

# Quinoline and Groundwater

## Quinoline

Quinoline is a naturally occurring substance found in coal and is a component of coal tar and petroleum. It can also be formed when organic material is burned and can be released during certain kinds of fossil fuel extraction and processing. Coal tar is used for many industrial purposes, including wood preservation, and as an ingredient in some personal care products. Quinoline is also used in industrial processes to dissolve other chemicals, prevent corrosion, and produce other chemicals including dyes, fragrances, and pharmaceuticals. Quinoline is present in tobacco smoke, which is a significant source of exposure for people who smoke and people exposed to second hand smoke.

Quinoline is part of a larger class of chemicals called polycyclic aromatic compounds (PACs). This class of compounds also includes well-known polycyclic aromatic hydrocarbons (PAHs), but quinoline contains nitrogen and is therefore not a PAH.

## Quinoline in Minnesota Waters

Quinoline has been observed in groundwater, moving away from a known contamination site and affecting nearby drinking water wells.<sup>1</sup> The Minnesota Pollution Control Agency (MPCA) has detected quinoline in groundwater at 12 percent of contaminated sites they investigated.

Quinoline has only been detected in drinking water near known contamination sites. The maximum level detected in drinking water in Minnesota is 19 µg/L. Most detections have been less than 0.24 µg/L. Quinoline is included in the Fourth Unregulated Contaminant Monitoring Rule (UCMR4), a three-year effort to monitor public drinking water, which began in 2018. As of August 2020, quinoline has not been detected in any Minnesota drinking water sample.<sup>2</sup>

\*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 0.03 parts per billion (ppb) for quinoline in groundwater. 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

Exposure to quinoline can potentially increase a person's risk of certain types of cancer, including cancer in the liver, blood vessels, and the nasal cavity according to laboratory studies in animals. These studies also suggest that cancers that develop in the liver can migrate to and establish new tumors in the lung.<sup>3,4</sup> Quinoline is classified as "possibly carcinogenic to humans" by the International Agency for Research on Cancer and "likely to be carcinogenic to humans" by the U.S. Environmental Protection Agency.

In animal studies, exposure to quinoline also caused harmful non-cancer effects on the liver, kidney, and the nasal cavity, and changes in the hematological (blood), including the spleen, and immune system.<sup>3,4</sup>

## Potential Exposure to Quinoline

Most people are exposed to quinoline when they breathe it in from the air or cigarette smoke.<sup>5</sup> Quinoline has been used as a flavoring agent in foods, and is found in some types of malt beverages such as Scotch whiskey.<sup>6</sup> Skin treatments or personal care products used to treat dry, itchy, and flaky skin can contain coal tar and be a source of exposure to quinoline for some people. Consult your doctor before using these products.

## Quinoline in the Environment

Naturally occurring quinoline is found in coal and peat.<sup>5</sup> Quinoline can also be found in the air from industrial and other processes, but degrades within a few days. Quinoline released into the soil is more persistent and has been found in groundwater by MPCA.<sup>1,3</sup> Quinoline is more common in urban air (including indoor air), soil, and water near known contaminated sites than other areas..

## Potential Environment Impacts of Quinoline

Little is known about concentrations of quinoline in Minnesota surface water, but the concentrations observed in groundwater are much lower than concentrations that would harm 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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