NOTICE OF PUBLICATION

AQUACULTURE & FISHERIES INNOVATION LAB

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Sustainable Aquaculture for a Secure Future

Title: **Role for leptin in promoting glucose mobilization during acute hyperosmotic stress in teleost fishes**

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Osmoregulation is critical for survival in all vertebrates, yet the endocrine regulation of this metabolically expensive process is not fully understood. Specifically, the function of leptin in the regulation of energy expenditure in fishes, and among ectotherms, in general, remains unresolved. In this study, we examined the effects of acute salinity transfer (72 h) and the effects of leptin and cortisol on plasma metabolites and hepatic energy reserves in the euryhaline fish, the tilapia (*Oreochromis mossambicus*). Transfer to 2/3 seawater (23 ppt) significantly increased plasma glucose, amino acid, and lactate levels relative to those in the control fish. Plasma glucose levels were positively correlated with amino acid levels (R2Z0.614), but not with lactate levels. The mRNA expression of liver leptin A (lepa), leptin receptor (lepr), and hormone-sensitive and lipoprotein lipases (hsl and lpl) as well as triglyceride content increased during salinity transfer, but plasma free fatty acid and triglyceride levels remained unchanged. Both leptin and cortisol significantly increased plasma glucose levels in vivo, but only leptin decreased liver glycogen levels. Leptin decreased the expression of liver hsl and lpl mRNAs, whereas cortisol significantly increased the expression of these lipases. These findings suggest that hepatic glucose mobilization into the blood following an acute salinity challenge involves both glycogenolysis, induced by leptin, and subsequent gluconeogenesis of free amino acids. This is the first study to report that teleost leptin A has actions that are functionally distinct from those described in mammals acting as a potent hyperglycemic factor during osmotic stress, possibly in synergism with cortisol. These results suggest that the function of leptin may have diverged

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during the evolution of vertebrates, possibly reflecting differences in metabolic regulation between poikilotherms and homeotherms.

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