Spectroscopic Studies for the Elucidation of Structure and Mechanism in the SenC/RegB/RegA Signal Transduction Pathway

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The SenC/RegB/RegA pathway acts to regulate expression of genes involved in maintaining oxygen levels and cellular redox potentials in *R. capsulatus*, a purple photosynthetic bacterium. Though the precise function of SenC is unknown, it is likely a redox sensor protein. RegB and RegA act as a signal transduction cascade. RegB contains a redox sensitive disulfide bond. When in oxidizing conditions, the disulfide bond is formed resulting in an inactive form. When active, RegB phosphoryates RegA resulting in an active form that can bind to a class of promoters resulting in repression of gene expression. The genes regulated code for proteins involved in processes such as photosynthesis, nitrogen and carbon fixation, respiration, and electron transport. These studies focus on the spectroscopic examination of the copper binding sites in SenC and RegB. EPR, Raman spectroscopy, EXAFS, and UV-VIS spectroscopy have elucidated structural and mechanistic information about these sites. In addition, fluorescence anisotropy and surface plasmon resonance have been used to probe the binding of RegA to its DNA promoter sequence.