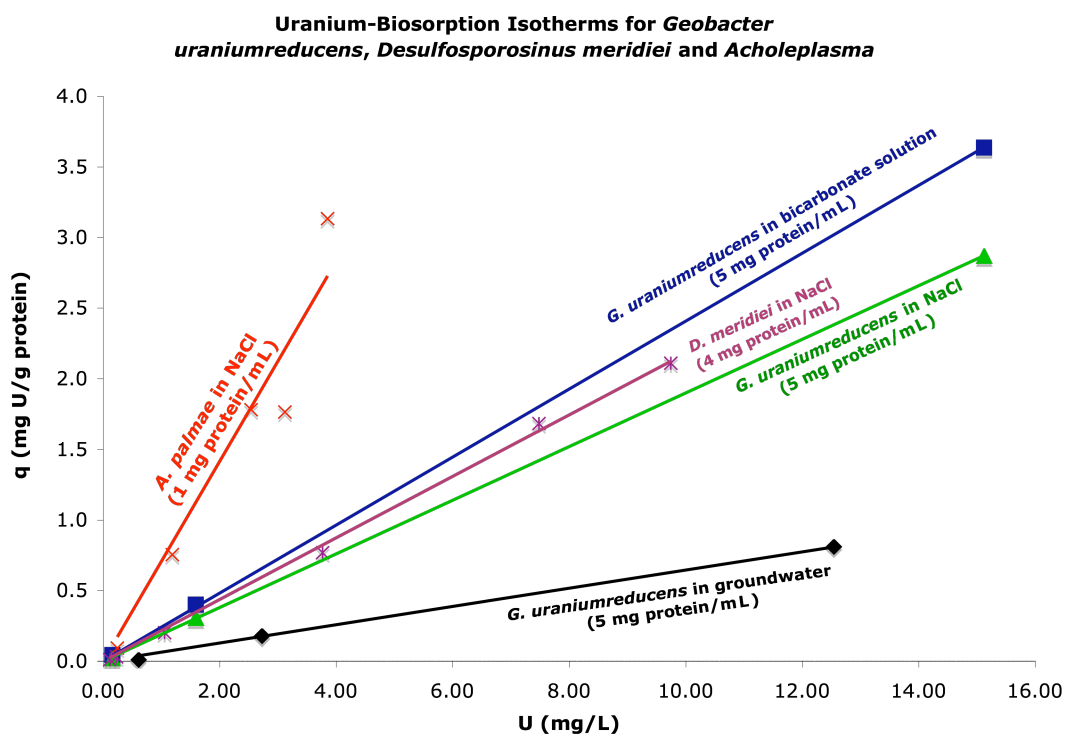


Role of U(VI) adsorption in U(VI) Reduction by *Geobacter* species

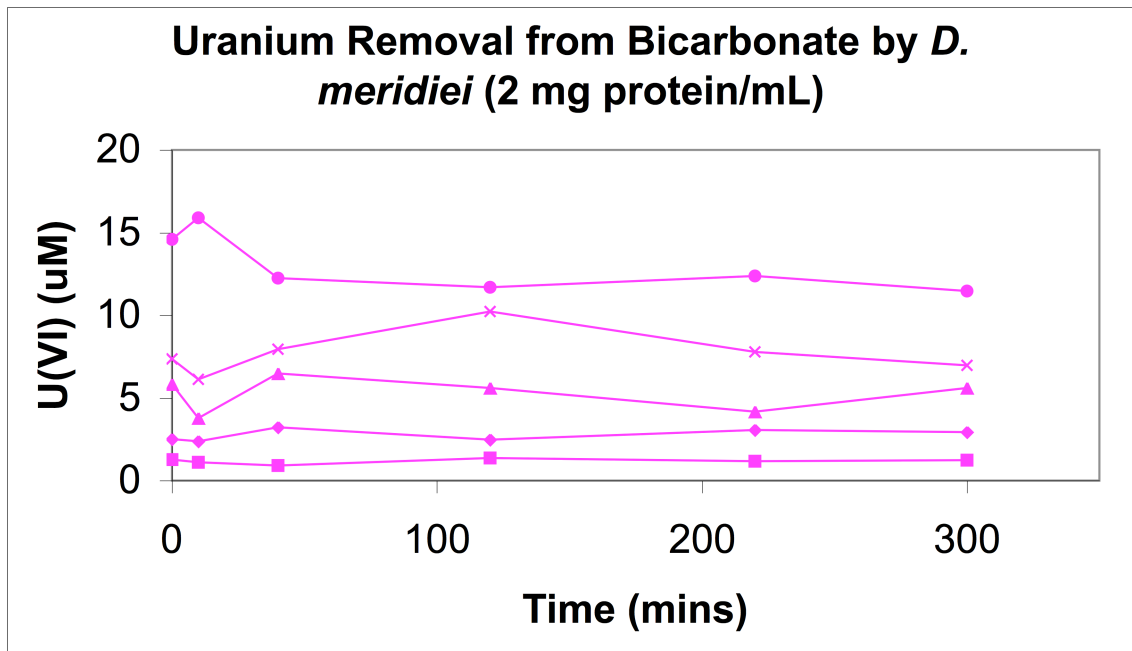
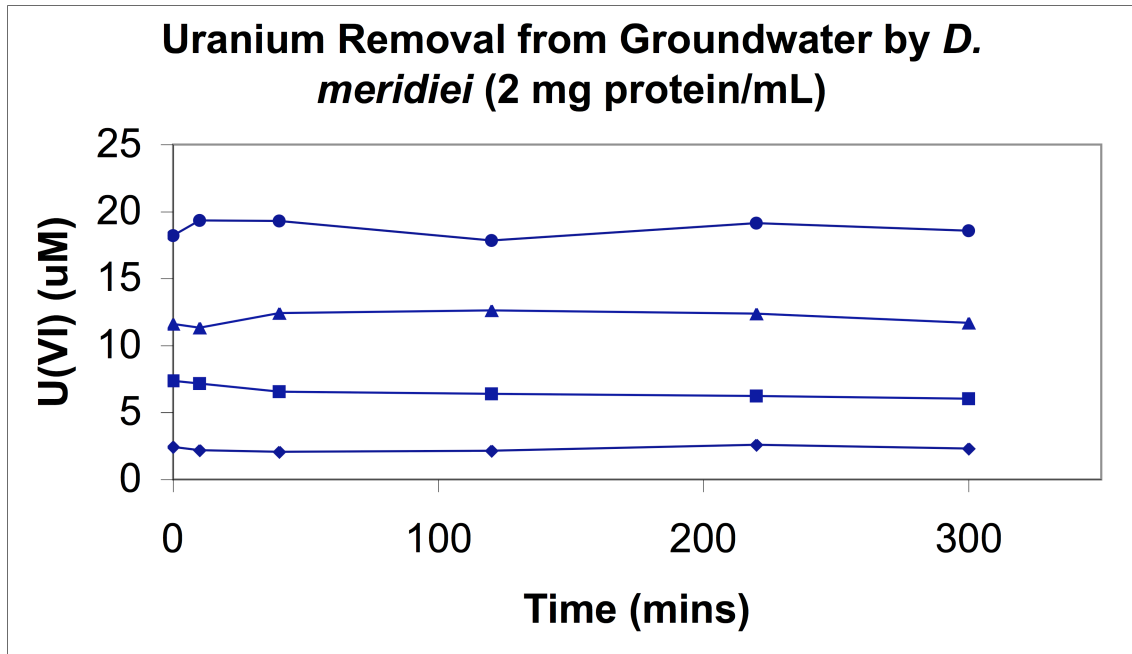
Previous work had suggested that *Acholeplasma palmae* has a higher capacity for uranium sorption than other bacteria studied. Sorption studies were performed with cells in suspension in various solutions containing uranium and results were used to generate uranium-biosorption isotherms.

Results from this study showed that the U(VI) sorption capacity of *G. uraniumreducens* was relatively similar in simple solutions, such as sodium chloride or bicarbonate. However, this ability to sorb uranium significantly decreased in groundwater. This suggested that certain chemicals present in the groundwater were inhibiting the ability of cell components of *Geobacter* to adsorb uranium. It was hypothesized that uranium removal would also be diminished in the bicarbonate solution. However, this did not seem to be the case as uranium was as easily removed in the bicarbonate solution as in the sodium chloride solution.

