examinetics

Occupational Health Pathfinder

Benzene exposure

Pathfinder: number 021
Issue date: 12/02/2008

Overview

Benzene is an organic chemical compound with known carcinogenic properties. The colorless, sweet-smelling liquid is highly flammable and used extensively as a solvent or intermediate in a number of industries to produce chemical compounds such as plastics, resins, pharmaceuticals, dyes and synthetic rubber. The widely used chemical is also a constituent in petrochemicals and is also employed to extract oils from nuts and seeds. Workers involved in the production or use of those applications are potentially exposed to the harmful health effects of benzene unless strict protective and preventative measures are in place.

Health effects of benzene exposure

There is extensive research and information surrounding the carcinogenic and toxicological profile of benzene. Exposures are from environmental (forest fires; volcano emissions) and industrial sources (heavy traffic emissions) as well as lifestyle sources (cigarette smoke). The eleventh edition of the National Toxicology Program's *'Report on Carcinogens'* describes, in the substance profile for benzene, that there is substantial epidemiological evidence to show the carcinogenic effects in humans based on occupational and geographic data.

The chemical nature of benzene makes the substance evaporate very quickly and so hazardous exposures are mainly thru inhalation. Dermal exposure occurs on contact with the chemical and its toxicological effects are often heightened by mixtures with other chemicals. Exposures also result thru accidental ingestion with food and drink. Acute short term exposure can result in dizziness, drowsiness, headaches, unconsciousness and vomiting. Long term and chronic exposure leads to the development of blood conditions and disorders of the tissues involved in the production of blood. This is due to the fact that benzene and its metabolites (constituent breakdown products) target the bone marrow once inside the body. Incidence of leukemia (cancer of blood forming cells in the bone marrow), Acute Myeloid Leukemia (AML) and Chronic Lymphocytic Leukemia (CLL), is linked to benzene exposure.

Regulatory measures

OSHA recommends that employers become familiar with regulations associated with benzene. Notably, employers should read and comply with the standards for the General Industry 29 CFR 1910 Subpart I for Personal Protective Equipment (respiratory protection 1910.134) and 1910 Subpart Z for toxic and hazardous substances (Benzene 1910.10.28). Also take a look at the standards for Shipyard Employment and the Construction Industry, 1915.1028 and 1926.1128 for benzene respectively. The standards outline employers' responsibilities, the exposure limits for benzene and requirements for employee training, medical monitoring, air monitoring, compliance program, protective equipment and evaluation and recordkeeping.

KEY POINT SUMMARY:

- Benzene is a colorless, sweet-smelling, organic chemical compound
- Benzene is used as a solvent and an intermediate in many industrial processes (eg. production of plastics)
- There is a plethora of research documenting benzene's toxicological and carcinogenic profile in animals and humans
- Acute short term exposure results in symptoms of dizziness, drowsiness, headaches, unconsciousness and vomiting
- Benzene targets the bone marrow once inside the body
- Incidence of leukemia (cancer of blood forming cells in the bone marrow) is linked to benzene exposure
- Employers should comply with the standards for the General Industry 29 CFR 1910 Subpart I for Personal Protective Equipment (respiratory protection 1910.134) and 1910 Subpart Z for toxic and hazardous substances (Benzene 1910.10.28)

FIND OUT MORE...

OSHA website
www.osha.gov/SLTC/benzene/

US EPA
www.epa.gov/ebtpages/pollchemicalsbenzene.html

National Institute for Occupational Safety and Health
www.cdc.gov/niosh/topics/benzene/

Business Owner Briefing
International Chemical Safety Cards (NIOSH)
www.cdc.gov/niosh/ipcsneng/neng0015.html

Medical Director Review
"Temporal Variation in the Association between Benzene and Leukemia Mortality" (Richardson, 2008)
www.pubmedcentral.nih.gov/articlerender.fcgi?tool=pubmed&pubmedid=18335105