Who let the ions out! Insights into an *E. coli* K+/H+ Antiporter and its metabolic control

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Our latest research is focused on a newly discovered K^+/H^+ antiporter, YcgO from *E.coli* whose K^+ efflux activity can effectively arrest bacterial growth through K^+ depletion except when grown with high levels of extracellular potassium to restore intracellular levels. In order, to facilitate survival *E.coli* cells repress the activity of this antiporter by complexing it with an unphosphorylated form of PtsN, a cytosolic factor that interacts with YcgO and prevents its activity. PtsN is part of a phospho relay system and its phosphorylated form results in its dissociation from YcgO resulting in activation of the antiporter. In this talk, we present the cryoEM structure of CPA1 family antiporter YcgO bound to PtsN and develop ideas that can help explain the basis for its inhibition and K^+-specificity. The domain organization of YcgO plays a critical role for this dimeric antiporter and the structure of the PtsN free state reveals the basis for its dimerization and allosteric regulation through cytosolic domains and PtsN.