



# HOUSING

---

## Preventing Carbon Monoxide Problems no. 9.939

by K.R. Tremblay Jr.<sup>1</sup>

### Quick Facts...

Hundreds of Americans die every year from carbon monoxide (CO) poisoning.

Carbon monoxide in the home can come from many sources.

If you experience CO poisoning symptoms, get fresh air immediately and go to an emergency room.

Prevention is the key to protecting you and your family.

Make sure your CO alarm meets the requirements of Underwriters Laboratories (UL) or International Approval Service (IAS).

**Colorado**  
**State**  
University

**Extension**

© Colorado State University  
Extension. 6/00. Reviewed 7/06.  
[www.ext.colostate.edu](http://www.ext.colostate.edu)

### What Is Carbon Monoxide?

You cannot see or smell carbon monoxide (CO), but at high levels it can kill a person in minutes. It is the leading cause of poisoning death, with over 500 victims in the United States each year.

Carbon monoxide is produced whenever a fuel such as gas, oil, kerosene, wood or charcoal is burned. The amount of CO produced depends mainly on the quality or efficiency of combustion. A properly functioning burner, whether natural gas or liquefied petroleum gas (LPG), has efficient combustion and produces little CO. However, an out-of-adjustment burner can produce life-threatening amounts of CO without any visible warning signs.

When appliances that burn fuel are maintained and used properly, the amount of CO produced usually is not hazardous. But if appliances are not working properly or are used incorrectly, dangerous levels of CO can collect in an enclosed space. Hundreds of Americans die accidentally every year from CO poisoning caused by malfunctioning or improperly used fuel-burning appliances. Many more people are harmed to some degree each year.

### Common Sources of CO in Homes

Accumulation of combustion gases can occur when a blocked chimney, rusted heat exchanger or broken chimney connector pipe (flue) prevents combustion gases from being exhausted from the home. CO also can enter the home from an idling car or from a lawnmower or generator engine operating in the garage.

Another source for CO is backdrafting. When ventilation equipment, such as a range-top vent fan, is used in a tightly sealed home, reverse air flow can occur in chimneys and flues. An operating fireplace also can interact with the flue dynamics of other heating appliances. Again, backdrafting may result.

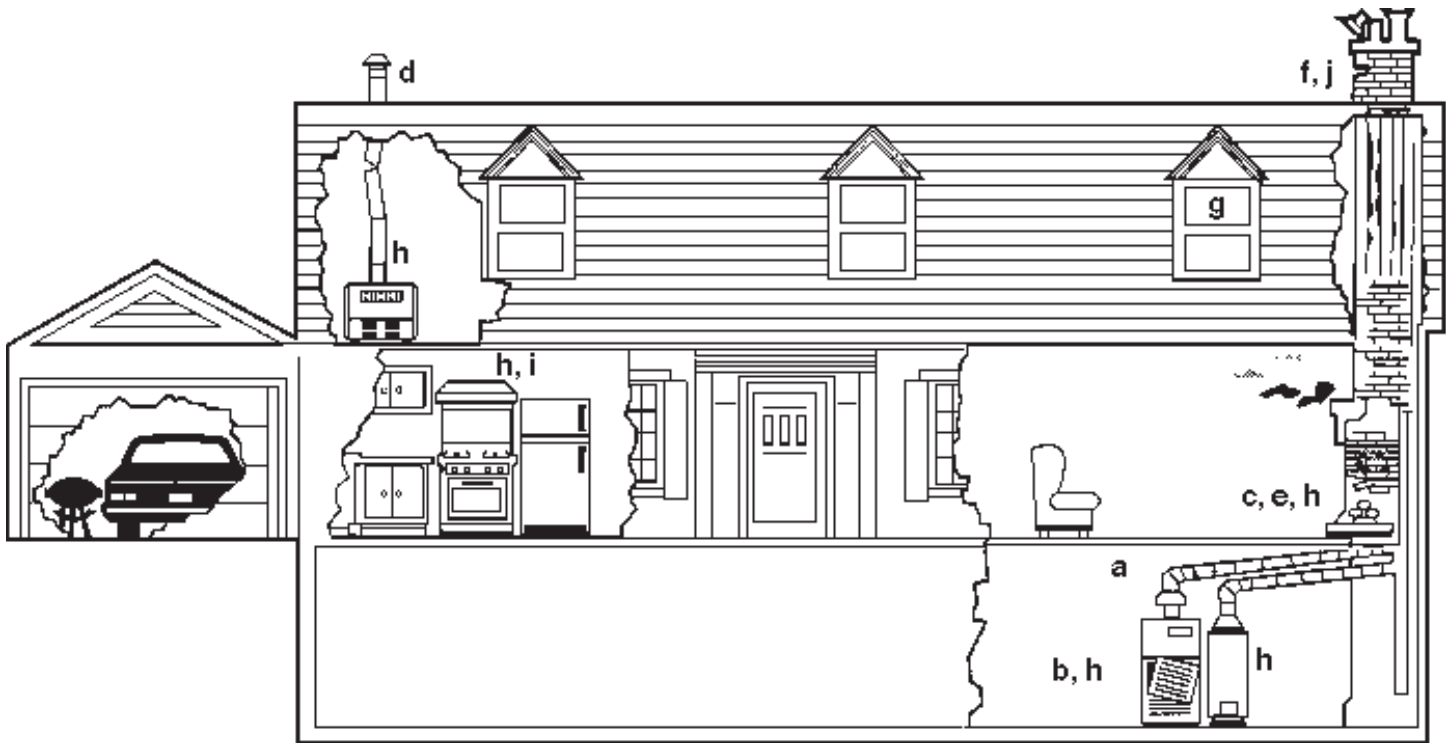
Other common sources of CO include unvented, fuel-burning space heaters (especially if malfunctioning) and indoor use of a charcoal barbecue grill. CO is produced by gas stoves and ranges and can become a problem with prolonged, improper operation — for example, if these appliances are used to heat the home. Flame color does not necessarily indicate CO production. However, a change in the gas flame's color can indicate a CO problem. If a blue flame becomes yellow, CO often is increased.

