



Vision:
To be the Healthiest State in
the Nation

1,4-DIOXANE

1,4-Dioxane is a man-made chemical. It has been widely used in laboratory and manufacturing processes and has been a byproduct of chemicals used in personal care products, laundry detergents and food. Until 1996, it was commonly used as a stabilizer in chlorinated solvents.

It is a colorless, flammable liquid with a mild sweet smell. It can be released into air, water and soil, where it is highly mobile. While it is very short-lived when released into the air, it is very long-lived in water. Currently, 1,4-dioxane is classified as contaminant of emerging concern and as likely to cause cancer.

The purpose of this factsheet is to provide an overview of frequently asked questions regarding 1,4-dioxane in the environment and its possible health effects, as well as current regulatory guidance.

GENERAL FACTS

What is 1,4-dioxane?

1,4-Dioxane is a man-made chemical. It can occur as a colorless, flammable liquid that easily dissolves in water. It has been used as a stabilizer for chlorinated solvents and in the production of medicines and glues. 1,4-Dioxane can be found in paints, lacquers, dyes, waxes, greases, cosmetics, detergents and other consumer products. It can also be found in food from packaging material, in some food supplements or on crops treated with pesticides containing 1,4-dioxane.

What happens to 1,4-dioxane when it is released into the environment?

1,4-Dioxane can be released into the environment in places where it is produced or used. Once released, it can get into the air, water and soil. This process is called contamination.

1,4-Dioxane stays in soil and water for a much longer time, than in the air. However, 1,4-dioxane can be released as a gas into the air from soil or water. When 1,4-dioxane is released into soil, it quickly moves into the groundwater. The chemical stays in the groundwater and normally does not break down or disappear. 1,4-Dioxane does not build up in plants or animals over time.

Why is 1,4-dioxane a concern?

1,4-Dioxane has been identified as a contaminant of emerging concern and as a likely human carcinogen (cancer-causing).

The chemical can remain in groundwater for a long time and can get into drinking water. 1,4-Dioxane has been detected in drinking water supplies, groundwater and soil throughout the world.

How can people come in contact with 1,4-dioxane?

The most common way people come in contact with 1,4-dioxane is by drinking 1,4-dioxane-contaminated tap water. Another common way of contact is breathing in the chemical after it has been released into the air during showering, bathing and/or laundering clothes with 1,4-dioxane-contaminated water.

There is a small chance that a person can come into contact with 1,4-dioxane by:

- Getting the chemical on their skin from soil that has been contaminated with 1,4-dioxane.
- Eating foods that have been contaminated with 1,4-dioxane.

How can 1,4-dioxane potentially affect health?

There are only a few scientific studies that provide information on the health effects of 1,4-dioxane in humans. Some studies have shown that contact with 1,4-dioxane can cause nausea, drowsiness, headache, eye, nose and throat irritation. Exposure to high levels of 1,4-dioxane can cause liver and kidney damage, as well as death.

Developing potential health effects from contact with 1,4-dioxane varies and depends on:

- How much 1,4-dioxane a person comes into contact with.
- How long a person is in contact with it.
- How often a person comes in contact with it.

Can 1,4-dioxane cause cancer?

The U.S. Environmental Protection Agency (EPA) classifies 1,4-dioxane as “likely to be carcinogenic to humans” which means that there is some evidence that the chemical can cause cancer.

The International Agency for Research on Cancer has classified 1,4-dioxane as possibly carcinogenic to humans.

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

Overall, there is currently no scientific evidence that shows a direct link between contact with 1,4-dioxane and cancer in humans. Animals used in laboratory studies developed cancer when exposed to 1,4-dioxane via inhalation and ingestion during most of their lives.

REGULATION AND ADVISORY

What is the current federal standard for 1,4-dioxane in drinking water?

Currently, 1,4-dioxane is not federally regulated by the EPA’s Office of Groundwater and Drinking Water. Though, it has been included in the list of proposed chemicals to be federally regulated by the EPA in the future. The current EPA Health Advisory Level (HAL) for 1,4-dioxane is 0.35 micrograms per liter (µg/L) considering an acceptable cancer risk of 1 in a million. 0.35 µg/L is the equivalent of approximately 5 filled shot glasses (7.5 oz) added to approximately 150 million gallons of water. Drinking water at or below the HAL for a lifetime is not expected to cause any increased harmful health effects.

