

1. PUBLIC HEALTH STATEMENT

This public health statement tells you about ethylbenzene and the effects of exposure.

The Environmental Protection Agency (EPA) identifies the most serious hazardous waste sites in the nation. These sites make up the National Priorities List (NPL) and are the sites targeted for long-term federal cleanup activities. Ethylbenzene has been found in at least 720 of the 1,467 current or former NPL sites. However, the total number of NPL sites evaluated for this substance is not known. As more sites are evaluated, the sites at which ethylbenzene is found may increase. This information is important because exposure to this substance may harm you and because these sites may be sources of exposure.

When a substance 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. This release does not always lead to exposure. You are 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 ethylbenzene, many factors determine whether you'll 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 the other chemicals you're exposed to and your age, sex, diet, family traits, lifestyle, and state of health.

1.1 WHAT IS ETHYLBENZENE?

Ethylbenzene is a colorless liquid that smells like gasoline. You can smell ethylbenzene in the air at concentrations as low as 2 parts of ethylbenzene per million parts of air by volume (ppm). It evaporates at room temperature and burns easily. Ethylbenzene occurs naturally in coal tar and petroleum. It is also found in many products, including paints, inks, and insecticides. Gasoline contains about 2% (by weight) ethylbenzene. Ethylbenzene is used primarily in the production of styrene. It is also used as a solvent, a component of asphalt and naphtha, and in fuels. In the

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chemical industry, it is used in the manufacture of acetophenone, cellulose acetate, diethylbenzene, ethyl anthraquinone, ethylbenzene sulfonic acids, propylene oxide, and α -methylbenzyl alcohol. Consumer products containing ethylbenzene include pesticides, carpet glues, varnishes and paints, and tobacco products. In 1994, approximately 12 billion pounds of ethylbenzene were produced in the United States. For more information on the physical and chemical properties of ethylbenzene, and its production, disposal, and use, see Chapters 3 and 4.

1.2 WHAT HAPPENS TO ETHYLBENZENE WHEN IT ENTERS THE ENVIRONMENT?

Ethylbenzene is most commonly found as a vapor in the air. This is because ethylbenzene moves easily into the air from water and soil. Once in the air, other chemicals help break down ethylbenzene into chemicals found in smog. This breakdown happens in less than 3 days with the aid of sunlight. In surface water such as rivers and harbors, ethylbenzene breaks down by reacting with other compounds naturally present in the water. In soil, the majority of ethylbenzene is broken down by soil bacteria. Since ethylbenzene binds only moderately to soil, it can also move downward through soil to contaminate groundwater. Near hazardous waste sites, the levels of ethylbenzene in the air, water, and soil could be much higher than in other areas. For more information on ethylbenzene in the environment, see Chapter 5.

1.3 HOW MIGHT I BE EXPOSED TO ETHYLBENZENE?

There are a variety of ways you may be exposed to this chemical. If you live in a highly populated area or near many factories or heavily traveled highways, you may be exposed to ethylbenzene in the air. Releases of ethylbenzene into these areas occur from burning oil, gas, and coal and from discharges of ethylbenzene from some types of factories. The median level of ethylbenzene in city and suburban air is about 0.62 parts of ethylbenzene per billion parts (ppb) of air. In contrast, the median level of ethylbenzene measured in air in country locations is about 0.01 ppb. Indoor air has a higher median concentration of ethylbenzene (about 1 ppb) than outdoor air. This is

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because ethylbenzene builds up after you use household products such as cleaning products or paints.

Ethylbenzene was found in only one of ten U.S. rivers and streams tested in 1982 and 1983. The average level measured was less than 5.0 ppb. Ethylbenzene gets into water from factory releases, boat fuel, and poor disposal of waste. Background levels in soils have not been reported. Ethylbenzene may get into the soil by gasoline or other fuel spills and poor disposal of industrial and household wastes.

Some people are exposed to ethylbenzene in the workplace. Gas and oil workers may be exposed to ethylbenzene either through skin contact or by breathing ethylbenzene vapors. Varnish workers, spray painters, and people involved in gluing operations may also be exposed to high levels of ethylbenzene. Exposure may also occur in factories that use ethylbenzene to produce other chemicals.

You may be exposed to ethylbenzene if you live near hazardous waste sites containing ethylbenzene or areas where ethylbenzene spills have occurred. Higher-than-background levels of ethylbenzene were detected in groundwater near a landfill and near an area where a fuel spill had occurred. No specific information on human exposure to ethylbenzene near hazardous waste sites is available.

