Water balance in nectar-feeding birds: the intestine as an osmoregulatory organ

Todd J. McWhorter
School of Animal & Veterinary Sciences, University of Adelaide, Australia.

To fuel their exceptionally high mass-specific metabolic energy demands, nectar-feeding birds often experience water fluxes closer to those experienced by amphibians and freshwater fish than those of endothermic vertebrates. Hummingbirds, sunbirds and honeyeaters may consume 5–8 times their body mass in nectar per day under energetically demanding conditions. This nectar is mostly water (~75% on average), and this large water load must be eliminated. The importance of post-renal modification of urine in the distal gut of birds for electrolyte and water balance has long been recognized. The potential for the small intestine to play a role in regulating water fluxes in these animals (i.e. "supply-side" water balance regulation), however, has only recently been explored. In this talk I will review studies of intestinal water absorption in species from three major evolutionary lineages of nectarivorous birds. These studies, which use pharmacokinetic modeling techniques to estimate net dietary water absorption across the intestine, have provided the first evidence of intestinal modulation of water uptake amongst vertebrates. Such studies allow us to link tissue and organ system regulation of function to water balance, and because of the nature of the diet of these animals, to their feeding ecology and behavior.