

MTBE: Hidden poison

Methyl tertiary butyl ether is a clear, flammable liquid with a turpentine-like smell. MTBE, made by mixing methanol and isobutylene, was first used in significant quantities in the late 1970s, when it replaced lead.

It also gained favor as an octane enhancer because it caused gasoline to burn more cleanly. In the early 1990s, the production and use of MTBE skyrocketed, after federal environmental officials required special gasoline

in parts of the country plagued by air pollution. The Environmental Protection Agency didn't specify MTBE, but it became the oil industry's preferred additive. Before long, MTBE was one of the most-common chemicals in

the whole country — but one with some troubling properties already known to the industry and soon well-known to water authorities. It doesn't readily cling to soil; it dissolves in water. Those factors made MTBE a

problem far beyond the other toxic components of gasoline. Add the fact that it was stored in underground tanks with a tendency to leak, and a groundwater problem was born.

MTBE timeline

- Late 1970s:** The oil industry began adding MTBE to gas to replace lead.
- 1981:** First documented well contamination in Rockaway, N.J.
- 1986:** A study shows widespread MTBE contamination in Maine.
- 1990:** Congress amends Clean Air Act to require MTBE or other cleaner-burning additives for areas with severe air pollution.
- 2000:** EPA warns states to take quick, aggressive action to clean up MTBE spills.
- 2004:** New York bans MTBE.



Danger in the air?

MTBE poses little threat once it reaches open air; it quickly evaporates and doesn't contribute meaningfully to smog. But gas station attendants and delivery truck drivers complain that inhaling it while they filled tanks caused health problems, such as:

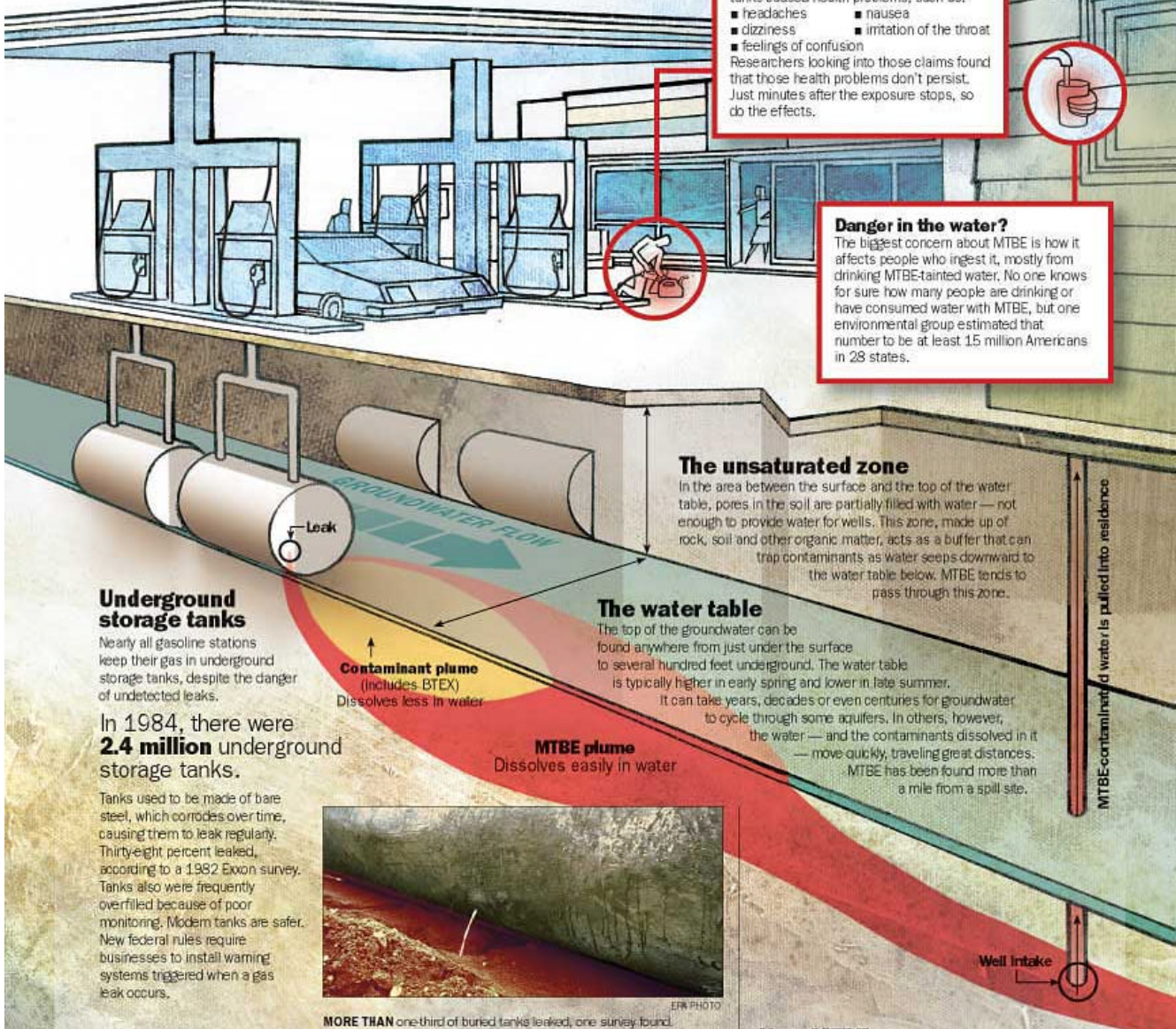
- headaches
- dizziness
- nausea
- irritation of the throat
- feelings of confusion

