The ToxGuide™ is developed to be used as a pocket guide. Tear off at perforation and fold along lines.

Sources of Exposure

General Populations

- Everyone is exposed to varying levels of carbon monoxide through inhalation of air. Exposure may be greater during times of the day when vehicular traffic is heavy; however, the most dangerous levels of carbon monoxide occur in indoor air.
- In the home, exposure may occur as a result of improperly adjusted or installed appliances that burn natural gasoline, kerosene or other fuels. These include stoves, furnaces, heaters, and generators.
- Exposure may also occur by breathing in cigarette smoke, either as a smoker or through second hand smoke.

Occupational Populations

- People who work in petroleum refineries, gas and coal burning power plants, petrochemical plants and coke oven plants are more likely to be exposed to higher levels of carbon monoxide from outdoor ambient air.
- People who work in smoke-filled environments such as restaurants, bar and casinos may be exposed to higher levels of carbon monoxide through inhalation of second-hand smoke.
- Exposure may also occur in taxi cab drivers and toll booth workers as a result of vehicular exhaust.

Toxicokinetics and Normal Human Levels

Toxicokinetics

- Following inhalation of contaminated air, carbon monoxide rapidly enters all parts the body including the blood, brain, heart, and muscles.
- In blood, carbon monoxide quickly distributes into erythrocytes where is exists primarily as a complex with hemoglobin (Hb) to form carboxyhemoglobin (COHb).
- In muscle, carbon monoxide exists as a complex with myoblobin forming carboxymyoglobin (COMb).
- In the maternal system, carbon monoxide distributes to fetal tissues and binds to fetal Hb and other heme proteins.
- Exercise decreases the carbon monoxide elimination half-time.
- Carbon monoxide is eliminated from the body predominantly through exhalation and <10% by oxidative metabolism.

Normal Human Levels

- Typical COHb level in nonsmokers is 0.5–1.5%.

Biomarkers/Environmental Levels

Biomarkers

- Blood carboxyhemoglobin is the principle biomarker for identifying exposure to carbon monoxide. The relationship between COHb levels and exposure is complicated by physiological factors that influence carbon monoxide uptake and elimination.

Environmental Levels

Air

- The average concentration in the Northern and Southern hemispheres are 0.12 and 0.04 ppmv, respectively.
- Background levels in homes where fireplaces were not operating are 0–7 ppmv.
- Average levels in homes without gas stoves range from 0.5 to 5 ppmv.

Sediment and Soil

- There are no data available on background levels of carbon monoxide in soil or sediment.

Water

- There were no data available for levels of carbon monoxide in drinking water or groundwater.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2012. Toxicological Profile for Carbon Monoxide. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.

ToxGuide™ for Carbon Monoxide

CO

CAS# 630-08-0

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U.S. Department of Health and Human Services
Public Health Service
Agency for Toxic Substances and Disease Registry
www.atsdr.cdc.gov

Contact Information:
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http://www.atsdr.cdc.gov/toxprofiles/index.asp

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Chemical and Physical Information

Carbon Monoxide is a Gas

- Carbon monoxide is a colorless, nonirritating, odorless, tasteless gas that is found in indoor and outdoor air.
- Carbon monoxide is made when carbon fuel is not burned completely. It is produced from both human and natural sources, with the most important man-made source arising from automobile exhaust.

Routes of Exposure

- Inhalation –Predominant route of exposure for general and occupational populations through inhalation of contaminated air.
- Oral – Not a route of exposure.
- Dermal – Not a route of exposure.

Carbon Monoxide in the Environment

- Carbon monoxide will partition in the atmosphere and is distributed globally by wind. As a result, carbon monoxide levels may be higher downwind from the source.
- Carbon monoxide remains in the atmosphere for about 2 months until it reacts with other chemicals and is converted to carbon dioxide.
- Most warm conditions in soil favor uptake while hot and dry conditions favor the release of carbon monoxide.
- Microorganisms in soil and water can also convert carbon monoxide to carbon dioxide.
- Carbon monoxide does not bioaccumulate in the food chain.

Relevance to Public Health (Health Effects)

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 have been derived for carbon monoxide.

Oral

- No acute-, intermediate-, or chronic duration oral MRLs have been derived for carbon monoxide.

Health Effects

- The primary targets for carbon monoxide toxicity are the heart and cardiovascular system, central nervous system, and the fetus and neonate. People with ongoing cardiovascular and/or respiratory disease may be particularly vulnerable.
- Carbon monoxide poisoning is one of the leading causes of death due to poisoning in the United States. Effects of severe poisoning may be life-threatening and include cardiac arrhythmias, myocardial ischemia, cardiac arrest, hypotension, respiratory arrests, noncardiogenic pulmonary edema, seizures, and coma.

Health Effects (continued)

- Symptoms associated with moderate carbon monoxide poisoning may include confusion, syncope, chest pain, dyspnea, weakness, tachycardia, tachypnea, and rhabdomyolysis. Symptoms of mild carbon monoxide poisoning include headache, nausea, vomiting, dizziness, and blurred vision.
- In animal studies, exposure to carbon monoxide during pregnancy resulted in decreased fetal weight, adverse central nervous system development, altered peripheral nervous system development, cardiac effects, altered sexual behavior, immunological effects, and hematological effects.
- DHHS, IARC, and EPA have not classified carbon monoxide for human carcinogenicity.

Children's Health

- Breathing in high levels of carbon monoxide during pregnancy can lead to miscarriage. Breathing low levels during pregnancy may lead to developmental impairment of the child.
- Asthmatic children may have increased vulnerability to carbon monoxide-associated respiratory effects.