

# Health Council of the Netherlands

## Carbon monoxide

### executive summary



At the request of the ministry of Social Affairs and Employment, the Health Council recommends health-based occupational exposure limits. This report contains an evaluation of the health hazard and recommendation for carbon monoxide. The evaluation was performed by the Dutch Expert Committee on Occupational Safety (DECOS), a permanent committee of the Health Council. Additional information on the task of the committee can be found at [www.healthcouncil.nl](http://www.healthcouncil.nl). The members of the committee are listed on the last page of the advisory report.

#### **Exposure to carbon monoxide**

Carbon monoxide is present in the human body as a result of endogenous physiological processes, but also as a result of exogenous exposure. For exposure to carbon monoxide in the working environment, anthropogenic sources are of particular relevance. These include the incomplete combustion of fossil fuels, wood and other products. People can also be exposed exogenously to intentionally produced carbon monoxide, which is an important industrial gas used in the production of certain chemical intermediates. It is also a reducing agent in the production of inorganic materials, organic chemicals and polymers. Furthermore, various other uses at industrial sites (including calibration of

analysis equipment, metal treatment and pharmaceutical production) can lead to exposure to carbon monoxide.

#### **Adverse health effects**

While carbon monoxide produced in the human body has an important physiological signalling function, external exposure to carbon monoxide can result in a variety of adverse effects. These can be acute effects and modes of action after high exposure, but also long-term effects caused by low levels of carbon monoxide. Acute high exposure leads to hypoxia, but non-hypoxic modes of action have also been identified. The mechanisms of toxicity after low exposure remain unclear. Regarding low exposure levels, the main effects consist of cardiovascular effects (angina pectoris, ST-segment changes, decreased maximum exercise tolerance and increased symptoms of ischaemic heart disease), neurological effects (visual and auditory sensory effects) and various effects on foetal development and offspring.

#### **Health-based recommended occupational exposure limit**

For hazardous substances to which people can be occupationally exposed, the committee determines whether a concentration can be

derived at which no adverse health effects are expected. This health-based recommended occupational exposure limit (HBR-OEL) is the basis for the state secretary to set a legally binding occupational exposure limit.

### Consulted research

For the adverse effects of carbon monoxide, a vast amount of data is available. The committee has therefore used reports published previously by expert groups. Furthermore, a literature search was performed to include the most recent literature in this evaluation. The committee considers cardiovascular effects, neurological effects and (neuro)-developmental effects to be most relevant after exposure to low levels of carbon monoxide. The committee concludes that the studies that reported cardiovascular effects are most suitable for deriving a health-based occupational exposure limit, since quantitative meta-analyses are available concerning low carbon monoxide concentrations in air.



### Recommendation to the state secretary

For occupational exposure to carbon monoxide, the committee recommends a health-based occupational exposure limit for carbon monoxide of 7.5 mg per m<sup>3</sup> air (6.4 ppm – parts per million), which represents a mean concentration during an 8-hour working day. The advised limit of 7.5 mg/m<sup>3</sup> (6.4 ppm) is three times lower than the current applied limit of 23 mg/m<sup>3</sup> (20 ppm).

As the committee has not identified literature suitable for derivation of a recommended OEL for short term exposure, the committee cannot recommend a STEL (Short Term Exposure Limit) or ceiling value.

This publication can be downloaded from [www.healthcouncil.nl](http://www.healthcouncil.nl).

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