Headway
the brain injury association

Carbon monoxide poisoning

This publication offers information on carbon monoxide poisoning and how it can cause acquired brain injury. It explains what carbon monoxide is, what carbon monoxide poisoning is, symptoms of carbon monoxide poisoning, what to do if you suspect carbon monoxide poisoning and prevention of carbon monoxide poisoning.

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Introduction

Every year, carbon monoxide (CO) poisoning is responsible for 40 deaths and more than 440 hospital admissions each year in England and Wales alone. 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 to 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.

The information in this publication does not replace clinical guidance from medical professionals. You should always get advice from your GP or other suitably qualified professional for help with managing the effects of brain injury.

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 so dangerous, and how it can cause a brain injury, it is necessary to know a little about how the brain works.

The brain relies on a constant supply of oxygen to survive. In fact, it uses around 20% of the body's total oxygen supply despite only making up 2% of body weight. 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 around 240 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, is particularly vulnerable to this depleted oxygen supply. Pregnant women, children, older people and people with health conditions such as respiratory disease, cardiovascular disease and anaemia are particularly susceptible to the toxic effects of CO.

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 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.

- **Severe exposure**: serious deterioration can occur quickly, resulting in seizures, coma or even death. Brain structural changes in severe exposure can include white matter, hippocampal 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 of acute poisoning and can include headaches, dizziness, nausea, 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 the 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 carbon monoxide poisoning or if your alarm sounds

If you suspect carbon monoxide (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 building

4. Once you are removed from the CO source (i.e. out of the building), ring the National Gas Emergency Service (available 24 hours) on 0800 111 999 or by textphone on 0800 371 787.

5. 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.

If you are experiencing moderate or severe symptoms, or if you feel you have been exposed to high levels, visit your nearest hospital Accident and Emergency department immediately.

If you are experiencing mild symptoms, or you 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.

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), monitoring of CO levels and general supportive care. A neurological examination may also be needed.

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 and research into its effectiveness is limited. Hyperbaric oxygen therapy is a specialised technique, which is only available in a few centres around the UK (mostly located around the coast, London and the Midlands). It may also be associated with complications of its own and it is not used routinely.

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.

Don’ts

- 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 the 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's

- Do fit a carbon monoxide alarm that meets British or European Standards.
- Do employ a qualified, reputable and registered engineer to work on all fuel-burning appliances.
- 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.

Useful organisations

The organisations listed below are provided for information purposes only. Their inclusion does not imply endorsement, recommendation, or approval by Headway. Users should make their own assessment of any organisation or service before engaging with them.

The Carbon Monoxide and Gas Safety Society
Web: www.co-gassafety.co.uk
Email: office@co-gassafety.co.uk

Carbon Monoxide Info
Web: www.carbonmonoxideinfo.co.uk
Email: support@carbonmonoxideinfo.co.uk

Gas Safety Register
Website: www.gassaferegister.co.uk
Tel: 0800 408 5500
Email: enquiries@gassaferegister.co.uk

Health and Safety Executive
Web: www.hse.gov.uk/gas/domestic/co.htm

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

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We hope that this has been a helpful resource. Please consider sharing your feedback with us by scanning the QR code or by visiting our publication feedback survey https://uk.surveymonkey.com/r/hwpublications.

Learn more and support our work at www.headway.org.uk/get-involved.

This information was last reviewed in 2025.

We're here to listen.

If you need support, or have a question about brain injury, contact our free nurse-led helpline:

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