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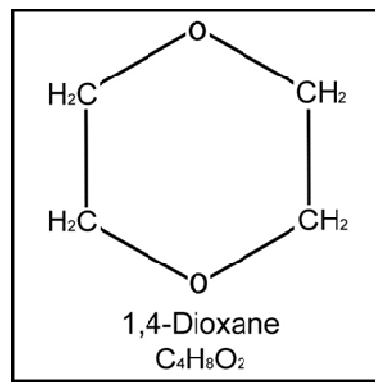
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1,4-Dioxane in Drinking Water

What is 1,4-Dioxane?

1,4-Dioxane ($C_4H_8O_2$) is a clear liquid used primarily as a solvent in the manufacture of chemicals. It is also used as a laboratory reagent, in adhesives, and it may also be present in small amounts in cosmetics and consumer products such as detergents and shampoos. 1,4-Dioxane dissolves and moves quickly in groundwater.

[Note: 1,4-dioxane is not the same as “dioxin,” which is a very different type of chemical.]



How Might I be Exposed?

People can be exposed to 1,4-dioxane by drinking contaminated water or using it to make beverages such as tea, coffee or formula. The amount of 1,4-dioxane absorbed through the skin during showering and bathing is not significant, although children may be incidentally exposed by ingesting water during bathing. Showering is not generally an exposure pathway of concern because 1,4-dioxane does not readily evaporate from water.

What Are The Health Effects of 1,4-Dioxane?

The possible health effects of 1,4-dioxane depend on the levels in water and the length of time someone is exposed to it. Scientific studies suggest that people exposed to elevated levels of 1,4-dioxane may have an increased risk of certain cancers. In several laboratory studies, high doses of 1,4-dioxane given to animals over long periods of time have caused liver and nasal cancers.

There are also non-cancer health effects associated with exposure to 1,4-dioxane. Very high levels of 1,4-dioxane can affect the nervous system, causing loss of coordination, dizziness and headache. These high levels can also cause liver and kidney damage. The guideline set to protect against cancer effects is low, and thus protects against the non-cancer effects as well.

What Is the Drinking Water Limit for 1,4-Dioxane?

MassDEP sets health-protective standards and guidelines for chemicals in drinking water. In 2011 MassDEP set a state drinking water guideline for 1,4-dioxane of 0.3 µg/L (micrograms per liter, sometimes described as parts-per-billion, or 'ppb'). This guideline is set to protect against cancer risk and is also protective against possible noncancer health effects.

What Is The Basis For The Drinking Water Guideline?

Drinking water guidelines are calculated using the US EPA's chemical-specific toxicity information, in this case for 1,4-dioxane. The guidelines include an adult consumption of 2 liters per day of contaminated water throughout a 70-year lifetime. For carcinogens, the guidelines are based on a cancer risk of one in one million from a lifetime exposure. This low risk limit used for setting guidelines for individual chemicals helps to ensure that mixtures of chemicals in drinking water will not exceed health protective limits (total risk from mixtures of one in a hundred thousand).

What is the Cleanup Requirement for Groundwater?

The MassDEP cleanup standard for 1,4-dioxane in groundwater that may be a source of drinking water (category GW-1) is currently 3 µg/L. This GW-1 standard is being revised to be consistent with the drinking water guideline of 0.3 µg/L.

As an alternative to the GW-1 standard, the cleanup may be based on site-specific health risk. Using this method, the health risk from all chemicals present in the groundwater would be assessed, and the cleanup requirement would be based on a total site risk limit of one in a hundred thousand. If 1,4-dioxane were the only contaminant present at a site, the cleanup goal would be 5 µg/L in the groundwater.

What Can I Do to Protect My Family from 1,4-Dioxane?

If you have concerns about the levels of 1,4-Dioxane in your drinking water, you may want to consider switching to drinking bottled water until your tap water meets MassDEP's health-protective drinking water guideline.