Gasoline Oxygenates in Drinking Water

FACT SHEET

NEW YORK STATE
DEPARTMENT OF HEALTH

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What are gasoline oxygenates?

Oxygenates are man-made chemicals that are added to gasoline to make it burn more efficiently. Adding oxygenates to gasoline increases the gasoline's octane level, and reduces pollutants (particularly carbon monoxide) emitted from motor vehicles. Oxygenates are liquids at room temperature, evaporate easily into air, and generally have distinctive odors that may be disagreeable, depending on the specific oxygenate. Most oxygenates are either alcohols or ethers, which are readily soluble in water. Two commonly used oxygenates are ethanol and MTBE (methyl *tert*-butyl ether). MTBE is no longer used as an oxygenate in New York State. Other oxygenates include:

DIPE (diisopropyl ether)
ETBE (ethyl *tert*-butyl ether)
TAME (*tert*-amyl methyl ether)
TAEE (*tert*-amyl ethyl ether)
TAA (*tert*-amyl alcohol)
TBA (*tert*-butyl alcohol)

How do oxygenates get into drinking water?

Oxygenates usually get into drinking water as a result of gasoline spills, improper gasoline disposal or gasoline leakage from underground storage tanks. The oxygenates in the soil can be dissolved in rainwater and carried through the soil into groundwater that is used as a drinking water source.

How are people exposed to oxygenates in drinking water?

Exposure means actually getting the contaminant into the body by ingesting it, inhaling it or absorbing it through the skin. Exposure depends on the amount of the chemical (contaminant dose), and on how long (duration) and how often (frequency) someone is in contact with it.

If groundwater contaminated with oxygenates is used as a public or private water source, people could be exposed to them by drinking the water, or by breathing the oxygenates that evaporate from the water during activities such as cooking, bathing or showering. Some oxygenates may also be absorbed through the skin.

What are the health effects caused by gasoline oxygenates?

The risk for health effects from oxygenates, as with all chemicals, depends primarily on the toxicity of the contaminant and the degree of exposure. The risk for health effects can also be influenced by a person's individual characteristics, such as age, gender, general health and genetic make-up.

The oxygenates for which we have the most health information are ethanol and MTBE. Human exposure to high levels of ethanol or MTBE in air can cause irritation of the eyes and respiratory tract, and effects on the central nervous system. The central nervous system effects may

include headaches, lightheadedness, stupor, dizziness, nausea and feelings of disorientation or confusion. The short-term health effects from high level exposure in air to other oxygenates are likely similar. Oral exposure to large amounts of ethanol (e.g., in alcoholic beverages) can also result in effects on the central nervous system, and can damage the liver. Consumption of alcoholic beverages during pregnancy can result in babies born with a broad array of physical defects and cognitive, behavioral, and emotional deficits, which can range from mild to severe. The most severe birth defect is fetal alcohol syndrome, a serious and lifelong condition characterized by birth defects and physical and mental disabilities. Physicians typically recommend that women abstain from drinking alcoholic beverages during pregnancy. Alcoholic beverages, which contain ethanol and other ingredients, have been linked to an increased risk of cancer in humans. The ethanol dose from having one drink a day is over 100,000 times greater than the ethanol dose that would result from drinking two liters of water per day if the water contained ethanol at the level of the New York State public drinking water standard (50 micrograms per liter (mcg/L)).

Studies in laboratory animals have evaluated the health effects of longer-term oral and inhalation exposure (i.e., months to years) to high levels of oxygenates. These studies show that longer-term, high level exposure to oxygenates cause adverse effects on the liver, kidney and central nervous system of laboratory animals. Two oxygenates, MTBE and TAME, cause cancer in laboratory animals exposed to high levels for most or all of their lifetime. Whether these or other oxygenates cause cancer in humans is not known.

Are there standards for gasoline oxygenates in drinking water?

In New York State, MTBE has a drinking water standard of 10 mcg/L in public drinking water systems. The other oxygenates each have a public drinking water standard of 50 mcg/L. These public drinking water standards are used as guidance when evaluating oxygenate contamination in private water supplies. There are currently no federal standards for individual oxygenates for public water systems. The United States Environmental Protection Agency has established an advisory level of 20 to 40 mcg/L for MTBE based on taste and odor.

What should I do if gasoline oxygenates are detected in my drinking water?

The presence of a fuel oxygenate in a private water supply suggests that there may be a spill nearby. The exposures resulting from environmental contamination are generally lower than exposure levels that are known to cause health effects. However, if oxygenates are detected in your water, you can take practical steps to minimize exposure to these contaminants. These measures could include using bottled water for drinking and cooking, increasing ventilation during bathing and showering, as well as reducing the duration of bathing and showering. The specific steps you should take to minimize exposure depend on the specific oxygenate and the level of the contamination.

Where can I get more information on gasoline oxygenates?

Additional information on the health effects of gasoline oxygenates can be obtained by contacting the New York State Department of Health Environmental Health Infoline at 1-800-458-1158, extension 27820.

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