

Benzophenone and Groundwater

Benzophenone

Benzophenone is an organic chemical that naturally occurs in some foods, such as grapes and mangoes, and is manufactured for commercial and industrial use. Benzophenone is used as a photoinitiator and fragrance enhancer, as an additive in plastics, coatings, and adhesives, as an ultraviolet curing agent in ink, and in the production of various other chemicals. Benzophenone was previously used as a flavoring agent in the United States, but was banned by the Food and Drug Administration (FDA) in 2018 from use in food and from use in plastic and rubber products that contact food.¹

Benzophenone in Minnesota Waters

In groundwater, benzophenone has been detected in approximately 9 percent of samples, with a maximum concentration of 0.22 micrograms per liter ($\mu\text{g/L}$).^{*} The maximum detections were found in groundwater samples from urban residential areas served by individual septic systems and in groundwater samples under landfills.²

In surface water, benzophenone has been detected in approximately 31 percent of samples, with a maximum concentration of 3.72 $\mu\text{g/L}$. The maximum detection was found in a sample intentionally collected downstream of wastewater discharge.²

Benzophenone has not been sampled for in Minnesota drinking water since 2008. Benzophenone was detected in approximately 2 out of 48 Minnesota drinking water samples collected in 2000-2001, with a maximum detection of 0.064 $\mu\text{g/L}$.³ No drinking water samples were above the MDH health-based guidance value.

^{*}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 a guidance value of 100 $\mu\text{g/L}$ for benzophenone in drinking 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

Studies on laboratory animals indicate that exposure to benzophenone can cause decreased body weight in offspring, as well as liver and kidney damage in adults. There is some evidence that benzophenone can cause liver and kidney tumors in laboratory animals. The International Agency for Research on Cancer (IARC) classifies benzophenone as Class 2B “possibly carcinogenic to humans.”⁵

Potential Exposure to Benzophenone

You can be exposed to benzophenone if you eat the foods it occurs in naturally, like grapes and mangoes. Additionally, you can be exposed to benzophenone through various plastic products and some fragrances.⁶

Benzophenone in the Environment

Benzophenone is both naturally occurring and human-made for industrial and commercial uses. Benzophenone may be released into air in emissions from coal and trash combustion, and into water by industrial runoff.¹ In the environment, benzophenone primarily resides in soil and sediment, where it slowly moves through the environment. In water, benzophenone breaks down over weeks to months.

Potential Environment Impacts of Benzophenone

Concentrations of benzophenone measured in surface waters are below levels that would cause harm to aquatic organisms. Though benzophenone would not likely accumulate in tissues, it does not appear to readily degrade under normal environmental conditions.

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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