Nutrition and Temperature Regulate the Expression of Heart-Type Fatty Acid Binding Protein Gene in Golden Pompano Larvae (Trachinotus ovata, Limmaeus, 1758)

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ABSTRACT

This study examined the regulation of nutrition and temperature on the expression of heart-type fatty acid binding protein (H-FABP) gene in golden pompano to understand the importance of protein development in fish larvae. Firstly, H-FABPs expression during ontogeny of larvae in the first 18 days after hatching was tested, and then the responses of H-FABPs to temperature (23, 26 and 29°C) on 12-days post hatching (DPH) and 18 DPH were compared. On 18 DPH, the response of H-FABPs to the manipulation of nutrients was evaluated. The expression of H-FABPs increased after transition to endogenous feeding, and was significantly affected by temperature. The expression of H-FABP at 23 and 26°C was higher than at 29°C on 12 DPH, and the expression of H-FABP at 29°C was higher than at other temperatures on 18 DPH, suggesting that H-FABP expression is determined by both temperature and fish age. The expression of H-FABP on 18 DPH was highest when Algalac 3080 enriched Artemia nauplii were fed to fish larvae. The correlation analysis between the expression of H-FABP and fatty acids shows that the ratio of fatty acids is more important than the relative quantity of single fatty acid in regulating the expression of H-FABP at the early stage of fish larvae. This study indicates that changes in environmental temperature and feed type influence H-FABP expression, growth and survival of golden pompano in early life H-FABPs subfamilies play various roles in fatty acid metabolism [13]. The heart-type FABPs (H-FABPs) subfamily contains the muscle and heart FABPs that have a high binding affinity for C16-C20 fatty acids [14]. Despite wide distribution in the heart, skeletal and smooth muscle, mammary epithelial cells, aorta, distal tubules of the kidney, lung, brain, placenta and ovary, H-FABP is mainly expressed in the brain and heart with a predominant expression in muscle cells [15]. H-FABPs in mammals have a role to play with the intramuscular fat accretion [16]. However, in previous studies on shark, catfish and lamprey, FABPs in the liver are clearly related to H-FABPs but not to liver-FABPs (L-FABPs) [17-19]. H-FABPs are mainly expressed in the liver of aquatic organisms and play a role in fatty acid mitochondrial β-oxidation [12].

Materials and Methods: These fish specimens were obtained from a previous feeding trial [33]. In brief, fertilized eggs of golden pompano were obtained from Lingshui, Hainan Province, and transported to the Tropical Fisheries Research and Development Center, South China Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences, Sanya 572018, China.

Keywords: FABP; Nutrition; Temperature; Gene expression; Fish larvae.