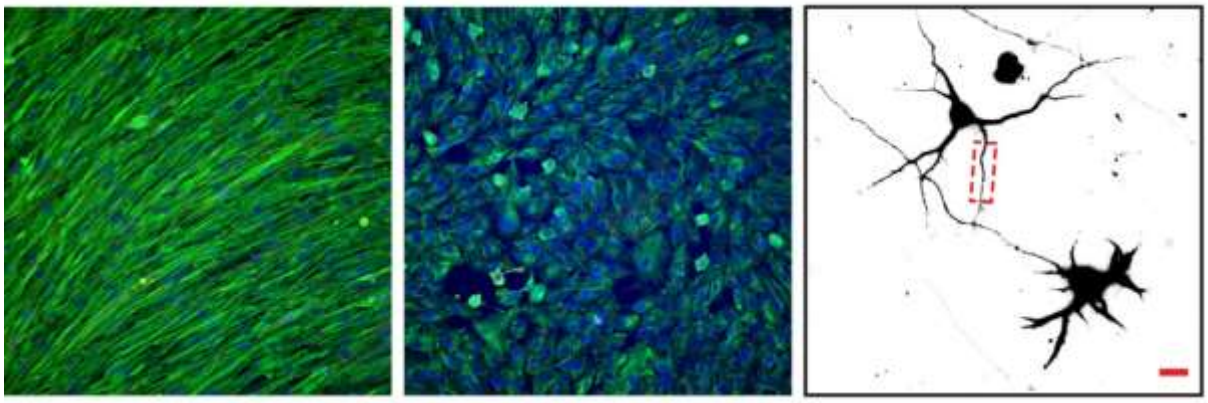
Quiescence



In vitro cell growth. Different cells grown outside the body on plastic. ***(left panel)*** *Single layer of cells grown until they stopped replication stained for DNA (blue) and cell boundary (green).* ***(centre panel)*** *Single layer of actively replicating stained for DNA (blue) and cell boundary (green).* ***(right panel)*** *Neurons from the brain grown on plastic stained for the cell boundary (Black).*

Quiescence (also named the 'G0' stage of the cell cycle) is the state in which cells are not dividing but retain the ability to restart their proliferation upon stimulation. Many cells in the body are in quiescence including hepatocytes (livercells), dermal fibroblasts (skin cells) and resting lymphocytes (immune system cells). Notably, many adult stem cells are maintained in a quiescent state but are able to re-enter the cell cycle to rapidly replicate and differentiate in response to stress such as injuries. Thus, the ability of cells to persist in quiescence and alternate to proliferation as required is crucial for tissue homeostasis renewal and response to life-threatening challenges. However, most research has focused on proliferating cells and our understanding of the molecular mechanisms that control quiescence especially is still very limited. Therefore, understanding how quiescence, proliferation and differentiation function will bring very exciting prospects for the development in the fields of biotechnology and medicine using targeted therapies or devices against quiescent cells to specifically spare them, kill them or modulate their behaviour. It is in this fascinating area that our lab undertakes research.

Specifically, we hope to understand how Adult-Stem Cells respond to their immediate surroundings (known as the cell microenvironment) to stay resting or to proliferate or to undergo differentiation. We use both *in vitro* cell culturing models and *ex vivo* models to investigate this process. Ultimately, we would hope to create an *in vitro* device where we could reliably grow tissue outside of the body for use in transplantation, as a research tool and as a model system to study disease thereby reducing the need for animal models.