

Ethylene Dibromide and Water

Ethylene dibromide (EDB), also known as 1,2-dibromoethane, is used in various industrial production processes like the production of dyes, waxes, resins, and in laboratories. It may also be used as an anti-knock agent in leaded gasoline, which still has limited uses in the transportation industry in the United States.

The Minnesota Department of Health (MDH) Risk Assessment Unit evaluates health risks for contaminants in drinking water and develops health-based guidance values for groundwater.¹ The toxicological summary for ethylene dibromide can be found at the MDH Human Health-Based Water Guidance Table website.² MDH works in collaboration with the Minnesota Pollution Control Agency and the Minnesota Department of Agriculture to understand the occurrence and environmental effects of these contaminants.

Ethylene Dibromide in Minnesota waters

Ethylene dibromide has been detected in Minnesota groundwater and public drinking water systems. In groundwater, ethylene dibromide was detected twice in over 3000 samples collected between 1988 and 2020, with a maximum concentration of 9.4 micrograms per liter ($\mu\text{g}/\text{L}$). One microgram per liter is the same as one part per billion (ppb), a common unit of measurement for contaminants in water.

Ethylene dibromide has been detected in six of 34,254 drinking water samples collected in the last 30 years, with a maximum detection of 5.1 $\mu\text{g}/\text{L}$. All six of the detections were above the 2023 MDH health-based guidance value. The most recent detection was in 2005. Ethylene dibromide was not detected in any surface water samples collected between 1994 and 2020.

MDH guidance value

MDH developed a health-based guidance value of 0.03 $\mu\text{g}/\text{L}$ for ethylene dibromide in drinking water. The United States Environmental Protection Agency (EPA) regulates ethylene dibromide under the Safe Drinking Water Act and has established a maximum contaminant level (MCL) of 0.05 $\mu\text{g}/\text{L}$. MCL values must take into consideration cost and technology limitations and are enforceable, while MDH guidance values are health-based.

MDH develops guidance values based on available epidemiological, toxicological, and exposure information to protect people, including people who may be more sensitive to chemical exposure, from 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

Animal studies show that exposure to ethylene dibromide may increase a person's risk of certain kinds of cancer, including cancer of the stomach, esophagus, blood vessels, liver, lung, thyroid gland, and adrenal gland. The United States Environmental Protection Agency classifies it as "likely to be carcinogenic to humans."³

In animal studies, exposure to ethylene dibromide also caused non-cancer effects on the immune system, male and female reproductive systems, liver, kidney, respiratory system, and spleen.

Potential exposure to Ethylene Dibromide

Drinking contaminated water or breathing air near industrial facilities that use ethylene dibromide are the most common ways people are exposed to ethylene dibromide. A person showering with contaminated water may inhale ethylene dibromide that migrates from water droplets into the air.⁴

Ethylene Dibromide in the environment

Ethylene dibromide most commonly enters the environment through industrial releases to air and water. Because it moves easily from water to air, ethylene dibromide does not remain in surface water and is not often detected there. Below the surface, ethylene dibromide moves with the flow of groundwater, so it can be transported away from the places where it is used and released.² Ethylene dibromide contamination underneath buildings may also lead to contamination of indoor air.

References

1. Minnesota Department of Health (MDH). (2023). Human Health-Based Water Guidance. <https://www.health.state.mn.us/communities/environment/risk/guidance/devprocess.html>.
2. Minnesota Department of Health (MDH). (2023). Human Health-Based Water Guidance Table. "Toxicological Summary for: 1,2-Dibromoethane." <https://www.health.state.mn.us/communities/environment/risk/docs/guidance/gw/dibromoethane12.pdf>.
3. United States Environmental Protection Agency (EPA). (2018). Drinking Water Standards and Health Advisories Table. <https://www.epa.gov/system/files/documents/2022-01/dwtable2018.pdf>.
4. Agency for Toxic Substances and Disease Registry (ATSDR). (2018). Toxicological Profile for 1,2-Dibromoethane. <https://www.atsdr.cdc.gov/ToxProfiles/tp37.pdf>.