



Carbon monoxide poisoning

Headway's publications are all available to freely download from the [information library](#) on the charity's website, while individuals and families can request hard copies of the booklets via the [helpline](#).

Please help us to continue to provide free information to people affected by brain injury by making a donation at www.headway.org.uk/donate. Thank you.

Acknowledgements: many thanks to Dr Steven White, Consultant Neurophysiologist, for co-authoring this factsheet.

Introduction

Every year, carbon monoxide (CO) poisoning is responsible for approximately 4000 attendances at A&E departments and around 30 deaths. It is not commonly known that exposure to CO, a gas formed by burning common household fuels, can ultimately lead to a type of brain injury known as anoxic brain injury. The effects of this can be as disabling as other forms of brain injury, such as a stroke or head injury.

It is very important to be aware of safety issues in the home and workplace in order to prevent exposure to CO. It is also important to be aware of the signs and symptoms of CO poisoning, and to seek appropriate treatment if you think you have been exposed.

This factsheet explains what CO poisoning is, signs and symptoms, treatment and how to prevent it. Words in **bold** are defined in a glossary at the end.

For quick reference, you can find information on what to do if you suspect CO poisoning, or if your CO alarm sounds, on page 3

What is carbon monoxide and how is it formed?

Carbon monoxide (CO) is a colourless and odourless gas, making its presence difficult to detect. It is formed when common domestic fuels, such as gas, coal, wood and charcoal are burned. Petrol engines can also form CO.

When fuel burns in an enclosed room, oxygen in the air is slowly used up and replaced with carbon dioxide. If carbon dioxide builds up, the fuel can no longer burn fully and begins to release CO instead.

What is carbon monoxide poisoning?

To understand why carbon monoxide (CO) is dangerous and how it can cause brain



injury, it is necessary to know a little bit about how the brain works.

The brain relies on a constant supply of oxygen to survive. Indeed, it uses around 20% of the body's total oxygen intake. Oxygen is needed by the brain to sustain chemical processes that ultimately create energy. If the oxygen supply is interrupted, the functioning of the brain can be disturbed.

Oxygen is delivered to the brain by binding tightly to molecules in the blood called **haemoglobin**. When there is a build-up of CO in the air, the CO is breathed in and binds tightly to the haemoglobin, taking up the space that oxygen would ordinarily rely on to travel to the brain. Further, the binding of CO to haemoglobin is 200 times stronger than the binding of oxygen. The oxygen supply that the brain so heavily relies on therefore gets disrupted, which can cause poisoning, and subsequently an **anoxic brain injury**.

The heart, as well as the brain, are particularly vulnerable to this depleted oxygen supply. Pregnant women and the foetus are also particularly susceptible to the toxic effects of CO.

What are the symptoms and signs of carbon monoxide poisoning?

Symptoms of carbon monoxide poisoning

The symptoms experienced from carbon monoxide (CO) poisoning can vary depending on how long and how intensely you have been exposed to CO. In acute poisoning, exposure to CO has occurred rapidly over a relatively short period of time. The symptoms can be as follows:

- Mild exposure: headaches, nausea, vomiting, a general feeling of unease or discomfort. These symptoms might be misdiagnosed as more common illnesses such as flu or food poisoning. As such, CO poisoning might not even be suspected at this stage.
- Moderate exposure: as exposure to CO continues, symptoms such as dizziness, weakness and unsteadiness may develop. There might be problems with concentration and thinking. Changes in behaviour, drowsiness or confusion may develop. There may be shortness of breath or chest pains.
- Severe exposure: serious deterioration can occur quite quickly, resulting in seizures, coma or even death. Brain structural changes in severe exposure can include **white matter** and **basal ganglia** damage.

Chronic exposure means that exposure to lower levels of CO has persistently occurred over a longer period of time. Symptoms tend to be milder than those in acute poisoning, and can include headaches, nausea, dizziness, light-headedness, fatigue, difficulties in



concentrating, memory problems and changes in mood.

Other signs to look out for

The symptoms listed above can be difficult to distinguish from common ailments. However, if the symptoms are only experienced while in the house, and disappear upon leaving the house, this can be a sign that there is an environmental cause, such as CO poisoning. Another sign is if other people in the house have also started developing symptoms.

You should also be wary of any changes in the colour of flames from a gas hob (they should be blue rather than dull yellow or orange), increased moisture building up on windows or walls, unusual smells in the house and/or flashing or blown-out pilot lights on gas stoves.

