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Maternal Genetic Effects in *Astyanax* Cavefish Development

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Abstract

The role of maternal factors in the evolution of development is poorly understood. Here we describe the use of reciprocal hybridization between the surface dwelling (surface fish, SF) and cave dwelling (cavefish, CF) morphs of the teleost *Astyanax mexicanus* to investigate the roles of maternal genetic effects in cavefish development. Reciprocal hybridization, a procedure in which F1 hybrids are generated by fertilizing SF eggs with CF sperm (SF X CF hybrids) and CF eggs with SF sperm (CF X SF hybrids), revealed that the CF degenerative eye phenotype showed maternal genetic effects. The eyes of CF X SF hybrids resembled the degenerate eyes of CF in showing ventral reduction of the retina and corresponding displacement of the lens within the optic cup, a smaller lens and eyeball, more lens apoptosis, a smaller cartilaginous sclera, and lens-specific gene expression characteristics compared to SF X CF hybrids, which showed eye and lens gene expression phenotypes resembling SF. In contrast, reciprocal hybridization failed to support roles for maternal genetic effects in the CF regressive pigmentation phenotype or in CF constructive changes related to enhanced jaw development. Maternal transcripts encoded by the *pou2f1b*, *runx2b*, and *axin1* genes, which are involved in determining ventral embryonic

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