

Benzene

WHAT IS BENZENE?

Benzene is a colorless liquid with a sweet odor. It evaporates into the air very quickly and dissolves slightly in water. It is highly flammable and is formed from both natural processes and human activities.

Benzene is a natural part of crude oil, gasoline, and cigarette smoke. Natural sources of benzene also include volcanoes and forest fires.

Industrial use includes adding benzene with other chemicals to make plastics, resins, and nylon and other synthetic fibers.

Benzene is also used to make some types of rubber, lubricants, dyes, detergents, drugs, and pesticides.¹

HOW ARE WE EXPOSED?

We are exposed to benzene in the following ways:

- Outdoor air contains low levels of benzene from tobacco smoke, automobile service stations, exhaust from motor vehicles, and industrial emissions.
- Air around hazardous waste sites or gas stations contains higher levels of benzene.
- Vapors (or gases) from products that contain benzene, such as glues, paints, furniture wax, and detergents, can also be a source of exposure.
- Working in industries that make or use benzene may also result in exposure.

SYMPTOMS & HEALTH OUTCOMES

- Breathing high levels of benzene can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, unconsciousness, and even death.^{2,3}
- Eating or drinking foods containing high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, rapid heart rate, and even death.^{4,5}
- Long-term exposure to benzene has a major effect on the blood. Benzene causes harmful effects on bone marrow and can decrease red blood cells leading to anemia.⁶ It can also cause excessive bleeding and can affect the immune system, increasing the chance for infection.^{7,8,9}
- Breathing high levels of benzene for many months has been associated with irregular menstrual periods and a decrease in the size of ovaries.¹⁰ It is not known whether benzene affects fertility in men.
- Benzene has been determined to be carcinogenic.¹¹ Long-term exposure to high levels of benzene in the air can cause leukemia, particularly acute myelogenous leukemia (AML), a cancer of the blood-forming organs.^{12,13}
- Benzene can pass from the mother's blood to a fetus.¹⁴ Animal studies have shown low birth weights, delayed bone formation, and bone marrow damage when pregnant animals breathed benzene.¹⁵

FOLLOW UP ACTION

Several tests can show if a patient has been exposed to benzene:

- Conduct a test to measure benzene in the breath; this test must be done shortly after exposure.
- Benzene can also be measured in the blood; however, since benzene disappears rapidly from the blood, this test is only useful for recent exposures.

If you think your patient may have been exposed to benzene:

- Refer patient to a physician.
- Chronic exposure can be addressed by treating the symptoms and informing patients about ways to limit future exposure to benzene (see “*Reducing Your Exposure*” section below).

REDUCING YOUR EXPOSURE

You can prevent or minimize exposure to benzene in the following ways:

- Whenever possible, limit contact with gasoline and cigarette smoke. Families are encouraged not to smoke in the home, in enclosed environments, or near children.
- Be aware of fumes from gasoline and from products that contain benzene such as paints, glues, furniture wax, and some detergents. When using these products, make sure that you are in a well ventilated area, such as outdoors or next to an open window or vent.
- Avoid idling vehicles in front of school doors or vent intakes.
- Keep the door between the garage (or other area where gasoline is stored) and the home shut tightly to decrease the inhalation of benzene from gasoline.

¹ Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological profile for benzene [update]. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service. Available: <http://www.atsdr.cdc.gov/toxprofiles/tp3.pdf>.

² Cronin HJ. 1924. Benzol poisoning in the rubber industry. *Boston Medical and Surgical Journal*, 191: 1164-1166.

³ Greenburg L. 1926. Benzol poisoning as an industrial hazard. *Public Health Rep*, 41: 1357-1375.

⁴ Von Oettingen WF. 1940. Toxicity and potential dangers of aliphatic and aromatic hydrocarbons. *Public Health Bulletin*, 255: 66-97.

⁵ Thienes CH & Haley TJ. 1972. *Clinical Toxicology*. 5th Edition ed. Lea & Febiger, Philadelphia, PA.

⁶ Snyder, R. 2007. Benzene's toxicity: A consolidated short review of human & animal studies by HA Khan. *Human and Experimental Toxicology* 26(9): 687-696.

⁷ Hunter CG & Blair D. 1972. Benzene: Pharmacokinetic studies in man. *Ann Occup Hyg*, 15: 193-199.

⁸ Hsieh GC, Sharma RP & Parker RDR. 1988. Subclinical effects of groundwater contaminants I: Alteration of humoral and cellular immunity by benzene in CD-1 mice. *Arch Environ Contam Toxicol*, 17: 151-158.

⁹ Huff JE et al. 1989. Multiple-site carcinogenicity of benzene in Fischer 344 rats and B6C3F1 mice. *Environ Health Perspect*, 82: 125-163.

¹⁰ Thurston et al. 2000. Petrochemical exposure & menstrual disturbances. *American Journal of Industrial Medicine* 38(5): 555-564.

¹¹ Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological profile for benzene [update]. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

¹² Aksoy M, Dincol K, Akgun T, Erdem S & Dincol G. 1971. Haematological effects of chronic benzene poisoning in 217 workers. *Br J Ind Med*, 28: 296-302.

¹³ Yin S-N et al. 1989. A retrospective cohort study of leukemia and other cancers in benzene workers. *Environ Health Perspect*, 82: 207-213.

¹⁴ Dowty BJ, Laseter JL & Storer J. 1976. The transplacental migration and accumulation in blood of volatile organic constituents. *Pediatr Res*, 10: 696-701.

¹⁵ Tatrai E, Ungvary GY, Hudak A, Rodics K, Lorincz M & Barcza GY. 1980. Concentration dependence of the embryotoxic effects of benzene inhalation in CFY rats. *J Hyg Epidemiol Microbiol Immunol*, 24: 363-371.