



PUBLIC HEALTH STATEMENT

Trichlorobenzenes

Division of Toxicology and Human Health Sciences

November 2014

This Public Health Statement is the summary chapter from the Toxicological Profile for Trichlorobenzenes. It is one in a series of Public Health Statements about hazardous substances and their health effects. A shorter version, the ToxFAQs™, is also available. This information is important 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. For more information, call the ATSDR Information Center at 1-800-232-4636.

Overview

We define a public health statement and show how it can help you learn about trichlorobenzenes.

Introduction

A public health statement summarizes information about a hazardous substance. The information is taken from a toxicological profile developed by the Agency for Toxic Substances and Disease Registry's (ATSDR's) Division of Toxicology and Human Health Sciences (DTHHS). A toxicological profile is a thorough review of a hazardous substance.

This toxicological profile examines trichlorobenzenes. This public health statement summarizes the DTHHS's findings on trichlorobenzenes, describes the effects of exposure to them, and describes what you can do to limit that exposure.

Trichlorobenzenes at hazardous waste sites

The U.S. Environmental Protection Agency (U.S. EPA) identifies the most serious hazardous waste sites in the nation. U.S. EPA then includes these sites in the National Priorities List (NPL) and targets them for federal clean-up activities. U.S. EPA has found 1,2,3-, 1,2,4-, and 1,3,5-trichlorobenzene in at least 31, 187, and 4 of the 1,699 current or former NPL sites, respectively.

The total number of NPL sites evaluated for trichlorobenzenes is not known. But the possibility remains that as more sites are evaluated, the number of sites at which trichlorobenzenes is found may increase. This information is important; these future sites may be sources of exposure, and exposure to trichlorobenzenes may be harmful.

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Why a trichlorobenzenes release can be harmful

When a contaminant is released from a large area such as an industrial plant or from a container such as a drum or bottle, it enters the environment. But such a release does not always lead to exposure. You can only be exposed to a contaminant when you come in contact with it. That contact—and therefore that exposure—can occur when you breathe, eat, or drink the contaminant, or when it touches your skin.

Even if you are exposed to trichlorobenzenes, you might not be harmed. Whether you are harmed will depend on such factors as the dose (how much), the duration (how long), and how you are exposed. Harm might also depend on whether you have been exposed to any other chemicals, as well as your age, sex, diet, family traits, lifestyle, and state of health.

A Closer Look at Trichlorobenzenes

Overview

This section describes trichlorobenzenes in detail and how you can be exposed to them.

What are trichlorobenzenes?

Trichlorobenzenes are human-made compounds that occur in three different chemical forms. Although they have the same molecular weight and molecular formula, they differ structurally by where the chlorine atoms are attached to the benzene ring. Compounds like these are referred to as isomers. 1,2,3-Trichlorobenzene and 1,3,5-trichlorobenzene are colorless solids, while 1,2,4-trichlorobenzene is a colorless liquid.

Although the three isomers of trichlorobenzene are structurally similar, they each may have different chemical and toxicological properties.

How are trichlorobenzenes used?

Trichlorobenzenes have primarily been used as solvents and chemical intermediates to produce other compounds. In the past, mixed isomers of trichlorobenzene had been used for termite control, but this is not a current use. One of the isomers (1,2,4-trichlorobenzene) is produced in large quantities and is used as a solvent to dissolve such special materials as oils, waxes, resins, greases, and rubber. It is also frequently used to produce dyes and textiles. The other two isomers, 1,2,3-trichlorobenzene and 1,3,5-trichlorobenzene, are produced in lower quantities and have fewer uses.

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Where are trichlorobenzenes found?

Trichlorobenzenes can be released into the air, water, and soil at places where they are produced or used.

Possible Sources	Outcome
Air	Trichlorobenzenes are volatile substances and may therefore partition or volatilize to air when released to the environment. The half-life (the time it takes for 50% of the compound to degrade) of trichlorobenzenes in air is about 1 month.
Water	Trichlorobenzenes have been detected in groundwater, drinking water, and surface water (rivers and lakes). Trichlorobenzenes have a tendency to evaporate over time from water, but can also adsorb to suspended solids and sediment in water.
Soil	Trichlorobenzenes evaporate from soils and are slowly broken down by microorganisms in soil and sediment.
Other Media	Trichlorobenzenes in water and soil may be absorbed or ingested by animals, including fish. Trichlorobenzenes are often detected in the fat of fish or other species living in contaminated waters. This is because trichlorobenzenes can easily dissolve in fat; consequently, fish can accumulate trichlorobenzenes in fatty tissues.

