



PUBLIC HEALTH STATEMENT

Trichlorobenzenes

Division of Toxicology and Environmental Medicine

September 2010

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 these substances 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.

This public health statement tells you about trichlorobenzenes and the effects of exposure to them.

The Environmental Protection Agency (EPA) identifies the most serious hazardous waste sites in the nation. These sites are then placed on the National Priorities List (NPL) and are targeted for long-term federal clean-up activities. 1,2,3-Trichlorobenzene, 1,2,4-trichlorobenzene, and 1,3,5-trichlorobenzene have been identified in at least 31, 187, and 41 of the 1,699 current or former NPL sites, respectively. Although the total number of NPL sites evaluated for these substances is not known, the possibility exists that the number of sites at which trichlorobenzenes are found may increase in the future as more sites are evaluated. This information is important because these sites may be sources of exposure and exposure to these substances may be harmful.

When a substance is released either from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment. Such a release does not always lead to exposure. You can be exposed to a substance only when you come in contact with it. You may be exposed by breathing, eating, or drinking the substance, or by skin contact.

If you are exposed to trichlorobenzenes, many factors will determine whether you will be harmed. These factors include the dose (how much), the duration (how long), and how you come in contact with it. You must also consider any other chemicals you are exposed to and your age, sex, diet, family traits, lifestyle, and state of health.

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1.1 WHAT ARE TRICHLOROBENZENES?

Description	<p>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.</p> <p>Although the three isomers of trichlorobenzene are structurally similar, they each may have different chemical and toxicological properties.</p>
Uses	<p>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.</p>

1.2 WHAT HAPPENS TO TRICHLOROBENZENES WHEN THEY ENTER THE ENVIRONMENT?

Air	<p>Trichlorobenzenes are volatile substances and may therefore partition 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.</p>
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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 and sediment	Trichlorobenzenes evaporate from soils and are slowly broken down by microorganisms in soil and sediment.
Land and aquatic animals	Trichlorobenzenes in water and soil may be absorbed or ingested by animals. High levels of trichlorobenzenes are often detected in fish or other species living in contaminated waters because trichlorobenzenes can accumulate in fatty tissues.

1.3 HOW MIGHT I BE EXPOSED TO TRICHLOROBENZENES?

Environmental exposure	Monitoring data suggest that the general population may be exposed to trichlorobenzenes by inhaling air and through the ingestion of food and drinking water. Other substances that have been released into the environment, such as higher chlorinated benzenes, or the formerly used pesticide, lindane, can break down into trichlorobenzene. Therefore, if you live in an area where these products were used or disposed of (hazardous waste sites) you may potentially be exposed to trichlorobenzenes as well.
Ingestion of food and fish	Trichlorobenzenes have been identified in a variety of food items including vegetables, milk, eggs/meat, and oils produced from corn, soybeans, peanuts, walnuts, hazelnuts, and rape, sunflower, sesame, and poppy seeds. People who eat large quantities of fish from areas contaminated by trichlorobenzenes may have higher exposure to these substances since fish tend to accumulate trichlorobenzenes in their fatty tissues.

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Occupational exposure	You can be exposed to trichlorobenzenes by inhalation and dermal contact with these substances if you are employed in an occupation where trichlorobenzenes are manufactured or used. According to the National Occupational Exposure Survey (NOES), workers employed in textile mill production and electric and electronic manufacturing tend to have the greatest potential exposure to trichlorobenzenes.
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1.4 HOW CAN TRICHLOROBENZENES ENTER AND LEAVE MY BODY?

Enter your body	<p>There is not enough information to determine how much or how fast trichlorobenzenes can enter your body if you inhale vapors or contaminated air, if you swallow these chemicals, or if they get onto your skin.</p> <p>Studies in animals suggest that trichlorobenzenes can rapidly enter the body through the lungs and the gastrointestinal tract. Less is known about entering the body through the skin.</p>
Leave the body	<p>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.</p> <p>In animals, trichlorobenzenes are transformed in the body into other chemicals, which are eliminated in the urine, feces, and bile in a few days.</p> <p>Studies in animals suggest that trichlorobenzenes do not accumulate in the body of mammals, but accumulate in fish.</p>

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1.5 HOW CAN TRICHLOROBENZENES AFFECT MY HEALTH?

This section looks at studies concerning potential health effects in animal and human studies.

