

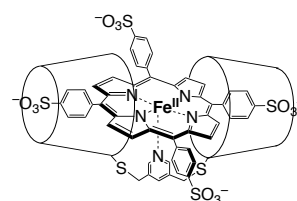
## Removal and quantification of biological CO in mammals using a synthetic heme protein model compound.

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**Keywords:** Carbon monoxide; hemoprotein; *in vivo*; CO receptor

Carbon monoxide (CO) is known as a toxic and biologically active gas. CO shows high toxicity because of CO strongly binds to hemoglobin and disperses in organs when inhaled in high amounts. The blood carboxyhemoglobin (CO-Hb) level has been established using oximeters. However, it's still a challenge to detect and quantify of CO in organs and tissues.

In this study, we established a simple spectrophotometric method for CO detection and quantification using hemoCD, a synthetic heme protein model compound composed of an iron(II)porphyrin and a cyclodextrin dimer (Figure 1)<sup>1</sup>. First, we quantified the amount of CO in rat tissues under normal condition and after inhaling CO gas in a time variation. During 20 min inhalation of rat to CO gas, CO-Hb is linearly increased, however, the amount of CO in organs didn't show significant increase compared to the results after 5 min of inhalation. The kinetic studies on CO-Hb and bio-distribution of CO in tissues after CO gas inhalation suggest a protective effect of circulating Hb in CO intoxication. Second, we followed the decrease of amount of CO in rat organs after ventilation with air and 100% oxygen after exposure to CO gas using hemoCD. Finally, we used the hemoCD as a CO removal agent after exposure of rat to CO gas 80 min. The accumulation of CO in rat tissues include brain were efficiently removed in the rats treated with hemoCD during oxygen ventilation (Figure 2).



$$K_d(\text{O}_2) = 17 \mu\text{M}, K_d(\text{CO}) = 0.02 \text{ nM}$$

Figure 1. Structure of a CO-scavenging agent, hemoCD.

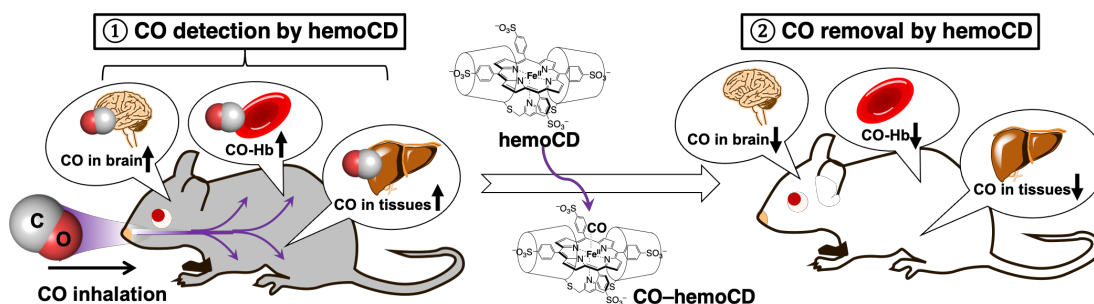


Figure 2. HemoCD used for CO detection and removal *in vivo* after inhalation of CO gas to rats.

1) Q. Mao, A. T. Kawaguchi, S. Mizobata, R. Motterlini, R. Foresti, H. Kitagishi, *bioRxiv*, DOI: <https://doi.org/10.1101/2020.10.12.336735>.