

TOXICOLOGY AND OCCUPATIONAL HEALTH HAZARDS

Benzene has long been recognized as a toxic compound with both acute and chronic effects. Poisoning occurs through inhalation, ingestion and by rapid absorption through the skin. Manifestations of acute benzene poisoning include headaches, confusion, loss of muscular control and irritation of the respiratory and gastrointestinal tract. Greater concentrations may result in unconsciousness and even in death. Exposure to long term chronic poisoning or shorter-term exposure at higher concentrations may have drastic aftereffects, such as anaemia and probably leukemia. Brain damage and damage to the urinary tract, mucous membranes, and other body parts may also occur.

Inhalation of benzene at different concentrations in the air is the most common source of benzene poisoning because benzene is rapidly absorbed by the lungs. Ingestion by mouth causes irritation of the mouth, esophagus, and stomach. Absorption of benzene by the blood may follow, with resultant chronic & acute poisoning. Absorption of the benzene through the skin is not a major source of benzene poisoning.

Exposure to benzene emissions may occur from many sources. A major source of evaporative benzene emissions is from motor gasoline. Another source of benzene emissions is in the manufacture of benzene & gasoline. Efficient process control in refineries, however, maintains evaporative losses a minimum. Historically, a major source of benzene emissions was in the use of benzene or benzene-containing solvents in the formulation of paints, thinners and adhesives. Because of the high toxic characteristics of benzene, its use in these applications has been practically eliminated.

Benzene is extremely flammable and a fire hazardous. Liquid very quickly evaporates even at even low temperatures and forms vapor (fumes), which can catch fire and burn with explosive violence. Invisible vapor spreads easily and can be set on fire by many sources such as pilot lights, welding equipment, electrical motors and switches. For fires involving this material, do not enter any enclosed or confined fire space without

proper protective equipment. This may include self-contained breathing apparatus to protect against the hazardous effects of normal products of combustion or oxygen deficiency. Normal combustion forms carbon dioxide and water vapor; incomplete combustion can produce carbon monoxide.

Treatment for acute benzene poisoning is similar to that used for many cases of poisoning from toxic volatile chemicals. These steps include removing the person from the source, artificial respiration, if necessary, and other standard first-aid procedures.

Good laboratory and plant practices are paramount in preventing benzene poisoning. These involve minimum concentrations of benzene, either in liquid form or in vapour form, in work areas. Non-permeable gloves are suggested and tested as a means of preventing skin contact. Viton rubber or poly(vinyl alcohol) materials were found to be the best of those tested. Various health hazards and first aids are given in detail below.

Eyes: Contact with the eyes causes irritation. Symptoms of eye irritation may include pain, tearing, reddening, swelling, and impaired vision. Flush eyes with water immediately while holding the eyelids open. Remove contact lenses if worn, after initial flushing, and continue flushing for at least 15 minutes. Get medical attention if irritation persists.

Skin: Contact with the skin causes irritation. Symptoms of skin irritation may include pain, reddening, swelling and blistering. Prolonged or frequently repeated contact may cause the skin to become cracked or dry from the defatting action of this material. Benzene is absorbed through the skin. Wash skin immediately with soap and water and remove contaminated clothes and shoes. Get medical attention if irritation persists. Discard contaminated clothing and shoes or thoroughly clean before use.

Ingestion: May be harmful if swallowed. In addition, because of its low viscosity, this material can directly enter the lungs if swallowed or vomited. Once in the lungs, it is very

difficult to remove and can cause severe injury or death. If swallowed, do not induce vomiting. Give a glass of water or milk to drink and get medical attention. Never give anything by mouth to an unconscious person.

Inhalation: Breathing this material at concentrations above the recommended exposure limit may cause nervous system effects. Symptoms of central nervous effects may include drowsiness, dizziness, headache, incoordination, or unconsciousness. Move the exposed person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms continue. Repeated or prolonged breathing of benzene vapors has been associated with the development of chromosomal damage in experimental animals and various blood diseases in humans ranging from aplastic anemia to leukemia (a form of cancer). All of these diseases can be fatal. The available information on the effects of benzene on human pregnancies is inadequate, but it has been established that benzene can cross the human placenta.

HANDLING AND STORAGE:

Special precautions must be taken in the storing and handling of benzene because of its flammability, volatility & toxicity. It is stored in steel containers. Benzene is usually stored as a liquid at temperatures above 46° F (8°C) to avoid freezing. Storage tanks for benzene may be equipped with external heating pads or internal coils and insulation to maintain storage temperatures. Adequate ventilation, labeling, and electrical grounding are required. Labeling is particularly important for the shipment of benzene. Workers must be protected from skin contact or insulation of fumes. Periodic physical examinations are recommended for those who work in areas where there is probable exposure to benzene. A benzene fire must be extinguished by smothering, using CO₂ or dry chemical fire extinguishers.