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Genetic linkage between altered tooth and eye development in lens-ablated *Astyanax mexicanus*

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Abstract

The phenotype of lens-ablated Mexican tetra (*Astyanax mexicanus*) compared to wild-type surface fish has been described and includes, among other effects, eye degeneration, changes in tooth number and cranial bone changes. Here, we investigate the spatiotemporal expression patterns of several key genes involved in the development of these structures. Specifically, we show that the expression of *pitx2*, *bmp4* and *shh* is altered in the eye, oral jaw, nasal pit and forebrain in these lens-ablated fish. Furthermore, for the first time, we show altered *pitx2* expression in the cavefish, which also has altered eye and tooth phenotypes. We thus provide evidence for a genetic linkage between the eye and tooth modules in this fish species. Furthermore, the altered *pitx2* expression pattern, together with the described morphological features of the lens-ablated fish suggests that *Astyanax mexicanus* could be considered as an alternative teleost model organism in which to study Axenfeld–Rieger syndrome (ARS), a rare autosomal dominant developmental disorder that is associated with PITX2 and which has both ocular and non-ocular abnormalities.

Keywords:

teeth, teleost, *pitx2*, *shh*, *bmp4*, modularity, ARS

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