P-105 **Lipossome enrichment enables taurine delivery to *Sparus aurata* larvae**

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INTRODUCTION AND OBJECTIVES

Taurine is an amino acid (AA) that plays a vital role in several important biological functions such as bile salt conjugation, osmoregulation, modulation of neurotransmitters, antioxidation and early development of visual, neural and muscular systems (Huxtable 1992).

Due to its abundance in animal tissues, taurine is highly available in carnivorous and omnivorous diets. Several animals may fully or in parts of their life stages depend on a dietary source of taurine, due to a limited endogenous rate of taurine biosynthesis caused by an inherent deficiency on the enzyme cysteine sulfinate decarboxylase. In fish, the ability to biosynthesise taurine varies inter-specifically and throughout ontogenesis (Yokoyama et al. 2001; Kim et al. 2008), suggesting that some fish species may rely on a dietary source of taurine during development. For this purpose, dietary taurine supplementation is recommended on a general basis for fish during the larval stage. However, fish larvae still rely on live prey, and manipulating live prey AA composition to fulfil larval requirements is still challenging. To overcome this limitation, Barr and Helland (2007) developed a technique to enrich live prey with liposomes that enables delivery of water soluble nutrients, such as taurine, to marine fish larvae.

Among the positive effects observed for fish fed taurine supplemented diets, an increase of feed intake and enhancement of growth performance have already been described (Matsunari et al. 2008). In fact, taurine has recently become one of the most promising candidates for growth promotion in fish.

Gilthead seabream (*Sparus aurata*) is a dominant species in the aquaculture industry of Southern European countries. Among the constraints found for this species are the low survival rates and incipient larval growth usually verified at the end of the first month of development.

This study aimed to assess the effect of dietary taurine supplementation on the performance of gilthead seabream larvae. For this purpose, gilthead seabream were fed rotifers supplemented with control or taurine-enriched liposomes and effect of dietary taurine supplementation on larval growth and survival was assessed.

MATERIALS AND METHODS

Gilthead seabream (*Sparus aurata*) larvae were reared according to standard zootechnical procedures in eight 100 L conical cylindrical sand-coloured tanks – 4 tanks per treatment according to the feeding regime (Control or Taurine). Larvae were fed with rotifers (*Brachionus plicatilis*) from the onset of exogenous feeding (3 days after hatching; DAH) until 19 DAH. Rotifers were enriched with commercial products and "blank" (Control) or taurine-enriched liposomes (Taurine) during 1 h previously to larval feeding. Liposomes were hydrated with sterilised seawater (Control) or taurine solution (Taurine) before the enrichment. The taurine solution was prepared by solving crystalline taurine (Sigma-Aldrich, Germany; 1.5 % of rotifer dry weight; DW) in seawater. Liposome hydration and rotifer enrichment were performed according to the procedures described by Barr and Helland (2007). From 14 to 29 DAH, gilthead seabream larvae were also fed with *Artemia* nauplii, while *Artemia* metanauplii enriched with commercial products was offered to the larvae from 25 DAH until the end of the experiment (31 DAH). Gilthead seabream larvae were always fed in excess, three times a day.

Gilthead seabream larvae were sampled regularly during the experimental period for total length (TL), dry weight (DW) and AA content analysis. Relative growth rate (RGR) and survival were assessed at the end of the experimental period. Rotifers from both treatments were also analysed for AA composition.

All results were tested by Levene's test for homogeneity of variances followed Student's t-test for detection of treatment mean differences. Data were analysed through Mann-Whitney U non parametric tests when mean variances were significantly different across treatments. The significance level used was $P \leq 0.05$.

RESULTS AND DISCUSSION

No significant differences were found between treatments for the rotifer indispensable AA profile. However, the percentage of taurine relatively to the total AA content was significantly higher (around 65%) in rotifers supplemented with taurine. These results show that a successful taurine supplementation was achieved. As previously observed by several authors for other FAA (Barr and Helland 2007; Saavedra et al. 2009), these results confirm rotifer enrichment with liposomes as a suitable system to

deliver amino acids to marine fish larvae. As mentioned by Saavedra et al. (2009), this is an important step towards AA supplementation of live feeds, since manipulation of live prey AA composition is difficult to accomplish (Conceição et al. 2003; Aragão et al. 2004). These results gain a higher relevance if considering that live feed AA supplementation is currently the only suitable system to deliver AA to marine fish larvae, since the acceptance of inert microdiets by fish larvae is often limited, and may result in low and/or variable ingestion rates during feeding experiments (Conceição et al. 2007).

No significant differences were found between treatments for growth or survival of gilthead seabream larvae during the experimental period. Similar findings were observed for the taurine, indispensable and dispensable AA contents of gilthead seabream larvae from both treatments. These results indicate that although rotifers were successfully enriched with taurine, results showed that dietary taurine supplementation did not significantly affect the growth performance, survival or AA composition of gilthead seabream larvae. Thus, dietary taurine supplementation did not result in an increase of whole body taurine levels. In other fish species, a positive correlation between taurine body levels and growth has been observed. For example, a simultaneous increase of taurine body levels and growth performance was found for larvae of several fish species (Conceição et al. 1997; Chen et al. 2004; Chen et al. 2005; Matsunari et al. 2005). Pinto et al. (*in press*) also suggested that higher taurine levels in Senegalese sole larvae would result in an increase of AA retention, indicating a higher growth potential in these larvae. In the current study, it is possible that dietary taurine supplementation did not result in an improvement of gilthead seabream larval growth performance because larval taurine levels were also not affected. Contrarily to other fish species that seem unable to biosynthesise taurine (Yokoyama et al. 2001), these findings suggest that gilthead seabream may not depend on a dietary source of taurine to maintain the taurine body pool. Therefore, dietary taurine supplementation is likely not required for this species during the larval stage, since this supplementation does not result in apparent benefits for larval growth.

CONCLUSIONS

This work has shown that rotifer supplementation with taurine-enriched liposomes is a suitable system to deliver taurine to marine fish larvae. Moreover, results from this study showed that dietary taurine supplementation did not increase taurine levels or bring apparent growth benefits for gilthead seabream larvae. These findings suggest that gilthead seabream larvae may not rely on dietary taurine for maintenance of the taurine body pool. Therefore, dietary taurine supplementation may not be required for gilthead seabream during the early developmental stages.

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