



## MTBE in Drinking Water

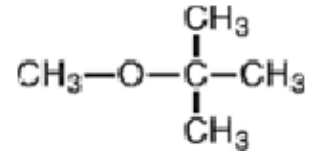
FACT SHEET 31-007-0212

### Concerns about MTBE

Low levels of Methyl tertiary-butyl ether (MTBE) have been found in ground water throughout the United States. Small amounts of MTBE in drinking water supplies impart a turpentine-like taste and odor, which make it unacceptable for drinking.

### Source

MTBE is a chemical compound manufactured by the chemical reaction of methanol and isobutylene. MTBE is a volatile, flammable, and colorless liquid that dissolves easily in water. In use since 1979 to replace lead in gasoline, MTBE is characterized as an oxygenate or octane enhancer, which is used almost exclusively as an additive in gasoline to improve combustion and reduce emissions.



The use of MTBE has increased nationwide to meet the oxygenated fuel requirements in the 1990 Clean Air Act (CAA) amendments, which requires the use of reformulated gasoline (RFG) containing an oxygenated agent to make gasoline burn more efficiently in areas with unhealthy levels of air contamination. MTBE has also been used as a laboratory chemical and in medicine to dissolve gallstones.

### Environmental Exposure and Fate

Any place that gasoline is used, transported, or stored is susceptible to MTBE contamination. Contamination of water sources may come from gasoline tanks of recreational water vehicles and automobiles, fuel pipelines, and underground fuel storage tanks (UST). MTBE does not readily adsorb to soil, so that when spilled on the ground, it can easily filter through soil directly into ground water. Additionally, MTBE vapors released into the atmosphere can mix and dissolve in rainfall and be carried into water sources. MTBE does not easily biodegrade once it is dissolved in water, and is considered to be more persistent in ground water than in surface water. In shallow surface water, volatilization into the air may reduce water contamination.

The half-life\* of MTBE in various water sources are:

Flowing surface water: hours to days

Standing water: days to weeks

Ground water: months to years

### Is MTBE Harmful to Humans?

Primary routes of exposure are through inhalation and ingestion. MTBE can be absorbed through the skin; however, the process is slow. The majority of MTBE exposure studies have focused on health effects of inhalation. Limited research to date has been done on ingestion and topical exposure to MTBE in drinking water. Immediate or acute symptoms from oral consumption may include nausea, dizziness, shortness of breath, and diarrhea. Long term health effects from exposure through inhalation and possibly consumption may include gastrointestinal irritation and liver and kidney damage. Additionally, cancer and nervous system effects have been observed in laboratory rats and mice exposed through inhalation of MTBE vapors and topical application of high concentrations of MTBE using oil. However, evidence to date is inconclusive on the cancer-causing or nervous system effects of ingesting or bathing in contaminated water at MTBE levels of 40 parts per billion (ppb) and below. Evidence has also shown that MTBE intake by humans and animals does not stay in the body long, but is metabolized or eliminated from the body within hours.

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\*Half-life: The length of time required for the mass, concentration, or activity of a chemical or physical agent to be reduced by one-half.

## **Current Federal Regulatory Guidance**

There is no national, health-based standard for MTBE in drinking water. However, MTBE has been placed on the United States Environmental Protection Agency (USEPA) Contaminant Candidate List (CCL) to determine necessary regulation, and the USEPA has initiated several activities, including additional research to address the health effects of MTBE in drinking water supplies and regular monitoring at all large public water systems and at a subset of medium and small water utilities. As an interim measure, USEPA has issued an unregulated drinking water advisory based on consumer acceptability (i.e., taste and odor) of MTBE concentrations in the range of 20 to 40 ppb: An exposure to this range is approximately 20,000-100,000 (or more) times lower than the range of exposure that produced cancer and non-cancer effects in rodents. Therefore, USEPA believes that the concentration range of 20-40 ppb or lower provides an adequate margin of safety for adverse human health effects.

To prevent MTBE and other fuel-related contamination events in ground and drinking water sources, additional regulations include the Underground Storage Tank (UST) program established in the 1984 Resource Conservation and Recovery Act (RCRA) amendments to set operating and technical standards for underground fuel storage tanks, including a leak detection and cleanup program. As of 1993, all USTs were required to comply, and tanks installed before December 1988 were required to be upgraded, replaced, or removed. It is estimated that perhaps 85% of all tanks were in compliance as of December 1998.

## **Current State Regulatory Guidance**

Approximately 25 States have initiated either a partial or complete ban of MTBE usage in petroleum products. To find additional State drinking water standards; contact the State water office or local water treatment plant (WTP). Contact information may also be obtained from <http://www.epa.gov/mtbe/contacts.htm>.

## **Impact on DOD**

The Department of Defense (DOD) consumes approximately 80% of all energy used by the Federal government, including approximately 200 million gallons of gasoline and diesel fuels. Any new drinking water regulations will impact both drinking water treatment and ground water cleanup activities. DOD installations in the Continental U.S. (CONUS) will also need to adhere to State requirements. Finally, if the USEPA determines that MTBE poses a significant threat to air quality, water quality, or human health, it could take action to restrict or ban the substance without new legislative authority.

## **Best Available Technology (BAT)**

The best approach to treat MTBE contamination in drinking water sources is to remove it at the WTP. There are a number of effective technologies that can remove MTBE from drinking water. The most common treatment technologies are 1) air stripping, 2) adsorption using granular activated carbon (GAC), and 3) advanced oxidation. Because small amounts of MTBE impart an objectionable taste and odor, WTPs will likely implement appropriate treatment. Consumers can also purchase commercial home treatment devices called point-of-use (POU) devices. Several of these devices are certified for efficacy by credible non-government organizations. Additional information about specific devices may be obtained from the following websites:

NSF International [http://www.nsf.org/consumer/drinking\\_water/](http://www.nsf.org/consumer/drinking_water/)

The Water Quality Association <http://www.wqa.org/>

Underwriters Laboratories, Inc. <http://www.ul.com/>