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August 1996

## Public Health Statement for Methyl-*tert*-butyl Ether

**CAS#** 1634-04-4

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**This Public Health Statement is the summary chapter from the [Toxicological Profile for methyl-\*tert\*-butyl ether](#) . It is one in a series of Public Health Statements about hazardous substances and their health effects. A shorter version, the [ToxFAQs™](#), is also available. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present. For more information, call the ATSDR Information Center at 1-888-422-8737.**

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This public health statement tells you about methyl tert-butyl ether (MTBE) and the effects of exposure.

The Environmental Protection Agency (EPA) identifies the most serious hazardous waste sites in the nation. These sites make up the National Priorities List (NPL) and are the sites targeted for long-term federal cleanup activities. MTBE has been found in at least 12 of the 1,430 current or former NPL sites. However, it's unknown how many NPL sites have been evaluated for this substance. As more sites are evaluated, the sites with MTBE may increase. This information is important because exposure to this substance may harm you and because these sites may be sources of exposure.

When a substance is released from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment. This release does not always lead to exposure. You are exposed to a substance only when you come in contact with it. You may be exposed by breathing, eating, or drinking the substance or by skin contact.

If you are exposed to MTBE, many factors determine whether you'll be harmed. These factors include the dose (how much), the duration (how long), and how you come in contact with it. You must also consider the other chemicals you're exposed to and your age, sex, diet, family traits, lifestyle, and state of health.

### 1.1 What is MTBE?

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MTBE is the common name for a synthetic chemical called methyl tert-butyl ether. It is a flammable liquid made from combinations of chemicals like isobutylene and methanol. It has a distinctive odor that most people find disagreeable. It was first introduced as an additive for unleaded gasolines in the 1980s to enhance octane ratings. In city areas where there are concerns over pollutants like carbon monoxide, EPA may require the use of MTBE or ethanol as an oxygenating agent to make the fuel burn more cleanly during the winter months. Fuels containing these additives are called reformulated gasolines. Most MTBE is mixed with gasoline, so most people would come in contact with it while exposed to automobile fuel vapors or exhausts. MTBE has other special uses as a laboratory chemical and in medicine to dissolve gallstones.

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### **1.2 What happens to MTBE when it enters the environment?**

MTBE will quickly evaporate from open containers. In the open air, it will quickly break down into other chemical compounds, with half of it disappearing in about 4 hours. Like most ethers and alcohols, MTBE dissolves readily in water. If spilled on the ground, rain water can dissolve MTBE and carry it through the soil and into groundwater. Spills or leaks from storage containers can seep into deeper soil layers and pollute groundwater, especially near manufacturing sites, pipelines, and shipping facilities.

Leakage from underground storage tanks, such as tanks at gasoline filling stations, can also add MTBE to groundwater. MTBE is not expected to concentrate in fish or plants found in lakes, ponds, and rivers.

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### **1.3 How might I be exposed to MTBE?**

Low levels of MTBE can be present in both indoor and outdoor air, and are mostly linked with the use of MTBE as a gasoline additive. Because it is not presently considered a major harmful pollutant, it is usually not included in routine national monitoring programs for liquids. This makes it difficult to estimate how much you could be exposed to. Because MTBE evaporates quickly, large amounts of the vapor could enter closed spaces. Leaks, spills, or open containers of MTBE pose a fire and explosion threat in the presence of open flames and electrical sparks, especially in closed spaces. Most people are exposed to MTBE from auto exhaust when driving or from gasoline while fueling their cars. People can also be exposed to MTBE from groundwater pollution. The chemical is likely to be present in very small amounts in the air in cities or near highways. MTBE is used to treat gallstones, so patients treated with this medical procedure will have some exposure.

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### **1.4 How can MTBE ether enter and leave my body?**

MTBE can enter your body rapidly if you breathe air, drink water, or eat food that contains it. If your skin comes into contact with MTBE, it can enter your body through the skin, but this happens more slowly. Most of the MTBE that you breathe in or take in by mouth can get into your blood. Not as much gets into the blood through the skin. No matter how you are exposed, a large amount of MTBE is breathed out without being changed into other chemicals. The MTBE that is not breathed out is changed into other chemicals such as butyl alcohol, methyl alcohol, formaldehyde, formic acid, and carbon dioxide. These chemicals also leave the body quickly in the air that you breathe out or in the urine. MTBE does not stay in any organs of your body for a long time. Most of it and its breakdown products leave the body in 1 or 2 days.

