

US EPA ARCHIVE DOCUMENT

Technical Factsheet on: TOLUENE

[List of Contaminants](#)

As part of the Drinking Water and Health pages, this fact sheet is part of a larger publication:
National Primary Drinking Water Regulations

Drinking Water Standards

MCLG: 1 mg/L

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HAL(child): 1 day: 20 mg/L; Longer-term: 2 mg/L

Health Effects Summary

Acute: EPA has found toluene to potentially cause the following health effects from acute exposures at levels above the MCL: low oral toxicity to central nervous system, may cause fatigue, nausea, weakness, confusion.

Drinking water levels which are considered "safe" for short-term exposures: For a 22 lb. child consuming 1 liter of water per day: a one-day exposure to 20 mg/L; upto a 7-year exposure to 2 mg/L.

Chronic: Toluene has the potential to cause the following health effects from long-term exposures at levels above the MCL: spasms, tremors, imbalance; impairment of speech, hearing, vision, memory, coordination; liver and kidney damage.

Cancer: There is inadequate evidence to state whether or not toluene has the potential to cause cancer from lifetime exposures in drinking water.

Usage Patterns

Production of toluene has increased: from 5.1 billion lbs. in 1985 to 6.4 billion lbs in 1993. In 1985, it was estimated that industries consumed toluene as follows: Benzene, 46%; gasoline blending, 37%; solvent, 8%; toluene diisocyanate, 7%; miscellaneous chemicals, 2%.

The largest chemical use for toluene is the production of benzene and urethane via hydrodealkylation.

Other uses include; manufacture of benzoic acid, benzaldehyde, explosives, dyes, and many other organic compounds; as a solvent for paints, lacquers, gums, resins; in the extraction of various principles from plants; as gasoline additive; as a diluent for photogravure inks; in cements, solvents, spot removers, cosmetics, antifreezes; an asphalt and naphtha constituent; in detergent manufacture; in fuel blending

Release Patterns

Toluene is released into the atmosphere principally from the volatilization of petroleum fuels and toluene-based solvents and thinners and from motor vehicle exhaust. Considerable emissions are from: its discharge into waterways or spills on land during the storage, transport and disposal of fuels and oils; from its production from petroleum and coal; as a by-product from styrene production, and from its use as a chemical intermediate.

From 1987 to 1993, according to EPA's Toxic Chemical Release Inventory, toluene releases to land and water totalled over 4 million lbs., of which about 83 percent was to land. These releases were primarily

from petroleum refining industries. The largest releases occurred in Texas and California. The largest releases directly to water occurred in Connecticut and West Virginia.

Environmental Fate

If toluene is released to soil, it will be lost by evaporation from near-surface soil and by leaching to the groundwater. Based on the reported Koc values, toluene will be expected to exhibit very high to moderate in soil and therefore may leach to the groundwater. Field data from infiltration sites is conflicting; in one study toluene is eliminated during bank infiltration, while in other studies it penetrates infiltration sites. These results may bear on site-related factors such as load, flow rate, soil characteristics, and other loss factors such as evaporation and biodegradation. Reported Koc values: Wendover silty loam, 37, Grimsby silt loam, 160, Vaudreil sandy loam, 46; sandy soil, 178; 100 and 151.

Biodegradation occurs both in soil and groundwater, but it is apt to be slow especially at high concentrations, which may be toxic to microorganisms. The presence of acclimated microbial populations may allow rapid biodegradation. Toluene completely degraded in groundwater in 8 days including a lag of 3-4 days while microbial populations became acclimated. Other investigators found that only 1-2% of toluene degraded in the subsurface environment and less than 90% degraded in 4 weeks in soil cores at various depths both above and below the water table. It will not significantly hydrolyze in soil or water under normal environmental conditions.

If toluene is released into water, its removal can be rapid or take several weeks, depending on temperature, mixing conditions, and acclimation of microorganisms. Toluene evaporates rapidly from water with an experimentally determined half-life of 2.9 to 5.7 hr for evaporation from 1 m of water with moderate mixing conditions. In a mesocosm experiment with simulated conditions for Narragansett Bay, RI, the loss was primarily by evaporation in winter with a half-life of 13 days. It will not significantly adsorb to sediment.

If toluene is released to the atmosphere, it will degrade by reaction with photochemically produced hydroxyl radicals (half-life 3 hr to slightly over 1 day) or be washed out in rain. It will not be subject to direct photolysis.

It will not significantly bioconcentrate in aquatic organisms. Reported BCFs: eels, 13.2; Manila clam, 1.67; mussel, 4.2; algae, 380; golden ide fish, 90.

The primary source of human exposure is from inhalation of contaminated ambient air, especially in traffic or near filling stations, or in occupational atmospheres where toluene-based solvents are used.

Chemical/Physical Properties

CAS Number: 108-88-3

Color/ Form/Odor: Colorless liquid with a sweet, benzene-like odor

M.P.: -95 C B.P.: 111 C

Vapor Pressure: 36.7 mm Hg at 30 C

Density/Spec. Grav.: 0.866 at 20 C

Octanol/Water Partition (Kow): Log Kow = 2.69

Solubility: N/A; Slightly soluble in water

Soil sorption coefficient: Koc measured at 37 to 178 in several soils; very high to moderate mobility in soil

Odor/Taste Thresholds: Odor and taste thresholds in water are reported as 0.04 and 1 mg/L

Bioconcentration Factor: BCFs: <100 in fish; <10 in shellfish; 380 in algae; not expected to bioconcentrate in aquatic organisms.

Henry's Law Coefficient: N/A

Trade Names/Synonyms: Methylbenzene, Methacide, Phenylmethane, Toluol, Antisal 1A

Other Regulatory Information

Monitoring:

-- For Ground/Surface Water Sources:

Initial Frequency- 4 quarterly samples every 3 years

Repeat Frequency- Annually after 1 year of no detection

-- Triggers - Return to Initial Freq. if detect at > 0.0005 mg/L

Analysis

Reference Source
EPA 600/4-88-039

Method Numbers
502.2; 524.2

Treatment - Best Available Technologies: Granular Activated Charcoal and Packed Tower Aeration

Toxic Release Inventory - Releases to Water and Land, 1987 to 1993 (in pounds):

	Water 732,310	Land 3,672,041
TOTALS* (in pounds)		
Top Ten States*		
TX	16,285	969,210
CA	0	930,000
CT	316,068	0
OK	0	287,000
VA	27,500	216,000
VI	2,970	191,504
IL	56	180,824
MI	0	129,226
WV	117,523	1,377
SC	6,000	89,578
Major Industries*		
Petroleum refining	227,196	2,580,941
Medicinals, botanicals	301,585	1,108
Petroleum/coal prods.	38,856	287,000
Misc Ind. Chemicals	179,576	107,159
Gaskets, sealing devices	4,002	216,000
Wood office furniture	0	129,226
Plastics, resins	57,661	39,139
Wood home furniture	30,000	65,444
Paints, allied products	5,927	88,024

* Water/Land totals only include facilities with releases greater than 10,000 lbs.

For Additional Information

EPA can provide further regulatory or other general information:
EPA Safe Drinking Water Hotline - 800/426-4791

Other sources of toxicological and environmental fate data include:
Toxic Substance Control Act Information Line - 202/554-1404
Toxics Release Inventory, National Library of Medicine - 301/496-6531
Agency for Toxic Substances and Disease Registry - 404/639-6000