A novel selenite-reducing system in the dissimilatory metal-reducing bacterium *Geobacter sulfurreducens*

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Geobacter sulfurreducens is an obligate anaerobic gram-negative bacterium, which grows by respiratory reduction of various metal (hydr)oxide compounds. The *G. sulfurreducens* genome contains 111 ORFs coding for *c*-type cytochromes and 10 ORFs for selenoproteins. Previously, we identified a novel mutiheme-containing selenoprotein (MHSEP), which carries five hemes and one selenocysteine residue per subunit, in *G. sulfurreducens*. MHSEP is encoded by the *extKL* gene located within an operon-like gene cluster containing 10 genes (*extHIJKLMNOPQS*), which code for a rhodanese-like protein (*extH*), a porin-like protein (*extI*), a hypothetical protein (*extJ*), *c*-type cytochromes (*extM, extN,* and *extS*), an iron-sulfur protein (*extO*), a *b*-type cytochrome (*extP*), and a membrane protein (*extQ*). However, little is known about the function of those genes/proteins. In this study, we investigated the function of MHSEP and other related proteins by biochemical and genetic analyses.

Phenotype analysis of gene-disrupted mutant strains showed that *extKL* and *extI* were important for the reduction of selenite and tellurite in *G. sulfurreducens*. MHSEP was recombinantly produced in a *G. sulfurreducens extKL*-disrupted strain, purified to homogeneity, and characterized. We found that purified MHSEP exhibited a selenite-reducing activity *in vitro*, suggesting that it is a novel-type of selenite reductase. In addition, our data suggested that ExtI may serve as a selenite/tellurite channel porin or as a membrane anchor protein for selenite/tellurite-reducing enzymes [1]. Furthermore, ExtH was characterized to exhibit a rhodanese activity, though it has only a slight sequence identity with ubiquitous rhodaneses. These results suggest that MHSEP, ExtI, and ExtH may play a role in selenite/tellurite reduction in *G. sulfurreducens*.

[1] Jahan, Tobe & Mihara (2018) *Int. J. Mol. Sci.* **19**, 809.