the DNA of cells and affects endocrine activity. A bigger concern is the potential for pyrene to build up in aquatic sediments, which could pose a risk to organisms that dwell in or near the bottom of lakes and rivers.

Health Risk Assessment Unit

The MDH Health Risk Assessment Unit evaluates the health risks from contaminants in 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 (MPCA). 2014. Interagency submission to MDH.
2. Minnesota Pollution Control Agency (MPCA). 2014. Data from EQuIS sent to MDH per request.

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