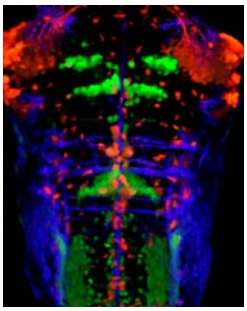

their processes. Previous studies in the Appel laboratory demonstrated that the *olig2* gene is necessary for formation of OPC and spinal motor neurons from the pMN domain of the zebrafish spinal cord. Because oligodendrocytes are present throughout the central nervous system, they extended this hypothesis along the anterior axis to the hindbrain.

Using elegant transgenic strategies and lineage-specific antibody labeling, Zannino *et al*. first characterized neuronal and glial cells in the hindbrain. They witnessed *olig2* mRNA expression specifically in rhombomeres 5 and 6 (r5/r6) of the hindbrain, which was corroborated by enhanced green fluorescent protein (GFP) driven by *olig2* regulatory DNA in transgenic embryos: Tg(*olig2:eGFP*). Antibody staining for Zn8, a marker for somatic abducens motor neurons, was also specific for the 5th and 6th rhombomeres, unlike the broad motor neuron marker, Isl1. Thus hindbrain abducens motor neurons and some OPCs may be specified from a common precursor population. Through time-lapse imaging of Tg(olig2:eGFP) embryos, they next demonstrated that OPCs come from within neuroepithelial precursors in the 5th and 6th rhombomeres of the hindbrain, but that many also arise from *olig2*- precursors elsewhere in the hindbrain.

The investigators next show that the knockdown of the *olig2* gene by targeted antisense morpholino (MO) resulted in a specific effect on hindbrain cells. In morpholino-injected embryos, *olig2* RNA expression was maintained in rhombomeres r5 and r6; however, these cells appeared abnormal at 48 hours post-fertilization, in that most cells appeared to be undifferentiated neuroepithelial precursors and did not possess abducens morphologies. Additionally, BrdU staining for mitotically active cells continued in the hindbrain of MO-injected embryos long after control siblings, suggesting that these cells remain in an undifferentiated state. These results suggest that Olig2 function is necessary for formation of both hindbrain OPCs and somatic abducens motor neurons.

This paper provides several important characterizations of hindbrain cell fate decisions in early development. First, their confocal imaging provides evidence for multiple origins of hindbrain OPCs. In addition, this work shows that timing of *olig2* expression is essential: at early stages the gene is expressed only in the neuroepithelial precursors of rhombomeres r5 and r6, and at later stages only in cells that already possess OPC morphology. Finally, Zannino *et al*. found that *olig2* is also necessary for a class of abducens motor neurons to exit the cell cycle and begin neurogenesis. Ultimately, this work characterizes crucial cell-fate decisions in the developing brain, demonstrating the essential combination of gene regulation and temporal control toward proper specification of both glial and neural cell types in the vertebrate hindbrain.

Original Research Article:
DA Zannino and B Appel (2009). Olig2+ Precursors Produce Abducens Motor Neurons and Oligodendrocytes in the Zebrafish Hindbrain. *J Neurosci.* **29** (8): 2322-2333.

A note from the Director

In my first year as the Director of the Vanderbilt Brain Institute and the Vanderbilt Neuroscience Graduate Program, I have been continually impressed with the passion for science and dedication to the research endeavor that embodies each of our graduate students. This volume serves as a tangible testament to the exceptional nature of these individuals, and illustrates both the diversity and quality of the neuroscience research enterprise at Vanderbilt. As the first stage in their passage to doctoral candidacy, these reviews serve as springboards to the student's proposed thesis research, and I am delighted to say that each of our candidates demonstrated a strong breadth and depth of knowledge in their chosen research areas while defending these reviews. I am proud to serve in a leadership role for an organization that can join together to highlight its accomplishments in such a novel, impressive and attractive manner, and I am deeply indebted to those (most notably, Chris Ciarleglio) who have taken a leadership role in making this journal a reality.

Yours in science,

Mark T. Wallace, Ph.D.