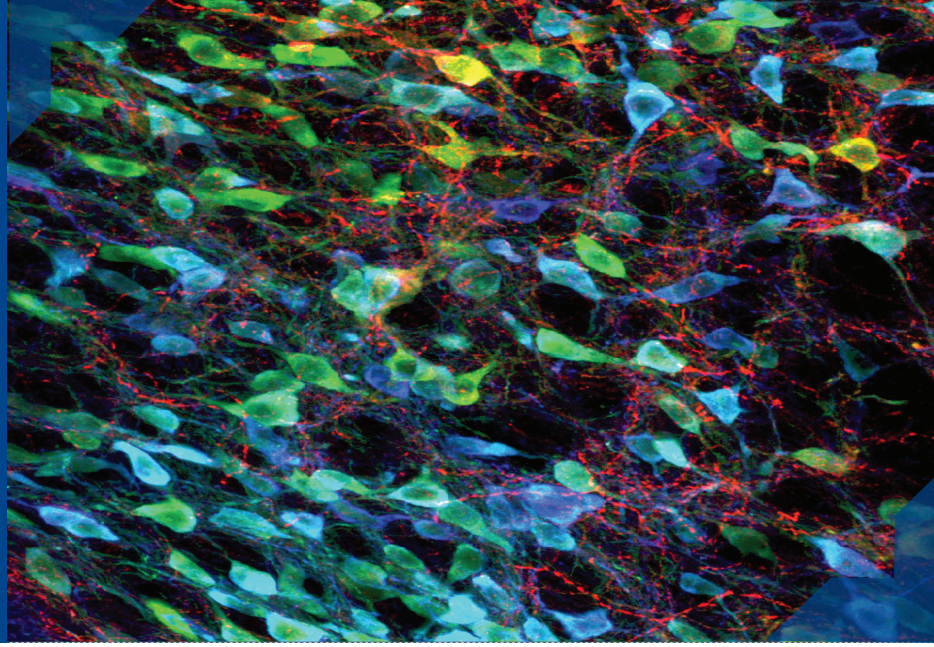
THE UNIVERSITY OF MELBOURNE

Centre for Stem Cell Systems

Stem Cell Stories



Towards stem cell therapies for Parkinson's

A bioengineering approach that supports survival of cells transplanted into the brain offers new hope of a treatment for Parkinson's and other brain diseases.

The need

Science is only beginning to tease out the many mysteries the brain holds regarding its function and the impact of disease or injury. As one of the most prevalent forms of brain disease, affecting approximately 700,000 Australians, Parkinson's Disease has been the subject of considerable study. We now know that Parkinson's is caused by a loss of dopamine-producing neurons, and while this loss occurs throughout the brain it is in the region called substantia nigra where the loss is most devastating. Because the disease is linked to a single type of cell, a stem-cell-based therapy to replace or repair cells in the damaged region is feasible. Early clinical studies have identified some of the obstacles – such as the best type of cells to transplant – but more needs to be done before a clinical treatment is a reality.

The projects

The research labs of Associate Professor Clare Parish and Dr Lachlan Thompson at The Florey have long been at the forefront of discovery in brain repair, particularly for Parkinson's. In 2011, the pair had already been working together to solve some of the problems associated with growing replacement cells in amounts that would be necessary for eventual therapy. More recently, the Parish and Thompson labs have focused on finding ways to ensure safe and effective incorporation of these cells into human patients. Up to now, one of the key challenges has been cell survival as the brain is a hostile place and transplanted cells often don't survive long enough to properly engraft. Bioengineering – creating scaffolds and hydrogels to support the transplanted replacement cells – offers an attractive solution. Scaffolds can provide cells with an architecture that is more closely aligned with how cells would normally exist, while hydrogels can provide both a buffer from attack and can be infused with proteins or other factors to ensure longer cell survival. Over the past few years, the Parish and Thompson research teams have published several articles outlining their advances using this strategy. In addition, the teams have continued to refine the processes of generating neurons from pluripotent stem cells and have shown in animal studies that their cells are able to survive and forge critical brain connections.

The impact

Cumulatively, the Parish and Thompson labs have made a series of rapid advances, bringing the goal of a cell-based therapy for Parkinson's a notch closer to reality, something the pair holds as their primary focus. Of equal importance, their findings, in terms of how to effectively grow neurons and how to deliver them into the injured brain, will have broader impact on research for a range of neurodegenerative conditions such as Alzheimer's and Huntington's, as well as brain damage caused by stroke and other injuries.

Associate Professor Clare Parish and Dr Lachlan Thompson are Group Leaders at the Florey Institute.

Explore their web pages for more information.