

**Toxicological  
Profile  
for**

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**TOTAL XYLENES**

U.S. DEPARTMENT OF HEALTH & HUMAN SERVICES  
Public Health Service  
Agency for Toxic Substances and Disease Registry

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Superfund

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TOXICOLOGICAL PROFILE FOR  
TOTAL XYLENES

Prepared by:

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Prepared for:

Agency for Toxic Substances and Disease Registry  
U.S. Public Health Service

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## 1. PUBLIC HEALTH STATEMENT

This Statement was prepared to give you information about xylene and to emphasize the human health effects that may result from exposure to it. The Environmental Protection Agency (EPA) has identified 1,177 sites on its National Priorities List (NPL). Xylene has been found at 236 of these sites. However, we do not know how many of the 1,177 NPL sites have been evaluated for xylene. As EPA evaluates more sites, the number of sites at which xylene is found may change. The information is important for you because xylene may cause harmful health effects and because these sites are potential or actual sources of human exposure to xylene.

When a chemical 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 as a chemical emission. This emission, which is also called a release, does not always lead to exposure. You can be exposed to a chemical only when you come into contact with the chemical. You may be exposed to it in the environment by breathing, eating, or drinking substances containing the chemical or from skin contact with it.

If you are exposed to a hazardous substance such as xylene, several factors will determine whether harmful health effects will occur and what the type and severity of those health effects will be. These factors include the dose (how much), the duration (how long), the route or pathway by which you are exposed (breathing, eating, drinking, or skin contact), the other chemicals to which you are exposed, and your individual characteristics such as age, sex, nutritional status, family traits, life style, and state of health.

### 1.1 WHAT IS XYLENE?

Xylene is primarily a man-made chemical. Chemical industries produce xylene from petroleum and to a smaller extent from coal. Xylene also occurs naturally in petroleum and coal tar, and is formed during forest fires. It is a colorless liquid with a sweet odor. There are three forms of xylene called isomers: meta-xylene, ortho-xylene, and para-xylene (m-, o-, and p-xylene). Mixed xylene is a mixture of the three forms of xylene and smaller amounts of other chemicals, primarily ethylbenzene. Mixed xylene usually contains 6%-15% ethylbenzene, although it may contain higher amounts. The term "total xylenes," as used in the title of this report, refers to the three forms or isomers of xylene (meta-, ortho-, and para-xylene) and also to mixed xylene. In this report, the term "total xylenes" and xylene will be used interchangeably.

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Solvents (liquids that can dissolve solids) and thinners for paints and varnishes often contain xylene, along with other solvents. Xylene is used as a solvent in the printing, rubber, and leather industries, and as a cleaning agent. It is also found in airplane fuel and gasoline, and is used as a material in the chemical, plastic, and synthetic fiber industries, and as an ingredient in the coating of fabrics and papers. Isomers of xylene are used in the manufacture of certain polymers, such as plastics.

Xylene evaporates and burns easily. Xylene does not mix well with water; however, it does mix with alcohol and with many other chemicals. Xylene is a liquid, and it can leak into soil, surface water (creeks, streams, rivers), or groundwater, where it may remain for 6 months or longer before it is broken down into other chemicals. However, because it evaporates readily, most xylene goes into the air, where it lasts for several days. During these several days in the air, the xylene is broken down by sunlight into other kinds of chemicals. Additional information regarding chemical and physical properties, use, and environmental fate of xylene can be found in Chapters 3, 4, and 5.

### 1.2 HOW MIGHT I BE EXPOSED TO XYLENE?

You may become exposed to xylene because of its wide distribution in the environment. Releases of xylene occur primarily from industrial sources, automobile exhaust, and from the use of xylene as a solvent. Hazardous waste disposal sites and spills of xylene into the environment also serve as possible sources of exposure. Levels of xylene measured in industrial areas and cities of the United States and Europe range between 0.0007 and 0.09 parts of xylene per million parts of air (ppm). Xylene is sometimes released into water and soil as a result of the use, storage, and transport of petroleum products. Surface water generally contains less than 1 part of xylene per billion parts of water (ppb), although the level may be higher in industrial areas. Levels of xylene in public drinking water supplies range from 0 to 750 ppb. Because xylene evaporates rapidly, the presence of xylene in upper layers of soil is probably not large. Little information exists about the amount of xylene in food. Levels ranging between 0.05 ppm and 0.12 ppm xylene have been found in fish.

You may also come in contact with xylene from a variety of consumer products, including cigarette smoke, gasoline, paint, varnish, shellac, and rust preventives. Breathing vapors from these types of products can expose you to xylene. Indoor levels of xylene can be higher than outdoor levels, especially in buildings with poor ventilation. Skin contact with products containing xylene, such as solvents, lacquers, paint thinners and removers, and pesticides may also expose you to xylene.