Researchers looking into those claims found that those health problems don't persist. Just minutes after the exposure stops, so do the effects.



Danger in the water?

The biggest concern about MTBE is how it affects people who ingest it, mostly from drinking MTBE-tainted water. No one knows for sure how many people are drinking or have consumed water with MTBE, but one environmental group estimated that number to be at least 15 million Americans in 28 states.



Underground storage tanks

Nearly all gasoline stations keep their gas in underground storage tanks, despite the danger of undetected leaks.

In 1984, there were **2.4 million** underground storage tanks.

Tanks used to be made of bare steel, which corrodes over time, causing them to leak regularly. Thirty-eight percent leaked, according to a 1982 Exxon survey. Tanks also were frequently overfilled because of poor monitoring. Modern tanks are safer. New federal rules require businesses to install warning systems triggered when a gas leak occurs.

Contaminant plume (includes BTEX)
Dissolves less in water

MTBE plume
Dissolves easily in water



MORE THAN one-third of buried tanks leaked, one survey found.

EW PHOTO

The unsaturated zone

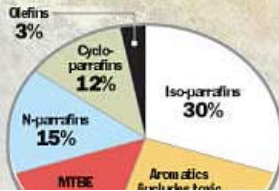
In the area between the surface and the top of the water table, pores in the soil are partially filled with water — not enough to provide water for wells. This zone, made up of rock, soil and other organic matter, acts as a buffer that can trap contaminants as water seeps downward to the water table below. MTBE tends to pass through this zone.

The water table

The top of the groundwater can be found anywhere from just under the surface to several hundred feet underground. The water table is typically higher in early spring and lower in late summer. It can take years, decades or even centuries for groundwater to cycle through some aquifers. In others, however, the water — and the contaminants dissolved in it — move quickly, traveling great distances. MTBE has been found more than a mile from a spill site.

How MTBE contaminates an aquifer

Gasoline containing MTBE flows downward from a leaking tank or other source through the unsaturated zone to the water table. Upon reaching the groundwater, also known as an aquifer, the contaminants form a plume. Since MTBE dissolves quickly and moves at roughly the same speed as water itself, the MTBE plume spreads easily, moving farther than other contaminants.



What's in reformulated gasoline?

Gasoline always has been a pollutant of concern for health and environmental authorities. Petroleum contains the BTEX compounds — benzene, toluene, ethylbenzene and xylene — that can cause serious health problems. Benzene, for example, is a known human carcinogen. Gasoline is distilled from crude oil, which is made up of decayed plant matter. Chemically, gas is made up of hydrocarbons, structures that are easily burned.

The BTEX chemicals, although worrisome, have not posed the widespread