

CARBON MONOXIDE

Carbon monoxide (CO) is an invisible, odorless, colorless, toxic gas.

It is produced by the incomplete burning of common fuels such as gasoline, coal, natural gas, propane, heating oil, kerosene and methane, or any other combustible material such as wood, cloth, or paper.

Fuels burn incompletely when an adequate supply of oxygen is not available.

Fire Facts

- Smoke inhalation from fires is the most common form of CO poisoning.
- Vehicle exhaust is the most common source of exposure for most people.
- The risk of CO poisoning can increase during winter, when homes are more tightly sealed to conserve heat and fuel-burning appliances are used more often.
- Carbon monoxide is almost identical in weight to normal air and thus mix freely with air.
- Carbon monoxide can ignite or even explode when it builds up in an enclosed, unventilated area and comes in contact with a spark or flame (flammability range; 12.5-74%).
- A spark from the operation of a wall switch, a cell phone/telephone or transmitting 2-way radio can ignite CO gas. However, long before CO will ignite, anyone exposed to these high percentages will be killed.

Fuel burning appliances and CO production

- The improper installation, use, and maintenance of fuel burning appliances cause the formation of carbon monoxide gas.
- Correct operation of fuel burning appliances requires two key conditions:
 1. There must be an adequate supply of air for complete combustion to take place.
 2. Products of combustion must be properly ventilated to the outside.

CO levels and your health

- When CO is inhaled, it is absorbed through the lungs and into the bloodstream where it prevents the body from absorbing oxygen by replacing the oxygen molecules attached to hemoglobin (the oxygen carrying agent in red blood cells) in the blood stream. CO bonds to hemoglobin about 250 times better than oxygen.
- Without oxygen, vital organs such as your heart and brain begin to deteriorate. To compensate, your heart rate increases, breathing may become difficult and in the most serious circumstances cardiac trauma, brain damage, coma and death will result.
- The health effects related to CO depend upon its concentration in the air and the length of exposure, as well as each individual's health condition. CO symptoms generally rise exponentially over time.
- The concentration levels of CO in the air are measured in parts per million (ppm)
- Health effects from exposure to CO levels in air of approximately 1 to 70 ppm are uncertain, but most people

will not experience any symptoms.

- Exposure to low levels of CO (200 ppm for 2 hours) can cause headaches, confusion, dizziness, weakness/fatigue, nausea and other symptoms similar to the flu.
- High-level exposure (400 ppm for 3 hours, 800 ppm for 2 hours, 1600 ppm for 1 hour) is life threatening, it can cause abdominal pain, diarrhea, impaired vision, convulsions, coma, and eventually death.
- Confusion -- a symptom of exposure to this colorless, odorless gas -- can interfere with a person's ability to recognize their life is in danger.
- Medical experts believe that the severity of the symptoms will increase for unborn babies, infants, children, seniors and people with heart or lung problems.
- CO poisoning is progressive. Prolonged exposure to even low levels of CO gas can cause the gas to build up to dangerous levels in your body over an extended period of time.

Safety Tips

The first line of defense in preventing CO poisoning is the proper installation, use, and maintenance of your fuel burning appliances.

Using Fuel Burning Appliances

- Ensure that the exhaust from all fuel burning appliances is vented to the outdoors.

- Ensure indoor fuel burning appliances such as fireplaces, furnaces, water heaters, wood and coal stoves, clothes dryers, space heaters, are equipped with air intakes to supply fresh air, and flue vents or pipes to exhaust toxic gases outdoors.
- Use re-locatable fuel burning devices such as vehicles, generators, engines, barbecues, camping stoves, or motors (lawnmowers and snowblowers) in a well-ventilated outdoor area.
- If you need to warm a vehicle, open the door before starting it and remove it from the garage immediately after starting it. Once the running vehicle is located outside, close the garage door to prevent carbon monoxide from accumulating inside the garage.
- An open wood-burning fireplace, when in use, can consume up to five to ten times as much air in your home as a furnace. Always open a fresh air supply, like a window, before lighting the fire to ensure that the products of combustion are properly expelled up the chimney.

- Do not use ovens, clothes dryers or gas ranges to heat your home.
- Ensure that doors between attached garages and homes are tightly sealed and contain effective weather stripping to provide a barrier against the passage of exhaust fumes.
- Keep the area around your fuel burning appliances free and unobstructed of any items that could restrict air circulation.

- Do not use fuel-burning appliances that have leaking exhaust systems.
- Keep a labeled and approved ABC-type fire extinguisher near all fuel burning appliances.

Maintenance of Fuel Burning Appliances

- Ensure that intakes, vents, and pipes on fuel burning appliances are kept clear of debris or other blockages.
- Have a qualified technician inspect and clean your fuel burning appliances and chimney at least once a year, preferably before the season of increased use.
- Visually inspect fuel-burning equipment and their venting systems on a regular basis for signs of cracks, wear, soot, rust or corrosion. Contact a qualified technician to repair equipment with signs of damage.
- Equipment that uses natural gas should show a clear blue flame. Have a qualified technician inspect flames with a yellow or orange hue as this color may indicate problems.

Detection Devices

The installation of a CO detector is the second line of defense against CO poisoning.

A CO detector must never be substituted for prevention measures.

There are three basic types of CO detection devices: Gel Cell, Electro-chemical, and Semiconductor.

Gel cell

Uses a sensing process in which a chemically treated filter changes color when exposed to CO. The color, which is read by a photoelectric eye, changes at the same rate as hemoglobin in human blood, getting darker as it absorbs higher levels. When a light sensor in the detector recognizes the color change, the alarm goes off.

Electro-chemical

Uses a chemical reaction that generates a current. The current flows through a circuit at a rate proportional to CO levels in the air. A microprocessor in the detector measures the CO concentration in the air, based on the current in the circuit.

Semiconductor

Uses metal oxide as a semiconductor, which changes its level of conductivity when exposed to CO. An electronic circuit senses the change in current through the semiconductor and sets off the alarm.