While larger combustion appliances are designed to be connected to a flue or chimney to exhaust combustion byproducts, some smaller appliances are designed to be operated indoors without a flue. Appliances designed as supplemental or decorative heaters (including most unvented gas fireplaces) are not designed for continuous use. To avoid excessive exposure to pollutants, never use these appliances for more than four hours at a time.

When operating unvented combustion appliances, such as portable space

heaters and stoves, follow safe practices. Besides observing fire safety rules, make sure the burner is properly adjusted and there is good ventilation. Never use these items in a closed room. Keep doors open throughout the house, and open a window for fresh air. Never use outdoor appliances such as barbeque grills or construction heaters indoors. Do not use appliances such as ovens and clothes dryers to heat the house.

Inspect heating equipment. To reduce the chances of backdrafting in furnaces, fireplaces and similar equipment, make sure flues and chimneys are not blocked. Inspect metal flues for rust. In furnaces, check the heat exchanger for rust and cracks. Soot also is a sign of combustion leakage. When using exhaust fans, open a nearby window or door to provide replacement air.



**Figure 1: Sources of and clues to a possible carbon monoxide problem.**

**CO clues you can see:**

- a. Rusting or water streaking on vent/chimney.
- b. Loose or missing furnace panel.
- c. Sooting.
- d. Loose or disconnected vent/chimney connections.
- e. Debris or soot falling from chimney, fireplace or appliance.
- f. Loose masonry on chimney.
- g. Moisture inside of windows.

**CO clues you cannot see:**

- h. Internal appliance damage or malfunctioning components.
- i. Improper burner adjustment.
- j. Hidden blockage or damage in chimney.

Only a trained service technician can detect hidden problems and correct these conditions!

**Warnings:**

- Never leave a car running in a garage, even with the garage door open.
- Never burn charcoal in houses, tents, vehicles or garages.
- Never install or service combustion appliances without proper knowledge, skills and tools.
- Never use a gas range, oven or dryer for heating.
- Never operate unvented gas-burning appliances in a closed room or in a room in which you are sleeping.

Adapted from "The Senseless Killer," U.S. Consumer Product Safety Commission, Washington, D.C.

*If you experience symptoms that you think could be from CO poisoning:*

**Get fresh air immediately.**

*Open doors and windows, turn off combustion appliances, and leave the house.*

**Go to an emergency room.**

*Tell the physician you suspect CO poisoning.*

*Proper installation, operation and maintenance of combustion appliances in the home are most important in reducing the risk of CO poisoning.*

*Poison Center  
1-800-222-1222*

*Because CO is a colorless, tasteless, and odorless gas that is quickly absorbed by the body and the symptoms often resemble other illnesses, it is often known as the "silent killer."*

## CO Poisoning Symptoms

The initial symptoms of CO poisoning are similar to the flu but without the fever. They include headache, fatigue, shortness of breath, nausea, dizziness, vomiting, disorientation, and loss of consciousness.

In more technical terms, CO bonds tightly to the hemoglobin in red blood cells, preventing them from carrying oxygen throughout the body. If you have any of these symptoms and if you feel better when you go outside your home and the symptoms reappear when you go back inside, you may have CO poisoning.

If you experience symptoms that you think could be from CO poisoning, **get fresh air immediately.** Open doors and windows, turn off combustion appliances, and leave the house. **Go to an emergency room** and tell the physician you suspect CO poisoning. If CO poisoning has occurred, it often can be diagnosed by a blood test done soon after exposure. Be prepared to answer the following questions for the doctor:

- Do your symptoms occur only in the house?
- Is anyone else in your household complaining of similar symptoms?
- Did everyone's symptoms appear about the same time?
- Are you using any fuel-burning appliances in the home?
- Has anyone inspected your appliances lately?
- Are you certain these appliances are properly working?

## Prevention Is the Key

At the beginning of every heating season, have a trained professional check all your fuel-burning appliances: oil and gas furnaces, gas water heaters, gas ranges and ovens, gas dryers, gas or kerosene space heaters, fireplaces and wood stoves. Make certain that the flues and chimneys are connected, in good condition and not blocked.

