

1. PUBLIC HEALTH STATEMENT

This Statement was prepared to give you information about nitrobenzene 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). Nitrobenzene has been found at 7 of these sites. However, we do not know how many of the 1,177 NPL sites have been evaluated for nitrobenzene. As EPA evaluates more sites, the number of sites at which nitrobenzene is found may change. The information is important for you because nitrobenzene may cause harmful health effects and because these sites are potential or actual sources of human exposure to nitrobenzene.

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 nitrobenzene, 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 NITROBENZENE?

Nitrobenzene is an oily yellow liquid with an almond-like odor. It may be pale yellow-brown in appearance. It dissolves only slightly in water, but very easily in some other chemicals.

Nitrobenzene is produced in large quantities for industrial use. Approximately 98% of the nitrobenzene produced in the United States is used to manufacture a chemical known as aniline. Nitrobenzene is also used to produce lubricating oils such as those used in motors and machinery. A very small amount of nitrobenzene is used in the manufacture of dyes, drugs, pesticides, and synthetic rubber.

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Small amounts of nitrobenzene are released to the air and to bodies of water by the industries that use this chemical. However, it is broken down to other chemicals within a few days after it is released. Air and water in most areas contain no nitrobenzene or such low amounts that they cannot be measured.

More information on the chemical and physical properties of nitrobenzene can be found in Chapter 3. Its production, import, uses, and disposal are presented in Chapter 4, and its occurrence and fate in the environment are described in Chapter 5.

1.2 HOW MIGHT I BE EXPOSED TO NITROBENZENE?

Because nitrobenzene is not usually found at hazardous waste sites, it is unlikely that you will be exposed to nitrobenzene if you live near one of these sites. However, you may be exposed if you live near one of the seven waste sites where it has been found or near a manufacturing or processing plant, such as those involved in petroleum refining and chemical manufacturing. Persons in these areas may be exposed to nitrobenzene in the air they breathe. However, even in these cases, the levels of nitrobenzene have been found to be extremely low, usually less than 1 ppb (one part nitrobenzene per billion parts of air). Levels of nitrobenzene in the air of residential areas are even lower. Nitrobenzene is almost never found in drinking water. There is no information available on the levels of nitrobenzene in food.

The most common way that humans are exposed to this compound is by occupational exposure. If you work in a plant or factory that produces nitrobenzene or uses nitrobenzene to make other products such as dyes, drugs, pesticides or synthetic rubber, you may be exposed to nitrobenzene in the air that you breathe or through your skin.

For more information on human exposure to nitrobenzene, see Chapter 5.

1.3 HOW CAN NITROBENZENE ENTER AND LEAVE MY BODY?

Nitrobenzene can enter your body easily and quickly through your lungs, through your skin, or if you eat or drink contaminated food or water. Nitrobenzene is easily absorbed through the skin and this is a frequent pathway of human exposure. Drinking alcoholic beverages may result in nitrobenzene entering your body at a faster rate, no matter how you are exposed.

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Nitrobenzene and its breakdown products leave the body within a few days. These are eliminated mostly in the urine and to a smaller extent in the feces.

More information on how nitrobenzene enters and leaves the body can be found in Chapter 2.

1.4 HOW CAN NITROBENZENE AFFECT MY HEALTH?

Nitrobenzene can cause a wide variety of harmful health effects to exposed persons. Direct contact of small amounts of nitrobenzene with the skin or eyes may cause mild irritation. Repeated exposures to a high concentration of nitrobenzene can result in a blood condition called methemoglobinemia. This condition affects the ability of the blood to carry oxygen. Following such an exposure, the skin may turn a bluish color. This may be accompanied by nausea, vomiting and shortness of breath. Effects such as headache, irritability, dizziness, weakness, and drowsiness may also occur. If the exposure level is extremely high, nitrobenzene can cause coma and possibly death unless prompt medical treatment is received. Consuming alcoholic beverages during nitrobenzene exposure may increase the harmful effects of nitrobenzene.

In studies with laboratory animals, a single dose of nitrobenzene fed to male rats resulted in damage to the testicles and decreased levels of sperm. This suggests that decreased fertility may be a concern in humans. There is very little information available about the effects of long-term exposure of humans or animals to nitrobenzene, and it is not known whether exposure to nitrobenzene can cause cancer.

Further information on the health effects of nitrobenzene in humans and animals can be found in Chapter 2. More information on nitrobenzene breakdown products can be found in Chapter 2. There are populations that are unusually susceptible to nitrobenzene, and this is further discussed in Chapter 2.

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

Tables 1-1 through 1-4 show the relationship between exposure to nitrobenzene at certain levels and known health effects. The exposure of laboratory animals to nitrobenzene through skin contact has resulted in harmful effects similar to those seen in laboratory animals by other routes of exposure. In general, the longer the period of contact with the skin, the more severe the effects.

Nitrobenzene can be smelled in water when it is present at 0.11 mg/L (milligrams of nitrobenzene per liter of water) or in air at 0.018 ppm (0.018 parts of nitrobenzene per million parts of air). It has an odor characteristic of bitter almonds or shoe polish.

