



FACT SHEET

Drinking Water Advisory: Consumer Acceptability Advice and Health Effects Analysis on Methyl Tertiary-Butyl Ether (MtBE)

The Advisory

The U.S. Environmental Protection Agency (EPA) Office of Water is issuing an Advisory on methyl tertiary-butyl ether (MtBE) in drinking water. This Advisory provides guidance to communities exposed to drinking water contaminated with MtBE. This document supersedes any previous drafts of drinking water health advisories for this chemical.

What is an Advisory?

The U.S. EPA Health Advisory Program was initiated to provide information and guidance to individuals or agencies concerned with potential risk from drinking water contaminants for which no national regulations currently exist. Advisories are not mandatory standards for action. Advisories are used only for guidance and are not legally enforceable. They are subject to revision as new information becomes available. EPA's Health Advisory program is recognized in the Safe Drinking Water Act Amendments of 1996, which state in section 102(b)(1)(F):

"The Administrator may publish health advisories (which are not regulations) or take other appropriate actions for contaminants not subject to any national primary drinking water regulation".

As its title indicates, this Advisory includes consumer acceptability advice as "appropriate" under this statutory provision, as well as a health effects analysis.

What is MtBE?

MtBE is a volatile, organic chemical. Since the late 1970's, MtBE has been used as an octane enhancer in gasoline. Because it promotes more complete burning of gasoline, thereby reducing carbon monoxide and ozone levels, it is commonly used as a gasoline additive in localities which do not meet the National Ambient Air Quality Standards.

In the Clean Air Act of 1990 (Act), Congress mandated the use of reformulated gasoline (RFG) in areas of the country with the worst ozone or smog problems. RFG must meet certain technical specifications set forth in the Act, including a specific oxygen content. Ethanol and MtBE are the primary oxygenates used to meet the oxygen content requirement. MtBE is used in about 84% of RFG supplies. Currently, 32 areas in a total of 18 states are participating in the RFG program, and RFG accounts for about 30% of gasoline nationwide.

Studies identify significant air quality and public health benefits that directly result from the use of fuels oxygenated with MtBE, ethanol or other chemicals. The refiners' 1995/96 fuel data submitted to EPA indicate that the national emissions benefits exceeded those required. The 1996 Air Quality Trends Report shows that toxic air pollutants declined significantly between 1994 and 1995. Early analysis indicates this progress may be attributable to the use of RFG. Starting in the year 2000, required emission reductions are substantially greater, at about 27% for volatile organic compounds, 22% for toxic air pollutants, and 7% for nitrogen oxides.

Why is MtBE a Drinking Water Concern?

A limited number of instances of significant contamination of drinking water with MtBE have occurred due to leaks from underground and

above ground petroleum storage tank systems and pipelines. Due to its small molecular size and solubility in water, MtBE moves rapidly into groundwater, faster than do other constituents of gasoline. Public and private wells have been contaminated in this manner. Non-point sources, such as recreational watercraft, are most likely to be the cause of small amounts of contamination in a large number of shallow aquifers and surface waters. Air deposition through precipitation of industrial or vehicular emissions may also contribute to surface water contamination. The extent of any potential for build-up in the environment from such deposition is uncertain.

Is MtBE in Drinking Water Harmful?

Based on the limited sampling data currently available, most concentrations at which MtBE has been found in drinking water sources are unlikely to cause adverse health effects. However, EPA is continuing to evaluate the available information and is doing additional research to seek more definitive estimates of potential risks to humans from drinking water.

There are no data on the effects on humans of drinking MtBE-contaminated water. In laboratory tests on animals, cancer and noncancer effects occur at high levels of exposure. These tests were conducted by inhalation exposure or by introducing the chemical in oil directly to the stomach. The tests support a concern for potential human hazard. Because the animals were not exposed through drinking water, there are significant uncertainties about the degree of risk associated with human exposure to low concentrations typically found in drinking water.

How Can People be Protected?

