Featured Publication Note
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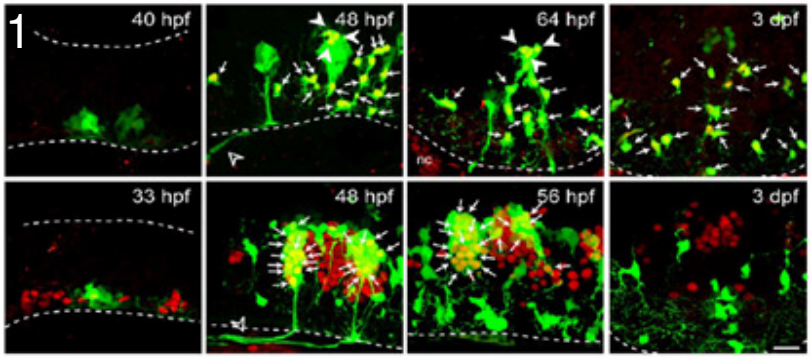
Cranial Motor Neuron and Oligodendrocyte Development

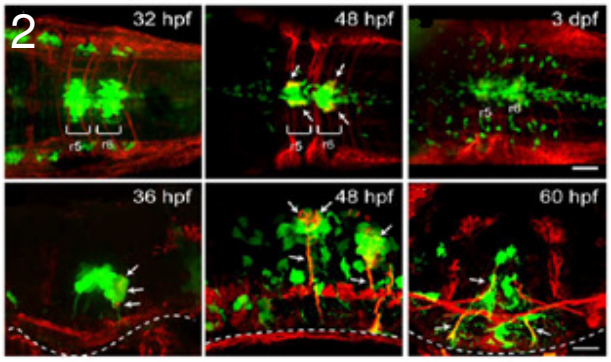
In the spinal cord of developing vertebrate embryos, motor neurons and most oligodendrocytes have a common origin. A subset of ventral spinal cord precursors, called pMN cells, produces first motor neurons and then oligodendrocyte progenitor cells (OPCs). This is dependent upon a transcription factor called Olig2, which is expressed by pMN cells.

In the hindbrain, less is known about the developmental relationship of motor neurons and oligodendrocytes and it is not clear whether hindbrain oligodendrocytes arise from *olig*$^+$ precursor cells that also produce somatic motor neurons. In this study, researchers have used zebrafish to investigate hindbrain (or cranial) motor neuron and OPC development using a combination of techniques, including time-lapse imaging using the Ultra*VIEW* Live Cell Imager.

Initial experiments suggested that hindbrain labelled *olig2*$^+$ cells included both motor neurons and OPCs. To support this, researchers labelled transgenic zebrafish embryos with cell type specific markers. Figure 1 shows that in the hindbrain, *olig2* expression marks all OPCs (top panels) but only a subset of motor neurons (bottom panels) in rhombomeres r5 and r6 (transiently divided segments of the developing neural tube). Using a Zn8 antibody they then definitively identified these motor neurons as abducens motor neurons (Figure 2). The images in this study were analyzed using Volocity 3D-4D imaging software. Volocity was also used to generate QuickTime movies.

Researchers also showed that motor neurons and OPCs outside of r5 and r6 develop independently from each other, and that in the absence of *olig2* function, the neuroepithelial precursors in r5 and r6 are not specified for neuronal or glial fates. This study has revealed both common and independent roles for *olig2* in the development of somatic motor neurons and oligodendrocytes of the hindbrain.





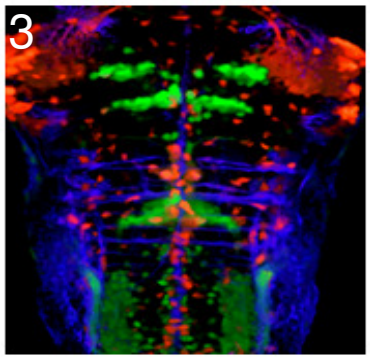


Figure 1: OPCs and a subset of motor neurons express *olig2*. Sections of transgenic *(olig2:egfp)* embryos. Top: Anti-Sox10 immunohistochemistry to mark OPCs. The arrows and arrowheads mark *olig2*$^+$Sox10$^+$ cells outside and within *olig2*$^+$ r5 and r6 clusters, respectively. Bottom: Anti-Isl immunohistochemistry to mark motor neurons. The arrows mark *olig2*$^+$Isl$^+$ motor neurons. Open arrowheads mark axonal projections. Scale bars: 24 µm. hpf/dpf = hours/days post-fertilization.
Figure 2: Abducens motor neurons express *olig2*. Zn8 immunohistochemistry to mark abducens motor neurons in transgenic *(olig2:egfp)* embryos. Whole embryos are viewed from different orientations. Arrows mark *olig2*$^+$Zn8$^+$ abducens motor neurons and projections. Dashed lines indicate the neural tube boundary. Scale bars (*top panels*): 48 µm (*bottom panels*): 24 µm.
Figure 3: From the front cover of the Journal of Neuroscience. Hindbrain of a 3dpf transgenic zebrafish embryo in which motor neurons express *egfp* (green) and oligodendrocytes express *DsRed2* (red). Abducens motor neurons and commissural axons were labeled using Zn8 immunocytochemistry (blue). This image was taken using the Ultra*VIEW*.