ACUTE REGULATION OF RENAL SULFATE SECRETION BY WINTER FLOUNDER (*PLEURONECTES AMERICANUS*)

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Marine teleosts prevent dehydration by drinking and absorbing salts across the gastrointestinal (GI) tract. Excessive sulfate uptake via drinking necessitates exaggerated mechanisms for sulfate secretion, which have been shown to be present in the renal proximal tubule (Renfro and Pritchard, Am. J. Physiol. 244: F488-F496, 1983). Although these mechanisms are important for regulating plasma sulfate, information on their control is limited to long-term effects of cortisol (Renfro, Am. J. Physiol. 257: R511-R516, 1989). Intestinal sulfate transport is altered by feeding, an effect that should change the rate of sulfate absorption (Pelis and Renfro, Am. J. Physiol. 284: R380-R388, 2003). Because the intestine is the site of absorption, and the kidney controls excretion, these tissues must coordinate to regulate plasma sulfate. Due to their proximity to the site of absorption, GI hormones and neurotransmitters could provide immediate control of renal sulfate transport and hence plasma sulfate levels.

To test the effect of acetylcholine on renal sulfate transport, primary cultures of winter flounder renal proximal tubule (fPTC's) were treated with 10 nM, 100 nM, or 1 μM carbachol (Cch, acetylcholine agonist), and sulfate transport was measured with Ussing chambers. 10 nM Cch had only a slight effect (17%) while 100 nM and 1 μM Cch significantly reduced net sulfate secretion 27-33% (Figure 1A). Preliminary data show that atropine blocks the inhibition by Cch suggesting the involvement of muscarinic receptors (data not shown). The effect of the GI hormone secretin was also tested. Treatment of fPTC's with 10 nM (27%) and 100 nM (52%) secretin caused a significant increase in sulfate secretion (Figure 1B). Although 500 nM secretin increased sulfate secretion 41% over its paired control the effect was not significant. Phlorizin-sensitive glucose current, a measure of proximal tubule-like function, was not altered by Cch or secretin treatment (data not shown).

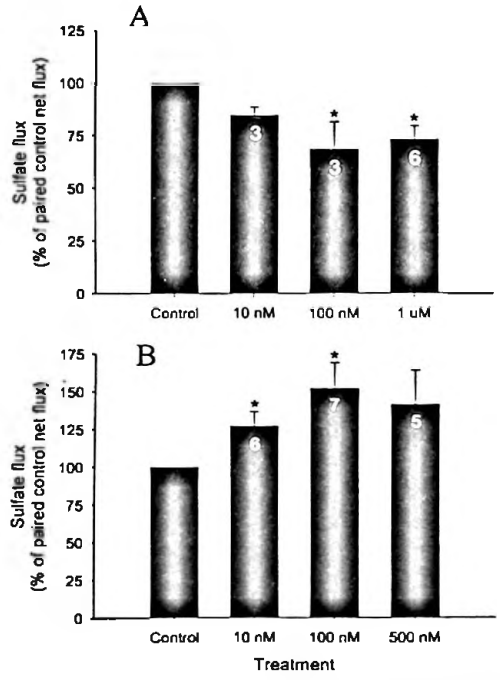

Figure 1. Effect of A. Cch (10 nM, 100 nM, and 1 μM) and B. secretin (10 nM, 100 nM, and 500 nM) on sulfate secretion by fPTC's. Values shown are means ± SEM. Values were obtained at 1.5 h. * Significantly different from paired control ($P < 0.05$).

These preliminary results indicate that sulfate secretion by the marine teleost renal proximal tubule is acutely regulated by acetylcholine and secretin. One or both of these messengers may be involved in coordination between intestinal sulfate absorption and renal sulfate secretion. Supported by NSF-IBN0078093. Ms. Unites was an REU student (NSF DBI-0139190).