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Elongases from fatty acids of amazon fish tambaqui (*Colossoma macropomum*)

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Tambaqui (*Colossoma macropomum*) is a native fish species of the Amazon basin, being one of the main species in Brazilian aquaculture with a production of approximately 134 ton in 2014. Therefore, it is important to determine nutritional requirements in this species to develop efficient and economical feeds. The biosynthetic capability of long-chain ($\geq C_{20}$) polyunsaturated fatty acids (LC-PUFA) including the biologically active eicosapentaenoic acid (EPA; 20:5n-3), arachidonic acid (ARA; 20:4n-6) and docosahexaenoic acid (DHA; 22:6n-3), has been extensively studied in many commercially important fish species to identify which fatty acids can satisfy the essential fatty acid (EFA) requirements for those species. LC-PUFA can be biosynthesized through the combined action of two enzymes, namely elongation of very long chain fatty acids (*Elovl*) proteins and fatty acyl desaturases. However, little is known about these LC-PUFA biosynthesizing enzymes in tambaqui. Here we have aimed to isolate and functionally characterize putative Elovl5 and Elovl2 elongases from Tambaqui, enzymes with key roles in LC-PUFA biosynthesis of vertebrates. Phylogenetic analyses confirmed that the isolated elovl cDNAs are orthologs of Elovl5 and Elovl2. Moreover, functional characterization, carried out in a yeast heterologous expression system, revealed that the tambaqui Elovl5 showed the ability to elongate C_{18} and C_{20} PUFA substrates, but no C_{22} substrates. Interestingly Elovl2 showed the ability to efficiently elongate PUFA substrates of varying chain lengths (C_{18}, C_{20} and C_{22}) and producing in some instances PUFA products of up to 26 carbons. While the capacity to elongate C_{18} and C_{20} PUFA substrates is shared with Elovl5, the tambaqui Elovl2, unlike Elovl5, can also elongate 22:5n-3 to produce 24:5n-3, a key intermediate component of the so-called "Sprecher pathway", a metabolic route that accounts for DHA biosynthesis in vertebrates. Given that complementary functions of the tambaqui Elovl5 and Elovl2, the present results confirm that this species can perform all the elongation reactions enabling the conversions from C_{18} PUFA into physiologically important LC-PUFA (ARA, EPA and DHA). Importantly for aquaculture, such enzymatic capabilities strongly suggest that tambaqui can efficiently utilize dietary oil sources such as vegetable oils rich in C_{18} PUFA to satisfy their EFA requirements.

Biography

Rodrigo O A Ozorio is a researcher at Centre of Marine and Environmental Research, Portugal. He has more than 20 years of experience in aquaculture research, special emphasis on the fish nutrition. He holds MSc and PhD degrees from Wageningen University and Research Centre, The Netherlands. Rodrigo has expertise on nutritional dynamics of fish and the economic potential of new aquaculture species based on a set of husbandry and physiological criteria. He participated in over 15 national and international projects (overall budget of 2.0 million euros), including four projects as scientific leader dealing with new aquaculture systems and sustainable alternative for intensive marine aquaculture. He supervised 8 PhD theses and 15 MSc theses and he authored over 56 scientific publications.

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