Assessing PACAP as an EGC stimulant in teleosts

Daniel Maguire,
Department of pathology and microbiology, Atlantic veterinary college, University of Prince Edward Island, Charlottetown, PEI

As the scale of aquaculture production continues to increase, the threat of antimicrobial resistance follows a similar trend. In less developed countries with warmer climates, high levels of antibiotic use have left Tilapia particularly vulnerable. One means of combating this is through the use of antimicrobial peptides as a replacement intervention. The neuropeptide pituitary adenylate cyclase-activating polypeptide, or PACAP, exists across species with a multitude of effects within the hosts system. Within teleost species, PACAP serves a role in fighting against bacterial pathogens via the stimulation of the host immune system as well as direct interaction with the bacteria. Host immune stimulation occurs through PACAP inciting expression of proinflammatory cytokines IL-1b, TNFa, and IL-6, as well as upregulating the expression of the PACAP receptor VPAC1. One cell that has been seen in high numbers following PACAP immunostimulation are eosinophilic granular cells (ECGs). ECG's play a similar role to mammalian mast cells in inflammation via degranulation and release of products. For this study, we used duplicate tanks for each treatment, with groups receiving (1) PACAP flush over the gills, (2) receiving PACAP flush through the naris, (3) receiving a PBS flush over the gills, and finally (4) receiving a PBS flush through the naris. Fish were then be sampled over 6, 24, 72 hours and 7 days. At each sampling event, samples for histological and gene expression analysis were collected. The impact of treatment on EGC accumulation and degranulation were assessed and will be discussed. Future work will evaluate the molecular signals associated with PACAP administration over short and long-term time frames.

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