Stem cells and neurogenesis in the developing and adult mammalian brain.

Research Interests

Neural stem cells generate the neurons and glial cells that are the building blocks of the brain. Identifying the factors that regulate their numbers is essential for understanding their role in developmental disorders, cancer and regeneration following neurotrauma or stroke. The *B-cell lymphoma 2 (Bcl-2)* family of pro-survival and pro-apoptotic genes play a key role in maintaining the balance between cell survival and apoptosis, an active form of cell death. The long-term goal of my research program is to identify the roles of the *Bcl-2* family in development and regeneration of the mammalian nervous system.

My laboratory has two main streams of research. The first focusses on the role of the Bcl-2 family in nervous system development. Although the canonical role of the Bcl-2 family is to regulate apoptosis, research has recently revealed Bcl-2 family members involved in mitochondrial dynamics, autophagy, calcium regulation and the cell cycle. My lab has demonstrated that the anti-apoptotic Bcl-2 proteins, myeloid cell leukemia -1 (Mcl-1) and Bcl-2 related gene long isoform (Bcl-xL) are involved in both neural progenitor cell survival and cell cycle regulation during developmental neurogenesis. Current projects in the lab are focussed on identifying the mechanisms by which these two proteins promote both cell survival and cell cycle exit.

The second research stream in my lab focusses on neural regeneration in the adult mammalian brain. My lab has previously developed a mouse model of a focal ischemic stroke that we are using to explore the endogenous potential of the brain to repair itself. Neural stem cells in the adult brain have the capacity respond to an ischemic stroke by proliferating to produce neural progenitor cells that can migrate to the injury and differentiate into neurons and glial cells. Unfortunately, the poor survival rate of neural progenitor cells and new neurons within the injury site limit the ability of the brain to repair itself. The survival of these neural progenitor cells and new neurons is dependent on the cellular interactions between the supporting glial cells and the vascular system = the neurovascular unit. My lab is examining the role of the neurovascular unit in promoting cellular regeneration following an ischemic stroke. In the clinic, strokes most often occur in individuals with additional health complications such as obesity. Current projects in the lab are examining the effect of obesity on the health of the neurovascular unit and its ability to respond to an ischemic stroke.