

Public Abstract

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Ph.D.

Molecular Microbiology and Immunology

Energy Metabolism and Uranium (VI) Reduction by *Desulfovibrio*

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Sulfate reducing bacteria (SRB) of the genus *Desulfovibrio* can breathe uranium in a manner similar to the way in which we (human beings) breathe oxygen. In respiration, we transfer electrons from food to oxygen, producing water, SRB transfer electrons to uranium (VI) to uranium (IV). (This transfer of electrons is also called reduction.) The reduction of U(VI) to U(IV) alters the solubility state of the uranium from a soluble to an insoluble, and therefore less biologically available, form. Because SRB are commonly found in uranium contaminated groundwater and soil, it is theoretically possible that we could use them to bioremediate uranium contaminated environments. However, before we attempt to use SRB to bioremediate uranium contaminated environments, we must first understand the SRB genes and enzymes involved in the process of uranium reduction. We have determined that the enzyme cytochrome c_3 can act as a U(VI) reductase by *Desulfovibrio* when hydrogen gas is the energy source; however, alternate pathways utilizing organic compounds for U(VI) reduction exist. In addition, we have observed that *Desulfovibrio* that have been previously exposed to uranium (such as those bacteria that would be found in a uranium contaminated environment) are impaired in utilizing some organic compounds, but not hydrogen gas, as an energy source for uranium (VI) reduction. This suggests that in order for us to use SRB to treat uranium contaminated environments, it would be more efficient to add hydrogen gas, not organic compounds, as an energy source for the SRB.

Advisor Signature: