Liposome model to demonstrate electron exchange between metal-reducing bacteria and Fe(III) oxides

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S. Oneidensis respire in the absence of oxygen using metal oxides, external to the cell, as terminal electron acceptors. This involves electron transfer across the bacterial cell envelope to the surface of minerals such as Fe(III) oxides. Genetic knockout studies have identified a suite of proteins associated with electron transport through the outer membrane [1]. This includes the MtrABC complex. Studies of MtrABC led to the putative model for Porin-Cytochrome Electron Transport (PCET) shown in Fig. 1 below [2].

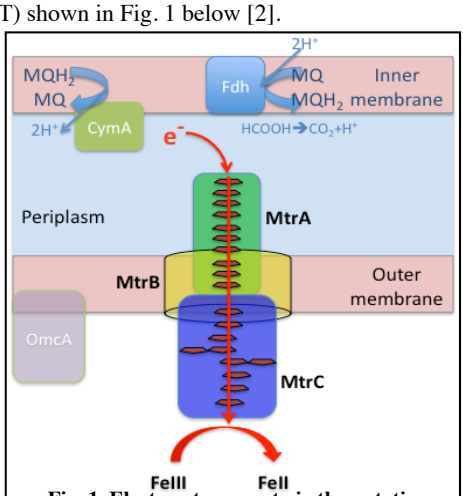

Fig. 1. Electron transport via the putative PCET system, MtrABC from *S. Oneidensis*

In this model the decaheme cytochromes MtrA and MtrC meet inside the transmembrane sheath, MtrB. The 20 hemes are closely aligned allowing electrons to flow through the MtrAC "wire". To test this model, we have inserted MtrABC into liposomes containing a hydrophyllic electron source, reduced methyl viologen, that also acts as a redox indicator. We describe the development of this technique and demonstrate that conduction through MtrABC directly to Fe(III) oxide minerals is sufficient to support *in-vivo*, anaerobic, solid-phase iron respiration [3].

[1] Myers *et al* (2002) *App. Env. Microbiol.* **68**, 2781-2793. [2] Hartshorne *et al* (2009) *PNAS*. **106**, 22169-22174. [3] White *et al* (2013) *PNAS* **110,** 6346-6351