What to do if you suspect CO poisoning or if your CO alarm sounds

If you suspect CO poisoning or if your CO alarm sounds, the first things you should do are:

1. Open any windows and doors to increase ventilation
2. Switch off any appliances and shut off the gas supply if easily accessible
3. Leave the house
4. If you are experiencing moderate or severe symptoms, or feel you have been exposed to high levels, **visit your nearest A&E department immediately**. If you are experiencing mild symptoms, or feel you have been exposed to low levels of CO, see your GP immediately. It is important to seek medical support as early as possible in both cases, so that the necessary tests can be done to check for CO poisoning. This might include having a blood, breath or urine test, depending on how much time has passed since the CO exposure.
5. Once you are removed from the CO source (i.e. out of the house), ring the National Gas Emergency Service (available 24 hours) on 0800 111 999.

Do not re-enter the house until any faulty appliances have been properly checked and you have been told by a qualified, registered engineer that it is safe to do so.

Treatment of carbon monoxide poisoning

Initial treatment of exposure to carbon monoxide (CO) involves immediate removal from



the source of poisoning (such as leaving the house), the administration of 100% oxygen (air that we breathe everyday only contains about 20% oxygen), and general supportive care.

Severe cases of CO poisoning are sometimes treated through hyperbaric oxygen therapy. This involves giving pure oxygen at an increased pressure in an enclosed **hyperbaric** chamber. It has been suggested that this may improve neurological outcomes, although it does remain controversial. Hyperbaric oxygen therapy is a specialised technique, which is only available in a few centres around the UK. It may also be associated with complications of its own and it is not used routinely. More information is available on the Hyperbaric Oxygen Treatment Trust's website at www.hyperbaricoxygentherapy.org.uk.

Prevention of carbon monoxide poisoning

Sometimes sustaining a brain injury through carbon monoxide (CO) poisoning is an unavoidable accident. However, there are some things that you can do to prevent the likelihood of CO exposure.

- **Do not** use poorly maintained appliances that burn gas or other fossil fuels
- **Do not** burn charcoal in an enclosed space
- **Do not** operate petrol-powered engines indoors or in enclosed spaces (including garages)
- **Do not** install, convert or service fuel-burning appliances without proper expertise
- **Do not** use gas appliances if they produce yellow flames and deposit soot on walls
- **Do not** use unflued appliances in small closed-up rooms
- **Do not** use gas cookers for heating rooms
- **Do not** sleep in a bedroom with a paraffin heater or an unflued gas fire
- **Do** fit a carbon monoxide alarm that meets British or European Standards. Headway has teamed up with the fire safety equipment supplier Safelincs to sell a range of CO alarms. For more information, visit www.safelincs.co.uk/headway/headway-co-alarms.



- **Do** employ a qualified, reputable and registered engineer for work on all fuel-burning appliances
- **Do** employ a suitably qualified engineer, who is registered with the Gas Safe Register, for work on gas appliances
- **Do** have fuel-burning appliances checked regularly by a qualified engineer
- **Do** make sure chimneys and flues are clean and not blocked
- **Do** make sure that all rooms are well ventilated when an appliance is being used
- **Do** fit an extractor fan in your kitchen

Conclusion

Unlike many other forms of acquired brain injury, carbon monoxide (CO) poisoning can be avoided through appropriate safety precautions and installation of a good CO alarm. Following the advice on this factsheet will help, and it is important to always seek immediate medical help if you or someone you know suspects they have been exposed.

Glossary

Anoxic brain injury - a type of brain injury in which there is a complete deprivation of oxygen to the brain. More information on this is available in the Headway factsheet [Hypoxic brain injury](#).

Basal ganglia - a structure in the brain involved in processing movement

Haemoglobin - molecules in the blood that are responsible for carrying oxygen around the body

Hyperbaric - gas that is at a greater pressure than normal

Hypoxic brain injury - a type of brain injury in which there is a partial deprivation of oxygen to the brain. More information on this is available in the Headway factsheet [Hypoxic brain injury](#).

White matter - area of tissue in the brain that appears white due to comprising fatty insulating layers around nerve cells



Useful organisations

The following websites contain useful information on the issues discussed in this factsheet:

Carbon Monoxide and Gas Safety Society, The

Web: www.co-gassafety.co.uk

Carbon Monoxide Info

Web: www.carbonmonoxideinfo.co.uk

Carbon Monoxide Kills

Web: www.carbonmonoxidekills.com

CO Awareness

Web: www.covictim.org

Gas Safety Register

Web: www.gassaferegister.co.uk

Health and Safety Executive

Web: www.hse.gov.uk/gas/domestic/co.htm

Heating Equipment Testing and Approval Scheme (HETAS)

Web: www.hetas.co.uk

Hyperbaric Oxygen Treatment Trust

Web: www.hyperbaricoxygentherapy.org.uk

NHS Choices

Web: www.nhs.uk/conditions/carbon-monoxide-poisoning

For more information about brain injury and its effects, visit our website at www.headway.org.uk/information-library.

Please tell us how helpful this publication has been by filling in our short survey at www.surveymonkey.co.uk/r/hwpublications.

First published 2010. Last reviewed and updated 2018. Next review 2020.