

Methyl-coenzyme M reductase (MCR) catalyzes the reversible reduction of methyl-coenzyme M (CH<sub>3</sub>-S-CoM) and coenzyme B (HS-CoB) to methane and heterodisulfide CoM-S-S-CoB (HDS). MCR contains the hdroporphinoid nickel complex coenzyme F430 in its active site and the Ni center has to be in its Ni(I) valence state for the enzyme to be active. Until now, no in vitro method has been described that fully converted the inactive MCRsilent-Ni(II) form to the active MCRred1-Ni(I) form.

With the potential use of recombinant MCR in the production of biofuels and the need to better understand this enzyme and its activation process, we studied its activation under non-turn over condition and achieved full MCR activation in the presence of protein components A2, an ATP carrier, and A3a. It was found that the presence of HDS promotes the inactivation of MCRred1, which makes it essential that the activation process is isolated from the methane formation assay which tends to result in minimal activation rates. Component A3a is a multi-enzyme complex that includes the mcrC gene product, an Fe-protein homolog, iron-sulfur flavoprotein, and protein components involved in electron bifurcation. A hypothetical model for the cellular activation process of MCR will be presented.

The next step is to test this model by using selected recombinant proteins that are expected to be essential for the activation of MCR. The progress on this project will be presented.