

This fact sheet answers the most frequently asked health questions (FAQs) about ethylene oxide. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**HIGHLIGHTS:** Large amounts of ethylene oxide are produced in the United States. Most of it is used to make other chemicals such as ethylene glycol, but smaller amounts are used as a pesticide or to sterilize medical equipment. Exposure to ethylene oxide can cause irritation of the eyes, skin, nose, throat, and lungs, and damage to the brain and nerves. It has been found at 3 of the 1,177 National Priorities List sites identified by the Environmental Protection Agency (EPA).

## What is ethylene oxide?

(Pronounced ěth'ə-lēn' ōk'sīd')

Ethylene oxide is a flammable gas with a somewhat sweet odor. It dissolves easily in water.

Ethylene oxide is a man-made chemical that is used primarily to make ethylene glycol (a chemical used to make anti-freeze and polyester). A small amount (less than 1%) is used to control insects in some stored agricultural products and a very small amount is used in hospitals to sterilize medical equipment and supplies.

## What happens to ethylene oxide when it enters the environment?

- Ethylene oxide rapidly breaks down when released to the environment.
- Because ethylene oxide is a gas, most is expected to be released to the air where it reacts with water vapor and sunlight and breaks down within a few days.
- Ethylene oxide will dissolve in water, but most of it will quickly evaporate to the air. The ethylene oxide remaining will be broken down by bacteria, or by reacting with water and other chemicals.

- When released to soil, most will evaporate to air and some may be broken down by bacteria or by reacting with water in the soil.
- Ethylene oxide does not persist long in the environment and is not expected to build up in the food chain.

## How might I be exposed to ethylene oxide?

- Most people are not likely to be exposed to ethylene oxide because it is not commonly found in the environment.
- If you work where ethylene oxide is made or used, you could be exposed to it by breathing it or getting it on your skin.
- Although ethylene oxide has been measured in some foods shortly after being sprayed as a pesticide, it is not known if any ethylene oxide would remain on the food by the time it is processed and eaten.

## How can ethylene oxide affect my health?

Breathing low levels of ethylene oxide for several months to years has caused irritation of the eyes, skin, and respiratory passages and affected the nervous system (headache, nausea, vomiting, memory loss, numbness, etc.). At higher levels of

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exposure for shorter periods, effects are similar but may be more severe. There is some evidence that exposure to ethylene oxide can cause a pregnant woman to have a miscarriage.

Animal studies indicate that in addition to irritation of the respiratory passages, nervous system effects, and reproductive effects, the kidneys, adrenal gland, and skeletal muscles may be affected from long-term exposure to ethylene oxide.

### How likely is ethylene oxide to cause cancer?

Increased incidences of leukemia and stomach cancer have been reported for workers exposed to ethylene oxide; however, the data are not considered conclusive. The carcinogenicity of ethylene oxide has been evaluated in rats and mice that breathed it. Leukemia, brain tumors, lung tumors, and other cancers were observed. The Department of Health and Human Services (DHHS) has determined that ethylene oxide may reasonably be anticipated to be a human carcinogen.

### Is there a medical test to show whether I've been exposed to ethylene oxide?

There are two kinds of tests that can determine if you have been recently exposed to ethylene oxide. One test measures ethylene oxide in blood and the other test measures it in your breath. However, these tests cannot be used to predict how it will affect your health. Because special equipment is needed, these tests are not usually done in the doctor's office.

### Has the federal government made recommendations to protect human health?

The Food and Drug Administration (FDA) has set a tolerance limit of 50 parts per million (50 ppm) of ethylene oxide

in ground spices. Any release to the environment greater than 10 pounds must be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set a limit of 1 ppm over an 8-hour workday, 40-hour workweek with a short-term exposure limit (not to exceed 15 minutes) of 5 ppm.

The National Institute of Occupational Safety and Health (NIOSH) recommends that average workplace air should contain less than 0.1 ppm ethylene oxide averaged over a 10-hour workday, 40-hour workweek.

The federal recommendations have been updated as of July 1999.

### Glossary

Carcinogen: A substance that can cause cancer.

Carcinogenicity: Ability to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or a gas.

National Priorities List: A list of the nation's worst hazardous waste sites.

ppm: Parts per million.

Tumor: An abnormal mass of tissue.

### References

Agency for Toxic Substances and Disease Registry (ATSDR). 1990. Toxicological profile for ethylene oxide. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