You may also be exposed to ethylbenzene from the use of many consumer products. Gasoline is a common source of ethylbenzene exposure. Other sources of ethylbenzene exposure come from the use of this chemical as a solvent in pesticides, carpet glues, varnishes and paints, and from the use of tobacco products. Ethylbenzene does not generally build up in food. However, some vegetables may contain very small amounts of it. For more information on human exposure to ethylbenzene, see Chapter 5.

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1.4 HOW CAN ETHYLBENZENE ENTER AND LEAVE MY BODY?

When you breathe air containing ethylbenzene vapor, it enters your body rapidly and almost completely through your lungs. Ethylbenzene in food or water can also rapidly and almost completely enter your body through the digestive tract. It may enter through your skin when you come into contact with liquids containing ethylbenzene. Ethylbenzene vapors do not enter through your skin to any large degree. People living in urban areas or in areas near hazardous waste sites may be exposed by breathing air or by drinking water contaminated with ethylbenzene.

Once in your body, ethylbenzene is broken down into other chemicals. Most of it leaves in the urine within 2 days. Small amounts can also leave through the lungs and in feces. Liquid ethylbenzene that enters through your skin is also broken down. Ethylbenzene in high levels is broken down slower in your body than low levels of ethylbenzene. Similarly, ethylbenzene mixed with other solvents is also broken down more slowly than ethylbenzene alone. This slower breakdown will increase the time it takes for ethylbenzene to leave your body. For more information on how ethylbenzene enters and leaves the body, see Chapter 2.

1.5 HOW CAN ETHYLBENZENE AFFECT MY HEALTH?

To protect the public from the harmful effects of toxic chemicals and to find ways to treat people who have been harmed, scientists use many tests.

One way to see if a chemical will hurt people is to learn how the chemical is absorbed, used, and released by the body; for some chemicals, animal testing may be necessary. Animal testing may also be used to identify health effects such as cancer or birth defects. Without laboratory animals, scientists would lose a basic method to get information needed to make wise decisions to protect public health. Scientists have the responsibility to treat research animals with care and compassion. Laws today protect the welfare of research animals, and scientists must comply with strict animal care guidelines.

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At certain levels, exposure to ethylbenzene can harm your health. People exposed to high levels of ethylbenzene in the air for short periods have complained of eye and throat irritation. Persons exposed to higher levels have shown signs of more severe effects such as decreased movement and dizziness. No studies have reported death in humans following exposure to ethylbenzene alone. However, evidence from animal studies suggests that it can cause death at very high concentrations in the air (about 2 million times the usual level in urban air). Whether or not longterm exposure to ethylbenzene affects human health is not known because little information is available. Short-term exposure of laboratory animals to high concentrations of ethylbenzene in air may cause liver and kidney damage, nervous system changes, and blood changes. The link between these health effects and exposure to ethylbenzene is not clear because of conflicting results and weaknesses in many of the studies. Also, there is no clear evidence that the ability to get pregnant is affected by breathing air or drinking water containing ethylbenzene, or coming into direct contact with ethylbenzene through the skin. Two long-term studies in animals suggest that ethylbenzene may cause tumors. One study had many weaknesses, and no conclusions could be drawn about possible cancer effects in humans. The other, a recently completed study, was more convincing, and provided clear evidence that ethylbenzene causes cancer in one species after exposure in the air to concentrations greater than 740 ppm that were approximately 1 million times the levels found in urban air. At present, the federal government has not identified ethylbenzene as a chemical that may cause cancer in humans. However, this may change after consideration of the new data.

There are no reliable data on the effects in humans after eating or drinking ethylbenzene or following direct exposure to the skin. For this reason, levels of exposure that may affect your health after eating, drinking, or getting ethylbenzene on your skin are estimated from animal studies. There are only two reports of eye or skin exposure to ethylbenzene. In these studies, liquid ethylbenzene caused eye damage and skin irritation in rabbits. More animal studies are available that describe the effects of breathing air or drinking water containing ethylbenzene.

For more information on levels of exposure associated with harmful health effects, see Chapter 2.

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1.6 HOW CAN ETHYLBENZENE AFFECT CHILDREN?

This section discusses potential health effects from exposures during the period from conception to maturity at 18 years of age in humans. Potential effects on children resulting from exposures of the parents are also considered.

Since ethylbenzene is contained in many consumer products (including gasoline, paints, inks, pesticides, and carpet glue), it is possible for children to be exposed to ethylbenzene, especially by inhalation. Children might also be exposed to ethylbenzene from hazardous waste.

Ethylbenzene vapors are heavier than air, and children generally spend more time on the floor or ground than do adults. We do not know whether children would be different than adults in their weight-adjusted intake of ethylbenzene.

