

Aerobic and anaerobic life on carbon monoxide

Holger Dobbek¹, Vitali Svetlitchnyi², Lothar Gremer², Ortwin Meyer² and Robert Huber³.

¹Laboratory for Protein Crystallography, University of Bayreuth, Germany; ²Department of Microbiology, University of Bayreuth, Germany and ³Department for Structural Research, Max-Planck-Institute for Biochemistry, Germany

Despite its toxicity CO can be used by several bacteria and archaea as a chemolithotrophic growth substrate, providing these microorganisms with energy and a carbon source [1]. CO dehydrogenases are the key enzymes in this process and catalyse the formal reaction:



The crystal structures of CO dehydrogenases from aerobic and anaerobic bacteria revealed unique active site architectures containing Cu, Mo, Fe, S and Ni [2-6]. The enzyme of the aerobic bacterium *Oligotropha carboxidovorans* revealed a binuclear active site in which Mo and Cu are bridged by sulfido-ligand [3]. The anaerobic bacterium *Carboxydotherrmus hydrogenoformans* employs for the same reaction an unrelated enzyme with an active site containing a [Ni-4Fe-5S] cluster [4]. Insight into the catalytic CO oxidation at these metal clusters has been gained by structural studies of different active and inhibited states of the enzymes [3-6].

Acetyl-CoA synthase (ACS) catalyses the synthesis of acetyl-CoA from CO, originating either from the environment or from the reduction of CO₂ by a CO dehydrogenase, a methyl group, transferred by the corrinoid/iron-sulfur protein, and CoA. The active site of the monomeric enzyme from *C. hydrogenoformans* contains a Ni-Ni-[4Fe-4S] cluster [6].

Recent insights into structural details of the two reactions will be presented.

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