

Ethylene Oxide Air Guidance

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Ethylene oxide (EtO) is a colorless, flammable gas commonly detected at low levels in outdoor air. EtO is most often used during the production of other chemicals including antifreeze, plastics, detergents, and upholstery. EtO is also used as a fumigant to control insects and as a sterilizing agent. Hospitals and certain industries use EtO to sterilize medical equipment or devices.

Small amounts of ethylene oxide occur naturally in the body from the normal breakdown of ethylene.

Ways you are exposed to ethylene oxide in air

- Working in an area that stores, uses, or produces EtO as part of an industrial or manufacturing process
- Living near a facility that utilizes or releases EtO into ambient air
- Tobacco smoke and secondhand smoke are sources of EtO particularly in indoor air
- Exposure to background levels of EtO in air without a nearby source

EtO released into outdoor air is typically at very low levels and breaks down through various pathways. This breakdown process can take up to a month or longer.

Potential health concerns from breathing ethylene oxide

Studies of those working with EtO at very high levels for short periods of time reported lung irritation, headaches, vomiting, memory loss, and nausea. Generally, inhaled EtO is eliminated from the body quickly, with levels dropping by half in less than an hour.

Animal studies show breathing EtO at higher levels can cause issues with reproduction and fertility, reduced body weight, and impaired neurological function.

EtO is designated as a known human carcinogen by the U.S. Environmental Protection Agency (EPA). Long-term, human occupational studies have shown evidence that exposure to EtO increases the risk of cancers of the immune system, including non-Hodgkin lymphoma, myeloma, and lymphocytic leukemia. Long-term exposure studies also show an increased risk of breast cancer in female workers.

Ethylene Oxide Health-Based Values

Sufficient toxicity data was available for MDH to develop Health-Based Values (HBVs) for the acute 24 hour, intermediate, and chronic exposures, and cancer (see table below). The HBVs are levels in air that are likely to pose little or no risk to human health over that time period. They are protective for the public, including sensitive subpopulations.

Breathing an amount of EtO that is above an HBV does not mean health effects will occur; however, the risk for health effects can increase as the level of exposure and / or time of exposure increases.

When HBVs are exceeded, MDH recommends taking steps to reduce or avoid exposures.

Duration	2025 HBV ($\mu\text{g}/\text{m}^3$)	Health Endpoint
Acute_{1hr} (1-hour)	Not Derived	--
Acute_{24hr} (24 hours)	50	Reproductive
Intermediate (>24 hours-1 year)	30	Neurological and reproductive
Chronic (>1 year-lifetime)	10	Neurological and reproductive
Cancer (lifetime)	0.002	Immune and reproductive

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