

## **Identification and Characterization of Pcc Extracellular Electron Transfer pathways of *Geobacter sulfurreducens***

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Redox active minerals, such as those of Fe(II) and/or Fe(III), play critical roles in supporting microbial metabolisms in soil and subsurface environment. Key to this type of microbe-mineral interactions is microbial ability to exchange electrons with the minerals. To exchange electrons with the minerals external to microbial cells, microorganisms usually form pathways that physically connect their intercellular metabolisms with extracellular redox transformation of minerals. Recently, the porin-cytochrome(Pcc) pathways were identified in *Geobacter sulfurreducens* for extracellular reduction of Fe(III)-bearing minerals. To date, the proposed pathways include the putative cytochromes and quinol oxidases of CbcL and ImcH in the cytoplasmic membrane, the periplasmic cytochrome PpcA, porin-like outer-membrane proteins OmbB and OmbC and the outer-membrane cytochromes OmaB, OmaC, OmcB and OmcC. It is suggested that CbcL and ImcH oxidize quinol in the cytoplasmic membrane and transfer released electrons to PpcA. PpcA then relays the electrons to OmaB and OmaC. Previous results confirmed that OmaB, OmaC, OmbB, OmbC, OmcB and OmcC formed the trans-outer-membrane Pcc complexes that transferred electrons across the outer membrane. Currently, protein purification and characterization of other components of the proposed Pcc pathways are underway for systematic investigation of this type of newly discovered microbial extracellular pathways at molecular level.