

## Short Communication on Molecular Expression of Growth Hormone (GH) During Initial Ontogeny in *Lepisosteidae*

Quintana CA. Frías<sup>1\*</sup>, Martha PV. Hernández<sup>1</sup>, Rostro Carlos I. Pérez<sup>1</sup> and Álvarez CA. González<sup>2</sup>

<sup>1</sup>Laboratorio de Investigación en Biotecnología Acuicola (LIBA), Tecnológico Nacional de México Campus Boca del Río (ITBoca). Carretera Veracruz-Córdoba Km.12, 94290. Boca del Río, Veracruz

<sup>2</sup>DACBIOL Laboratorio de Acuicultura Tropical, Universidad Juárez Autónoma de Tabasco. Carretera Villahermosa-Cárdenas km 0.5, 86139, Villahermosa, Tabasco, México

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### Description

The expression of hormones represents one of the fundamental molecular tools for understanding digestive physiology and early development in freshwater fish larvae in this sense, Growth Hormone (GH) is a well conserved hormone and is expressed mainly in the anterior pituitary gland of all vertebrates and is responsible for exponential growth by Agnés, et al. [1]. Although the growth promoting effect of GH is well known, fish growth is multifactorial and GH may act at different levels [2]. Growth Hormone (GH) is the main regulator of somatic growth and metabolism in fish, as in other vertebrates [3]. Until recently, it was believed that GH had no role in embryo growth, but GH transcripts have been detected in rainbow trout embryos prior to pituitary organogenesis and even in mature oocytes in studies by Yang et al. [4]. In tetrapod vertebrates, embryonic and fetal growth had been considered to be independent of pituitary GH, although it is required for postnatal growth and development. However, recent studies suggest that extrapituitary GH plays an important role in early embryonic growth and differentiation [5], this information led to another dimension of the action of GH in vertebrates in early development. Although GH expression has been extensively described in euteleosteans, little is known about GH in primitive fish physiology so far [6].

The presence of GH in the embryo and early larval stages has been confirmed in fish such as grouper (*Epinephelus colloidis*) [7,8], the japónica eel (*Anguilla japonica*) [9] and several species of teleost fish [6] such as the Catan *Atractosteus spatula* [10] and the tropical gar (*Atractosteus tropicus*) [11]. Likewise, the expression of GH in the early stages of development suggests that it plays an important role in the growth and survival of the larvae, which has been proven by the growth stimulating effects when using exogenous GH, and the transfer and overload-GH gene expression demonstrated in teleost larvae by Haishen et al. [12]. Although GH has been detected in many groups, but may be functionally limited within a large number of taxa, comparison of GH sequences has been informative in a variety of phylogenetic analyzes. Given the phylogenetic position of the catanes relative to chondrosteian fishes such as amia (*Amia calva*) and teleosts, the characterization of GH, as in the case of *Lepisosteus osseus* [13], should be useful for interpretation of evolutionary trends in GH structure in the Neopterygii group and among Actinopterygii. Growth hormone (GH) shows a higher phylogenetic percentage of amino acid identity (99%) in reference to the sequence in *Lepisosteus oculatus* and *Acipenser sinensis*, while 95% is referenced with another group of vertebrates such as *Fukomys damarensis*, *Heterocephalus glaber* and *Vulpes lagopus*. Therefore, the amino acid structure of this

\*Correspondence to:

Quintana CA Frías, Laboratorio de Investigación en Biotecnología Acuicola (LIBA), Tecnológico Nacional de México Campus Boca del Río (ITBoca), Veracruz, E-mail: [cafq22@hotmail.com](mailto:cafq22@hotmail.com)

hormone is closely related not only in the actinopterygium group but also in most vertebrates, presenting differences in their amino acid sequence of less than 5% [11].

Regarding the expression of GH during the first stages of fish development, various studies show that the presence of this hormone is detected in time at hatching, post-hatching, and larval period, once the yolk is absorbed, increasing at from the first days of hatching. Such is the case of the tropical gar, whose expression of this hormone increases 9 days after hatching. However, in another group of species such as sea bream, GH expression in larvae has been detected for the first time on day 3 after hatching [14], in Japanese sole, the percentage of GH increased dramatically. continuous from the first feeding (approximately 9 DAH), similar to that obtained in this study, it seems that the higher percentage of GH through the early stages of the life of the present species would be a physiological approach with high growth potential in the period larval. In the case of the catan (*Atractosteus spatula*), hatching occurs only two days after the fertilization of the eggs and the larvae grow using their yolk reserves up to 5 DDE when they start feeding, although yolk reserves are still present until on 8 DEE. Development during this first week is characterized by organogenesis and growth at a rate of 1 mm/day. After 10 DEE, when metamorphosis is complete, the larvae reach their highest growth rate at 5-6 mm/day [15]. The relative expression of GH through larval stages indicates the existence of substantial expression of this hormone in the fertilized eggs, increasing the expression on day 11 DAH to decrease in the following days, this is consistent with the formation of the pituitary gland. At present, it is not possible to attribute this incredible growth rate only to the GH-GH receptor axis, since thyroid hormones (T3) have also been evidenced in the early stages with an increasing concentration until day 10 [16,17].

## Discussion and Conclusion

These studies suggest that GH expression is essential for larval growth, and that during initial ontogeny such expression is highly variable among fish species. For example, in the japan eel (*Anguilla japonica*) the transcription of GH protein and GH production in the pituitary began between days 3 and 6 after hatching, suggesting that GH is essential for larval growth to accelerate growth. Somatic growth and thus reach the juvenile stage. Another recent study suggests that extrapituitary GH is expressed in early embryos in rainbow trout, as well as in other tetrapod vertebrates, the GH transcription observed in pinto grouper (*Epinephelus colloides*) began on day 1 after hatching and on day 2 after

hatching into larvae. These results corroborate with those observed in trout, although this species does not present larval development unlike the other species. GH may act as an autocrine-paracrine factor during early embryogenesis in species such as *A. tropicus*, as well as in other fish species suggesting that this function may have appeared early during vertebrate evolution and that GH plays an important role during evolution. Early embryogenesis in fish. In this way, the molecular expression of GH and its role during larval stages will contribute to a better understanding of larval physiology. On the other hand, gene technology provides the means for a commercial supply of recombinant GH in large quantities, which could be used to enhance the growth of a species related to an aquaculture value.

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