Introduction

    Since 1979 the United States has required gasoline refineries to put an additive in their gasoline called METHYL-TERT-BUTYL ETHER, aka MTBE. The purpose of this additive was to burn cleaner, thus reducing the amount of air pollution caused by automobiles in the United States.  Some would argue that other, less obvious reasons exist for the introduction of MTBE into gasoline in America.

    MTBE is a clear flammable liquid not found in nature.  The molecular structure of MTBE is C5H12O.  It was originally added to gasoline to raise octane levels and reduce the amount of carbon monoxide released into the air from automobiles.  MTBE can be absorbed through skin contact, breathed in contaminated air or consumed in contaminated food or water.  MTBE can be smelled and tasted in water in concentrations ranging from 15 to 130 parts per billion.  According to the Environmental Protection Agency, "[Plants and animals are not likely to store methyl tertiary-butyl ether.](http://www.epa.gov/opptintr/chemfact/f_mtbe.txt)"  Due to the high vapor pressure of MTBE (313 Torr@30o), it is easily transferable from air to water or from gasoline directly into water.  Although research about long-term effects of MTBE is insufficient, it is a suspected carcinogen.  But short-term effects have found "...breathing large amounts of MTBE for short periods of time adversely affects the nervous system of animals."(U.S. EPA)  When completely combusted, MTBE is not harmful, but if gasoline evaporates or leaks into the ground, MTBE can contaminate air and water.

    In 1990 Congress passed Clean Air Act Amendments requiring the use of oxygenated fuels in reformulated gasoline.  MTBE was added to gasoline statewide in California in 1996.  In [Santa Monica](http://www.uswaternews.com/archive/96/quality/smonica.html), California, three of five wells, which provide 40 percent of the city's drinking water,  had to be shut down .  MTBE concentrations in the wells were as high as 600 parts per billion.  The Office of Environmental Health Hazard Assessment has set the interim "Action Level" for MTBE at 35 parts per billion.  In 1987, MTBE was introduced to Denver's gasoline at levels of 15%.  Seven years later, significant amounts of MTBE were discovered in water supplies in the Reno area.  Reno does not use MTBE at levels that would cause significant amounts of MTBE water pollution.  Thus, the pollution in Reno was blamed on mountain rains that carried the contaminated water into streams that run directly into these water supplies.  This is an example of how easily MTBE can contaminate water supplies once it has been released. In Fairbanks, Alaska, after MTBE was introduced into the gasoline supply, more than 200 people complained of fuel related headaches, dizziness, short of breath, skin rashes, and nausea.  Shortly after hearing of this, the city stopped the use of MTBE until studies could be done on its effects on human health. Alaska has now banned MTBE completely. On March 10, 1998, the East Bay Municipal Utility District Board of Directors voted to ban the use of high-emission, two-cycle engines on San Pablo Reservoir.  The Board decided that MTBE is a serious threat to water quality.  Governor Pete Wilson signed in October of '97 the MTBE bill, SB 521, sponsored by California Senator Dick Mountjoy.  Senator Mountjoy had introduced an amendment earlier that year that would ban MTBE, but the Oxygenated Fuels Association's lobbying resulted in the amending of the bill from a ban to a study.  The amended bill granted money to the University of California for a state-wide research program on MTBE.  If the results show that MTBE is, in fact, harmful, the Governor is required by law to take action and protect the people of California.

    According to the EPA, the overall toxicity of auto exhaust has been reduced by 30 to 40 percent.  Information from the Auto/Oil Air Quality Improvement Research Program, however, states that Carbon Monoxide output has only been affected in older vehicles, which account for about a fifth of all automobiles.  MTBE is produced from isobutylene, which is a waste product from gasoline refining.  The production of MTBE has grown into a multi-billion dollar industry for gasoline refiners, who now not only are spared the trouble of eliminating isobutylene, but are reaping in profits.  According to Dr. Wortman, a former engineer-scientist of the California Air Resources Board, the bill requiring MTBE use in gasoline in all of California was passed because of political pressure.  "The chair kept banging on me that the governor insisted on passing it", said Wortman.  "The Air Resources Board staff selectively threw out all the data they didn't like."  One of the most influential parties on the mandate requiring MTBE statewide in California was the Atlantic Richfield Company, commonly known as ARCO.  They were the only oil company in California with the capabilities to produce MTBE at the time it was first required statewide.  Dr. Wortman says that "ARCO was lying" about their claim that MTBE would clean the air, and "they didn't have a shred of true scientific evidence...just had a cheaper way of making gas."

    The Environmental Protection Agency has continued to show support for MTBE, but its contradicting policies raise several questions about the true danger of using MTBE in gasoline.  When the EPA's regulations of MTBE are compared to its regulation on Benzene, a known carcinogen, something interesting can be seen.  Benzene is limited to 1% in gasoline, while MTBE is limited to 20%.  On the other hand, they have required industry, in case of a spill, to report all spills or releases over 10 Lbs. for Benzene, and anything over 1 lb for MTBE. It seems from this information that the EPA actually considers MTBE to be far more dangerous than Benzene.

      Two main reasons exist for our selection of this topic. Perhaps the most deciding factor in this choice was the relevance of our experiment to a controversial debate that is taking place right now in California. We didn't want to spend a great deal of time conducting a meaningless experiment that would yield useless results. We felt it would be more appropriate to choose an experiment that support or refute one side's arguments of the debate. Another reason we felt this topic was appropriate was the fact that it involves manipulation of the government to serve personal interest. Situations in which the people are lied to and in this case, physically harmed, by decisions made by our government that are not in the best interest of its citizens are of great importance. The lobbying of politicians in the United States has grown to a point where both the people and the environment can be blatantly abused to benefit a certain party. In some countries it is a punishable offense called bribery. Here in America we call it "lobbying".

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