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Coordinated rearrangements between cytoplasmic and periplasmic domains of the membrane protein complex ExbB-ExbD of *Escherichia coli*

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In gram-negative bacteria, the transport of larger essential nutrients such as ferric siderophores or vitamin B12 depends on TonB-dependent transporters. These transporters bind their substrates with high affinity and ensure transport by contacting the Ton system, an energy transduction complex. The required energy obtained from the chemiosmotic gradient maintained across the cytoplasmic membrane. TonB, in complex with ExbB and ExbD, transduces this energy causing conformational rearrangements at the periplasmic face of outer membrane receptors and thereby facilitating passage of nutrients into the periplasm. Despite decades of research, the stoichiometry, subunit organization, and mechanism of action of the membrane proteins of the Ton system remain unclear. We copurified ExbB with ExbD as a ~240 kDa protein-detergent complex, measured by light scattering and by native gels. Quantitative Coomassie staining revealed a stoichiometry of ExbB4-ExbD2. Negative stain electron microscopy and 2D analysis showed particles of ~10 nm diameter in multiple structural states. Nanogold labeling identified the position of the ExbD periplasmic domain. Random conical tilt was used to reconstruct the particles in three structural states followed by sorting of the single particles and refinement of each state. The different states are interpreted by coordinated structural rearrangements between the cytoplasmic domain and the periplasmic domain, concordant with *in vivo* predictions.

Biography

Sofia Khalil was born on 9 August 1978 in Egypt. After graduation in Biochemistry Science in 1999, she conducted her master studies in the Biochemistry department, Faculty of Science, Alexandria University in Egypt (2000-2004). She continued in her academic career by conducting her PhD studies at Chemistry and Biochemistry department, Concordia University, Montreal, Canada (2006-2010). Her research interest focused on the protein-protein interaction networks in *E. coli*. She had a postdoctoral position in the Microbiology and Immunology department, Faculty of medicine at McGill University, Montreal, Canada (2011). Finally she has worked in a lecturer position at Biochemistry department, Faculty of Science, Alexandria University in Egypt (2012 up to now).

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