

Trimethylbenzenes and Groundwater

Trimethylbenzenes

Trimethylbenzenes (TMBs) are a major component of products created through petroleum processing. TMBs are found in crude oil, coal tar and in gasoline as a fuel additive. Some manufacturers also use TMBs to make dyes, perfumes, and resins; as well as consumer products including spray paints, fuel injector cleaners, hobby paints, shoe polish, pharmaceuticals, and other fuel additives.¹ TMBs have three different chemical structures: 1,2,3-TMB, 1,2,4-TMB, and 1,3,5-TMB. It is usually found as a mixture of all three structures.

Trimethylbenzenes in Minnesota Waters

All three TMBs have been detected in Minnesota groundwater and surface water. They have been detected in about one percent of groundwater samples at maximum levels of 790 µg/L* (1,3,5-TMB), 218 µg/L (1,2,4-TMB), and 0.0415 µg/L (1,2,3-TMB).² They have been detected in six to twelve percent of surface water samples at maximum levels of 1.1 µg/L (1,3,5-TMB), 5.2 µg/L (1,2,4-TMB), and 0.1 µg/L (1,2,3-TMB).²

1,3,5-TMB has been detected in 0.2 percent of over 31,000 samples of drinking water since 1989, with a maximum level of 16 µg/L. 1,2,4-TMB has been detected in 0.4 percent of over 31,000 samples of drinking water since 1989, with a maximum level of 80 µg/L. There have been no detections of 1,2,4-TMB above 30 µg/L since 2005. 1,2,3-TMB has not been tested for in Minnesota drinking water.³

*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 30 parts per billion (ppb) each for 1,2,3-TMB, 1,2,4-TMB, and 1,3,5-TMB 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 in laboratory animals exposed to TMBs have shown effects on the nervous, respiratory, and blood systems. Effects on the nervous system (changes in pain sensitivity, motor function, and cognitive function) were consistently seen at low doses of TMBs.

People who have been exposed to TMBs have also experienced effects on the nervous, respiratory, and blood systems. However, these effects were observed following exposure to mixtures that contained many chemicals in addition to TMBs, making it difficult to determine how much the TMBs contributed to the observed health effects.

Potential Exposure to Trimethylbenzenes

TMBs are released when gas combusts in engines. You are most likely to be exposed to TMBs in the air in areas with high motor vehicle traffic, at gas stations, if you work in or near a petroleum refinery, or when you use consumer products that contain TMBs. You can also get TMBs on your skin if you work in

a petroleum refinery or use consumer products that contain TMBs such as spray paints, fuel injector cleaners, hobby paints, shoe polish, and fuel additives.¹ You may be exposed to TMBs through contaminated drinking water, but this is much less common than exposure through air.^{1,3}

Using Trimethylbenzenes Safely

If you work with gasoline or petroleum refining, make sure to wear the proper protective equipment. Always follow the directions when you use paints and automotive products such as polishes, fuel injector cleaners, and gasoline. Always dispose of household hazardous wastes, such as paints, cleaners, and fuels, properly.

Trimethylbenzenes in the Environment

TMBs enter the environment when they are released to the air or into the water. When TMBs are released to water, they can bind to the soil or volatilize into the air. Once in the soil, they tend to stay in the soil and can take a long time to break down.¹

Potential Environment Impacts of Trimethylbenzenes

Detections of TMBs in surface water are far below concentrations that would cause harm to aquatic organisms.

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. Hazardous Substances Databank (HSDB). 2019. <https://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB>
2. National Water Quality Monitoring Council. 2016. Water Quality Portal. <https://www.waterqualitydata.us/portal/>. Accessed January 2019
3. Minnesota Drinking Water Information System (MNDWIS). 2019. Accessed January 2019.

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