



Carbon Monoxide -- The Silent, Cold Weather Killer

What is carbon monoxide?

Carbon monoxide, or CO, is a colorless, odorless, toxic gas. It is produced by the incomplete combustion of solid, liquid, and gaseous fuels. Appliances fueled with gas, oil, kerosene, or wood may produce CO. If such appliances are not installed, maintained, and used properly, CO may accumulate to dangerous and even deadly levels in cars, homes, or poorly ventilated areas.

Where does CO come from?

Carbon monoxide is produced by devices that burn fuels. Therefore, any fuel-burning appliance in your home is a potential CO source. Electrical heaters and electric water heaters, toasters, etc., do not produce CO under any circumstances. Under normal circumstances, CO should not be detectable in the typical home or workplace.

When appliances are kept in good working condition, they produce little CO. But improperly operating or improperly vented appliances can produce elevated -- even fatal -- CO concentrations in your home. Likewise, using kerosene heaters or charcoal grills indoors, or running a car in a garage, can cause levels high enough to result in CO poisoning.

Common sources of CO include the following wood or gas fueled appliances:

- Room heaters
- Furnaces
- Charcoal grills
- Cooking ranges
- Water heaters
- Automobiles run in closed garages
- Fireplaces
- Portable generators
- Wood burning stoves

Who is at risk of CO poisoning?

Any person or animal in space shared with a device capable of generating CO should be considered at risk of CO poisoning. CO exposures especially affect unborn babies, infants, and people with anemia or a history of heart disease. Breathing low levels of the chemical can cause fatigue and increase chest pain in people with chronic heart disease.

In 1989, the most recent year for which statistics are available, there were about 220 deaths from CO poisoning associated with gas-fired appliances, about 30 CO deaths associated with solid-fueled appliances (including charcoal grills), and about 45 CO deaths associated with liquid-fueled heaters.

Each year, nearly 5,000 people in the United States are treated in hospital emergency rooms for CO poisoning; however, this number is believed to be an underestimate of CO poisoning because many people with CO symptoms mistake the symptoms for the flu or are misdiagnosed.

Why is CO the silent, cold weather killer?

Carbon monoxide poisoning can kill without warning, as your family sleeps.

Because CO gas has no warning properties, even at toxic or life threatening levels, it is considered a silent killer. And since so many deaths occur as the result of defective or poorly operated home heating devices, CO has been termed the "silent, cold weather killer."

Although not always experienced, the initial symptoms of CO are similar to the flu (but without the fever). They include:

- Dizziness
- Fatigue
- Headache
- Nausea
- Irregular breathing

It is critical to note that death from CO poisoning can result with some or all of these symptoms never being experienced, in which case the overexposed victim simply "falls asleep" and never regains consciousness.

How can I prevent CO poisoning?

Dangerous levels of CO can be prevented by proper appliance maintenance, installation, and use. Timely inspections of potentially CO-producing equipment, and the use of CO toxic level concentration alarms, are also key to avoiding a CO fatality.

To avoid CO poisoning, follow these tips:

Installation:

- Proper installation is critical to the safe operation of combustion appliances. All new appliances have installation instructions that should be followed exactly. Local building codes should be followed as well.
- Appliances designed to be vented should be vented properly, according to manufacturers' instructions.
- Adequate combustion air should be provided to ensure complete combustion.
- All combustion appliances should be installed by professionals.

Maintenance:

- A qualified service technician should perform preventive maintenance on homes with central and room heating appliances (including water heaters and gas dryers) annually. The technician should look at the electrical and mechanical components of appliances, such as thermostat controls and automatic safety devices.
- Chimneys and flues should be kept free of blockages, corrosion, and loose connections.
- Individual appliances should be serviced regularly.
- Kerosene and gas space heaters (vented or unvented) should be cleaned and inspected to ensure proper operation.

Appliance Use:

- Follow manufacturers' directions for safe operation.
- Make sure the room where an unvented gas or kerosene space heater is used is well ventilated; doors leading to another room should be open to allow added ventilation.
- Never use an unvented combustion heater overnight or in a room where you are sleeping.
- Never use charcoal grills inside a home, tent, camper, or unventilated garage.
- Don't leave vehicles running in an enclosed garage, even to "warm up" a car on a cold morning.

Inspections

In addition to professional preventive maintenance on a potentially CO-producing appliance, timely inspections should be performed by the homeowner to identify signs of possible CO problems. Look for the following conditions, and if detected, have a professional service technician fully examine the unit for safety and continued use.

- Rusting or water streaking on vent/chimney
- Loose or missing furnace panel
- Sooting on internal or attic spaces
- Loose or disconnected vent/chimney connections
- Debris or soot falling from chimney, fireplace, or appliance
- Loose masonry on chimney

In addition, there are signs that might indicate improper appliance operation which include:

- Decreasing hot water supply
- Furnace unable to heat house or runs constantly
- Sooting, especially on appliances
- Unfamiliar or burning odor
- Increased condensation inside windows

Alarms

Next to prevention of the production of toxic CO gas, the best defense against this deadly killer is a CO alarm. These relatively new devices can detect toxic concentration of CO in the air, sound an alarm, and thereby save lives.