No data describe the effect of exposure to ethylbenzene on children or immature animals. It is likely that children would show the same health effects as adults. Respiratory and eye irritation and dizziness are the most prevalent signs of exposure to high levels of ethylbenzene in adults, and children would probably also exhibit these effects. We do not know whether children differ in their susceptibility to the effects of ethylbenzene. We do not know whether ethylbenzene causes birth defects in people. Minor birth defects have occurred in newborn animals whose mothers were exposed by breathing air contaminated with ethylbenzene.

We do not know whether ethylbenzene can cross the placenta to an unborn child or accumulate significantly in breast milk.

1.7 HOW CAN FAMILIES REDUCE THE RISK OF EXPOSURE TO ETHYLBENZENE?

If your doctor finds that you have been exposed to significant amounts of ethylbenzene, ask your doctor if children may also be exposed. When necessary your doctor may need to ask your state public health department to investigate.

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Ethylbenzene is found in consumer products including gasoline, pesticides, carpet glues, varnishes, paints, and tobacco products. Exposure to ethylbenzene vapors from household products and newly installed carpeting can be minimized by using adequate ventilation. Household chemicals should be stored out of reach of young children to prevent accidental poisonings. Always store household chemicals in their original labeled containers; never store household chemicals in containers children would find attractive to eat or drink from, such as old soda bottles. Gasoline should be stored in a gasoline can with a locked cap. Keep your Poison Control Center's number by the phone. To minimize exposure, children should be kept out of areas where products that contain ethylbenzene are being used. Sometimes older children sniff household chemicals in an attempt to get high. Your children may be exposed to ethylbenzene by inhaling products containing it, such as paints, varnishes, or gasoline. Talk with your children about the dangers of sniffing chemicals.

1.8 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO ETHYLBENZENE?

Ethylbenzene is found in the blood, urine, breath, and some body tissues of exposed people. Urine is most commonly tested to determine exposure to ethylbenzene. The test measures the presence of substances formed following an exposure to ethylbenzene. These substances are formed by the breakdown of ethylbenzene. You should have this test done within a few hours after exposure occurs because these substances leave the body very quickly. Although this test can prove your exposure to ethylbenzene, it cannot yet predict the kind of health effects that might develop from that exposure. For more information on the different substances formed by ethylbenzene breakdown and on tests to detect these substances in the body, see Chapters 2 and 6.

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. Federal agencies that develop regulations for toxic

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substances include the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA).

Recommendations provide valuable guidelines to protect public health but cannot be enforced by law. Federal organizations that develop recommendations for toxic substances include the Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH).

Regulations and recommendations can be expressed in not-to-exceed levels in air, water, soil, or food that are usually based on levels that affect animals; then they are adjusted to help protect people. Sometimes these not-to-exceed levels differ among federal organizations because of different exposure times (an 8-hour workday or a 24-hour day), the use of different animal studies, or other factors.

Recommendations and regulations are also periodically updated as more information becomes available. For the most current information, check with the federal agency or organization that provides it. Some regulations and recommendations for ethylbenzene include the following:

The federal government has developed regulatory standards and guidelines to protect you from possible health effects of ethylbenzene in the environment. EPA's Office of Drinking Water (ODW) set 700 ppb (this equals 0.7 milligrams ethylbenzene per liter of water or mg/L) as the acceptable exposure concentration of ethylbenzene in drinking water for an average weight adult. This value is for lifetime exposure and is set at a level that is expected not to increase the chance of having (noncancer) adverse health effects. The same EPA office (ODW) set higher acceptable levels of ethylbenzene in water for shorter periods (20 ppm or 20 mg/L for 1 day, 3 ppm or 3 mg/L for 10 days). EPA has determined that exposures at or below these levels are acceptable for small children. If you eat fish and drink water from a body of water, the water should contain no more than 1.4 mg ethylbenzene per liter.

EPA requires that a release of 1,000 pounds or more of ethylbenzene be reported to the federal government's National Response Center in Washington, D.C.

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OSHA set a legal limit of 100 ppm ethylbenzene in air. This is for exposure at work for 8 hours per day.

NIOSH also recommends an exposure limit for ethylbenzene of 100 ppm. This is for exposure to ethylbenzene in air at work for up to 10 hours per day in a 40-hour work week. NIOSH also set a limit of 125 ppm for a 15minute period.

For more information on regulations and advisories, see Chapter 7.

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

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road NE, Mailstop E-29
Atlanta, GA 30333

* Information line and technical assistance

Phone: 1-888-42-ATSDR (1-888-422-8737)
Fax: (404) 639-6314 or 639-6324

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

* To order toxicological profiles, contact

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Phone: (800) 553-6847 or (703) 605-6000

