

Sources of Exposure

Toxicokinetics and Normal Human Levels

Biomarkers/Environmental Levels

General Populations

- Ambient air that contains carbonyl sulfide from a variety of natural and anthropogenic sources.
- Natural sources of carbonyl sulfide are significantly greater than anthropogenic emissions.
- Carbonyl sulfide is generated from wetlands, salt marshes, soil, oceans, deciduous and coniferous trees, and volcanic gases.
- Carbonyl sulfide is produced or released during production as a chemical intermediate, combustion of selected fuels and other substances, extraction and recovery processes, and selected manufacturing processes.

Occupational Populations

- Occupational exposure is primarily a result of carbonyl sulfide production and use as a chemical intermediate and its production as a byproduct in petroleum refining and coal distillation.

Toxicokinetics

- Limited data indicate that carbonyl sulfide is absorbed from the respiratory tract.
- How carbonyl is broken down in the body is not known.
- No information was located regarding elimination and excretion following absorption of carbonyl sulfide.

Normal Human Levels

- No information was located regarding normal levels of carbonyl sulfide in humans.

Biomarkers

- No information was located regarding biomarkers of exposure to carbonyl sulfide.

Environmental Levels

Air

- Carbonyl sulfide in the air at the majority of locations sampled in the United States averaged 1.8 ppb.

Water

- Carbonyl sulfide in surface water samples from temperate and subtropical North Atlantic regions and the Gulf of Mexico were found to be supersaturated with carbonyl sulfide with respect to atmospheric equilibrium. The highest concentrations were measured in coastal and shelf samples. The average concentration was 1.9 ppt in one study.

Soil

- Carbonyl sulfide concentrations ranged from 250 to 120,000 ppt in soil from a forested area and a former rape field.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2016. Toxicological Profile for Hydrogen Sulfide and Carbonyl Sulfide. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

ToxGuide™ for Carbonyl Sulfide COS

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U.S. Department of Health and
Human Services
Public Health Service
Agency for Toxic Substances
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COS



Chemical and Physical Information

Routes of Exposure

Relevance to Public Health (Health Effects)

Carbonyl Sulfide is a Gas

- Carbonyl sulfide is a colorless gas with a typical sulfide odor (odorless in the absence of impurities). Odor may be detected in air at concentrations of 0.055 ppm.
- Carbonyl sulfide is found in numerous natural sources, including volcanic gases, petroleum crude oil, sulfurous waters, salt marshes, and soils.
- Carbonyl sulfide can be made from hydrolysis of ammonium or potassium thiocyanate using dilute sulfuric acid, as a byproduct of carbon disulfide production, by the reaction of carbon monoxide with sulfur, by the reduction of sulfur dioxide with carbon, or by the reaction of phosgene and cadmium sulfide.
- Carbonyl sulfide is produced as an impurity in natural gas and refinery gases, from combustion of sulfur-containing fuels, and from the pyrolysis of carbonaceous fuels with oxygen, steam, and sulfur compounds.
- Carbonyl sulfide has few commercial uses; it can be used in the manufacture of thiocarbamate herbicides, synthesis of aliphatic polyureas, and production of selected organic compounds and semiconductors.
- Carbonyl sulfide may be used as a grain fumigant.

- Inhalation - Most likely route of exposure for general population because carbonyl sulfide is ubiquitous in air; most likely route of occupational exposure at facilities where carbonyl sulfide is produced, used, or generated.
- Oral – Not a likely source of exposure because carbonyl sulfide is a gas.
- Dermal - Potential route of exposure particularly among workers who handle carbonyl sulfide-containing substances.

Carbonyl Sulfide in the Environment

- Most carbonyl sulfide enters the air and can remain for a long time in the upper atmosphere.
- Carbonyl sulfide does not adsorb to soils, and may thus enter groundwater from which it quickly dissipates to air.
- Carbonyl sulfide can be broken down slowly in air by photochemical reactions and by photochemically-produced hydroxyl radicals.
- In water, carbonyl sulfide slowly hydrolyzes to form hydrogen sulfide and carbon dioxide.
- Carbonyl sulfide on soil surfaces tends to volatilize into the air. Ambient carbonyl sulfide in soil may be degraded by some bacteria.
- Carbonyl sulfide is not expected to bioconcentrate in fish or other aquatic organisms.

Health effects are determined by the dose (how much), the duration (how long), and the route of exposure.

Minimal Risk Levels (MRLs)

Inhalation

- No acute-, intermediate-, or chronic-duration inhalation MRLs were derived for carbonyl sulfide.

Oral

- No acute-, intermediate-, or chronic-duration oral MRLs were derived for carbonyl sulfide.

Health Effects

- No studies were located regarding health effects in humans exposed to carbonyl sulfide.
- Limited animal data implicate the nervous system as the most likely target of carbonyl sulfide toxicity.
- Neurological effects in animals included abnormal locomotion, decreased motor activity and grip strength, changes in brainstem auditory evoked potentials, and degenerative effects in selected areas of the brain.
- No studies were located regarding the carcinogenicity of carbonyl sulfide in humans or animals.

Children's Health

- Children exposed to carbonyl sulfide would be expected to experience effects similar to those expected in adults.
- No information was located regarding carbonyl sulfide-related developmental effects in humans or experimental animals.