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Title: "*Methane oxidation by an integral membrane metalloenzyme*"

Abstract:

Methanotrophic bacteria utilize methane as their sole source of carbon and energy. The first step in their metabolic pathway is the oxidation of methane to methanol by methane monooxygenase (MMO) enzyme systems. Understanding how MMOs hydroxylate methane at ambient temperature and pressure is of fundamental chemical and potential commercial importance. There are two types of MMO systems, a soluble cytoplasmic complex (sMMO) and a membrane-bound particulate system (pMMO). All methanotrophs produce pMMO, and several strains also produce sMMO under copper-limiting conditions. The crystal structure of the sMMO hydroxylase, which contains a carboxylate-bridged diiron center, has been known for more than a decade. By contrast, the metal content, organization, and location of the active site in pMMO have been and continue to be controversial. We have characterized pMMO from multiple methanotrophs by spectroscopic, crystallographic, and biochemical methods. Our data reveal the composition, location, and potential functional relevance of up to three distinct metal centers. The current state of knowledge regarding the active site will be discussed.