

Public Abstract

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Chemotaxis is the phenomenon of motile cells directing their movement in response to chemical signals from the environment; for bacteria this means moving toward favorable environments (attractant response) and away from unfavorable environments (repellent response). Sensing the environment is performed by a group of related chemoreceptors that communicate chemical sensory information from outside the cell, through the cellular membrane, and into the cytoplasm. This dissertation describes two studies employing site-directed spin labeling (SDSL) electron paramagnetic resonance (EPR) spectroscopy to probe important features of the Escherichia coli aspartate chemoreceptor (Tar). In the first, SDSL-EPR spectroscopy is used to resolve that the last 35 residues of Tar are intrinsically disordered and serving as a tether for interaction with the enzymes of adaptational modification. The second study describes efforts to use SDSL-EPR spectroscopy to resolve the nature of ligand-mediated and adaptational modification-mediated conformational signaling in the Tar cytoplasmic domain. The results indicate that adaptational modification modulates peptide backbone stability in a crucial region of the receptor but the consequence of ligand recognition is likely a distinct conformational phenomenon. In total the results described in this dissertation significantly enhance the collective understanding of bacterial chemoreceptor structure and signaling mechanism.