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An Electron Transfer Protein from a Psychrophilic Hydrocarbonoclastic Microorganism

Investigating the energetic and dynamics of the psychrophilic, hydrocarbonoclastic bacterium, *Colwellia psychrerythraea,* helps elucidate how such microorganisms are able to perform cellular processes at reasonable rates at low temperatures. This project probes specifically the electron transfer protein, cytochrome c_{552}, of the bacterium. Interpreting how processes such as electron transport occur at decreased temperature will shed light on the understanding of how psychrophilic bacteria function, and also their role in bioremediation.

Cytochrome c is overexpressed in *E. coli,* isolated, and purified via cation exchange chromatography. This study aims to investigate the function, stability, and flexibility of the protein. The use of a variety of spectroscopic methods can monitor the changes in the environment of the characteristic heme group as the protein undergoes thermal denaturation. The changes in characteristic bands and peaks will provide insight into the dynamics of the protein as a whole as well as the significance of the individual amino acids involved.

In this study, the dynamics of cytochrome c from *Colwellia psychrerythraea* will be probed from several facets. Comparing the energetics and dynamics of this psychrophilic bacterium to a mesophilic analogue, *Marinobacter hydrocarbonoclasticus,* will reveal the features that allow the former to adequately perform the same functions as the latter yet at decreased temperatures. Additionally, using site-directed mutagenesis, the function of individual amino acid interactions can be probed. Before being able to perform comparisons, the study investigates the structure and thermodynamics of the wild type *Colwelia psychrerythraea* cytochrome c.