



**Bureau of
Environmental Health
Health Assessment Section**

"To protect and improve the health of all Ohioans"

Methane

Answers to Frequently Asked Health Questions

What is methane?

Methane (CH₄), also known as marsh gas or fire damp, is an odorless, colorless, flammable gas. Methane is the main component (97%) of natural gas and one of the most abundant organic compounds on Earth. Methane, like other hydrocarbons (fossil fuels), can generate heat and energy when burned.

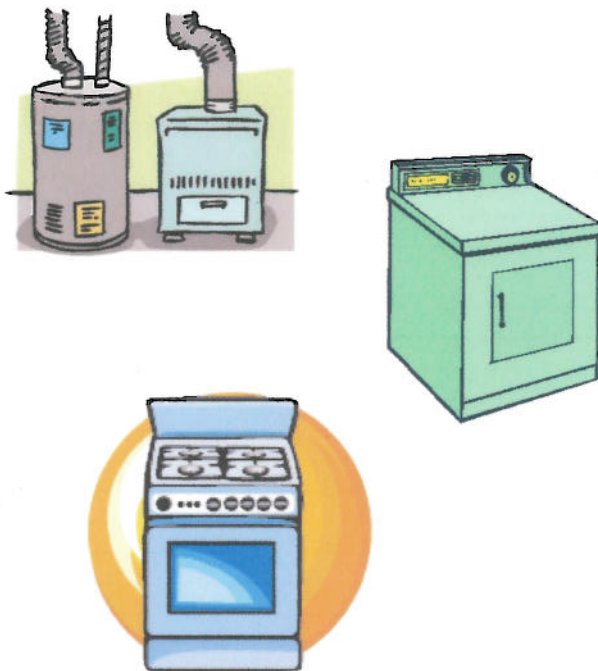
How is methane produced?

Methane is naturally produced by the decay and break down of organic materials commonly found in landfills, coal, oil and natural gas deposits, septic/sewer systems, etc.

Other natural sources of methane include: wetlands (marshes and bogs), oceans, methane hydrates, mud volcanoes, livestock, termites, rice cultivation and many other natural activities where you find organic matter breaking down and decaying.

How is methane used?

Methane is the main component of natural gas and is widely used in homes, businesses and factories all over the world. In homes, methane may be used to fuel a water heater, furnace, stove, clothes dryer, etc. In the industrial sector, methane is used as a fuel for gas boilers and turbines.



What happens to methane in the environment?

Although one of the most common compounds on Earth, methane makes up an extremely small amount of gas in our atmosphere. The methane released outdoors from wetlands, landfills, livestock farms, or sources deep underground, mix with the air and dilute (decrease in concentration).

How do you come in contact with methane?

Most exposure to methane gas comes from people breathing trace amounts (background levels found everywhere) in the ambient (outdoor) air. Exposure may also occur by breathing methane in an indoor air environment, as methane can enter indoors through very small cracks in a building's foundation.

As methane is slightly soluble (can mix with water), it can be carried by contaminated groundwater and enter homes through private water wells used for drinking and/or food preparation. When methane-contaminated groundwater comes into contact with air, the methane quickly off-gasses (turns to a vapor) and escapes into the surrounding air.

Note: If the leaking methane is trapped in an enclosed space such as a basement, crawl space, utility closet, under-sink cabinet, sewer trap, etc., and there is a spark or ignition source (fire/pilot light), there is a potential for an explosion/fire hazard.

How can you detect methane?

Recall that methane is odorless. Make note that you can smell commercial natural gas (methane) only because the gas utility companies add a foul-smelling chemical odorant (mercaptan) to alert people to a natural gas leak. Methane monitors can also be used to detect methane leaks in your home.

How does methane affect health?

At low levels, methane is non-toxic and does not pose a health threat.

At very high levels methane can displace (move) the amount of oxygen in the air and can cause asphyxiation (suffocation) resulting in symptoms like headaches, dizziness, weakness, nausea, vomiting, increased breathing rate, loss of coordination, loss of consciousness, and possibly death.

Because methane is extremely flammable in the presence of oxygen and an ignition source (open flame, pilot light), the main public health threat posed from methane is the physical explosion hazard posed by methane levels between 5% and 15% by volume* in the air.

Common/Major Sources of Methane:

Natural Gas Fields

Large deposits of oil and natural gas exist 1 to 2 miles below the Earth's crust. Deeper deposits, very far underground, usually contain primarily natural gas, and in many cases, pure methane.



Landfills

Methane is generated in landfills and open dumps as garbage breaks down under anaerobic (without oxygen) conditions. According to the U.S. Environmental Protection Agency (EPA), landfills account for 17 percent of all methane emissions in the United States.



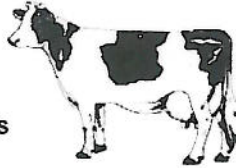
Coal Mines

Methane trapped in coal deposits and in the surrounding strata is released during normal mining operations in both underground and surface mines.



Livestock (manure management – biogas)

Domesticated livestock such as cattle, buffalo, sheep and goats produce significant amounts of methane as part of their normal digestive processes and by-products (breathing and flatulence).



Wastewater Treatment

The treatment of municipal sewage and industrial wastewater in anaerobic conditions produces methane gas.



* Measuring methane

Lower Explosive Limit (LEL) = 5%

The lowest concentration (percentage %) of methane in air capable of producing a flash of fire in presence of an ignition source (arc, flame, heat). Methane has a LEL of 5%.

Upper Explosive Limit (UEL) = 15%

Highest concentration (percentage %) of methane in air capable of producing a flash of fire in presence of an ignition source (arc, flame, heat). Concentrations higher than 15% are considered "too rich" to burn.

Note: Often officials will discuss methane measurements in a percent (%) of the LEL. Our federal ATSDR public health partners suggest methane gas is a concern at levels as low as 1% of the LEL.

Are there recommendations to protect public health?

The National Institute for Occupational Safety and Health (NIOSH) recommends a maximum safe methane concentration for workers during an 8-hour period of 1,000 parts per million (or 0.1 percent).

Ohio Administrative Code - Private Water Systems: 3701-28-10 (O). Ohio's private wells that produce methane gas at concentrations greater than 10 mg/l (ppm) are to be vented to the atmosphere by:

- Venting through a well cap with a screened vent, at least 1 inch in diameter, extending to a height where the methane will not present a hazard.
- Use of a gas shroud.
- Use of a vented tank equipped with spray device to disperse the water.

<http://www.odh.ohio.gov/~media/ODH/ASSETS/Files/rules/final/3701-28/3701-28-10.ashx>

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