

BENZENE

(C₆H₆) CAS # 71-43-2 (Volatile Organic Compound)

Synonyms include benzol, coal tar naphtha, phenyl hydride, and cyclohexatriene

SOURCE/USE

Benzene is obtained from crude petroleum and is used mainly as a raw material in the synthesis of such chemicals as styrene, phenol, and cyclohexane, and for manufacturing dyes, detergents, explosives, rubber, plastics, and pharmaceuticals. It is also found as a contaminant in some industrial solvents and as a constituent of motor fuels, unleaded gasoline in particular. Benzene is expected to be one of the more toxicologically important air contaminants found during remediation projects.

ROUTES OF EXPOSURE

Although the risk of off-post acute exposure to benzene as a result of remediation at the Rocky Mountain Arsenal is very small, any such exposure would very likely be via inhalation. The concentrations resulting in acute clinical effects discussed in this document reflect occupational exposures and are much higher than those likely to be encountered at the fence line during remediation at the Rocky Mountain Arsenal. Benzene vapor is heavier than air and may cause asphyxiation in enclosed, poorly ventilated, or low-lying areas. Other routes of exposure include dermal/ocular contact and ingestion.

APPLICABLE STANDARDS AND LIMITS	
ATSDR MRL	Acute 0.16 mg/m ³ Intermediate 0.013 mg/m ³
OSHA PEL	3 mg/m ³
OSHA STEL	16 mg/m ³
Odor threshold	19 mg/m ³
RMA acute fence line criteria	ARC - 1.1 mg/m ³ MARC - 3.3 mg/m ³
RMA chronic fence line criteria	Cancer - 0.56 µg/m ³ Noncancer - 6.0 µg/m ³

The goal of the remediation is exposure prevention through remedial design, environmental monitoring, and modeling. Failure of prevention could result in acute and/or chronic exposures. Following is an overview of the types of health effects associated with benzene exposure.

ACUTE HEALTH EFFECTS

Generally, symptoms of CNS toxicity are apparent immediately after inhalation of high concentrations of benzene and 30 to 60 minutes after ingestion. Inhalation of lower concentrations can result in headache, lightheadedness, dizziness, confusion, nausea, impaired gait, and blurred vision. More severe effects include tremors, respiratory depression, confusion, loss of consciousness, coma, and death. Coma may be prolonged, although most victims regain consciousness rapidly after they are removed from exposure.

Acute exposure to benzene vapor may irritate the mucous membranes of the respiratory tract. With massive exposure, accumulation of fluid in the lungs and respiratory arrest may ensue. Pulmonary aspiration of toxic vomitus or ingested liquid benzene may cause inflammation of the lungs.

Massive doses of benzene can cause cardiac abnormalities. Benzene may lower the threshold of the heart muscle to the effects of epinephrine, potentially resulting in arrhythmia. Blood in the urine and protein in the urine can occur after massive inhalation. These effects usually are reversible if exposure is terminated.

Skin irritation has been noted at occupational exposures of greater than 60 ppm for up to three weeks. Benzene can produce defatting of the skin, erythema and burning. In severe cases, it can cause edema and blistering.

No studies were located regarding ocular effects in humans after inhalation exposure to benzene. High concentrations of benzene vapor can cause eye irritation, but inflammation is generally slight.

CHRONIC HEALTH EFFECTS

Repeated exposure to high levels of benzene can result in persistent CNS effects. Chronic benzene exposure in the workplace is associated with hematologic disorders (i.e., thrombocytopenia, aplastic anemia, myelocytic leukemia, and monocytic leukemia).

Benzene is classified as a human carcinogen by the EPA. The available data on the developmental and reproductive effects of benzene after inhalation exposure are inconclusive.