

This fact sheet answers the most frequently asked health questions (FAQs) about hydrogen sulfide. For more information, call the CDC Information Center at 1-800-232-4636. 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: Hydrogen sulfide occurs naturally and is also produced by human activities. Very high levels (>500 ppm) can result in sudden unconsciousness or death. Lower, longer-term exposure (around 10 ppm or less) can cause eye irritation, headache, and fatigue. Hydrogen sulfide has been found in at least 34 of the 1,832 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is hydrogen sulfide?

Hydrogen sulfide is a flammable, colorless gas that smells like rotten eggs. People usually can smell hydrogen sulfide at low concentrations in air ranging from 0.0005 to 0.3 parts per million (ppm). It is often referred to as sewer gas or stink damp.

Hydrogen sulfide occurs naturally in crude petroleum, natural gas, volcanic gases, and hot springs. It can also result from bacterial breakdown of organic matter. Bacteria found in your mouth and digestive tract produce hydrogen sulfide during the digestion of food containing vegetable or animal proteins. Industrial sources of hydrogen sulfide include petroleum refineries, natural gas plants, petrochemical plants, coke oven plants, food processing plants, and tanneries.

It is used primarily in the production of sulfur and sulfuric acid.

What happens to hydrogen sulfide when it enters the environment?

- Hydrogen sulfide can be released into air, water, and soil at places where it is produced or used.
- It is released primarily as a gas and spreads in the air. It can remain in the air from 1 to 42 days, depending on the season.
- In air, it can change into sulfur dioxide and sulfates.
- Levels in water are very low because it readily evaporates.
- In soil, hydrogen sulfide will be consumed by bacteria and changed to sulfur.

How might I be exposed to hydrogen sulfide?

- You might be exposed to hydrogen sulfide from breathing contaminated air or drinking contaminated water. Because the gas is heavier than air, risk of exposure is greater at ground level and in enclosed spaces when there are releases into the environment.

- You can be exposed to hydrogen sulfide when living near facilities that generate and release it into the environment, like a wastewater treatment plant, a gas and oil drilling operation, a farm with manure storage or livestock confinement facilities, or a landfill.
- You can be exposed at work if you work in rayon textiles, petroleum and natural gas drilling and refining, or wastewater treatment industries. Workers on farms with manure storage pits or landfills can be exposed to higher levels of hydrogen sulfide.

How can hydrogen sulfide affect my health?

The effects of hydrogen sulfide exposures in humans varies and depends on concentration levels, exposure duration, affected tissues and co-exposures to other toxic gases. Inhaling the gas quickly affects vital systems such as the respiratory, cardiovascular, and nervous systems during short term (up to about 1-2 weeks) exposure to high concentrations (>150 ppm) and can cause long-term health effects or death.

The odors emitted from the gas become noticeable at low levels (0.0005 ppm). But people lose the ability to smell the gas after about 2 to 15 minutes of exposure at about 100 ppm, which makes the odor an ineffective hazard warning for the presence of hydrogen sulfide gas.

Eye, nose, or throat irritation can occur to long term (exposures (a year or more) at low exposure concentrations of H₂S (ranging from 5 to 50 ppm). Some asthmatics may have difficulty breathing and experience headaches, nausea, and vomiting. Some of these symptoms may resolve when the exposure is removed.

People can lose their sense of smell or lose consciousness from short exposures (up to about 1-2 weeks) at moderate or high concentrations (greater than 100 ppm). In some cases, the effects go away when exposure is removed. However, in some individuals, long-term or permanent effects may occur.

Hydrogen Sulfide

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How likely is hydrogen sulfide to cause cancer?

Hydrogen sulfide has not been shown to cause cancer in humans, and its possible ability to cause cancer in animals has not been studied thoroughly.

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have not classified hydrogen sulfide as to its carcinogenicity. The EPA has determined that data for hydrogen sulfide are inadequate for carcinogenic assessments.

How can hydrogen sulfide affect children?

There is very little information on possible health problems in children who have been exposed to hydrogen sulfide. Exposed children probably will experience effects similar to those experienced by exposed adults. Whether children are more sensitive to hydrogen sulfide exposure than adults is not known.

It is not known whether hydrogen sulfide causes birth defects in people. The results of studies in animals suggest that exposure to low concentrations of hydrogen sulfide during pregnancy does not cause birth defects.

How can families reduce the risk of exposure to hydrogen sulfide?

- Hydrogen sulfide is part of the natural environment; the general population will have some exposure to hydrogen sulfide. Families can be exposed to more hydrogen sulfide than the general population if they live near natural or industrial sources of hydrogen sulfide, such as hot springs, manure holding tanks, or pulp and paper mills. However, their exposure levels are unlikely to approach those that sicken people exposed at work.

- Families can reduce their exposure to hydrogen sulfide by avoiding areas that are sources of hydrogen sulfide. For example, individuals of families that live on farms can avoid manure storage areas where high concentrations of hydrogen sulfide may be found.

Is there a medical test to show whether I've been exposed to hydrogen sulfide?

Hydrogen sulfide and its breakdown products (metabolites) can be measured in blood and urine. However, the detection of hydrogen sulfide or its metabolites cannot predict the kind of health effects that might develop from that exposure. Because hydrogen sulfide and its metabolites leave the body fairly rapidly, the tests need to be conducted soon after exposure.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) set an acceptable ceiling limit of 20 ppm for hydrogen sulfide in workplace air. The ceiling limit is a 15-minute time-weighted average that cannot be exceeded at any time during the working day.

The National Institute for Occupational Safety and Health (NIOSH) recommends a 10-minute ceiling limit of 10 ppm. NIOSH also determined that 100 ppm is immediately dangerous to life or health of workers.

References

This ToxFAQs™ information is taken from the 2016 Toxicological Profile for Hydrogen Sulfide and Carbonyl Sulfide produced by the Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Office of Innovation and Analytics, 1600 Clifton Road NE, Mailstop S106-5, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636.

ToxFAQs™ on the web: www.atsdr.cdc.gov/toxFAQs.

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.