Osmoregulation and Digestion

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Various aspects of the compromise between digestion/assimilation versus ionoregulation/acid-base balance have been studied in the common killifish (*Fundulus heteroclitus*) in both fresh water and sea water. This euryhaline teleost is unusual in lacking both an HCl-secreting stomach and an active Cl^- uptake mechanism in the gills in freshwater. Feeding results in an intense "acidic tide" in the bloodstream *in vivo*, which coincides with a large elevation of intestinal HCO_3 secretion *in vitro*, part of which is coupled to increased Cl^- uptake and greater fluid absorption; all occur at a greater rate in freshwater than in seawater killifish. Despite large changes in water absorption, changes in gut permeability to the paracellular marker polyethlene glycol are only minor, but dependent on the size of the molecules. *In vivo* experiments with radiolabelled food indicate faster uptake of Cl^- than Na^+ from the meal in both salinities, and faster excretion of these dietary ions in sea water than in fresh water. Behavioral experiments have demonstrated that the salt content of a single meal may influence subsequent salinity choice in a manner that may be beneficial to ionoregulation (NSERC Discovery and NSF).

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