



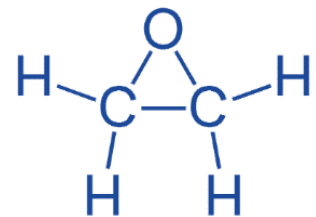
NewFields Note

Ethylene Oxide (EtO) in Air – Background *versus* Point Source

NewFields Note: Technical information in a condensed, easily digestible format that is intended to promote environmental science education, knowledge transfer, and empowerment ... *one note at a time.*

Ethylene oxide (EtO) is a colorless, flammable, reactive gas that has both anthropogenic and natural sources.

Anthropogenic EtO is produced primarily as an intermediate for the manufacture of products such as antifreeze, plastics, and detergents and also directly as a sterilizing agent, pesticide, and spice fumigant. Numerous industrial sectors related to fuel combustion (electric generation, industrial boilers) are identified as sources of EtO in the National Emissions Inventory. EtO is also a constituent of tobacco smoke. Naturally occurring EtO is formed in the environment from the degradation or metabolism of ethylene in certain plants and microorganisms.



The proportion of anthropogenic and naturally occurring EtO in air produces site-specific mixtures of EtO including local point sources and/or regional (background) sources. Distinguishing among these sources of EtO is important because EtO is designated as a hazardous air pollutant (HAP) regulated under the Clean Air Act. In 2016, the EPA classified EtO as a human carcinogen (1×10^6) when only 0.1 ppt of EtO is inhaled over one's lifetime. This threshold is much lower than OSHA's permissible exposure limit (PEL) and short-term exposure limit (STEL) of 1 ppm and 5 ppm, respectively, which are protective of occupational exposure. In March 2024, EPA announced final amendments to the National Emission Standards for Hazardous Air Pollutants (NESHAP) for commercial EtO sterilization facilities and fumigation operations, which will reduce EtO emissions from these point sources by more than 90%.

EtO has been measured at concentrations that exceed 0.1 ppt in samples collected at ambient air monitoring locations where there is no known impact from EtO emissions sources (e.g., industrial chemical manufacturers or sterilization operations). Therefore, a careful evaluation of background, both anthropogenic and natural, is critical to assessing the potential impact of point sources of anthropogenic EtO under investigation.

Many commercial laboratories cannot detect EtO at the 0.1 ppt level by EPA Method TO-15/TO-15A. Analytical challenges include potential interferences, e.g., acetaldehyde, methanol, and trans-2-butene. Also, certain air sampling canisters can increase EtO concentrations over time resulting in a positive bias. NewFields scientists can (1) provide a critical review of existing air data and (2) design and implement field sampling and analytical plans to collect the data needed to accurately assess background *versus* point source contributions of EtO.

For additional information, please contact your NewFields Technical Lead. Or send us an email at Science_Info@newfields.com!

