

# Development of Photoactivatable Carbon Monoxide-Releasing Molecules (photoCORMs)

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Carbon monoxide (CO) is a colorless and odorless gas, which is considered to be a “silent killer” because of its strong affinity for hemoglobin over molecular oxygen.<sup>1</sup> However, despite its toxicity, CO is increasingly appreciated as a potential therapeutic agent, thanks to its anti-inflammatory, anti-microbial, anti-cancer, and other therapeutic effects at low concentration.<sup>2</sup> When directly inhaled, CO rapidly reacts with hemoglobin, which forms carboxylhemoglobin, and thus inhibiting the oxygen transport by red blood cells, and subsequently leads to tissue hypoxia. Hence, the control of the concentration of CO released in biological systems is of great significance.

To date, numerous carbon monoxide-releasing molecules (CORMs) based on metal complexes or organic compounds have been developed;<sup>3</sup> however, their medical applications are still challenged by the capacity to effectively deliver and liberate CO in a biological system. Hence, the development of metal-free CORMs is a promising alternative strategy for intracellular CO delivery. The light-triggered CO release as one of the most promising ways provides a precise temporal and spatial control of this process. The light-triggered CO releasing molecule is then called photoCORM and can be used as a prodrug when it is stable in the dark.

This presentation includes two parts. The first part, we studied the photophysical and photochemical properties of coumarin-3-carboxylic acid. Meanwhile, the mechanism of CO release was investigated by using HPLC, HRMS, and spectroscopy techniques. The second part was designed based on the study of flavonol and cyanines<sup>4</sup> from our group in very recent years. Fusing those two chromophores can lead to a novel CO-releasable hybrid system that could serve as a general strategy for designing new classes of photoCORMs. The major target of this project is to develop better water solubility photoCORMs. The comprehensive mechanistic studies of these two projects will be presented in detail in the presentation.

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