Structural and Functional Consequences of Methane Monooxygenase

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Soluble methane monooxygenase (sMMO) in methanotropic bacteria converts methane to methanol. The mechanistic elucidation of this enzyme is a critical factor for its application in the fields of bioenergy and bioremediation. The sMMO consists of a hydroxylase (MMOH, 251 kDa), a regulatory (MMOB, 15.9 kDa), and a reductase (MMOR, 38.6 kDa) component. MMOB is essential for catalytic activity in the MMOH which houses the diiron active sites. The detailed mechanism, unfortunately, has remained ambiguous due to the lack of atomic-level information. We recently reported the crystal structure of the MMOH-MMOB complex and this makes clear how methane is converted to methanol in the sMMO system. Two MMOB units bind to MMOH and cause crucial conformational changes. The MMOH-MMOB complex provides an elegant model of how a large enzyme complex precisely controls its chemistry. This presentation will explain how four substrates including methane, oxygen, electrons, and protons are controlled by MMOB.