



### H133 Maternal Death by Fire and Fetal Carboxyhemoglobin Levels

*Nicole D. Lee, MS\*, Western Michigan University, Kalamazoo, MI 49007; Theodore T. Brown, MD, Kalamazoo, MI 49008*

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**Learning Overview:** After attending this presentation, attendees will understand: (1) the physiology of acute carbon monoxide exposure and carboxyhemoglobin levels, (2) the existing research from animal models and limited case studies on maternal carboxyhemoglobin levels and concurrent fetal levels, (3) how paired maternal and fetal carboxyhemoglobin levels vary based on the type of carbon monoxide exposure, and (4) how the findings from the present case fit into prior findings.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by providing attendees with a better understanding of the significance of carboxyhemoglobin levels in mothers and fetuses in the setting of both acute and chronic carbon monoxide exposure.

The effect of maternal carbon monoxide exposure on fetuses is an underreported topic. The relationship between maternal carboxyhemoglobin levels and fetal carboxyhemoglobin levels has yet to be fully explained, especially in cases of acute, non-smoking-related exposures. Data from animal model experiments on rabbits and ewes demonstrated a lag in rising fetal carboxyhemoglobin levels after acutely exposing the mother to carbon monoxide. Eventually, over several hours, the fetal levels exceed the mother's and reached equilibrium approximately 10% higher. A search of previously published studies on humans only revealed seven paired reports of maternal and fetal carboxyhemoglobin. Presented here is a pregnant female involved in a residential fire where carboxyhemoglobin levels were tested in both the mother and fetus.

An 8-month pregnant, 35-year-old woman died in a house fire caused by an overloaded extension cord. Postmortem examination documented extensive fire-related changes, which included singed hair, diffuse charring of the skin, skin splits, and soot deposition of the airways. The skin splits were predominantly on the forehead, left temple, perioral region, chin, upper chest, bilateral upper extremities, and lower abdomen. There was dense soot in the nares, oral cavity, and trachea, and scant soot in the bilateral mainstem bronchi and proximal esophagus. The muscles, body cavities, and organs had a bright red-pink discoloration. The decedent's carboxyhemoglobin level was elevated at 51.3%. Her cause of death was inhalation of products of combustion and thermal injuries. The fetus had neither trauma nor malformations. Fetal heart carboxyhemoglobin level was 4.9%.

The research on what fetal carboxyhemoglobin levels occur at certain maternal carboxyhemoglobin levels is unclear. While there are some studies on chronic maternal exposure to carbon monoxide (mostly through smoking) and paired fetal and maternal carboxyhemoglobin levels, there are very few case studies available regarding acute carbon monoxide toxicity and concurrent maternal and fetal carboxyhemoglobin levels. The levels found in this case provide insight into this relationship by corroborating previous findings that demonstrated a lag between acute and severe maternal exposure and a corresponding rise in fetal levels.

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#### Carboxyhemoglobin, Pregnant, Fire