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Structure and function of a chloride pump rhodopsin from marine bacteria

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Recently, light-driven sodium pump rhodopsin (NaR/KR2/NDQ rhodopsin) and chloride pump rhodopsin (ClR/NTQ rhodopsin) from marine flavobacteria were identified by metagenomics study. One of them, light-driven sodium pump rhodopsin (NaR) structure was determined. The other one we have solved the first crystal structure of a unique class light-driven chloride pump (ClR) from Nonlabens marinus S1-08, at resolutions of 1.57 Å. Like structured Halorhodopsin (HR), ClR can transfer chloride ion from extracellular to cytosol. Although both ClR and HR are same light-driven chloride pump rhodopsin, we found some evidences that ClR and HR are different in structure and mechanism. The structures reveal two chloride-binding sites, one around the protonated Schiff base and the other on a cytoplasmic loop. We identify a "3 omega motif" formed by three non-consecutive aromatic amino acids that is correlated with the B-C loop orientation. Detailed CIR structural analyses with functional studies in E. coli reveal the chloride ion transduction pathway. Our results help understand the molecular mechanism and physiological role of ClR and provide a structural basis for optogenetic applications.

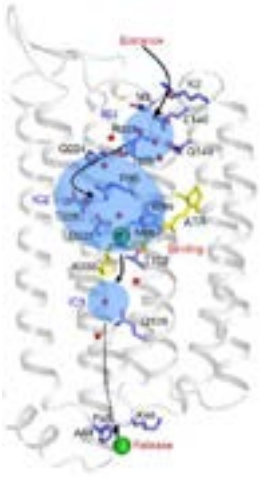

Figure 1: *Chloride ion conductance pathway in ClR*

Biography

Hyun-Soo Cho has research interest in understanding the structural and functional role of various proteins involved in cancer and immune diseases. He is specialized in X-ray crystallography to solve protein structures with other biophysical and biochemical techniques including Cryo_EM recently. His ongoing research projects include various enzymes and receptors especially G-Protein Coupled Receptor (GPCR) related with cancer and immune system.

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