The Florida Department of Health has set a Florida HAL of 0.35 µg/L for 1,4-dioxane in drinking water.

What is the current federal regulated level of 1,4-dioxane in air?

There is no federal standard for 1,4-dioxane in air.

The Occupational Safety and Health Administration (OSHA) enforces a 1,4-dioxane permissible exposure limit (PEL) for workers of 100 parts per million (ppm) as an 8-hour total-weighted average. However, while OSHA has established a PEL for 1,4-dioxane, it recognizes many of its PELs are outdated and may not adequately protect workers. For 1,4-dioxane, OSHA suggests that workers follow either of the following exposure limit recommendations:

- The California OSHA limit of 0.28 ppm.
- The National Institute for Occupational Safety and Health recommended exposure limit of 1 ppm that is not to be exceeded during a 30-minute exposure.
- The American Conference of Governmental Industrial Hygienists threshold limit value of 20 ppm.

What is the current state regulated level of 1,4-dioxane in groundwater, surface water and soil in Florida?

The Florida Department of Environmental Protection (FDEP) is the state’s lead agency for environmental management of Florida’s air, water and land. FDEP enforces state regulated levels for 1,4-dioxane in groundwater, surface water and soil per Florida Administrative Code, Chapters 62-780 and 62-777:

	Groundwater (µg/L)	Surface Water (µg/L)	Soil	
			Residential (mg/kg)	Commercial (mg/kg)
	3.2	120	23	38

µg/L = microgram per liter
 mg/kg = milligram per kilogram

BIOMONITORING AND BLOOD TESTING

Can a test determine if I have come in contact with 1,4-dioxane?

1,4-Dioxane can be measured in blood and urine. However, there are many challenges with testing for 1,4-dioxane in humans because it requires a specialized medical test that is not available at most doctor's offices. Furthermore, testing would need to be completed within days of contact with 1,4-dioxane because it leaves the body quickly after a person comes in contact with it.

What can the results from testing for 1,4-dioxane NOT tell me?

Medical test results would not indicate when, where, how and for how long a person came in contact with 1,4-dioxane. It would also not explain the potential health effects from contact with the chemical.

COMMUNITY CONCERNS

How do I know if my drinking water has 1,4-dioxane?

If your drinking water source is from a public water system you will be notified if they found chemicals in your water above health standards.

If you have a private well, in general, the Department of Health strongly recommends that you test your water at least once per year. More information on private well water testing can be found here: floridahealth.gov/environmental-health/private-well-testing/index.html

If my drinking water has 1,4-dioxane, should my pets drink it?

No. Pets should be given the same drinking water you drink. If the drinking water contains levels of 1,4-dioxane causing a possible concern, use a different water source for pets.

I drank water with 1,4-dioxane while I was pregnant and lactating. What impact could it have on my child?

Limited data are available on the effects of 1,4-dioxane on children or pregnant women. At this time, it is unknown if or how 1,4-dioxane can harm an unborn child.

Is it ok to swim in my pool if it is contaminated with 1,4-dioxane?

Swimming in water contaminated with 1,4-dioxane poses a low risk of developing harmful health effects because, in general, the chemical does not easily get into a person's body through their skin. There is a small chance that a person could breathe in the chemical. Drinking water containing the chemical is more dangerous, so people should take precautions to avoid swallowing the pool water if it is contaminated with 1,4-dioxane.

How can I reduce contact with 1,4-dioxane?

If 1,4-dioxane has been found in your drinking water, another water source, like bottled water, should be used instead. Drinking water contaminated with 1,4-dioxane is the most common way people come in contact with the chemical.

Can I eat my homegrown produce that I watered with 1,4-dioxane contaminated water?

1,4-Dioxane is released quickly from the body and does not build up over time or through the food chain. Although, as limited data are available on 1,4-dioxane contaminated water and home-grown produce, it is not recommended to consume produce that has been watered with 1,4-dioxane contaminated water.

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If you have questions or comments about this factsheet, we encourage you to contact us.

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