

This fact sheet answers the most frequently asked health questions (FAQs) about 1,4-dioxane. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to 1,4-dioxane occurs from breathing contaminated air, ingestion of contaminated food and drinking water, and dermal contact with products such as cosmetics that may contain small amounts of 1,4-dioxane. Exposure to high levels of 1,4-dioxane can result in liver and kidney damage. 1,4-Dioxane has been found in at least 31 of 1,689 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is 1,4-dioxane?

1,4-Dioxane is a clear liquid that easily dissolves in water. It is used primarily as a solvent in the manufacture of chemicals and as a laboratory reagent; 1,4-dioxane also has various other uses that take advantage of its solvent properties.

1,4-Dioxane is a trace contaminant of some chemicals used in cosmetics, detergents, and shampoos. However, manufacturers now reduce 1,4-dioxane from these chemicals to low levels before these chemicals are made into products used in the home.

What happens to 1,4-dioxane when it enters the environment?

- 1,4-Dioxane can be released into the air, water, and soil at places where it is produced or used as a solvent.
- In air, 1,4-dioxane is present as a vapor.
- In water, 1,4-dioxane is stable and does not degrade; also
- In soil, 1,4-dioxane does not stick to soil particles, so it can move from soil into groundwater.
- Fish and plants will not accumulate 1,3-dioxane in their tissues.

How might I be exposed to 1,4-dioxane?

- Breathing air, drinking water, or eating foods that contain 1,4-dioxane. During showering, bathing, or laundering, 1,4-dioxane in tap water may volatilize and you can be exposed to 1,4-dioxane vapors.
- Your skin may contact 1,4-dioxane when you use cosmetics, detergents, bubble baths, and shampoos containing 1,4-dioxane.

How can 1,4-dioxane affect my health?

Few studies are available that provide information about the effects of 1,4-dioxane in humans. Exposure to very high levels of 1,4-dioxane can result in liver and kidney damage and death. Eye and nose irritation was reported by people inhaling low levels of 1,4-dioxane vapors for short periods (minutes to hours).

Studies in animals have shown that breathing, ingesting, or skin contact with 1,4-dioxane can result in liver and kidney damage. Animals that breathed high amounts of 1,4-dioxane also became drowsy.

Scientists do not know whether 1,4-dioxane affects reproduction or the ability to fight infections in people or animals.

How likely is 1,4-dioxane to cause cancer?

The limited number of studies available does not show whether 1,4-dioxane causes cancer in humans. However, laboratory rats and mice that drank water containing 1,4-dioxane during most of their lives developed liver cancer; the rats also developed cancer inside the nose. Scientists are debating the degree to which the findings in rats and mice apply to exposure situations commonly encountered by people.

The U.S. Department of Health and Human Services considers 1,4-dioxane as reasonably anticipated to be a human carcinogen.

How can 1,4-dioxane affect children?

There are no studies of children exposed to 1,4-dioxane. However, children might experience health problems similar to those in adults if they were exposed to high concentrations of 1,4-dioxane.

Scientists do not know whether exposure of pregnant women to 1,4-dioxane can harm the unborn child. Not enough animal studies are available that can help predict what might happen in people. 1,4-Dioxane does not build up in the body, but a nursing mother exposed to a high amount of 1,4-dioxane might pass it to the infant in breast milk.

How can families reduce the risks of exposure to 1,4-dioxane?

Families that drink water that could be contaminated with 1,4-dioxane can reduce the risk for exposure to 1,4-dioxane by drinking uncontaminated bottled water. Children who live near hazardous waste sites that might be contaminated with 1,4-dioxane should be discouraged from playing in mud and water near these sites because these sites might contain 1,4-dioxane. Children also should be discouraged from eating mud, and they should follow careful hand washing.

1,4-Dioxane may be a contaminant in cosmetics, detergents, and shampoos that contain the following ingredients (which may be listed on the product label): “PEG,” “polyethylene,” “polyethylene glycol,” “polyoxyethylene,” “polyethoxyethylene,” or “polyoxynolethylene.” Many products on the market today contain 1,4-dioxane in very small amounts. However, some cosmetics, detergents, and shampoos may contain 1,4-dioxane at levels higher than recommended by the FDA for other products. Families wishing to avoid cosmetics containing the ingredients listed above may do so by reviewing the ingredient statement that is required to appear on the outer container label of cosmetics offered for retail sale. Also, families may look for cautionary statements on the labels of foaming detergent bath products with directions for safe use, the need to keep out of the reach of children, or the need for adult supervision.

Is there a medical test to determine whether I've been exposed to 1,4-dioxane?

1,4-Dioxane and its breakdown products can be measured in your blood and urine, and positive results indicate you have been exposed to 1,4-dioxane. The tests are not routinely available at your doctor's office because they require special equipment, but the doctor can collect the samples and send them to a special laboratory. The tests need to be conducted within days after the exposure because 1,4-dioxane and its breakdown products leave the body fairly rapidly. These tests do not predict whether exposure to 1,4-dioxane will produce harmful health effects.

Has the federal government made recommendations to protect human health?

EPA recommends that the levels of 1,4-dioxane in drinking water that children drink for 1 day not exceed 4 milligrams per liter (4 mg/L) or 0.4 mg/L if they drink the water for 10 days. However, a federal drinking water standard is not available.

The Occupational Safety and Health Administration (OSHA) has set a limit for of 100 parts 1,4-dioxane per 1 million parts of air (100 ppm) in the workplace.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for 1,4-Dioxane (Draft for Public Comment). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

