Competitive Reduction of U(VI) and Fe(III) by Iron Reducing Bacteria. (S03-revill171101-Oral)

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Abstract:

A considerable body of research has been conducted to understand bacterial reduction of metal contaminants on an individual basis. However, utilization of metals when multiple metabolic substrates are available has received little attention. To better understand these processes, the reduction of U(VI) in the presence of Fe(III) was investigated - Shewanella alga strain BrY and Shewanella putrefaciens strain CN32 were used as model metal reducing organisms. Both BrY and CN32 reduced U(VI) and Fe(III) simultaneously throughout the course of a 400 h reaction, despite energy yield considerations that predict uranium to be the more energetically favorable electron acceptor. Extensive EPS production and biofilm development appear to limit substrate availability spatially within the biofilm. Kinetic models suggest that respiration on Fe(III) is diffusion limited while respiration on uranyl is not. These findings reveal that in addition to thermodynamic and kinetic considerations, biofilm formation and the associated chemical gradients can limit substrate availability and impact microbially driven contaminant reduction in surface environments.

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