MtBE has a very unpleasant taste and odor, and these properties can make contaminated drinking water unacceptable to the public. This Advisory recommends control levels for taste and odor acceptability that will also protect against potential health effects.

Studies have been conducted on the concentrations of MtBE in drinking water at which individuals can detect the odor or taste of the chemical. Humans vary widely in the concentrations they are able to detect. Some who are sensitive can detect very low concentrations, others do not taste or smell the chemical even at much higher concentrations. Moreover, the presence or absence of other

natural or water treatment chemicals can mask or reveal the taste or odor effects.

Studies to date have not been extensive enough to completely describe the extent of this variability, or to establish a population threshold of response. Nevertheless, we conclude from the available studies that keeping concentrations in the range of 20 to 40 micrograms per liter ($\mu\text{g/L}$) of water or below will likely avert unpleasant taste and odor effects, recognizing that some people may detect the chemical below this.

Concentrations in the range of 20 to 40 $\mu\text{g/L}$ are about 20,000 to 100,000 (or more) times lower than the range of exposure levels in which cancer or noncancer effects were observed in rodent tests. This margin of exposure is in the range of margins of exposure typically provided to protect against cancer effects by the National Primary Drinking Water Standards under the Federal Safe Drinking Water Act. This margin is greater than such standards typically provided to protect against noncancer effects. Thus, protection of the water source from unpleasant taste and odor as recommended will also protect consumers from potential health effects.

EPA also notes that occurrences of ground water contamination observed at or above this 20-40 $\mu\text{g/l}$ taste and odor threshold -- that is, contamination at levels which may create consumer acceptability problems for water suppliers -- have to date resulted from leaks in petroleum storage tanks or pipelines, not from other sources.

What is Being Done About the Problem?

Research

The EPA, other federal and state agencies, and private entities are conducting research and developing a strategy for future research on all health and environmental issues associated with the use of oxygenates. To address the research needs associated with oxygenates in water, a public, scientific workshop to review the EPA's Research Strategy for Oxygenates in Water document was held on October 7, 1997.

Discussions included current, or soon to be started, oxygenate projects in the areas of environmental monitoring/occurrence, source characterization, transport and fate, exposure, toxicity, remediation, among others. The identified research will help provide the

necessary information to better understand the health effects related to MtBE and other oxygenates in water, to further our knowledge on remediation techniques, and to direct future research planning towards the areas of highest priority. This document is expected to be available for external review by January, 1998. EPA plans to hold a workshop with industry to secure commitments on conducting the needed research in the Spring of 1998.

The EPA has also recently notified a consortium of fuel and fuel additive manufacturers of further air-related research requirements of industry under section 211(b) of the Clean Air Act (CAA). The proposed animal inhalation research focuses on the short and long term inhalation effects of conventional gasoline and MtBE gasoline in the areas of neurotoxicity, immunotoxicity, reproductive and developmental toxicity, and carcinogenicity. The testing requirements will also include an extensive array of human exposure research. This research will be completed at varying intervals over the next five years and could be very useful for assessing risks from MtBE in water, depending on the outcome of studies underway on the extrapolation of inhalation risks to oral ingestion.

When adequate research on the human health effects associated with ingestion of oxygenates becomes available, the EPA Office of Water will issue a final health advisory to replace the present advisory.

Monitoring

The EPA's Office of Water has also entered into a cooperative agreement with the United States Geological Survey (USGS) to conduct an assessment of the occurrence and distribution of MtBE in the 12 mid-Atlantic and Northeastern states. Like California, these States have used MtBE extensively in the RFG and Oxygenated Fuels programs. This study will supplement the data gathered in California and will attempt to shed light on the important issues of (1) whether or not MtBE has entered drinking water distribution systems or impacted drinking water source supplies, and (2) determine if point (land) or nonpoint sources (air) are associated with detections of MtBE in ground water resources. Activities are underway to begin collecting data in early 1998.

