Supramolecular Porphyrin-Cyclodextrin Complexes as a Potential Antidote for Fire Gas Poisoning

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Hemoglobin (Hb) is the most abundant heme protein contained in the blood of mammals. Molecular oxygen (O_2) binds to iron(II) heme in the globin protein that protects the heme iron(II) from irreversible oxidation to iron(III) heme (hemin) in the biological aqueous media. To realize the synthetic model compound of Hb, our group has been focusing on the iron(II)porphyrin/per-*O*-methylated β-cyclodextrin supramolecular system in aqueous solution.[1] We have intensively studied the synthesis and biomedical application of the Hb model compounds *in vivo*.

Carbon monoxide (CO) binds to Hb more strongly than O_2 in blood, thus resulting in CO poisoning. Our Hb model compound, **hemoCD-P**, which is composed of 5,10,15,20-tetrakis(4-sulfonatophenyl)porphinatoiron(II) and per-*O*-methylated β-cyclodextrin dimer linked by a pyridine ligand, captures CO from CO-Hb during circulation in the blood of animals. Once injected, **hemoCD-P** removes CO in the animal body and is excreted in the urine within one hour. Therefore, **hemoCD-P** can be potentially used as an injectable CO antidote. Another derivative (**hemoCD-I**) having an imidazole ligand is also used for capturing cyanide in the animals. The mixture of **hemoCD-P** and **hemoCD-I**, which is named as **hemoCD-Twins**, is the potential antidote for fire gas poisoning that contains CO and HCN as highly toxic gaseous components (**Fig. 1**).

In this presentation, I would like to show the basic concept of our Hb model compound and recent progress of the compound for the biomedical use.[1-3]

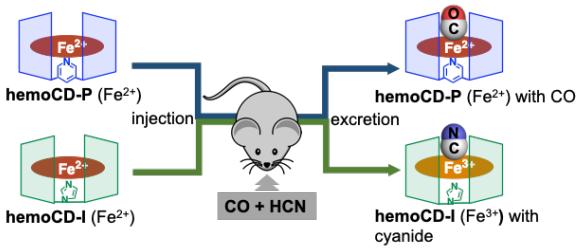

Fig. 1. hemoCD-Twins as an antidote system for fire gas poisoning.

References

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