

HIGH DIETARY LEVELS OF ARACHIDONIC ACID NOT ONLY AFFECTS THE NORMAL PIGMENTATION PATTERNS IN POST-METAMORPHIC SENEGALESE SOLE LARVAE, BUT ALSO DISRUPTS THE PROCESS OF EYE MIGRATION IN PSEUDO-ALBINO FISH

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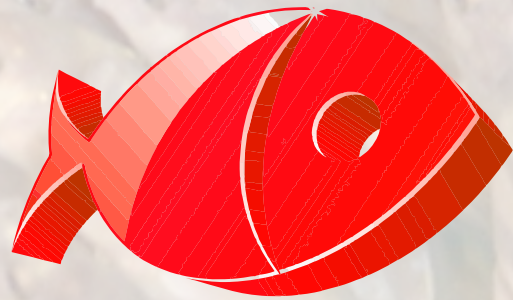
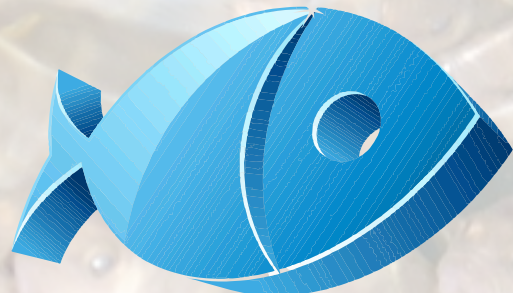
In this presentation we review and present new unpublished data on the effects of arachidonic acid (ARA) on two distinct morphogenetic processes – pigmentation and eye migration – taking place during larval metamorphosis in Senegalese sole (*Solea senegalensis*, Kaup 1858). Pigmentary disorders and impaired eye migration in flatfishes are currently major problems in aquaculture, entailing economical, biological, and ethical issues; thus, they require extensive research on the causative factors responsible for disrupting the aforementioned morphogenetic processes. Thus, we decided to study the effects of high dietary ARA levels on Senegalese sole larvae by feeding from 2 to 50 days post-hatch (dph) with live prey enriched with an experimental emulsion containing high levels of ARA (ARA-H) versus a reference commercial enriching product (Algamac[®]). Tested diets affected the survival, but not larval growth performance at 50dph. The incidence of normally pigmented post-metamorphic larvae fed the control diet was 99.1±0.3%, whereas it was only 18.7±7.5% in fish fed ARA-H diet. The effects of ARA on normally pigmented and pseudo-albino fish were evaluated by means of the expression patterns of several gene markers involved in the pigmentation process and ARA metabolism, as well as the shape and density of melanophores in the dorsal skin of metamorphosed fish that was analyzed by means of texture and image segmentation analyses. Thus, new data on the regulation of molecular processes governing the transition from the larval to the adult skin pigmentation phenotype will be presented and discussed with regards to the frame of the study. In addition, the effects of high dietary ARA levels in the eye migration and cranial bone remodeling processes in postmetamorphic larvae was evaluated by means of geometric morphometric analyses and the staining of cranial skeletal elements. The frequency of fish presenting cranial deformities was

higher in fish fed ARA-H ($95.1 \pm 1.5\%$) than those fed the control diet ($1.9 \pm 1.9\%$) and significantly and negatively correlated with the incidence of normally-pigmented animals ($R^2 = -0.88$, $P < 0.001$). Pseudo-albino fish differed from the normally pigmented ones by the disposition of the eyes with regards to the vertebral column and mouth axes, and by the interocular distance and head height, as well as by the osteological development of some skeletal structures from the neuro- and splanchnocranium. Up to now, high dietary levels of ARA had only been correlated to pigmentary disorders, but this is the first study among flatfishes that describes the impaired migration of the ocular side eye to the ventral surface – the right eye in the case of Senegalese sole – whereas the left eye migrating into the ocular side occurred almost normally. In agreement with these morpho-anatomical and molecular results, significantly higher prostaglandin E2 (PGE2) production was observed in pseudo-albinos larvae than in normally pigmented larvae and higher PGE2 production in normally pigmented larvae fed ARA-H than in those fed the control diet. All the results are discussed considering the role of PGE2, an ARA-derivate hormone, on Senegalese sole larval metamorphosis and quality.

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