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TABLE 1-1. Human Health Effects from Breathing Nitrobenzene

Short-term Exposure (less than or equal to 14 days)		
<u>Levels in Air</u>	<u>Length of Exposure</u>	<u>Description of Effects</u>
		The health effects resulting from short-term exposure of humans to air containing specific levels of nitrobenzene are not known.
Long-term Exposure (greater than 14 days)		
<u>Levels in Air</u>	<u>Length of Exposure</u>	<u>Description of Effects</u>
		The health effects resulting from long-term exposure of humans to air containing specific levels of nitrobenzene are not known.

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TABLE 1-2. Animal Health Effects from Breathing Nitrobenzene

Short-term Exposure (less than or equal to 14 days)		
<u>Levels in Air (ppm)</u>	<u>Length of Exposure</u>	<u>Description of Effects*</u>
10	10 to 14 days	Increased liver, kidney and spleen weights and methemoglobinemia in rats.
125	14 days	Brain lesions in mice; death in rats.
Long-term Exposure (greater than 14 days)		
<u>Levels in Air (ppm)</u>	<u>Length of Exposure</u>	<u>Description of Effects*</u>
5	90 days	Damage to the kidneys and increased methemoglobinemia in rats.
50	90 days	Damage to the spleen, liver, and testes of rats.

*These effects are listed at the lowest level at which they were first observed. They may also be seen at higher levels.

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TABLE 1-3. Human Health Effects from Eating or Drinking Nitrobenzene

Short-term Exposure (less than or equal to 14 days)		
<u>Levels in Food</u>	<u>Length of Exposure</u>	<u>Description of Effects</u>
		The health effects resulting from short-term exposure of humans to food containing specific levels of nitrobenzene are not known.
<u>Levels in Water</u>		The health effects resulting from short-term exposure of humans to water containing specific levels of nitrobenzene are not known.
Long-term Exposure (greater than 14 days)		
<u>Levels in Food</u>	<u>Length of Exposure</u>	<u>Description of Effects</u>
		The health effects resulting from long-term exposure of humans to food containing specific levels of nitrobenzene are not known.
<u>Levels in Water</u>		The health effects resulting from long-term exposure of humans to water containing specific levels of nitrobenzene are not known.

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TABLE 1-4. Animal Health Effects from Eating or Drinking Nitrobenzene

Short-term Exposure (less than or equal to 14 days)		
<u>Levels in Food (ppm)</u>	<u>Length of Exposure</u>	<u>Description of Effects*</u>
4,000	1 day	Methemoglobinemia in rats.
6,000	1 day	Testicle damage in rats.
11,000	1 day	Brain hemorrhage in rats.
<u>Levels in Water</u>		The health effects resulting from short-term exposure of animals to water containing specific levels of nitrobenzene are not known.
Long-term Exposure (greater than 14 days)		
<u>Levels in Food</u>	<u>Length of Exposure</u>	<u>Description of Effects</u>
		The health effects resulting from long-term exposure of animals to food containing specific levels of nitrobenzene are not known.
<u>Levels in Water</u>		The health effects resulting from long-term exposure of animals to water containing specific levels of nitrobenzene are not known.

*These effects are listed at the lowest level at which they were first observed. They may also be seen at higher levels.

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More information on the health effects associated with exposure to nitrobenzene is presented in Chapter 2.

1.6 WHERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO NITROBENZENE?

Nitrobenzene reacts with red blood cells in the body to produce methemoglobin. If you have recently been exposed to nitrobenzene, the levels of methemoglobin in your blood will be elevated. This level can be measured. However, many toxic chemicals produce methemoglobin, and this method does not give specific information about nitrobenzene exposure.

In cases of long-term exposure to nitrobenzene, the presence of its breakdown products, p-nitrophenol and p-aminophenol, in the urine is an indication of nitrobenzene exposure. These tests require special equipment and cannot be routinely done in a doctor's office. The results of these tests cannot be used to determine the level of nitrobenzene exposure or if harmful health effects can be expected to occur.

Information regarding tests for the detection of nitrobenzene in the body is presented in Chapters 2 and 6.

1.7 WHAT RECOMMENDATIONS HAS THE FEDERAL GOVERNMENT MADE TO PROTECT HUMAN HEALTH?

The federal government has developed regulations and guidelines in order to protect individuals from the possible health effects of nitrobenzene in drinking water. The Environmental Protection Agency (EPA) has concluded that the amount of nitrobenzene in drinking water should not exceed 19.8 mg/L and that any release in excess of 1,000 pounds should be reported.

The Occupational Safety and Health Administration (OSHA) has set a legal limit (Permissible Exposure Limit, or PEL) of 1 ppm in workroom air to protect workers during an 8-hour shift in a 40-hour workweek.

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1.8 WHERE CAN I GET MORE INFORMATION?

If you have any more questions or concerns not covered here, please contact your State Health or Environmental Department or:

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

This agency can also give you information on the location of the nearest occupational and environmental health clinics. Such clinics specialize in recognizing, evaluating, and treating illnesses that result from exposure to hazardous substances.

