Reductase activity of outer membrane c-type cytochromes in Shewanella oneidensis

Topic: Anaerobic metabolism

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Dissimilatory iron reduction (DIR) is a respiratory process in which microorganism couple the reduction of metals to energy production. This process widely shaped the bio- and geosphere on our planet (Nealson, *et al* 2002). A better understanding of DIR is crucial for applications in biotechnology like remediation of contaminated soils or current production in microbial fuel cells. An important model organism to investigate DIR is the γ-proteobacterium *Shewanella oneidensis* which has to use an extended respiratory pathway to transport electrons through the periplasmic space to insoluble crystalline Fe(III)-oxides. C-type cytochromes are thought to mediate the electron transfer to the transition metal. Genome analysis revealed five genes for outer membrane c-type cytochromes, three of those have an unknown function so far.

We wanted to investigate the specificity of all five putative outer membrane cytochromes towards metallic electron acceptors. Therefore we constructed a mutant with an in-frame-deletion of genes *mtrD-omcB* and inserted an inducible promotor in front of the known key players *mtrA* and *mtrB.* Genes for membrane cytochromes were cloned into pBad202-vector and transformed into the mutant. After characterizing protein expression, we measured reduction rates of cell suspensions with different metal-oxides. To further investigate the functionality of the proteins, we measured the ability to generate electricity in a microbial fuel cell. The results so far point towards different reduction abilities of the cytochromes for reducing soluble and insoluble iron forms.

Nealson, K.H. *et al* (2002) *Antonie van Leeuwenhoek* 81, 215-22.