

## MS06 Structural Enzymology

MS6-05

Multimetal Methyltransferase Making Methanogenesis

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### Abstract

B12-dependent radical SAM enzymes are one of the largest groups of radical SAM enzymes with more than 200,000 members. This family of metalloenzymes are unique in their ability to form carbon-carbon bonds between unactivated sp<sup>3</sup>-hybridized carbons. Using biochemical and biophysical techniques including X-ray crystallography and electron paramagnetic resonance we have investigated methanogenesis marker protein 10 (Mmp10). Mmp10 has been shown to perform a post-translational methylation of an arginine within the active site of methyl-coenzyme M reductase. This is one of many post-translational modifications that are profoundly important for the methane production by microbes using methyl-coenzyme M reductase. Our crystallographic snapshots of Mmp10 reveal unique features including four distinct metal centres and a tyrosine that can coordinate the radical SAM clusters fourth iron allowing it to switch between radical and nucleophilic chemistry. The various snapshots we obtain have shown not only how this enzyme binds its protein substrate but also how it can utilise SAM in multiple ways to methylate its substrate<sup>1</sup>.

### References

<sup>1</sup> Fyfe CD, Bernardo-García N, Fradale L, Grimaldi S, Guillot A, Brewee C, Chavas LMG, Legrand P, Benjdia A, Berteau O. - 2022 - Crystallographic snapshots of a B12-dependent radical SAM methyltransferase. *Nature* (7896):336-342.

Mmp10 with its substrate and four metal centres

