Ethylene Oxide- Information about Health Concerns

Emory Southeast Pediatric Environmental Health Specialty Unit

PEHSU Participants

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Accreditation & Disclosures

- *Drs Geller and Mutic have no conflicts of interest to disclose relative to this topic. Both are employees of Emory University.*

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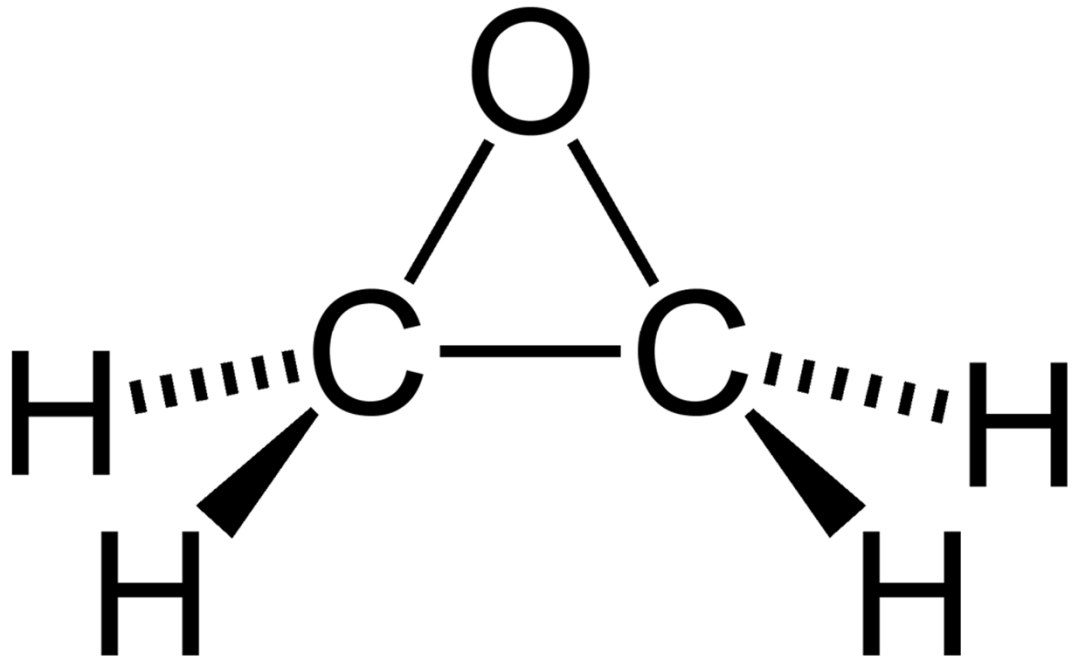
- *Neither EPA nor ATSDR endorse the purchase of any commercial products or services mentioned in PEHSU publications*

What is a PEHSU?

- Grant funded
- Provide an independent source of information and education to professionals and community members
- Regarding effects of environmental exposures of all kinds on children and women of child-bearing age
- Housed for the Southeast US (Federal Region 4) at Emory since the program's inception in 2000

EtO - Chemical Structure



Background Information- EtO

- Most EtO used for precursor for industrial chemicals (e.g., ethylene glycol), plastics, PVC pipes
- Less than 1% used for sterilization of medical equipment, consumer products, certain foods (e.g., spices) that can't be steam sterilized
- Used as a fumigant for some agricultural products

IARC Monograph- Ethylene Oxide https://monographs.iarc.fr/wp-content/uploads/2018/06/mono100F-28.pdf

"A Comparison of Gamma, E-beam, X-ray and Ethylene Oxide Technology for the Industrial Sterilization of Medical Devices and Healthcare Products," Gamma Industry Processing Alliance, Aug 31, 2017.

EtO Background

Physical properties:

- High Vapor Pressure- gas at 20^0C
- Colorless, tasteless vapor
- Odor-threshold is 500 ppm
- Sweet, ether-like odor
- Flammable, explosive
- Reacts with water, strong acids, alkalis, and oxidizers
- Atmospheric persistence: 50-60 day half-life; degrades to hydroxyl radicals

National Library of Medicine- Toxnet. https://toxnet.nlm.nih.gov/cgi-bin/sis/search2/f?./temp/~7WUNLz:1
ATSDR. Medical Management Guidelines for Ethylene Oxide. https://www.atsdr.cdc.gov/mmg/mmg.asp?id=730&tid=133

How long does EtO stay in the body?

- Physiological half life: 45-60 minutes
- Exhaled as EtO or metabolized and excreted in urine
- Completely eliminated within hours to a day after exposure has ended

National Library of Medicine- Toxnet. https://toxnet.nlm.nih.gov/cgi-bin/sis/search2/f?./temp/~7WUNLz:1

Routes of Exposure to EtO

- Inhalation – most likely exposure pathway, due to high vapor pressure

- Dermal- liquid EtO

Occupational High Level EtO Exposure

ACUTE Effects

- Respiratory, skin, eye irritant
- Causes bronchospasm (asthma-like effects); at high levels, ? immediate or delayed effects on the lung
- ?Seizures, CNS depression, ?delayed 6+ hours
- Nausea/ vomiting- ? Delayed 6+ hours
- Kidney damage
- Increased risk of pregnancy miscarriage

ATSDR. Medical Management Guidelines for Ethylene Oxide. https://www.atsdr.cdc.gov/mmg/mmg.asp?id=730&tid=133

Occupational High Level EtO Exposure

CHRONIC Health Effects

- Cancer
- Reproductive effects, fetal effects
- Impaired cognitive function, seizures
- Damage to liver and kidneys
- Skin allergy
- Cataracts and corneal burns
- Peripheral and central neuropathy

World Health Organization. Concise International Chemical Assessment Document 54; 2003. http://www.who.int/ipcs/publications/cicad/en/cicad54.pdf
Hazardous Substances Database; National Library of Medicine. https://toxnet.nlm.nih.gov/cgi-bin/sis/search2/f?./temp/~7WUNLz:1

Low Level EtO Exposure – Health Effects

- Acute - none likely

- Chronic
  - Increased risk of certain cancers
  - Risk likely increases with higher intensity and longer duration of exposure

EtO Metabolites

- Conjugates with glutathione – nontoxic
- Ethylene glycol – level produced is much too low (< 0.001%) to cause any discernable health effects

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