

Origin and evolution of vertebrate brain

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The evolution of the brain has long been a focus of the comparative morphology. It has been known that the diversification of vertebrate brain associates with the modifications of the developmental mechanism that is involved in the brain formation. Recent studies have provided significant insights for understanding the developmental process of the brain in various vertebrates and also identified several regulatory- and axon guidance-genes relating to the formation of the brain. In our study, we focused on lamprey, a kind of cyclostome, diverged from gnathostome lineage after the split between vertebrates and chordates. We found that the expression pattern of several regulatory genes in the lamprey are quite similar to the other vertebrates, suggesting that the basic mechanism for the brain development are likely to have been established in a common ancestor before the divergence of cyclostomes and gnathostomes. On the other hand, genes encoding signaling and axon guidance molecules, such as *Hh* and *EphC*, portrayed different expression patterns between cyclostomes and gnathostomes in the ventral telencephalon and cerebellum, suggesting that these regions were modified during vertebrate evolution. Based on these results, we discussed the origin and evolution of vertebrate central nervous system.