How do CO alarms work?

A CO detector sounds an alarm because it detects an elevated level of CO in the household. Different brands of detectors are designed with different options and features. Some are made to sound an alarm at persistent, low levels of CO while others will sound an alarm only at life-threatening levels. Some detectors are more sensitive than others and will detect an alarm sooner than other varieties of alarms. Some CO detectors may produce alarms at a low level even though the level may not be immediately dangerous.

Underwriters' Laboratory (UL) Listed CO detectors manufactured after October 1995, are required to have information on product packaging that clearly states the sensitivity level of the detector. Carefully read the product packaging of the CO detector you purchase, and understand what an alarm signal indicates.

Where should the detector be installed?

CO gas distributes evenly and fairly quickly throughout the house; therefore, a CO detector should be

installed in sleeping portions of the house, but outside individual bedrooms, in order to alert all occupants who are sleeping in that part of the house.

A UL Listed CO detector will sound an alarm before dangerous levels of CO accumulate. CO indicator cards and other devices are also intended to detect elevated levels of CO, but these devices are not equipped with an audible alarm and cannot wake room occupants at night, when most CO poisonings occur.

Do not place the detector within five feet of household chemicals as they may damage the unit or cause false alarms. Wall or ceiling installations are acceptable locations for mounting CO detectors, but always read and follow the manufacturer's instructions when installing a CO detector. If your detector is wired directly into your home's electrical system, you should test it monthly. If your unit operates off of a battery, test the detector weekly and replace the battery at least once a year.

Responding to CO alarms

A CO detector alarm indicates elevated levels of CO in the home. Never ignore the alarm or otherwise silence it unless a qualified individual has examined the affected area and deemed it safe.

If your alarm sounds, immediately open windows and doors for ventilation. If anyone in the home is experiencing symptoms of CO poisoning (headache, dizziness, or other flu-like symptoms) immediately evacuate the house and call the fire department. If no one is experiencing these symptoms, continue to ventilate, turn off fuel-burning appliances, and call a qualified technician to inspect your heating system and appliances, as soon as possible. Because you have provided ventilation, the CO buildup may have dissipated by the time help responds and your problem may appear to be temporarily solved. Do not operate any fuel-burning appliances until you have clearly identified the source of the problem.

Aren't there lots of problems with alarms?

For various reasons, there have been some problems in the past with the use of CO alarms. Some problems were due to the alarms themselves, others to ambient air pollution or improper use of the alarms.

Avoid placing a CO detector directly on top of or directly across from fuel-burning appliances. These appliances will emit some CO when initially turned-on.

Underwriters' Laboratory responded to early concerns about nuisance alarms by revising their standard governing CO detectors (UL 2034). New UL Listed CO detectors available October 1995, were required to meet the revised standard in order to bear the UL mark. These detectors will ignore low levels of CO for a much longer period of time and will be equipped with reset buttons to help confirm life-threatening CO problems.

If you experience nuisance alarms, have a qualified technician come to your home as soon as practically possible and carefully inspect for sources of CO from all fuel-burning appliances, including gas ranges, gas stoves, and fireplaces. As stated previously, never ignore or otherwise silence the alarm.

Who can I contact for more information?

AIHA: For additional information or expert referrals on the topic of carbon monoxide, its toxic effects, and related matters, contact the American Industrial Hygiene Association (AIHA) at (703) 849-8888; or online at <http://www.aiha.org>. You may also write to AIHA, 2700 Prosperity Avenue, Suite 250, Fairfax, VA 22031. AIHA represents a professional organization of engineers and scientists knowledgeable of the hazards of indoor air pollutants.

CPSC: The U.S. Consumer Product Safety Commission (CPSC) serves the public with respect to the safety of consumer products that both potentially generate CO as well as detect it. Call CPSC's hotline at (800) 638-2772 or CPSC's TTY (for the hearing impaired) at (800) 638-8270. Information is available via Internet gopher services at cpsc.gov, and reports of product hazards may be sent directly to info@cpsc.gov.

USEPA: General information about in-home air quality, including carbon monoxide, may be obtained from the U.S. Environmental Protection Agency (USEPA). Call (800) 438-4318; or visit their web site at <http://www.epa.gov>.

UL: Information about Underwriters' Laboratory can be obtained from their corporate headquarters. Call (847) 272-8800, or write to UL Corporate Headquarters, 333 Pfingsten Road, Northbrook, IL 60062-2096.

Fire Departments: It may be useful to contact your local fire department at their nonemergency telephone number to find out what their response will be to a CO alarm in a residence. Your local fire department may also offer free home fire safety inspections that would include checks of potentially CO-generating equipment.

Utility Company: You may also wish to contact your local utility company (gas or electric). Some utilities provide free in-home inspections and additional brochures on the topic of CO safety; some may even provide financial assistance with the purchase of selected CO monitors.

Additional reading

For an in-depth discussion of the toxic effects of carbon monoxide, read chapter 8, "Carbon Monoxide," of the book *Indoor Air Pollution -- A Health Perspective*, edited by Jonathan Samet and John Spengler. It was published in 1991 by the Johns Hopkins University Press, 701 West 40th Street, Baltimore, MD 21211-2190.

Thanks

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