HEALTH AND SOCIAL CARE COMMITTEE - Prevention Inquiry

Call for Proposals – February 2023

The CO Research Trust – Carbon Monoxide, Pregnancy and the Unborn Child

Carbon Monoxide (CO) is a colourless, tasteless, odourless, non-irritating gas produced as a by-product during incomplete combustion of fuels due to there being insufficient oxygen present.

According to the Cross Government Group on Gas Safety and Carbon Monoxide (*Annual Report 2020-21*), there are approximately 20 deaths per year from CO exposure. It is generally accepted that this is an underestimate due to difficulties in diagnosis and may be the tip of the iceberg. It is thought that many people are being exposed at lower levels, which has a detrimental effect on their health, especially amongst vulnerable and at-risk groups including pregnant women and unborn children.

A recent project funded by the CO Research Trust, entitled *Identifying and Protecting Women from CO Exposure,* found that there is a significant public health concern relating to the lack of awareness around the exposure of unborn children to CO. Evidence is accumulating of high domestic CO levels, with UK homes at levels above those recommended as safe (*Croxford et al. 2008*). Other studies have also indicated that, compared with fire alarms, CO alarms are rarely installed in owner occupied homes and despite changes to legislation it is currently unknown whether the private rented sector is complying.

The foetus *in utero* is extremely vulnerable to CO exposure (*Aubard & Magne 2000*). Chronic exposure can cause disproportionate harm to the foetus, placing them at greater risk of damage than the mother. This is because foetal blood takes up CO more avidly than that of the mother's, resulting in a longer exposure time of CO for the foetus. Data suggests that the peak exposure levels in the foetus are higher than

the mother and falling more slowly once the mother is no longer exposed. Studies show that foetal death and death in the first month of life, along with congenital malformations and neurological problems, can occur with moderate to severe maternal exposure to CO (*Aubard & Magne, 2000; Kosaki et al., 2020; Cramer, 1982; Yildiz et al., 2010; Koren et al., 1991*). Studies also conclude that such outcomes cannot be excluded even when exposure is at lower levels (*Caravati et al., 1988; Kreshak et al., 2022; Kopelman & Plaut, 1998*).

The research project "*Identifying and Protecting Women from CO Exposure"* funded by CORT found that multiple factors put unborn children at risk, including a lack of awareness amongst pregnant women and midwifery staff as well as high-risk pregnancies. It also found that midwifery staff often do not have the knowledge or resources to identify possible CO poisoning in the home. Most importantly maternity staff are also not routinely offered training that enables them to have honest conversations about the potential sources of CO or how to help women protect themselves, despite taking exhaled CO breath readings at booking.

Although there is a general understanding of the increased risk of CO exposure to babies *in utero*, lack of awareness is widespread. There is no protocol for the identification of pregnant women who have been exposed to CO and here a defined treatment pathway for them. Symptoms of CO poisoning can be non-specific, including headache, fatigue, nausea, and vomiting – all symptoms that may be mistaken for the signs of pregnancy, making them easy to miss.

Difficulties in the diagnosis of CO poisoning are also a significant concern. Even if CO exposure is suspected, levels are likely to have dropped upon arrival at an antenatal appointment - making detection very difficult.

Research published in January 2023 (*Jarman et al. 2023*) has suggested that diagnosis is difficult in anyone. Treatment of CO exposure has changed over the

years, with acutely exposed pregnant women being recommended treatment with Hyperbaric Oxygen Therapy (HBOT) as recently as 2014, as the speed at which HBOT removed CO from the body was considered important for the outcome of the baby. However, NHS England ruled out the use HBOT for the treatment of CO exposure in 2018. Therefore the only treatment available for CO for anyone, including pregnant women, is high flow oxygen.

In another recent paper, (*Angelova PR et al*, 2023) it is suggested that the use of oxygen as a treatment for CO exposure may have an unintended consequence of causing additional neural damage. Given that this is the only approved therapeutic treatment for patients diagnosed with CO exposure this highlights the fact that not only do we not have the best tools for diagnosis, but questions remain around appropriate treatment.

Given the challenges around diagnosis and treatment, as well as lack of awareness, guidance, pathways, and education, for healthcare professionals, it would be timely for the Committee to look at what the Government can do to remedy these shortcomings and help to prevent this avoidable poison.

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