

1. PUBLIC HEALTH STATEMENT

This public health statement tells you about carbon monoxide and the effects of exposure to it.

When a substance is released either from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment. Such a release does not always lead to exposure. You can be exposed to a substance only when you come in contact with it. You may be exposed by breathing, eating, or drinking the substance, or by skin contact.

If you are exposed to carbon monoxide, many factors will determine whether you will be harmed. These factors include the dose (how much), the duration (how long), and how you come in contact with it. You must also consider any other chemicals you are exposed to and your age, sex, diet, family traits, lifestyle, pregnancy status, and state of health.

1.1 WHAT IS CARBON MONOXIDE?

Carbon monoxide is a gas	Carbon monoxide is a colorless, nonirritating, odorless, and tasteless gas. It is found in both outdoor and indoor air.
Sources of carbon monoxide in the atmosphere	<p>Carbon monoxide is made when carbon in fuel is not burned completely. Carbon monoxide is produced from both human-made and natural sources. The most important human-made source of carbon monoxide arises from the exhaust of automobiles.</p> <p>Inside homes, improperly adjusted gas appliances, furnaces, wood burning stoves, and fireplaces are a potential source of carbon monoxide (see Section 1.3).</p> <p>Carbon monoxide is released from wood burning/volcanoes/forest fires.</p>
Industrial uses	Carbon monoxide can be used in industry to synthesize many compounds such as acetic anhydride, polycarbonates, acetic acid, and polyketone.

1. PUBLIC HEALTH STATEMENT

1.2 WHAT HAPPENS TO CARBON MONOXIDE WHEN IT ENTERS THE ENVIRONMENT?

Converts to carbon dioxide	<p>When carbon monoxide is released to the environment, it enters the air and remains in the atmosphere for an average of about 2 months.</p> <p>Eventually, carbon monoxide reacts with other compounds in the atmosphere and is converted to carbon dioxide.</p> <p>Microorganisms found in soil and water can also convert carbon monoxide to carbon dioxide.</p>
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1.3 HOW MIGHT I BE EXPOSED TO CARBON MONOXIDE?

Sources of exposure	<p>All people are exposed to carbon monoxide at varying levels through inhalation of air. Places and times of the day that have a lot of vehicular traffic generally have higher levels of carbon monoxide as compared to areas of low traffic.</p> <p>You can be exposed to carbon monoxide from tobacco smoke whether as a smoker or from second-hand smoke.</p> <p>You can be exposed to carbon monoxide by using gas appliances or wood burning stoves and fireplaces.</p> <p>In emergency situations where power is lost, using an improperly vented generator inside a home or building or using gas grills, charcoal grills, or hibachis indoors can lead to dangerous levels of carbon monoxide.</p> <p>People are exposed to carbon monoxide inside of vehicles.</p> <p>High levels of carbon monoxide exposure have been observed when using recreational watercraft and boats.</p> <p>Gasoline-powered small engines and tools (e.g., gas-powered compressors or pressure washers) can emit high levels of carbon monoxide in a short period of time.</p> <p>See Chapter 6 for more information regarding these exposures.</p>
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1. PUBLIC HEALTH STATEMENT

1.4 HOW CAN CARBON MONOXIDE ENTER AND LEAVE MY BODY?

Carbon monoxide enters and leaves the body	<p>Carbon monoxide in the air rapidly enters all parts of the body, including blood, brain, heart, and muscles when you breathe.</p> <p>The carbon monoxide in your body leaves through your lungs when you breathe out (exhale), but there is a delay in eliminating carbon monoxide.</p> <p>It takes about a full day for carbon monoxide to leave your body.</p>
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1.5 HOW CAN CARBON MONOXIDE AFFECT MY HEALTH?

This section looks at studies concerning potential health effects in animal and human studies.

Carbon monoxide can harm the heart, brain, and lungs	<p>Breathing high levels of carbon monoxide can kill you.</p> <p>Breathing lower levels of carbon monoxide can permanently harm your heart and brain.</p> <p>Carbon monoxide can be more harmful to you if you have heart or lung disease.</p>
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1.6 HOW CAN CARBON MONOXIDE AFFECT CHILDREN?

This section discusses potential health effects in humans from exposures during the period from conception to maturity at 18 years of age.

Breathing carbon monoxide during pregnancy can harm your unborn child	<p>Breathing high levels of carbon monoxide can lead to miscarriage.</p> <p>Breathing lower levels of carbon monoxide during pregnancy may harm the mental development of your child.</p>
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1. PUBLIC HEALTH STATEMENT