Effects in humans	<p>There is virtually 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 and a report of a woman who developed a blood disorder due to prolonged inhalation of trichlorobenzenes from her husband's work clothes.</p> <p>However, based on results from studies in animals, it is reasonable to predict that humans exposed to high amounts of trichlorobenzenes may develop liver problems.</p>
Laboratory animals	<p>Studies in animals indicate that oral administration of trichlorobenzenes for short or long periods produces mainly alterations in the liver and kidneys.</p> <p>Prolonged administration of 1,2,4-trichlorobenzene to rats did not affect their capacity to reproduce.</p> <p>Placing trichlorobenzenes on the skin or the eyes of animals produced transitory irritation.</p> <p>It should be noted that, in general, animals have been exposed to considerably higher amounts of trichlorobenzenes than the amounts that humans can encounter in the environment.</p>

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Cancer	<p>There are no studies of cancer in humans exposed to trichlorobenzenes.</p> <p>Mice given 1,2,4-trichlorobenzene in the food for 2 years developed cancer of the liver.</p> <p>The EPA has stated that 1,2,4-trichlorobenzene is not classifiable as to human carcinogenicity. However, this was based on studies conducted prior to 1990; newer information has not been evaluated.</p>
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1.6 HOW CAN TRICHLOROBENZENES AFFECT CHILDREN?

This section discusses potential health effects in humans from exposures during the period from conception to maturity at 18 years of age.

Effects in children	There are no studies of children exposed to trichlorobenzenes.
Laboratory animals	For the most part, studies in rats and mice given 1,2,4-trichlorobenzene during pregnancy have not found adverse 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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1.7 HOW CAN FAMILIES REDUCE THE RISK OF EXPOSURE TO TRICHLOROBENZENES?

Avoid sources of trichlorobenzenes	<p>Trichlorobenzenes do not have widespread use in consumer products that are readily available to the general public. However, 1,2,4-trichlorobenzene is often detected in air, water, and aquatic species such as fish. The highest levels are typically encountered near facilities that manufacture and use trichlorobenzenes and other chlorinated substances or hazardous waste sites at which these substances may have been disposed of. Avoiding these areas will reduce your risk of exposure to trichlorobenzenes and other chemicals.</p> <p>Avoiding high consumption of root crops and fish living in contaminated environments will reduce the risk of exposure.</p>
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1.8 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO TRICHLOROBENZENES?

Detecting exposure	<p>Trichlorobenzenes can be measured in blood and body fat, but the tests used are not routinely available in the doctor's office.</p> <p>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.</p>
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Measuring exposure	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. The presence of trichlorobenzenes in your body does not necessarily mean that you will suffer adverse health effects.
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1.9 WHAT RECOMMENDATIONS HAS THE FEDERAL GOVERNMENT MADE TO PROTECT HUMAN HEALTH?

The federal government develops regulations and recommendations to protect public health. Regulations can be enforced by law. The EPA, the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA) are some federal agencies that develop regulations for toxic substances. Recommendations provide valuable guidelines to protect public health, but cannot be enforced by law. The Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH) are two federal organizations that develop recommendations for toxic substances.

Regulations and recommendations can be expressed as “not-to-exceed” levels. These are levels of a toxic substance in air, water, soil, or food that do not exceed a critical value. This critical value is usually based on levels that affect animals; they are then adjusted to levels that will help protect humans. Sometimes these not-to-exceed levels differ among federal organizations because they used different exposure times (an 8-hour workday or a 24-hour day), different animal studies, or other factors.

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 provides it.

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Some regulations and recommendations for trichlorobenzenes include the following:

Levels in drinking water set by 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>The EPA established a maximum contaminant level (MCL) of 0.07 mg/L for 1,2,4-trichlorobenzene in drinking water.</p>
Bottled water	<p>The FDA has determined that the concentration of 1,2,4-trichlorobenzene in bottled drinking water should not exceed 0.7 mg/L.</p>

1.10 WHERE CAN I GET MORE INFORMATION?

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.

ATSDR can also tell you the location of occupational and environmental health clinics. These clinics specialize in recognizing, evaluating, and treating illnesses that result from exposure to hazardous substances.

Toxicological profiles are also available on-line at www.atsdr.cdc.gov and on CD-ROM. You may request a copy of the ATSDR ToxProfiles™ CD-ROM by calling the toll-free information and technical

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assistance number at 1-800-CDCINFO (1-800-232-4636), by e-mail at cdcinfo@cdc.gov, or by writing to:

Agency for Toxic Substances and Disease Registry
Division of Toxicology and Environmental Medicine
1600 Clifton Road NE
Mailstop F-62
Atlanta, GA 30333
Fax: 1-770-488-4178

Organizations for-profit may request copies of final Toxicological Profiles from the following:

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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