

# Carbon Monoxide (CO)

## What is carbon monoxide?

CO is a colorless, odorless, tasteless, poisonous gas that can cause sudden illness and death if inhaled at sufficient concentrations. It is produced by incomplete combustion of carbon-containing materials.

## How can I be exposed to carbon monoxide?

Any person in an area with a fuel-burning device that is able to produce CO is at risk of being exposed if there is not proper venting. Common sources of CO include:

- Generators;
- Charcoal grills;
- Gas cooking ranges;
- Kerosene room heaters;
- Wood and gas fireplaces;
- Wood, coal or gas burning stoves;
- Gas furnaces, water heaters, and clothes dryers; and
- Diesel, natural gas, propane and gasoline-powered trucks, cars, boats, machinery, equipment, and tools.

## What are the symptoms of carbon monoxide exposure?

You cannot smell, taste or feel CO. Therefore, its presence may not be evident until symptoms develop. Symptoms of CO poisoning include:

- Fatigue;
- Dizziness;
- Headache;
- Rapid heart rate;
- Irregular breathing;
- Nausea and/or vomiting;
- Thought impairment or disorientation;
- Wheezing, bronchial constriction, or persistent cough; and
- Chest pain in persons with coronary artery disease.

Death can occur in the absence of some or all of these symptoms. In this case, the victim simply loses consciousness and never awakens. Because the symptoms mimic other illnesses, persons with CO poisoning often overlook the significance of the body's response to the gas.

**How can carbon monoxide affect my health?**

When hemoglobin in the blood comes in contact with CO, it is converted to carboxyhemoglobin (COHb), which hinders the delivery of oxygen to the body. The amount of COHb in the blood determines whether the toxic health effects or symptoms occur. In general, persistent exposure to CO at 50 parts per million (ppm) would result in a concentration of less than 10 percent COHb in the blood. This amount is not expected to produce symptoms in normal individuals. However, a person with heart disease might be affected by a level below 10 percent.

### **Are some people at greater risk of carbon monoxide poisoning?**

CO is especially harmful to unborn babies, infants, the elderly, and people with anemia. Those with a history of respiratory illness or heart disease are also at a greater risk level.

Each year, approximately 500 Americans die from unintentional CO poisoning, more than 20,000 visit the emergency room, and more than 4000 are hospitalized due to CO poisoning. Fatalities are most common among those 65 years and older.

### **Is there a medical test to show whether I've been exposed to carbon monoxide?**

A test is available to measure the amount of COHb in the blood. COHb amounts of 2 percent for non-smokers or more than 9 percent for smokers strongly supports CO poisoning.

- COHb levels of 0 to 10 percent may be without symptoms;
- COHb levels of 10 to 20 percent may cause headache, dilation of surface blood vessels, and difficulty breathing;
- COHb levels of 20 to 30 percent may cause throbbing headache, nausea, vomiting, fatigue and irritability;
- COHb levels of 30 to 40 percent may cause dizziness, confusion, and increased heart rate and breathing rate; and
- At levels between 50 to 60 percent, one might lose consciousness; at a level of over 70 percent, the result may be coma and death.

### **How can families reduce the risk of being exposed to carbon monoxide?**

Individuals potentially exposed to CO indoors should consider installing a detector to warn them of its presence. However, no detector is 100 percent reliable, and sensitive individuals may experience health issues at levels of CO below the detection limit of the detector.

In addition to installing CO detectors, **people should:**

- Have heating systems, water heaters, and any other gas-, oil-, or coal-burning appliances serviced by a qualified technician every year;
- Have chimneys cleaned each year;
- Have cars exhaust system checked every year;
- Install battery-operated CO detectors in homes and check batteries when changing the time on clocks in the spring and fall; and
- Seek medical attention promptly if CO poisoning is suspected and if feeling dizzy, light headed, or nauseous.

**They should not:**

- Heat a house with a gas oven;
- Run a car or truck inside a garage attached to a house, even if the door is left open;
- Burn any substance in a stove or fireplace that is not vented;
- Enter confined spaces, such as traffic tunnel, that are not vented and/or shown to be free of CO; or
- Use a generator, charcoal grill, camp stove, or other gas or charcoal-burning device inside the home, basement, garage, or outside the home near a window.

### **What should I do if I think I or someone else may have been exposed to carbon monoxide?**

If you suspect you or someone else may have been exposed to CO, especially if you/they are experiencing symptoms: you/they should leave the area immediately, get fresh air and seek emergency medical care. Most hospitals can test the blood for the presence of CO.

### **Can illness due to carbon monoxide be treated?**

Yes. The treatment for CO poisoning is high-dose oxygen, usually using a facemask attached to an oxygen reserve bag. CO levels in the blood may be periodically checked until they are low enough to safely send you home. In severe cases of CO poisoning, a hyperbaric pressure chamber, when available, may be used to give even higher doses of oxygen.

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

The U.S. Occupational Safety and Health Administration (OSHA) has set a Permissible Exposure Limit (PEL) for CO in workplace settings of a time-weighted-average (TWA) of 50 ppm (55 mg/m<sup>3</sup>). The TWA PEL must not be exceeded during any eight-hour work shift of a 40-hour workweek.

The Pennsylvania Department of Health recommends that CO in indoor air not exceed 9 ppm (10.31 mg/m<sup>3</sup>).

### **Where can I get more information?**

Please contact the Pennsylvania Department of Health, Division of Environmental Health Epidemiology at 717-787-3350 or by email at [RA-DHENVHEALTH@pa.gov](mailto:RA-DHENVHEALTH@pa.gov)

## **References**

ACGIH. Guide to Occupational Exposure Values. 2007.

DHHS.CDC.NIOSH. NIOSH Pocket Guide to Chemical Hazards. September 2005.

CDC. Carbon Monoxide-Related Deaths – United States, 1999-2004. MMWR2007; 56:1309-1312.

CDC. Preventing Carbon Monoxide Poisoning After an Emergency – <http://emergency.cdc.gov/disasters/cofacts.asp>

CPSC Carbon Monoxide Questions and Answers Document #466 <http://carbonmonoxidemyths.com/f-a-q/cpsc-faq/>

EMedicineHealth – [http://www.emedicinehealth.com/carbon\\_monoxide\\_poisoning/page7\\_em.htm](http://www.emedicinehealth.com/carbon_monoxide_poisoning/page7_em.htm)