1.7 HOW CAN FAMILIES REDUCE THE RISK OF EXPOSURE TO CARBON MONOXIDE?

<p>Reduce indoor air levels of carbon monoxide</p>	<p>The most dangerous levels of carbon monoxide usually occur in indoor air. High levels occur as a result of improperly installed or unvented appliances that burn natural gas, kerosene, or other fuels. These include stoves, furnaces, heaters, and generators. Make sure that all of your appliances are installed properly and have periodic maintenance performed by professional installers. Always follow the manufacturer's recommendations on installing and using these devices.</p> <p>Make certain wood burning heaters and fireplaces are properly vented.</p> <p>Never use a gas-powered generator or burn charcoal indoors, as this can quickly lead to dangerous levels of carbon monoxide in your home.</p> <p>Do not use older portable propane heaters in enclosed indoor settings, including campers and tents, as dangerous levels of carbon monoxide can build up. Look for portable heaters that contain an oxygen depletion sensor (ODS) and are safer to use when camping. If oxygen levels start to fall, the sensor automatically shuts down the heater before it can produce dangerous levels of carbon monoxide. Older generation heaters without an ODS are intended for outdoor use only and should not be used indoors.</p> <p>Do not use gasoline-powered tools like pressure washers inside of homes. Substitute less hazardous equipment whenever possible. Use electric tools or tools with engines that are separate from the tools and can be located outside and away from air intakes.</p> <p>Do not let your car idle for long periods of time in your garage.</p>
<p>Avoid tobacco smoke</p>	<p>You can reduce your exposure to carbon monoxide by avoiding smoke from cigarettes and cigars since the smoke contains carbon monoxide.</p>

1. PUBLIC HEALTH STATEMENT

<p>Reduce outdoor exposure to carbon monoxide</p>	<p>You can reduce your exposure to carbon monoxide outdoors by avoiding running or exercising near busy roadways.</p> <p>Accidental carbon monoxide poisonings can occur from recreational water craft. Most new boats come with carbon monoxide detectors; however, the U.S. Coast Guard advises owners of boats built prior to 1998 to have the monitors inspected or replaced.</p>
<p>Install carbon monoxide detectors in your home</p>	<p>Carbon monoxide detectors can be purchased at home remodeling or hardware stores. It is important to understand that most smoke detectors do not detect carbon monoxide, so you should install carbon monoxide detectors in your home as well as smoke detectors.</p>

If your doctor finds that you have been exposed to significant amounts of carbon monoxide, ask whether your children might also be exposed. Your doctor might need to ask your state health department to investigate.

1.8 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO CARBON MONOXIDE?

<p>Carbon monoxide exposure can be measured with a blood test</p>	<p>Medical devices called carbon monoxide-oximeters can estimate the level of carbon monoxide in blood by using a simple test. These devices are found in clinical laboratories and hospitals.</p>
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1.9 WHAT RECOMMENDATIONS HAS THE FEDERAL GOVERNMENT MADE TO PROTECT HUMAN HEALTH?

The federal government develops regulations and recommendations to protect public health. Regulations can be enforced by law. The EPA, the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA) are some federal agencies that develop regulations for toxic substances. Recommendations provide valuable guidelines to protect public health, but cannot be enforced by law. The Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH) are two federal organizations that develop recommendations for toxic substances.

1. PUBLIC HEALTH STATEMENT

Regulations and recommendations can be expressed as “not-to-exceed” levels. These are levels of a toxic substance in air, water, soil, or food that do not exceed a critical value. This critical value is usually based on levels that affect animals; they are then adjusted to levels that will help protect humans. Sometimes these not-to-exceed levels differ among federal organizations because they used different exposure times (an 8-hour workday or a 24-hour day), different animal studies, or other factors.

Recommendations and regulations are also updated periodically as more information becomes available. For the most current information, check with the federal agency or organization that provides it.

Some regulations and recommendations for carbon monoxide include the following:

Levels in air set by EPA	EPA established an environmental limit of 10 milligrams per cubic meter (mg/m^3) (9 parts per million by volume [ppmv]) of carbon monoxide in air averaged over 8 hours. This limit is not to be exceeded more than once per year.
Levels in workplace air set by OSHA	OSHA set a legal limit of $55 \text{ mg}/\text{m}^3$ (50 ppmv) for carbon monoxide in air averaged over an 8-hour work day.

1.10 WHERE CAN I GET MORE INFORMATION?

If you have any more questions or concerns, please contact your community or state health or environmental quality department, or contact ATSDR at the address and phone number below.

ATSDR can also tell you the location of occupational and environmental health clinics. These clinics specialize in recognizing, evaluating, and treating illnesses that result from exposure to hazardous substances.

1. PUBLIC HEALTH STATEMENT

Toxicological profiles are also available on-line at www.atsdr.cdc.gov and on CD-ROM. You may request a copy of the ATSDR ToxProfiles™ CD-ROM by calling the toll-free information and technical assistance number at 1-800-CDCINFO (1-800-232-4636), by e-mail at cdcinfo@cdc.gov, or by writing to:

Agency for Toxic Substances and Disease Registry
Division of Toxicology and Human Health Sciences (proposed)
1600 Clifton Road NE
Mailstop F-62
Atlanta, GA 30333
Fax: 1-770-488-4178

Organizations for-profit may request copies of final Toxicological Profiles from the following:

National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22161
Phone: 1-800-553-6847 or 1-703-605-6000
Web site: <http://www.ntis.gov/>