Elucidating the Mechanism and Role of O_2-Dependent Globin Coupled Sensor Signaling

Emily E. Weinert

Recent studies have suggested that heme proteins play roles in sensing the bacterial environment and controlling the switch between motile and sessile (biofilm) states. Globin coupled sensors are heme proteins that consist of a globin domain linked by a central domain to an output domain. Diguanylate cyclase-containing globin coupled sensors are found in a number of bacteria, including human and plant pathogens and environmental bacteria. Current efforts to elucidate the signal transduction mechanism of these enzymes have found that cyclase activity is controlled by ligand binding to the heme within the globin domain. In addition, both ligand binding to the heme and c-di-GMP binding to an inhibitory site control the oligomerization state of the enzyme. Furthermore, our work on a plant pathogen suggests that these sensor proteins control O_2-dependent bacterial virulence. These studies provide insight into the mechanism by which heme ligand binding can control activity of globin coupled sensors, as well as highlight the biological relevance of the pathways they control.