Public Abstract
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Examination of Specific Amino Acid Residues of *Desulfovibrio desulfuricans* Cytochrome c_3 in Electron Transfer
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Sulfate-reducing bacteria (SRB) are strictly anaerobic microorganisms present throughout the environment. These microorganisms are able to utilize a variety of electron donors and couple the oxidation of those compounds to the reduction of sulfate, with sulfate as the terminal electron acceptor and hydrogen sulfide as an end product of respiration. The generation of hydrogen sulfide is problematic because of its corrosive effects on metals and concrete. On the positive side, there exists the potential to utilize the metabolic properties of the bacteria for the bioremediation of toxic metals such as uranium. Many of the SRB are capable of altering the redox state of uranium from soluble U(VI) to the insoluble mineral uraninite U(IV) that is less biologically available. Of particular interest in this investigation is the involvement of the predominant c-type tetraheme cytochrome, cytochrome c_3, implicated as a metal reductase in SRB metabolic processes. To explore this possibility, a number of mutant cytochrome c_3 proteins were generated and electron transfer capabilities to metals and metal complexes were examined. UV spectroscopy was used to observe the redox properties of wild-type and mutant cytochromes with the addition of uranium and molybdate. Oxidation and reduction was observed to be similar to non-mutant, for the mutations F19A, C45A, K66A, K72A, and M80K. However, the K14A mutant was not oxidized when molybdate was added to the reduced protein. This lysine residue may represent a critical point of interaction between the cytochrome and the metal.