BIOCHEMISTRY 640

(Biomembranes Discussion Group)

Wednesday, January 24, 2018

Room 4-70 Medical Sciences Building

4:00 PM

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"Understanding details of a P-type ATPase Reaction Mechanism using single-molecule FRET"

Phosphorylation-type (P-type) ATPases are a family of integral membrane proteins responsible for the transport of many different ions across cellular membranes. P-type ATPases are essential to life, with roles in cellular signalling and the generation of electrochemical gradients to aid in ion transportation across membranes. The various P-type ATPases exhibit a high degree of structural conservation, suggesting a common reaction mechanism, which is typically defined by large conformational changes that allow for ions to bind and be transported across to the alternate side of the membrane. While a general reaction mechanism and structures of reaction intermediates are known for various P-type ATPases, detailed information regarding the rate-limiting step and individual reaction intermediates are unknown. To elucidate more details into the reaction mechanism, Dyla et al. (2017), used single-molecule fluorescence resonance energy transfer (smFRET) to measure the dynamics of *Listeria monocytogenes* Ca^{2+}ATPase 1 (LMCA1), a bacterial P-type ATPase. By generating mutations to LMCA1, smFRET measurements of individual reaction intermediates were obtained, giving insight into the rate-limiting step along with reversible and irreversible steps in this reaction. Further studies using this technique could show how individual domains of P-type ATPases interact during ion transport. This technique could also further the understanding of the reaction mechanism of other P-type ATPases.

Reference:
Dyla et al. 2017. Dynamics of P-type ATPase transport revealed by single-molecule FRET. *Nature*. https://www.nature.com/articles/nature24296