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Crossing over cross-talks: Global signal integration of bacterial two component systems

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Abstract

Bacteria are endowed with a unique family of protein pair known as the two-component system (TCS) to sense various environmental signals encompassing pH, temperature, light, chemo- attractants and osmolarity. A series of histidyl-aspartyl phosphorelays of these TCS allow bacteria to modulate the expression of the downstream genes which controls a broad variety of phenotypes spanning morphogenesis, central metabolism, cell differentiation, motility through biofilm formation and even virulence of pathogenic bacteria. Considering the functional importance of the TCS in the physiological processes and virulence *per se* of pathogenic bacteria, the non-conventional cross-talk between non-cognate pairs has been shown *in vitro* and biochemical kinetics and mathematical modeling have also been done. However, such studies were focused to elucidate their cross-interaction in parts and little had been focused on integrating the total TCS of bacteria with an aim to bring out the mechanism of signal integration as a whole. This might help the bacteria to better adapt to or identify an environment. We have attempted to delineate the global picture of all the interacting twocomponent systems in an organism using sets of graph theoretical parameters. These might serve as models to give a bird's eye view of the gross behavior of the TCS interactions already established individually *in vitro* and/or *in vivo*. Our models correctly predict the order of the dynamic behavior of the systems. Moreover, the effects of knock-outs on the signaling network have also been predicted from our newly introduced parameter.

Biography

Chandrajit Lahiri has completed his Ph.D from Bose Institute, Kolkata, India and postdoctoral studies from the Indian Institute of Science, Bangalore, India and later from Technical University of Munich, Germany. He is an Associate Professor in the Department of Bioinformatics at Karunya University based at the southernmost state of India. He has shifted his field of study from Chemistry and Biochemistry through Molecular Microbiology to Evolutionary and Structural Bioinformatics and lately Network Biology. He is serving as a representative member of the International Complex Systems Society from India and editorial board member of some journals of international repute.