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How Trichlorobenzenes Can Affect Your Health

Overview

This section looks at how trichlorobenzenes enter your body and potential trichlorobenzenes health effects found in human and animal studies.

How trichlorobenzenes enter your body

Trichlorobenzenes can enter your body from the air, water, or soil.

Possible Sources	Possible Exposure Pathway
Air	<p>There is not enough information to determine how much or how fast trichlorobenzenes can be absorbed by your body if you inhale vapors or contaminated air.</p> <p>A study in rats indicated that trichlorobenzenes can be absorbed by the body through the lungs. However, we do not know how fast or how much can be absorbed.</p>
Water	<p>We do not know enough to determine how much or how fast trichlorobenzenes can be absorbed by your body if you swallow these chemicals.</p> <p>Studies in animals indicate that these chemicals can be quickly absorbed through the gastrointestinal tract.</p>
Soil	<p>We do not know whether trichlorobenzenes can be absorbed through your skin if you touch soil containing these chemicals.</p> <p>Studies in animals have shown that some 1,2,4-trichlorobenzene can be absorbed through the skin.</p>

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What happens to trichlorobenzenes in your body

There is no information regarding what happens to trichlorobenzenes in humans. In animals, trichlorobenzenes are transformed in the body into other chemicals.

How trichlorobenzenes leave your body

There is no information on how these compounds could leave the body in humans, but based on studies in animals, they probably leave principally in the urine.

In animals, degradation products of trichlorobenzenes leave the body in the urine, feces, and bile in a few days following exposure.

Studies in animals suggest that trichlorobenzenes do not accumulate in the body of mammals, but can accumulate in fish to some extent.

Introduction to trichlorobenzenes health effects

The health effects of trichlorobenzenes depend on how much of these compounds you are exposed to and the length of that exposure. Environmental monitoring data suggest that any trichlorobenzene's levels that the public might encounter through contact or through water, soil, or food are much lower than animal-study levels.

Short-term exposure effects

There is no information regarding health effects of trichlorobenzenes in humans other than reports of minimal eye and throat irritation in certain people exposed to vapors of 1,2,4-trichlorobenzene.

Placing trichlorobenzenes on the skin or the eyes of animals produced irritation that eventually went away after time.

Long-term exposure effects

Very limited information exists regarding effects of long-term exposure in humans. There is a report of a woman who developed a blood disorder due to prolonged inhalation of trichlorobenzenes from her husband's work clothes.

Prolonged administration of 1,2,4-trichlorobenzene to rats did not affect their capacity to reproduce.

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**Trichloro-
benzenes and
cancer**

There are no studies of cancer in humans exposed to trichlorobenzenes.

Mice given 1,2,4-trichlorobenzene in the food for 2 years developed cancer of the liver.

The EPA has stated that 1,2,4-trichlorobenzene is not classifiable as to human carcinogenicity. However, this was based on studies prior to 1990; newer information has not been evaluated.

Children and Trichlorobenzenes

Overview

This section discusses potential health effects of trichlorobenzenes exposure in humans from when they're first conceived to 18 years of age, and how you might protect against such effects.

**Exposure
effects for
children**

There are no studies of children exposed to trichlorobenzenes. Therefore, we do not know whether children are more susceptible than adults to the effects of exposure to trichlorobenzenes.

**What about
birth defects?**

We do not know whether exposure of women to trichlorobenzenes during pregnancy can produce birth defects in their babies.

For the most part, studies in rats and mice given 1,2,4-trichlorobenzene orally during pregnancy did not cause effects in their pups at birth or later during the growing period. However, a study in rats found lesions in the eyes of the pups.

Breast milk

Trichlorobenzenes have been found in human breast milk, which means that mothers can transfer these chemicals to their babies by nursing.

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How Can Families Reduce the Risk of Exposure to Trichlorobenzenes?

If your doctor finds that you have been exposed to significant amounts of trichlorobenzenes, ask whether your children might also be exposed. Your doctor might need to ask your state health department to investigate.

Food

Trichlorobenzenes tend to accumulate in the fatty tissue of fish; therefore, avoid eating large quantities of fish from areas contaminated with trichlorobenzenes. Avoid consumption of food crops grown in areas contaminated with trichlorobenzenes.

Drinking water

Avoid drinking water from sources that are known to be contaminated with trichlorobenzenes. Use bottled water if you have concerns about the presence of chemicals in your tap water. You may also contact local drinking water authorities and follow their advice.

