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If Veterans don't help Veterans, who will?

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The ToxGuide™ is developed to be used as a pocket guide. Tear off at perforation and fold along lines.

Sources of Exposure

General Populations

- The major sources of benzene exposure are tobacco smoke, automobile service stations, exhaust from motor vehicles, and industrial emissions.
- About 50% of the entire nationwide exposure to benzene results from smoking tobacco or from exposure to tobacco smoke.
- Vapors (or gases) from products that contain benzene, such as glues, paints, furniture wax, and detergents, can also be a source of exposure.

Occupational Populations

- Individuals employed in industries that make or use benzene may be exposed. These industries include benzene production (petrochemicals, petroleum refining, and coke and coal chemical manufacturing), rubber tire manufacturing, and storage or transport of benzene and petroleum products containing benzene.
- Other workers who may be exposed to benzene because of their occupations include steel workers, printers, rubber workers, shoe makers, laboratory technicians, firefighters, and gas station employees.

Toxicokinetics and Normal Human Levels

Toxicokinetics

- Benzene is rapidly absorbed through the lungs; approximately 50% of the benzene in air is absorbed.
- Over 90% of ingested benzene is absorbed through the gastrointestinal tract.
- Absorbed benzene is rapidly distributed throughout the body and tends to accumulate in fatty tissues.
- The liver serves an important function in benzene metabolism, which results in the production of several reactive metabolites.
- At low exposure levels, benzene is rapidly metabolized and excreted predominantly as conjugated urinary metabolites.
- At higher exposure levels, metabolic pathways appear to become saturated and a large portion of an absorbed dose of benzene is excreted as parent compound in exhaled air.

Normal Human Levels

- Median level in blood is 0.06 µg/L for non-occupationally exposed individuals and 0.05 µg/L in a subset of non-smokers.

Biomarkers/Environmental Levels

Biomarkers

- Urinary benzene level is the most sensitive biomarker of exposure to low concentrations.
- Urinary levels of several benzene metabolites including muconic acid and S-phenyl mercapturic acid are also sensitive biomarkers of exposure.

Environmental Levels

Air

- The concentration of benzene in air samples from metropolitan areas was 0.58 ppb.

Sediment and Soil

- Benzene was detected in less than 10% of sediment samples with a median level of <5 ppb.

Water

- Benzene was detected in approximately 40% of surface water samples with levels ranging for non-detectable to 100 µg/L.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Benzene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.

ToxGuide™ for Benzene

C_6H_6

CAS# 71-43-2

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U.S. Department of Health and Human Services
Public Health Service
Agency for Toxic Substances and Disease Registry
www.atsdr.cdc.gov

Contact Information:
Division of Toxicology
and Environmental Medicine
Applied Toxicology Branch

1600 Clifton Road NE, F-32
Atlanta, GA 30333
1-800-CDC-INFO
1-800-232-4636
www.atsdr.cdc.gov/toxpro2.html

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

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Chemical and Physical Information

Benzene is a colorless liquid

- Benzene, also known as benzol, has a sweet odor.
- Benzene is highly flammable.
- Benzene is made mostly from petroleum sources. Various industries use benzene to make other chemicals, such as styrene (for Styrofoam® and other plastics), cumene (for various resins), and cyclohexane (for nylon and synthetic fibers).
- Benzene is also used for the manufacturing of some types of rubbers, lubricants, dyes, detergents, drugs, and pesticides.
- Benzene is also a natural component of crude oil, gasoline and cigarette smoke.

Routes of Exposure

- Inhalation – Primary route of exposure for general and occupational populations.
- Oral – Minor route of exposure.
- Dermal – Minor route of exposure.

Benzene in the Environment

- Benzene enters the air, water, and soil as a result of industrial processes, emissions from burning coal and oil, tobacco smoke, gasoline exhaust and gasoline leaks, and from natural sources including volcanoes and forest fires.
- Benzene in the atmosphere chemically degrades in only a few days.
- Benzene released to soil or waterways is subject to volatilization, photooxidation, and biodegradation.

Relevance to Public Health (Health Effects)

Health effects are determined by the dose (how much), the duration (how long), and the route of exposure.

Minimal Risk Levels (MRLs)

Inhalation

- An MRL of 0.009 ppm has been derived for acute-duration inhalation exposure (≤14 days).
- An MRL of 0.006 ppm has been derived for intermediate-duration inhalation exposure (15–364 days).
- An MRL of 0.003 ppm has been derived for chronic-duration inhalation exposure (≥1 year).

Oral

- No acute- or intermediate-duration oral MRLs were derived for benzene.
- An MRL of 0.0005 mg/kg/day has been derived for chronic-duration oral exposure (≥1 year).

Health Effects

- The primary target organs for acute exposure are the hematopoietic system, nervous system, and immune system.
- The primary target for adverse systemic effects of benzene following low-level chronic exposure is the hematological system.
- Benzene is a known human carcinogen and is associated with leukemia, especially acute myelogenic leukemia.
- Benzene exposure may also be associated with reproductive and developmental effects based on animal studies.

Children's Health

- It is not known if children are more susceptible to benzene poisoning than adults.