



PUBLIC HEALTH STATEMENT

NITROBENZENE

CAS#: 98-95-3

Division of Toxicology

December 1990

This Public Health Statement is the summary chapter from the Toxicological Profile for Nitrobenzene. 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 1-888-422-8737.

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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1.2 HOW MIGHT I BE EXPOSED TO NITROBENZENE?

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.

1.3 HOW CAN NITROBENZENE ENTER AND LEAVE MY BODY?

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.

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.

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1.5 WHAT LEVELS OF EXPOSURE HAVE RESULTED IN HARMFUL HEALTH 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.

It is not known what nitrobenzene levels result in harmful health effects in people. Damage to the kidneys and increased methemoglobinemia in rats is seen at 5 ppm. Damage to the spleen, liver, and testes of rats has been noted at levels of 50 ppm nitrobenzene in air.

1.6 IS THERE 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.

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

The National Institute for Occupational Safety and Health (NIOSH) recommends an occupational exposure limit of 23 mg/m³ for nitrobenzene for a 10-hour workday in a 40-hour workweek.

The EPA recommends that levels in lakes and streams should be limited to 17 parts of nitrobenzene per million parts of water (17 ppm) to prevent possible health effects from drinking water or eating fish contaminated with nitrobenzene.

The EPA requires that discharges, spills, or accidental releases of 1,000 pounds or more of nitrobenzene must be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit of 5 milligrams nitrobenzene per cubic meter of air (5 mg/m³) for an 8-hour workday in a 40-hour workweek.

The American Conference of Governmental and Industrial Hygienists (ACGIH) and the National Institute for Occupational Safety and Health (NIOSH) also recommend an occupational exposure limit of 5 mg/m³ for nitrobenzene.

The federal recommendations have been updated as of July 1999.

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1.8 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 F-32
Atlanta, GA 30333

Information line and technical assistance:

Phone: 888-422-8737
FAX: (770)-488-4178

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

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 1990. Toxicological profile for nitrobenzene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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