

## Communication pathway from sensor to signaling domain of oxygen sensor protein from *Bacillus subtilis*, HemAT-Bs, by UV resonance Raman spectroscopy

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HemAT from *Bacillus subtilis* (HemAT-Bs) is a heme-based signal transducer protein responsible for aerotaxis. It discriminates  $O_2$ , the physiological effector, from other gas molecules and it consists of two domains, the sensor and signaling domains. The sensor domain contains a heme that acts as the  $O_2$  binding site, whereas the signalling domain interacts with a histidine kinase protein (CheA), a component of the CheA/CheY two-component signal transduction system that regulates the rotation direction of the flagellar motor. We have monitored the site-specific protein conformational changes upon ligand binding of full-length HemAT-Bs and several mutants by static and time resolved ultraviolet resonance Raman (UVRR) spectroscopy.

We found that Tyr70 (B-helix) in the heme distal side, and Tyr133 and Trp132 (G-helix) in the heme proximal side undergo environmental changes upon ligand binding. In addition, time-resolved UVRR studies indicated two phases of intensity changes for the above mentioned aromatic residues, suggesting that the change in the heme structure drives the displacement of B- and G-helices. It is also deduced that hydrogen bonds between Thr95 and heme-bound  $O_2$  and between His86 and heme 6-propionate communicate the heme structural changes to the protein moiety upon only  $O_2$  binding. Finally, the results suggest that  $O_2$  binding to heme causes displacement of the G-helix, which would be important for transduction of the conformational changes from the sensor domain to the signaling domain.

### Biography

Samir F. El-Mashtoly completed his Ph.D. in 2004 from Tohoku University in Japan. He worked as a postdoctoral fellow at Okazaki Institute for Integrative Bioscience in Japan, Albert Einstein College of Medicine in NY, USA, and Biophysics Department, Ruhr- University Bochum in Germany. Last year, he was appointed as assistant Professor at Center for Aging and Associated Diseases, Zewail City of Science and Technology in Egypt. He has published around 15 papers in reputed journals.

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