New insights into gill epithelial transport: Linking ammonia excretion and sodium uptake

Wright, P.A.[1], Wood, C.M.[2], and Cooper, C.A.[1]

[1]Department of Integrative Biology, University of Guelph, Canada, [2]Department of Biology, McMaster University, Canada

Models of gill epithelial transport are rapidly changing as researchers discover more complex and specialized cell types and use genomic data to uncover completely new protein transporters. Maetz and Garcia Romeu (1964) first suggested a linkage between ammonia excretion and active Na^+ uptake at the gills of freshwater animals. Although many studies have provided supporting evidence for such a linkage, only in the last 4 years with the discovery of ammonia-transporting Rhesus (Rh) glycoproteins in gill tissue have we been able to more fully understand the model of gill ammonia transport in freshwater animals. Recent evidence supports an apical "Na^+/NH_4^+ exchange complex" consisting of several membrane transporters (Rhcg, V type H^+ATPase, Na^+/H^+ exchanger (NHE 2/3, Na^+ channel) working together as a metabolon providing an acid-trapping mechanism for apical excretion in freshwater fish. The model for gill ammonia transport in seawater is more controversial, although Rhcg also appears to be associated with Na^+ transport. This presentation will review recent studies linking ammonia excretion and sodium uptake in light of the new gill models. Funded by NSERC Discovery grants to PAW and CMW.