

DIFFERENTIAL ROLES FOR HEDGEHOG SIGNALING IN MOTOR NEURON DEVELOPMENT

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ABSTRACT

Induction of neurons in the correct number and location is essential for the proper development and function of a nervous system. Signaling mediated by the Hedgehog (Hh) family of secreted proteins plays a vital role in the induction of the vertebrate branchiomotor neurons, which are located in the brainstem and regulate chewing, swallowing, and sound production. The Gli family of zinc-finger transcription factors mediates Hh signaling in all vertebrates. For instance, zebrafish *gli1* is required for motor neuron specification in the brainstem but not in the spinal cord, whereas mouse *gli* genes function redundantly for motor neuron development. We examined motor neuron induction in *you-too* (*yot*) mutants, which encode dominant repressor forms of Gli2 (Gli2^{DR}), and following morpholino-mediated knockdown of *gli3* function. Motor neuron induction at all axial levels was reduced in *yot* (*gli2^{DR}*) mutant embryos, and *gli1* or *gli3* knockdown in *yot* (*gli2^{DR}*) mutants resulted in severe or complete loss of motor neurons. These observations demonstrate that Gli activator function (encoded by *gli1*, *gli2*, and *gli3*) is essential for motor neuron induction and Hh-regulated gene expression in zebrafish.