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olig2 Is Required for Zebrafish Primary Motor Neuron and Oligodendrocyte Development

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Abstract

Oligodendrocytes are produced from the same region of the ventral spinal cord that earlier generated motor neurons in bird and rodent embryos. Motor neuron and oligodendrocyte precursor cells express *Olig* genes, which encode basic helix–loop–helix transcription factors that play important roles in the development of both motor neurons and oligodendrocytes. We found that oligodendrocytes develop similarly in zebrafish embryos, in that they arise from ventral spinal cord and migrate to new positions. Developing primary motor neurons and oligodendrocytes express *olig2* as do neural plate cells that give rise to both primary motor neurons and oligodendrocytes. Loss of *olig2* function prevented primary motor neuron and oligodendrocyte development, whereas *olig2* overexpression promoted formation of excess primary motor neurons and oligodendrocytes. We provide genetic evidence that Hedgehog signaling is required for zebrafish *olig2* expression and oligodendrocyte development. However, *olig2* overexpression did not promote primary motor neuron or oligodendrocyte development in embryos with reduced Hedgehog signaling activity. One possibility consistent with these data is that Hedgehog signaling, partly by inducing *olig2* expression, specifies neural precursor cells that have potential for primary motor neuron or oligodendrocyte fate.

Keywords

zebrafish; oligodendrocyte; glia; motor neuron; spinal cord; neurogenesis; Hedgehog; Olig

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