

Isobutanol and Drinking Water

Isobutanol is a contaminant that has been found in waters that could be used as drinking water sources in Minnesota. The Minnesota Department of Health (MDH) developed a health-based guidance value for isobutanol in drinking water and, based on this value and levels found in drinking water, does not expect isobutanol in drinking water will harm Minnesotans.

Summary

Isobutanol is used as a solvent and chemical manufacturing ingredient in several industries and may be used as a biofuel. The first commercial isobutanol biofuel site opened in Minnesota in 2012. Isobutanol has been found in stormwater runoff and groundwater in Minnesota.

Isobutanol

Isobutanol is used as a solvent in the flavor, fragrance, pharmaceutical, and pesticide industries and as a chemical manufacturing ingredient for products such as lacquer, paint strippers, paint primer, and craft paints. It is an approved food additive and is also naturally-occurring in some foods and many alcoholic beverages.

Isobutanol may also be used as a biofuel because, like ethanol, it can be manufactured from corn and other plants. The first commercial bio-based isobutanol site in the United States opened in 2012 at a converted ethanol plant in southwestern Minnesota.¹ A second plant was converted from ethanol to isobutanol production by 2015.

Isobutanol in Minnesota Waters

Isobutanol has been detected in stormwater runoff near an isobutanol production site in Minnesota at levels between 98 and 308 parts per billion (ppb). This runoff flows to a retaining pond which may be connected to local groundwater.

Isobutanol has been detected in groundwater monitoring wells near landfills at levels between 74.5 and 105 ppb.²

MDH Guidance Value

Based on available information, MDH developed a guidance value of 300 ppb for isobutanol in water.³ A person drinking water at or below the guidance value would have little or no risk of health effects.

Potential Health Effects

Consuming water with very high levels of isobutanol daily over many months may cause male reproductive toxicity, based on some animal studies.

Potential Exposure to Isobutanol

Many foods and beverages contain small amounts of naturally occurring isobutanol. The use of aerosol primers, lacquers, liquid hobby paints, and some fragrances may result in inhalation exposure. Exposure can also occur when a spill, leak, or other release of isobutanol causes it to enter the air or water that may be used as a drinking water source.^{4,5}

Isobutanol in the Environment

There is potential for significant growth in the isobutanol industry in Minnesota. It is possible that isobutanol will enter the environment through spills, leaks, or other releases at the sites where isobutanol is manufactured or in the transportation of isobutanol.

Isobutanol can also occur naturally in the environment from the fermentation of carbohydrates. Fermentation is the chemical breakdown of a substance, such as the sugars present in plants, by microorganisms including bacteria or yeast.

In most soil types, isobutanol will break down over a period of days to weeks. Isobutanol dissolves easily in water, but can enter the air (volatilize) from surface water.

Potential Environmental Impacts of Chemical

Isobutanol is not likely to bioaccumulate (build up in body tissue) in aquatic life or be toxic to aquatic life. However, if large amounts of isobutanol are present in the aquatic environment, such as during a spill, the breakdown of isobutanol by microorganisms living in the water may lead to the depletion of dissolved oxygen, which can negatively impact fish and other aquatic life.

CEC Program

The MDH Contaminants of Emerging Concern Program (CEC) evaluates health risks from contaminants in drinking water and develops drinking water guidance. 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.

References

1. MDA (2013). Petroleum Replacement Promotion: 2013 Legislative Report. <http://www.mda.state.mn.us/news/government/~media/Files/news/govrelations/legrpt-petroleum13.ashx>
2. MPCA (2016). Data from EQuIS sent to MDH per request.
3. MDH (2016). Toxicological Summary for Isobutanol. <http://www.health.state.mn.us/divs/eh/risk/guidance/gw/isobutsumm.pdf>
4. Hazardous Substances Data Bank (HSDB) (2005). National Library of Medicine. Isobutyl Alcohol. <https://toxnet.nlm.nih.gov/cgi-bin/sis/search2/f?./temp/~EZ0JaW:1>
5. Organisation for Economic Cooperation and Development (OECD) (2004). Screening Information Dataset (SIDS): Isobutanol. <http://www.inchem.org/documents/sids/sids/78831.pdf>

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July 2016

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