Electrochemical investigation of bacterial Fe(III) reduction.

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In the absence of oxygen, some micro-organisms can respire Fe(III) in the form of insoluble iron oxides but the mechanisms by which they access these oxides remain enigmatic. It is generally assumed that direct contact of the micro-organisms with the oxide surface is required. This may hold in many cases, but an alternative strategy is to solubilize Fe(III) using organic ligands. Recent voltammetric studies in natural suboxic or anoxic sediments have yielded electrochemical signals that were tentatively attributed to the presence of organically-complexed Fe(III) [1, 2]. Here, we report similar observations in sedimentary environments ranging from a tropical lake to the Arctic continental shelf, demonstrating the ubiquity of this phenomenon. Similar signals were also obtained during *in-vitro* Fe(III) reduction with indigenous sedimentary bacteria as well as a laboratory culture of *Shewanella putrefaciens* 200R. In all cases, these voltammetric signals were generated only when dissolved Fe(II) was present. Although these results strongly suggest that Fe(III)-reducing micro-organisms produce organically-complexed Fe(III) in sediments, the physical and chemical processes that contribute to this voltammetric signal have not been thoroughly evaluated. Studies are underway to further elucidate the processes that generate this signal. Preliminary results in the absence of organic ligands suggest that it may also arise from electrochemically active colloidal Fe(III)-species, as previously observed [3].

References

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