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In addition to painters (or paint industry workers), biomedical laboratory workers, distillers of xylene, wood processing plant workers, garage workers, metal workers, and furniture refinishers also may be exposed to xylene. Exposure to high levels of xylene is most likely to occur in workers who smoke and routinely come in contact with solvent products. Additional information on the potential for human exposure can be found in Chapter 5.

### 1.3 HOW CAN XYLENE ENTER AND LEAVE MY BODY?

Xylene is most likely to enter your body through breathing xylene vapors. Less often, xylene enters the body through the skin following direct contact. Exposure to xylene may also take place by eating or drinking xylene-contaminated food or water. Xylene is rapidly absorbed by the lungs following breathing air containing xylene. The amount of xylene retained by the lungs ranges from 50% to 75% of the amount of xylene to which you are exposed. Physical exercise increases the amount of xylene absorbed by the lungs. Absorption of xylene after eating food or drinking water containing it is both rapid and complete. Absorption of xylene through the skin also occurs rapidly following direct contact with xylene or exposure to xylene vapors in the air. At hazardous waste sites, breathing xylene vapors, drinking wellwater contaminated with xylene, and direct contact of the skin with xylene are possible ways you can be exposed. Xylene passes into the blood soon after entering the body.

In humans and laboratory animals, xylene is broken down into other chemicals in the liver and lungs. This process changes most of the xylene that is breathed in or swallowed into a different form. Once xylene has been broken down, the breakdown products rapidly leave the body, mainly in urine but some unchanged xylene also leaves in breath from the lungs. Small amounts of broken down xylene have appeared in urine of humans as soon as 2 hours after breathing air containing xylene. Usually most of the xylene that is taken in leaves the body within 18 hours after exposure ends. Storage of xylene in fat or muscle may prolong the time needed for xylene to leave the body. Additional information on how xylene can enter and leave your body can be found in Chapter 2.

### 1.4 HOW CAN XYLENE AFFECT MY HEALTH?

Short-term exposure of humans to high levels of xylene or chemical mixtures containing xylene causes irritation of the skin, eyes, nose, and throat; difficulty in breathing; impaired function of the lungs; delayed response to a visual stimulus; impaired memory; stomach discomfort; and possible changes in the liver and kidneys. Death can occur in individuals who are exposed to very high levels of xylene for a short period of time. Both short- and long-term exposure to high concentrations of xylene can also cause

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a number of effects on the nervous system, such as headaches, lack of muscle coordination, dizziness, confusion, and changes in one's sense of balance.

Results of studies with animals indicate that large amounts of xylene can cause changes in the liver and adverse effects on the kidney, lung, heart, and nervous system. Short-term exposure to high concentrations of xylene causes death in some animals, as well as muscular spasms, incoordination, hearing loss, changes in behavior, changes in organ weights, and changes in enzyme activity. Long-term exposure to low concentrations of xylene has not been well studied in animals.

Information from animal studies is not adequate to determine whether or not xylene causes cancer in humans. However, exposure of pregnant women to high levels of xylene may cause adverse effects in the fetus. Studies with unborn animals indicate that high levels of xylene may cause increased numbers of deaths, decreased weight, skeletal changes, and delayed skeletal development. In many instances, the levels of xylenes causing these effects also caused the mothers to be ill. The higher the level of exposure and the longer the exposure to xylene, the greater the chance for adverse health effects. Additional information regarding the health effects of xylene can be found in Chapter 2.

### 1.5 WHAT LEVELS OF EXPOSURE HAVE RESULTED IN HARMFUL HEALTH EFFECTS?

Xylene or chemical mixtures containing xylene are deadly to humans if large enough quantities are swallowed or inhaled. However, the levels which cause death in humans are not known. Lower levels (100-299 ppm) of inhaled xylene can cause eye, nose, and throat irritation, delayed response to a visual stimulus, and poor memory. Direct contact of humans with several drops of xylene causes skin irritation. The lowest level at which you can detect the odor (smell) of xylene in air ranges from 0.1 ppm to 2.0 ppm.

In animals, moderate to high levels (1,300-2,000 ppm) of xylene inhaled for short periods of time may cause decreased breathing rate, hearing loss, inactivity, unconsciousness, and biochemical changes in the brain. With longer-term inhalation, adverse health effects in animals generally occur at lower levels (230-800 ppm). In animals breathing high levels of xylene over long-term exposures, possible adverse health effects include changes in heart rate and blood flow, changes in the chemical composition of nerves, and hearing loss. In animals given high levels (5,000 ppm) of xylene orally over short-term exposures, a possible adverse health effect is impaired eye function. In animals exposed by mouth to very high levels (40,000 ppm) of xylene, death can occur.

Tables 1-1 through 1-4 show the relationship between exposure to xylene and known health effects.