BENZENE

FACT SHEET ON A DRINKING WATER CHEMICAL CONTAMINANT

GENERAL INFORMATION

Synonyms:
- None

Chemical Description:
- Volatile organic compound

Properties:
- Highly flammable liquid with an aromatic odor
- Nearly colorless
- Relatively soluble in water and mixes well with a variety of organic solvents
- Vapors three times heavier than air

Production and Use:
- Produced in large amounts mainly for production of other compounds such as styrene, synthetic rubber, phenol, alkylamesulfonate detergent, nitrobenzene (aniline), and cyclohexane; also produced indirectly in large volumes, such as during gasoline refining and in low volumes in a number of biological processes
- Component of petroleum
- Added to gasoline to increase octane

ENVIRONMENTAL PROFILE

Occurrence:
- Occurs in drinking water, food, and air
- Occurs in ground water and surface public water supplies with higher levels in ground water
- Found as a naturally occurring compound at parts per billion (ppb) levels in a large number of foods
- Found in urban and suburban air, generally at average levels less than 10 ppb; has been reported to occur in indoor air at levels higher than those found outdoors

Releases:
- Releases to the environment are primarily to air, with smaller amounts to water and soil
- Releases to water are mainly due to spills of gasoline and other petroleum products and from use as a solvent

Environmental Fate:
- When released to surface water, it rapidly evaporates to air
- When released to the ground, it binds to some degree with soil and slowly migrates to ground water
- Degrades rapidly in air with a half life less than one day
- Biodegrades poorly in water and is expected to remain stable in ground water

HEALTH EFFECTS

Humans:
- Acute exposure to high levels of benzene produces primarily central nervous system (CNS) effects and death; at non-lethal levels, mild CNS effects appear to be concentration dependent and rapidly reversible; also causes immune system depression and bone marrow toxicity leading to aplastic anemia; lower levels do not seem to elicit these effects no matter how long the exposure
- Has caused chromosomal aberrations (mutagenic effects) in exposed workers
- Causes various kinds of leukemia
- Benzene is classified as a group A carcinogen, a human carcinogen, based on epidemiological studies showing a causal association between benzene exposure and cancer

Experimental Animals:
- Rats orally exposed for 52 weeks—Zymbal gland tumors, skin cancer, and leukemias
- Variety of mammals exposed by inhalation for 12-15 days—anemia
- Dogs exposed by inhalation at 600-1,000 ppm for 12 to 15 days—reduced white blood cells
- No reproductive effects, but potent growth inhibitor *in utero*
- Not mutagenic in bacterial systems although the metabolite, benzene oxide, is mutagenic

REGULATORY HISTORY

Existing Standards:

- **Clean Air Act (CAA):** Registered
- **Clean Water Act (CWA):** Reportable quantity 1,000 pounds
- **Resource Conservation and Recovery Act (RCRA):** Listed for ground-water monitoring
- **Superfund (CERCLA):** Reportable Quantity 10 pounds
- **SARA:** Registered
- **Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA):** Not available
- **Toxic Substances Control Act (TSCA):** On Inventory

HEALTH INFORMATION

Maximum Contaminant Level Goals (MCLG):

- Non-enforceable levels based solely on an evaluation of possible health risks and exposure, and taking into consideration a margin for public safety
- Set at zero for cancer causing chemicals in water

MCLG for Benzene = 0 mg/L

Maximum Contaminant Levels (MCL):

- Legally enforceable levels for contaminants in public drinking water supplies
- Based on health risks associated with the contaminants in public drinking water supplies

MCL for Benzene = 0.005 mg/L

EPA Health Advisories (HA):

- **Short-term HAs:** Provide acceptable concentrations of contaminants in water for up to 10 day exposures, primarily to evaluate the public health risk resulting from an accidental spill or an emergency contamination situation
- **Longer-term HAs:** Provide guidance for persistent water contamination situations to cover a period of up to 7 years
- **Lifetime HAs:** Derived in the same way as an MCLG

Health Advisories:

Short-term HA for a child = 0.235 mg/L
Longer-term HAs = Not determined

ANALYTICAL METHODS

- Gas chromatography
  EPA Method 502

WATER TREATMENT

Permanent Treatment:
Best Available Technology (BAT):

- granular activated carbon adsorption
- air stripping
- boiling

SHORT-TERM HAZARD ELIMINATION

- If the drinking water standards are exceeded, install BAT or use an alternative drinking water supply such as bottled water
- Boiling for 10 minutes effectively removes 99% of benzene originally present—potential inhalation hazard

ADDITIONAL HELP

- State or county health officials can indicate a certified laboratory for testing
- Experts in the state Department of Environmental Protection or Natural Resources may also be of help
- The EPA has toll-free numbers for further information on drinking water quality, treatment technologies, for obtaining Health Advisories, and for other regulatory information
- EPA Hotlines are available Monday through Friday, 8:30 a.m. to 4:30 p.m. EST:

•Safe Drinking Water:	**800-426-4791**
•Air Quality:	**800-631-2700**
•National Pesticides:	**800-858-PEST**
•Superfund/RCRA:	**800-424-9346**
	800-343-3958

- For information on the Clean Water Act, call (202) 260-7301
- For information on the Toxic Substances Control Act, call (202) 554-1404