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Government policies continued

In August 2010, the USEPA finalized its review of the latest information regarding 1,4-dioxane and approved a toxicity reassessment suggesting it is approximately nine times more probable to cause cancer than previously thought. The new health protective risk range for 1,4-dioxane is between .35 ppb and 35 ppb for a lifetime of exposure of about 70 years. The previous range was 3 ppb to 300 ppb. The USEPA uses this range to determine the degree of clean-up when there are no current drinking water standards.

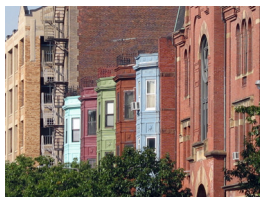


Photo Credit: Monica D. Ramirez.

One part per billion is equal to one pinch of salt in a 10 ton bag of potato chips

Want to learn more about 1,4-Dioxane?

- **US Department of Labor, Occupational Safety & Health Administration:**
<http://www.osha.gov/SLTC/healthguidelines/dioxane/recognition.html>
- **Agency for Toxic Substances and Disease Registry:**
<http://www.atsdr.cdc.gov/toxprofiles/tp.asp?id=955&tid=199>
- **US Environmental Protection Agency:**
www.epa.gov/opptintr/chemfact/dioxa-sd.txt
www.epa.gov/ttn/atw/hlthef/dioxane.html#ref7
www.clu-in.org/contaminantfocus/default.focus/sec/1,4-Dioxane/cat/Policy_and_Guidance/
- **National Institute of Environmental Health Sciences:**
<http://ntp.niehs.nih.gov/ntp/roc/twelfth/profiles/Dioxane.pdf>

Dean Carter Binational Center



The mission of the Binational Center is to resolve environmental and human health challenges along the US – Mexico Border



Superfund Research Program
The University of Arizona

The mission of the Superfund Program is to advance science and to use the research conducted for the improvement of human health and the environment



For further information:

Denise Moreno, Program Coordinator
1703 East Mabel Street
Tucson, Arizona 85721-0207
Tele: 520.429.1428, Fax: 520.626.2466
dmoreno@pharmacy.arizona.edu
www.binational.pharmacy.arizona.edu

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1,4-DIOXANE AND OUR HEALTH

What is 1,4-Dioxane?

1,4-Dioxane is a man-made organic (contains carbon) chemical compound. It is a colorless, flammable liquid with a mild ether-like odor. 1,4-Dioxane dissolves in water at all concentrations. Often, it is referred to as just "dioxane."

1,4-Dioxane is a:

Solvent - a liquid that can dissolve oily and greasy substances. 1,4-Dioxane is employed in surface finishing processes.

Stabilizer for other solvents - prevents other solvents from degrading. 1,4-Dioxane is utilized primarily as a stabilizer for chlorinated solvents like 1,1,1-trichloroethane or TCA. About 90% of the 1,4-dioxane produced is used to stabilize chlorinated solvents.

By-product - produced during the manufacturing process of some chemicals.

Ingredient - it can be present in food packaging material, food additives, varnishes, waxes, plastics, antifreeze, cosmetics, detergents, shampoos, and pesticides.

How is 1,4-Dioxane Present in our Environment?



Photo Credit: Denise Moreno.

1,4-Dioxane can be released into the air, water, and soil. It has similar evaporation properties to water; it can be present as a liquid or as a vapor in the air. 1,4-Dioxane does not attach to soil, so it can be released from soil to contaminate groundwater. When mixed with water, 1,4-dioxane does not readily decompose or degrade.



1,4-Dioxane and Our Health

How does 1,4-Dioxane affect our health?



Whether 1,4-dioxane makes you sick depends on:

- **Dose** - How much you are exposed to?
- **Duration** - How long you have been exposed?
- **Exposure Route** - Drinking/eating (ingestion), breathing (inhalation), or skin contact (dermal contact)
- **Genetics** - Family traits
- **Individual characteristics** - Age, general health, and lifestyle

1,4-Dioxane exposure occurs by absorption through the skin, through inhalation, and through ingestion. The following are the resulting affects according to the exposure duration:

- **Acute (short-term)** - vertigo, drowsiness, headache, and irritation of the eyes, nose, throat, skin, and lungs.
- **Chronic (long-term)** - damage to the liver and kidneys, development of tumors, and liver and nasal cancer.

Studies in animals have shown that 1,4-dioxane exposure mainly affects the liver and kidneys. The levels of 1,4-dioxane used in studies with experimental animals are much higher than the levels the general public might be exposed to commonly (includes exposure via consumer products, food, or environmental sources). Few studies are available that provide information about the effects of 1,4-dioxane in humans. Deaths have been reported due to severe accidental exposure to high concentrations of 1,4-dioxane vapors in occupational settings.



Photo Credit: Monique D. Ramirez

How can I reduce 1,4-Dioxane exposure in my home?

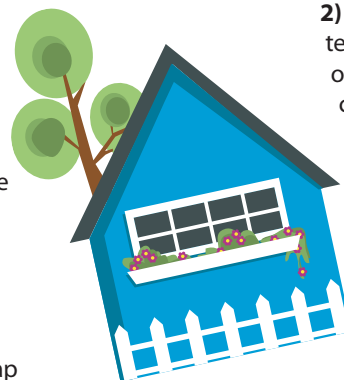
Reducing skin exposure

To avoid skin contact with 1,4-dioxane, choose cosmetic, detergent, and shampoo products that do not contain: **PEG, polyethylene, polyethylene glycol, or polyoxyethylene**. Contact with contaminated water via bathing or showering is another potential route of exposure.

Reducing ingestion and Inhalation exposure

Food may contain 1,4-dioxane due to pesticides or packaging. When tap water is contaminated with this chemical, drinking water or inhaling vapors during bathing or showering, are also routes of exposure. The only way to know if your drinking water contains 1,4-dioxane is to contact your local water provider and/or have your water tested. If you own a private water well, you can take a sample to a state certified laboratory. In Arizona call 602-364-0728 for a list of state certified laboratories.

There are technologies available that can treat 1,4-dioxane polluted water. They are applied at a large scale and can be very costly to operate. The three types that are currently used at contaminated sites are:



1) Pump-and-treat - contaminated water is pumped out and treated on the surface. This treated water is then pumped back into the groundwater at a strategic place that in turn keeps the 1,4-dioxane from moving or contaminating other water sources.

2) Advanced Oxidation Processes - this treatment system uses hydrogen peroxide with ultraviolet light or ozone to destroy 1,4-dioxane. This treatment option is commonly combined with pump-and-treat.

3) Ex Situ Bioremediation - uses bacteria that degrade 1,4-dioxane into less toxic components.

What are the government policies concerning 1,4-Dioxane?

Due to the occurrence of cancer in animals studies to 1,4-dioxane, the International Agency for Research on Cancer, US Environmental Protection Agency, and US Department of Health and Human Services has determined that it may cause cancer in humans. 1,4-Dioxane is considered an "emerging contaminant" or in other words it is potentially a threat to human and environmental health. Currently, there is no federal drinking water standard for 1,4-dioxane, however some states, such as Maine, and Michigan, have established their own enforceable drinking water standards. The Occupational Safety and Health Administration has established a workplace exposure limit for 1,4-dioxane of 100 parts per billion (ppm) for an 8-hour workday, 40 hours per week.



The US Environmental Protection Agency (USEPA)

has created a health advisory level regarding 1,4-dioxane. This advisory is a recommendation, but cannot be enforced by the law. They are available at: www.epa.gov/waterscience/criteria/drinking/dwstandards.html