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### **1.5 How can MTBE affect my health?**

Some people who were exposed to MTBE while pumping gasoline, driving their cars, or working as attendants or mechanics at gas stations complained of headaches, nausea, dizziness, irritation of the nose or throat, and feelings of spaciness or confusion. These symptoms were reported when high levels of MTBE were added to gasoline in order to lower the amount of carbon monoxide, a known poison, released from cars. MTBE has a very unpleasant odor that most people can smell before any harmful effects would occur, but some people might feel irritation of the nose or throat before noticing the smell. MTBE caused side effects in some patients who were given MTBE to dissolve gallstones. The MTBE is given to these patients through special tubes that are placed into their gallbladders. If MTBE leaks from the gallbladder into other areas of the body, the patient can have minor liver damage, a lowering of the amount of white blood cells, nausea, vomiting, sleepiness, dizziness, and confusion. These effects are not long-lasting.

We know more about how MTBE affects the health of animals than the health of humans. Some rats and mice died after they breathed high amounts of MTBE, but these levels were much higher than people are likely to be exposed to. MTBE also caused irritation to the noses and throats of animals that breathed MTBE. The most common effect of MTBE in animals is on their nervous systems. Breathing MTBE at high levels can cause animals to act as if they are drunk. For example, some became less active, staggered, fell down, were unable to get up, and had partially closed eyelids. These effects lasted only for about an hour, and then the animals seemed normal again. Some animals that breathed high levels of MTBE for several hours a day for several weeks gained less weight than normal, probably because they ate less food while they were inactive. When rats breathed high levels of MTBE for several hours every day for two years, some got more serious kidney disease than these rats usually get as they

grow old. Some of the male rats developed cancer in the kidney, but whether this has meaning for people is not known. When mice breathed high levels of MTBE for several hours every day for a year and a half, some had larger livers than normal, and some mice developed tumors in the liver. When rats were given high levels of MTBE by mouth for 2 years, some male rats developed cancer in the testes and some female rats developed cancer of the blood (leukemia) and cancer (lymphoma) of some of the tissues that produce blood cells. The Department of Health and Human Services (DHSS), the International Agency for Research on Cancer (IARC), and the EPA have not classified MTBE for its ability to cause cancer. When pregnant rats, rabbits, or mice breathed MTBE, birth defects occurred only in the baby mice. We do not know if this has any relevance for people. MTBE did not affect the animals' ability to reproduce.

Some rats and mice died after being given very large amounts of MTBE by mouth. The amounts were much higher than people are likely to swallow from drinking water containing MTBE. The effects on the nervous system in animals that are given MTBE by mouth are the same as the effects that occur in animals that breathe MTBE. Some animals that were given MTBE by mouth had diarrhea and irritation in their stomachs and intestines. Some animals also had very slight liver damage.

MTBE irritated the skin of animals when it was placed directly on their skin. MTBE also irritated the eyes of animals when it was placed in their eyes or when air containing MTBE came into contact with their eyes.

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### **1.6 Is there a medical test to determine whether I have been exposed to MTBE?**

There are no specific medical tests to determine whether you have been exposed to MTBE. But MTBE and its breakdown product, butyl alcohol, can be measured in exhaled air, in blood, and in urine. Because MTBE and its breakdown products leave the body in 1 or 2 days, these measurements can only tell if you have been exposed recently. The effects of exposure to MTBE, such as stomach aches, fatigue, and dizziness, are common to many chemicals and illnesses. These symptoms are not very useful in determining whether you were exposed to this particular chemical.

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### **1.7 What recommendations has the federal government made to protect human health?**

To protect workers, the American Conference of Governmental Industrial Hygienists (ACGIH) recommends that the amount in workroom air be limited to 100 parts per million (ppm) in an 8- to 10-hour work shift. At this time, governmental agencies such the National Institute for Occupational Safety and Health (NIOSH),

Occupational Safety and Health Administration (OSHA), and EPA have not established exposure criteria for MTBE.

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## 1.8 Where can I get more information?

**If you have any more questions or concerns, please contact your community or state health or environmental quality department or:**

Agency for Toxic Substances and Disease Registry  
Division of Toxicology  
1600 Clifton Road NE, Mailstop F-32  
Atlanta, GA 30333

### Information line and technical assistance:

Phone: 888-422-8737  
FAX: (770)-488-4178

ATSDR can also tell you the location of occupational and environmental health clinics. These clinics specialize in recognizing, evaluating, and treating illnesses resulting from exposure to hazardous substances.

### To order toxicological profiles, contact:

National Technical Information Service  
5285 Port Royal Road  
Springfield, VA 22161  
Phone: 800-553-6847 or 703-605-6000

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## References

Agency for Toxic Substances and Disease Registry (ATSDR). 1996. [Toxicological profile for methyl t-butyl ether](#). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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This page was updated on August , 2008

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