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Opinion

Astyanax Mexicanus : A Cave-Dwelling Vertebrate Model for Evolution, Adaptation and Development

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Introduction

The teleost Astyanax mexicanus could be a single species consisting of two radically different forms: a sighted pigmented surface-dwelling form (surface fish) and a blind de-pigmented cave dwelling form (cavefish). the 2 kinds of Astyanax have favorable attributes, including descent from a typical ancestor, simple laboratory culture, and therefore the ability to perform genetic analysis, permitting their use as a model system to explore questions in evolution and development. Although functional eyes are lacking in adults, cavefish embryos begin to develop eye primordia, which subsequently degenerate. the foremost explanation for eye degeneration appears to be apoptotic necrobiosis of the lens, which prevents the expansion of other optic tissues, including the retina. Ultimately, the loss of the attention is that the reason behind craniofacial differences between cavefish and surface fish. Lens apoptosis is induced by enhanced activity of the Hedgehog signaling system along the cavefish embryonic midline. The absence of melanin pigmentation in cavefish is because of a block within the ability of undifferentiated melanoblasts to accumulate L-tyrosine, the precursor of L-DOPA and melanin, in melanosomes. Genetic analysis has shown that this defect is caused by a hypomorphic mutation within the p/oca 2 gene encoding an integral melanosomal membrane protein. We discuss how current studies eye and pigment regression have revealed a number of the mechanisms within which cavefish development has been changed during evolution.

Description

A diverse group of animals, including members of most major phyla, have adapted to life within the perpetual darkness of caves. These animals are united by the convergence of two regressive phenotypes, loss of eyes and pigmentation. The mechanisms of regressive evolution are poorly understood. The teleost Astyanax mexicanus is of special significance in studies of regressive evolution in cave animals. This species includes an ancestral surface dwelling form and plenty of con-specific cave-dwelling forms, a number of which have evolved their recessive phenotypes independently. Recent advances in Astyanax development and genetics have provided new information about how eyes and pigment are lost during cavefish evolution; namely, they need revealed a number of the molecular and cellular mechanisms involved in trait modification, the quantity and identity of the underlying genes and mutations, the molecular basis of parallel evolution, and therefore the evolutionary forces driving adaptation to the cave environment. Astyanax mexicanus, also called the Mexican tetra, may be a teleost species originating in South America. Cataloged in 1936 by Hubbs and Innes because the first blind fish within the Characidae family, it became available within the US aquarium change the 1940's, and early investigations were disbursed by Breder (1942).

Conclusion

While its classification was initially in question, it's now understood that two distinct styles of the species may be found within the wild: the surface morphology, a sighted river-dwelling fish found within the North and Central Americas, and also the troglobitic morphology, a blind cave-dwelling fish indigenous to the Sierra de El Abra, Sierra de Guatemala, and Sierra de Colmena regions of Mexico. Theoretically, and although they need been much debated and opposition one another, the neutral and selective hypotheses for the loss of eyes in cave animals don't seem to be mutually exclusive

processes. Evidence from developmental biology and from molecular evolution studies suggests that both indeed occurred together.

Acknowledgment

None

Conflict of Interest

None