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The role of multiheme c-type cytochromes in *Shewanella* sp. ANA-3 with respect to iron (III) reduction

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Fe(III) reducing and As(V) respiring prokaryotes contribute to arsenic mobilization in aquifers contaminated with arsenic, specifically in places such as Bangladesh. Under oxic conditions As(V) predominates and is often adsorbed onto mineral surfaces such as amorphous iron oxide (hydrous ferric oxide, HFO). However, under anoxic conditions prokaryotes can respire As(V) by reducing it to As(III), which becomes the predominant form of arsenic. As(III) sorbs to fewer minerals and has a greater hydrologic mobility compared to As(V). Microbial mobilization of arsenic from subsurface material most likely involves a combination of respiratory processes specific to iron reduction and arsenate respiration. Arsenic reduction and mobilization from subsurface material most likely involves a combination of metabolic pathways encoded in clusters such as *mtr/omc* and *arr*. The *mtr/omc* gene cluster encodes a number of c-type cytochromes important for iron reduction and the *arr* gene cluster encodes an arsenate respiratory reductase. The mechanism of iron reduction is not completely elucidated. We are currently exploring the molecular genetics underlying Fe and As geochemistry using a model Fe(III) and As(V) respiring bacterium, *Shewanella* sp. ANA-3. Specifically, we are investigating the role of c-type cytochromes encoded by the *mtr/omc* gene cluster with respect to iron reduction. Strains carrying multiple gene deletions were more severely impaired in iron reduction abilities than single gene deletions, although not completely eliminated. An ANA-3 strain carrying a complete deletion in the *mtr/omc* gene cluster was still capable of reducing iron oxide to Fe(II). These results suggest additional pathways or other cytochromes are involved in iron reduction. Work is currently underway to identify addition genes essential to iron reduction.

Future work will be to generate combinations of iron and arsenate reducing mutants in order to investigate the contribution of iron and/or arsenate reduction to arsenic mobilization. This work addresses the importance of metal reducing prokaryotes as a major risk factor for human exposure to arsenic in contaminated drinking water.