CDB SEMINAR

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16:00~17:00 C1F CDB Auditorium

Evolution and development of the bifurcated caudal axial skeleton in the twin-tail goldfish

Summary

The basic architecture of caudal axial skeletal system is highly conserved among vertebrates. However, this conserved architecture has undergone drastic modification in the ornamental goldfish lineage, through artificial selection. Certain of these strains, known as twin-tail goldfish, possess bifurcated caudal fins in which several vertebral elements are duplicated to form a laterally bifurcated caudal axial skeletal system. The uniqueness of such highly modified caudal axial skeletal systems in nature suggests that rare genetic mutation, which drastically altered the developmental mechanisms underlying axial skeleton formation, may have occurred during goldfish domestication. In this study, we proceeded to identify the genetic alteration that gave rise to bifurcated cauda axial skeleton in twin-tail goldfish. Morphological observation, backcross analysis and functional assays were used to demonstrate that formation of the bifurcated caudal axial skeleton requires a stop-codon mutation in one of two recently duplicated *chordin* genes. Gene expression pattern analyses suggest that the ventral tissues of the twin-tail goldfish early embryos are increased in size, and these tissues form the late embryonic bifurcated fin fold. Moreover, unlike previously-described *chordin* deficient vertebrate embryos, hindbrain tissues were not reduced in twin-tail goldfish embryos; the presence of duplicated *chordin* genes presumably prevent over reduction of anterior-dorsal tissues. Furthermore, analysis of Chinese archivers suggests that the developmental changes occurred during 600 years of goldfish domestication.

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