INFLUENCE OF METAL CATIONS ON THE TURNOVER RATE OF CELLOBIOSE DEHYDROGENASE

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Cellobiose dehydrogenase (EC 1.1.99.18) is an extracellular fungal redox enzyme, which has recently shown promising properties for applications in both biosensors and biofuel cells [1]. It is a two domain enzyme composed of a catalytic FAD containing domain connected through a polypeptide linker region with a cytochrome b domain. In the catalytic reaction, the substrate is oxidised at the FAD domain, which in turn is reoxidised through an intramolecular and sequential electron transfer process donating the electrons to the cytochrome b domain, from which the electrons can be donated directly to an electrode. The mechanism with which the electrons are transferred between the two domains is unknown and very pH dependent. However, it is believed that the surface exposed heme of the cytochrome b domain enters the substrate channel of the FAD domain allowing the electrons to be transferred between the two domains.

We have now found that when increasing the concentration of metal cations the rate of the intramolecular electron transfer reaction of CDH can be increased substantially up to 8 times. The increase was higher with divalent metal cations compared to monovalent metal cations but was also dependent on the type of cation. Enzyme activity assays in solution revealed similar results. These findings are of interest both for a deeper understanding of the electron transfer pathway in the enzyme and a way how to increase the bioelectrocatalytic current density when the enzyme is used in the direct electron transfer mode on an electrode. Recent results and a proposed mechanism to explain the observed effect will be shown and discussed.

Reference