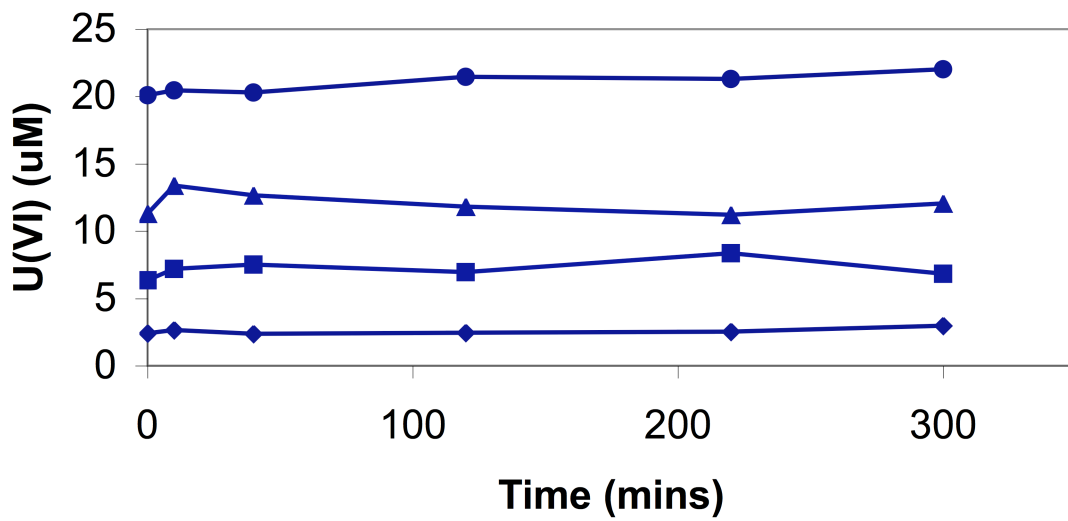


To complete the set of isotherms for all selected bacteria in all the selected media, additional sorption experiments were performed for *A. palmae* and *D. meridiei* in bicarbonate and in groundwater. No uranium removal was achieved for either bacteria in either solution. This lack of uranium removal from solution may have been as a result of differences in solution chemistry. The uranyl-acetate in the bicarbonate solutions prepared for this set of experiments tended to precipitate out of solution after several days in some of the containers. For the groundwater sets, no precipitation was observed,

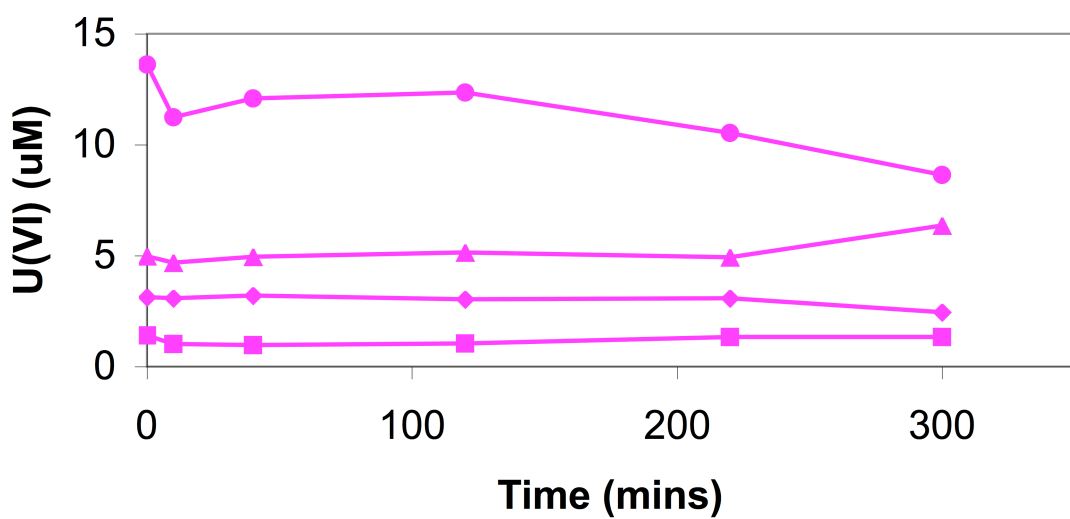
suggesting that some components of the groundwater may have inhibited the uranium sorption capability of cells of *A. palmae* and *D. meridiei*. Immediate follow-up experiments included increasing the biomass for *A. palmae* and *D. meridiei* in the sorption assays to complete the set for the biosorption isotherms.



**Uranium Removal from Groundwater by
A. palmae (2 mg protein/mL)**



Uranium Removal from Bicarbonate by *A. Palmae* (2 mg protein/mL)



Difficulties in documenting biosorption were also encountered in subsequent work with *G. uraniireducens*. FeCl_2 was eliminated from the medium to remove any bias that could be created by having a compound with the potential to sorb uranium. However, eliminating the addition of FeCl_2 as a reductant in the media was detrimental to the cells. After several transfers, the cells would not grow well.

These studies demonstrated that there is the potential for U(VI) to be adsorbed to a diversity of microorganisms that might be present in the subsurface following stimulation of microbial growth with the addition of acetate. However, the extent of U(VI) adsorption is greatly influenced by geochemical conditions. More in depth analysis of the factors controlling biosorption are required before any definitive conclusions about the importance of biosorption in long-term uranium removal from contaminated groundwater at the Rifle, Colorado study site can be made.