Whenever possible, choose appliances that vent fumes to the outside. Have them properly installed, and maintain them according to manufacturers' instructions. Read and follow all instructions that accompany any fuel-burning device. If you cannot avoid using an unvented gas or kerosene space heater, carefully follow the cautions that come with the device. Use the proper fuel and keep doors to the rest of the house open. Crack a window to ensure enough air for ventilation and proper fuel burning.

These problems could indicate improper appliance operation:

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

Proper installation, operation and maintenance of combustion appliances in the home are most important in reducing the risk of CO poisoning. Some rules are:

- **Never** idle the car in a garage, even if the garage door is open. Fumes can build up very quickly in the garage and living area of your home.
- **Never** use a gas oven to heat your home, even for a short time.
- **Never** use a charcoal grill indoors, even in a fireplace.
- **Never** sleep in a room with an unvented gas or kerosene space heater.
- **Never** use any gasoline-powered engines (mowers, weed trimmers, snow blowers, chain saws, small engines or generators) in enclosed spaces.
- **Never** ignore symptoms, particularly if more than one person is feeling them. You could lose consciousness and die if you do nothing.

## Web Sites

American Lung Association:  
[www.stateoftheair.org](http://www.stateoftheair.org)

Consumer Product Safety Commission:  
[www.cpsc.gov](http://www.cpsc.gov)

Environmental Protection Agency: [www.epa.gov/iaq](http://www.epa.gov/iaq)

Healthy Indoor Air for America's Homes:  
[www.healthyindoorair.org](http://www.healthyindoorair.org)

Homesafe.com: [www.homesafe.com/coalert](http://www.homesafe.com/coalert)

## References

American Lung Association. (2000). *Fact sheet: Carbon Monoxide*. New York, NY: ALA.

Penney, D. (Ed.) (2000). *Carbon monoxide toxicity*. Boca Raton, FL: CRC Press.

Ponessa, J.T. (1999). *Carbon monoxide in the home*. In *Healthy indoor air for America's homes*. Bozeman, Mont.: Montana State University Extension Service.

U.S. Consumer Product Safety Commission. (1997). *The "Senseless Killer"*. Washington, D.C.: CPSC.

U.S. Consumer Product Safety Commission. (1998). *What you should know about combustion appliances and indoor air pollution*. Washington, D.C.: CPSC.

U.S. Environmental Protection Agency. (1996). *Protect your family and yourself from carbon monoxide poisoning*. Washington, D.C.: EPA.

U.S. Environmental Protection Agency. (1996). *The inside story: A guide to indoor air quality*. Washington, D.C.: EPA.

## Install Carbon Monoxide Alarms

In recent years, CO alarms have become widely available. When selecting a CO alarm, make sure it meets the stringent requirements of Underwriters Laboratories (UL) or International Approval Service (IAS). Modern CO alarms can provide warnings for even nonlethal levels of this dangerous pollutant. However, do not think of the alarm as the "be all, end all" to alert you to dangerous CO levels. The U.S. Consumer Product Safety Commission recommends having at least one CO alarm in every home, placed outside of the sleeping area. Homes with several sleeping areas require multiple alarms.

Look for an alarm with a long-term warranty and one that easily can be self-tested and reset to ensure proper functioning. Consumer organizations such as Consumer Reports occasionally evaluate these devices. Some general points to consider before buying a CO alarm:

- Some inexpensive alarms consist of a card with a spot (spot detectors) that changes color in the presence of CO. The absence of an audible signal does not meet UL or IAS requirements for alarms, so these devices do not provide adequate warning of CO.
- Some CO alarms have a sensor that must be replaced every year or so. The expense of this part should be a factor in purchase decisions.
- Battery-operated alarms are portable and will function during a power failure, which is when emergency heating might be used. Batteries must be replaced, although some alarms have long-life batteries that will last up to five years.
- Line-powered alarms (110 volt) require electrical outlets but do not need batteries. They will not function during a power failure. Some line-powered alarms have battery backups.
- Some alarms have digital readouts indicating CO levels. Alarms with memories can help document and correct CO problems.

### If the CO detector alarm sounds:

- Make sure it is your CO detector and not your smoke detector.
- Check to see if any member of the household is experiencing symptoms of CO poisoning. If you suspect poisoning, get everyone out of the house immediately and seek medical attention. Tell the doctor that you suspect CO poisoning.
- If no one is feeling symptoms, ventilate the home with fresh air. Turn off all potential sources of CO: your oil or gas furnace, gas water heater, gas range and oven, gas dryer, gas or kerosene space heater, and any vehicle or small engine.
- Have a qualified technician inspect your chimneys and fuel-burning appliances to make sure they are operating correctly and that nothing is blocking the fumes from being vented out of the house.

<sup>1</sup> Colorado State University Extension housing specialist and professor, design and merchandising.

Colorado State University, U.S. Department of Agriculture and Colorado counties cooperating. Extension programs are available to all without discrimination. No endorsement of products mentioned is intended nor is criticism implied of products not mentioned.