Electron exchange between microorganisms and conductive minerals

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Some microorganisms can acquire energy through up-taking (or injecting) electrons from (or to) iron minerals. Our group has demonstrated the novel way of microbial energy metabolism, in which conductive minerals work as electric wires between two microorganisms. Firstly, we investigated the electron exchange via conductive minerals within a model microbial consortium consisting of *Geobacter* and *Thiobacillus*, and demonstrated that nanoparticles of electrically conductive magnetite (Fe_3O_4) facilitate electron exchange between them [1]. Also we found that the magnetite-dependent electron exchange facilitates symbiotic methanogenesis from organic compounds [2]. Our results suggest that microorganisms use nanoparticles of conductive minerals as electric wires, resulting in efficient electron exchange and cooperative catabolism. Given that conductive minerals are ubiquitously and abundantly present in nature, electric interactions between microorganisms and conductive minerals may contribute greatly to diverse biogeochemical reactions.

[1] Kato *et al* (2012) *Proc. Natl. Acad. Sci. U. S. A.* **109**, 10042-10046 [2] Kato *et al* (2012) *Environ. Microbiol.* **14**, 1646-1654