Underground Storage Tanks

Under EPA regulations, leaks from underground storage tank systems (USTs) which may cause

contamination of groundwater with MtBE or other materials are required to be reported to the "implementing agency" which, in most cases, is a state agency. The EPA Office of Underground Storage Tanks and State and local authorities are addressing the cleanup of water contaminated by such leaks. All USTs installed after December 1988 have been required to meet EPA regulations for preventing leaks and spills. All USTs that were installed prior to December 1988 must be upgraded, replaced, or closed to meet these requirements by December 1998.

Safe Drinking Water Act Candidate List

The Safe Drinking Water Act (SDWA), as amended in 1996, requires EPA to publish a list of contaminants that may require regulation, based on their known or anticipated occurrence in public drinking water systems. The SDWA, as amended, specifically directs EPA to publish the first list of contaminants (Contaminant Candidate List, or CCL) by February 1998, after consultation with the scientific community, including EPA's Science Advisory Board, and after notice and opportunity for public comment. The amendments also require EPA to select at least five contaminants from the final CCL and make a determination of whether or not to develop regulations, including drinking water standards, for them by 2001. The EPA Office of Water published a draft CCL for public comment in the Federal Register on October 6, 1997 (62 FR 52194). MtBE is included on the draft CCL based on actual MtBE contamination of certain drinking water supplies, e.g., Santa Monica, and the potential for contamination of other drinking water supplies in areas of the country where MtBE is used in high levels.

How Can I Get My Water Tested?

A list of local laboratories that can test your water for MtBE can be obtained from your state drinking water agency. The cost for testing is approximately \$150 per sample. The analysis should be performed by a laboratory certified to perform EPA certified methods. The laboratory should follow EPA Method 524.2 (gas chromatography/mass spectrometry).

How Can I Get Rid of MtBE If It's In My Water?

In most cases it is difficult and expensive for individual home owners to treat their own water. Any detection of MtBE should be reported to

your local water authority, who can work with you to have your water tested and treated.

Are There Any Recommendations for State or Public Water Suppliers?

Public water systems that conduct routine monitoring for volatile organic chemicals can test for MtBE at little additional cost, and some States are already moving in this direction.

Public water systems detecting MtBE in their source water at problematic concentrations can remove MtBE from water using the same conventional treatment techniques that are used to clean up other contaminants originating from gasoline releases, such as air stripping and granular activated carbon (GAC). However, because MtBE is more soluble in water and more resistant to biodegradation than other chemical constituents in gasoline, air stripping and GAC treatment requires additional optimization and must often be used together to remove MtBE effectively from water. The costs of removing MtBE will be higher than when treating for gasoline releases that do not contain MtBE. Oxidization of MtBE using UV/peroxide/ozone treatment may also be feasible, but typically has higher capital and operating costs than air stripping and GAC.

To Obtain the Advisory:

Call the National Center for Environmental Publications and Information (NCEPI) at 1-800-490-9198 to be sent a copy or write to NCEPI, EPA Publications Clearinghouse, P.O. Box 42419, Cincinnati, OH 45242 .

Internet download:

www.epa.gov/OST/Tools/MtBEaa.pdf

To Obtain the Research Strategy on Oxygenates in Water, External Review

Draft, Contact: Diane Ray, U.S. EPA, Office of Research and Development, NCEA, MD-52, RTP, NC 27711 or by phone (919)541-3637.

Internet download:

www.epa.gov/ncea/oxywater.htm

To Obtain the 211(b) Air-Related Research Requirements, Contact:

John Brophy, U.S. EPA, Office of Air and Radiation; phone (202) 564-9068;
www.epa.gov/omswww/omsfuels.htm

For Further Information on the Advisory, Contact:

Charles Abernathy
U.S. EPA, Office of Water, Mail Code 4304
1200 Pennsylvania Ave., Washington, DC. 20460
mtbe.advisory@epa.gov
(202)260-5374

For Further Information on the Research Strategy, Contact:

Diane Ray, U.S. EPA, Office of Research and Development, NCEA, MD-52, RTP, NC 27711
or by phone (919)541-3637.