Regrow with the flow: force and flow regulate neural progenitor quiescence following spinal cord injury

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Regenerative vertebrates, such as zebrafish and salamanders, exhibit near complete recovery from traumatic spinal cord injuries. This process requires tissue remodeling and reactivation of quiescent neural progenitors to replace lost and defective tissues. Using zebrafish models of spinal cord injury and high-speed live imaging and biosensors, we show that flow and tissue remodeling generate distinct biomechanical forces that orchestrate and drive the neural progenitor activation and local repair. We identify specifically located mechanically gated cation channels on the membrane and cilia of the neural progenitors and the downstream transcriptional programs that trigger exit from quiescence. Furthermore, we show that biomechanical sensing is also an important mechanism in control of normal spinal cord development and growth.