Contaminated groundwater or soil

Trichlorobenzenes have been detected in groundwater. Avoid contact with groundwater known to be contaminated with trichlorobenzenes. Prevent children from playing in dirt if you live near a waste site that has trichlorobenzenes. Discourage your children from putting objects in their mouths. Make sure that they wash their hands frequently and before eating.

Medical Tests to Determine Trichlorobenzenes Exposure

Overview

We identify medical tests that can detect whether trichlorobenzenes are in your body, and we recommend safe toxic-substance practices.

Trichlorobenzenes can be measured in blood and body fat

Trichlorobenzenes can be measured in blood and body fat, but the tests are not routinely available at the doctor's office. The detection of trichlorobenzenes cannot predict the kind of health effects that might develop from that exposure.

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There is not enough information to determine whether trichlorobenzenes detected in your body indicate that you have been exposed recently to a high amount or you are continuously exposed to lower amounts.

Detecting trichlorobenzenes in your body generally means that you were exposed to these compounds. However, detecting breakdown products of trichlorobenzenes may mean that you were exposed to trichlorobenzenes or that you were exposed to other chemicals that produce the same breakdown products.

Federal Government Recommendations to Protect Human Health

Overview

One way the federal government promotes public health is by regulating toxic substances or recommending ways to handle or to avoid toxic substances.

The federal government regulates toxic substances

Regulations are enforceable by law. The U.S. EPA, the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA) are some federal agencies that have adopted toxic substances regulations.

The federal government recommends safe toxic substance practices

The Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH) have made recommendations about toxic substances. Unlike enforceable regulations, these recommendations are advisory only.

Toxic substance regulations

Regulations and recommendations can be expressed as “not-to-exceed” levels; that is, levels of a toxic substance in air, water, soil, or food that do not exceed a critical value usually based on levels that affect animals; levels are then adjusted to help protect humans. Sometimes these not-to-exceed levels differ among federal organizations. Different organizations use different exposure times (an 8-hour workday or a 24-hour day), different animal studies, or emphasize some factors over others, depending on their mission.

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Recommendations and regulations are also updated periodically as more information becomes available. For the most current information, check with the federal agency or organization that issued the regulation or recommendation.

Some regulations and recommendations for trichlorobenzenes include:

Federal Organization	Regulation or Recommendation
U.S. Environmental Protection Agency (U.S. EPA)	<p>The EPA has determined that exposure to 1,2,4-trichlorobenzene and 1,3,5-trichlorobenzene in drinking water at concentrations of 0.1 and 0.6 milligrams per liter (mg/L), respectively, for 1 or 10 days is not expected to cause any adverse effects in a child.</p> <p>The EPA has determined that lifetime exposure to 0.07 mg/L 1,2,4-trichlorobenzene and 0.04 mg/L 1,3,5-trichlorobenzene is not expected to cause any adverse effects.</p> <p>EPA established a maximum contaminant level (MCL) of 0.07 mg/L for 1,2,4-trichlorobenzene in drinking water.</p>
Occupational Safety and Health Administration (OSHA)	OSHA has not established regulations for workers exposed to trichlorobenzenes.
National Institute for Occupational Safety and Health (NIOSH)	NIOSH considers 1,2,4-trichlorobenzene hazardous to the eyes, skin, respiratory system, liver, and reproductive system and established a recommended exposure limit (REL) of 5 ppm (concentration that should not be exceeded during any part of the working exposure).
Food and Drug Administration (FDA)	The FDA has determined that the concentration of 1,2,4-trichlorobenzene in bottled drinking water should not exceed 0.07 mg/L.

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Additional Information

Overview

Where to find more information about trichlorobenzenes.

Who to contact If you have any more questions or concerns, please contact your community or state health or environmental quality department, or contact ATSDR at the address and phone number below.

Additional information from ATSDR ATSDR can provide publically available information regarding medical specialists with expertise and experience recognizing, evaluating, treating, and managing patients exposed to hazardous substances.

Where to obtain toxicological profile copies Toxicological profiles are also available online at www.atsdr.cdc.gov. For more information:

- Call the toll-free information and technical assistance number at 1-800-CDCINFO (1-800-232-4636) or
- Write to:

Agency for Toxic Substances and Disease Registry
Division of Toxicology and Human Health Sciences
1600 Clifton Road NE
Mailstop F-57
Atlanta, GA 30333

For-profit organizations should request final toxicological profile copies from:

National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22161
Phone: 1-800-553-6847 or 1-703-605-6000
Web site: <http://www.ntis.gov/>

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