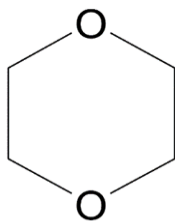




Nontechnical Summary of the TSCA Risk Evaluation for 1,4-Dioxane



C₄H₈O₂ (CASRN: 123-91-1)

Why Is EPA Providing This Document?

EPA evaluated the risks of 1,4-dioxane to human health and the environment under the Toxic Substances Control Act ([TSCA](#)). This document summarizes the results of the completed risk evaluation.

What Is 1,4-Dioxane and How Is It Used?

1,4-Dioxane is used as a solvent in many industrial processes, to make other chemicals, and in laboratories. 1,4-Dioxane can form as a byproduct and has been found as a contaminant in household items like soaps. Even though its name is similar to “[dioxin](#),” they are *not* the same. 1,4-Dioxane is produced, imported, and used throughout the United States.

How Might 1,4-Dioxane Harm People Who Are Exposed?

Based on animal studies, exposure to 1,4-dioxane can cause several types of cancer, including liver and lung cancer. Other effects include risk of liver and kidney damage as well as harm to nasal tissue needed for smell.

How Might Persons Be Exposed to 1,4-Dioxane?

Exposure to 1,4-dioxane can occur in and near workplaces that use it as a solvent or through other activities that generate 1,4-dioxane as a byproduct. At work, people can be exposed by using products that contain 1,4-dioxane.

Workers can be exposed by breathing 1,4-dioxane or getting it on their skin.

1,4-Dioxane can be released to air and water. For example, it may be released in wastewater from industrial facilities to nearby lakes and rivers. “Down-the-drain” releases can result from use of consumer products like detergents that contain 1,4-dioxane. It is not removed through typical water treatment techniques and has been found in the drinking water of some U.S. communities. As a result, people can be exposed by drinking water contaminated with 1,4-dioxane.

How Has EPA Assessed 1,4-Dioxane under TSCA?

In December 2020, EPA published a [Risk Evaluation for 1,4-Dioxane](#)¹ that evaluated risks to the following groups:

- people who use 1,4-dioxane at work;
- consumers who use household products that contain 1,4-dioxane; and
- members of the general population exposed to 1,4-dioxane from contact with surface water.

The 2020 assessment also evaluated risks to fish and other aquatic species like plants.

In November 2024, EPA published a *Supplement to the Risk Evaluation for 1,4-Dioxane*. It assessed risks excluded from the 2020 Risk Evaluation, including

- workers exposed to 1,4-dioxane after it is produced as a byproduct; and
- general population members exposed to 1,4-dioxane in drinking water or air.

Both risk evaluations considered groups of people who have higher exposures to 1,4-dioxane or are more likely or liable to be

¹ The nontechnical summary for the 2020 Risk Evaluation is available at <https://www.epa.gov/sites/default/files/2021-01/documents/epa-hq-oppt-2019-0238-0110.pdf>.

harm by exposure. Such “potentially exposed or susceptible subpopulations” include

- workers;
- consumers;
- people who live near release sites; and
- people who may be more susceptible to 1,4-dioxane due to age, genetic variations, health conditions, or other factors.

What Is EPA’s Final Risk Determination for 1,4-Dioxane under TSCA?

1,4-Dioxane presents an unreasonable risk of injury to human health. It does not present an unreasonable risk of injury to the environment.

The Agency considered the following factors when determining unreasonable risk from 1,4-dioxane:

- nature and severity of the health and environmental effects;
- duration, amount, and frequency of 1,4-dioxane exposures;
- populations exposed; and
- EPA’s confidence in the risk estimates.

The following conditions of use² significantly contribute to the unreasonable risk:

- Manufacture (including domestic manufacture and import)
- Processing (including repackaging, recycling, non-incorporative, as a reactant, and as a byproduct, including ethoxylation processing and polyethylene terephthalate [PET] manufacturing)
- Industrial/commercial use: Intermediate
- Industrial/commercial use: Processing aid
- Industrial/commercial use: Functional fluids (open and closed system): Metalworking fluid, cutting and tapping fluid, polyalkylene glycol fluid, hydraulic fluid
- Industrial/commercial use: Laboratory chemicals

- Industrial/commercial use: Adhesives and sealants: Film cement
- Industrial/commercial use: Other uses: Spray polyurethane foam
- Industrial/commercial use: Other uses: Printing and printing compositions
- Industrial/commercial use: Other uses: Dry film lubricant
- Industrial/commercial use: Other uses: Hydraulic fracturing
- Industrial/commercial use: Arts, crafts, and hobby materials: Textile dye
- Industrial/commercial use: Cleaning and furniture care products: Surface cleaner
- Industrial/commercial use: Laundry and dishwashing products: Dish soap
- Industrial/commercial use: Laundry and dishwashing products: Dishwasher detergent
- Industrial/commercial use: Laundry and dishwashing products: Laundry detergent
- Industrial/commercial use: Paints and coatings: Paint and floor lacquer
- Consumer use: Cleaning and furniture care products: Surface cleaner
- Consumer use: Laundry and dishwashing products: Dish soap
- Consumer use: Laundry and dishwashing products: Dishwasher detergent
- Consumer use: Laundry and dishwashing products: Laundry detergent
- Consumer use: Paints and coatings: Paint and floor lacquer
- Disposal.

The following conditions of use do not significantly contribute to the unreasonable risk:

- Distribution in commerce
- Industrial/commercial use: Automotive care products: Antifreeze
- Consumer use: Arts, crafts, and hobby materials: Textile dye
- Consumer use: Automotive care products: Antifreeze

² Under TSCA, conditions of use are the specific circumstances, “as determined by the Administrator, under which a chemical substance is intended, known, or reasonably foreseen to be manufactured, processed,

distributed in commerce, used, or disposed of.” Note that some of the bullets listed above represent multiple/grouped conditions of use.

- Consumer use: Other consumer uses:
Spray polyurethane foam.

Human Health: Workers and other people nearby³ who breathe or get 1,4-dioxane on their skin can be at risk for liver, kidney, and nasal tissue damage. They can also be at risk for cancer. Consumers, bystanders,⁴ and general population members who drink water contaminated with 1,4-dioxane can have a cancer risk. Use of household items containing 1,4-dioxane as a byproduct did not present an unreasonable risk to consumers or bystanders.

The Environment: EPA did not find that 1,4-dioxane presents an unreasonable risk to the environment.

How Will EPA Protect Human Health from 1,4-Dioxane under TSCA?

Following a final determination of unreasonable risk, TSCA requires EPA to address the unreasonable risk. The Agency may propose regulations that could include banning or limiting 1,4-dioxane in specific uses. EPA may also propose labeling or recordkeeping requirements to restrict use. After taking public comment on proposed regulations, TSCA requires EPA to finalize risk management regulations for 1,4-dioxane.

EPA encourages workers to follow workplace safety requirements, including the use of personal protective equipment such as masks and gloves.

For More Technical Information, Including Previous EPA Actions, See the Following:

- [EPA's 2024 Supplement to the Risk Evaluation for 1,4-Dioxane](#)
- [EPA's 2024 Risk Determination for 1,4-Dioxane](#)
- [EPA's 2020 Risk Evaluation for 1,4-Dioxane](#)
- [Risk Evaluations for Existing Chemicals under TSCA](#)

³ Under TSCA, "occupational non-users" are workers in close proximity with other workers using an industrial product that contains 1,4-dioxane.

⁴ Under TSCA, a "bystander" is a person near someone using a consumer product containing 1,4-dioxane.