

FIGHT MND.

Researcher .

A/PROF LACHLAN THOMPSON

IMPACT Project.

ESSENTIAL PRECLINICAL STEPS TOWARDS A STEM CELL TRIAL FOR MND



A/Prof Lachlan Thompson

Where do you work?

I work at The Florey Institute of Neuroscience and Mental Health, University of Melbourne.

Can you summarise your research experience and background?

I did my undergraduate studies (BSc) at UoM before completing my doctoral degree at Monash (2002). I then undertook 5 years of postdoctoral training at Lund University in Sweden (2003-2007) where I developed expertise in the area of neural transplantation and cell-based therapies for repair of the central nervous system. In 2008 I moved back to Melbourne to establish a laboratory in this field at the Florey. It is an important and steadily growing area on the Australian research landscape. We are aggressively exploring the capacity for stem cells to be utilised as a therapy for MND. While there is undoubtedly potential there, harnessing and understanding this so that a therapy can be established with predictable and effective outcomes remains the key challenge for this field. Certainly, it is a surmountable challenge, we think.

Why did you decide to pursue research into MND?

Most of my career has been dedicated to developing cell-based therapies for Parkinson's disease. This has allowed us to establish a strong foundation of understanding around how neural circuitry can be re-established in the damaged central nervous system through transplantation of the correct cell type. In

the context of central nervous system repair, an important similarity shared by PD and MND is that the neurodegenerative process involves primarily a single cell type. It struck us that many of the principles that have underpinned success in the establishment of cellular therapy for Parkinson's disease could be applied to MND, and thus we were motivated to explore this.

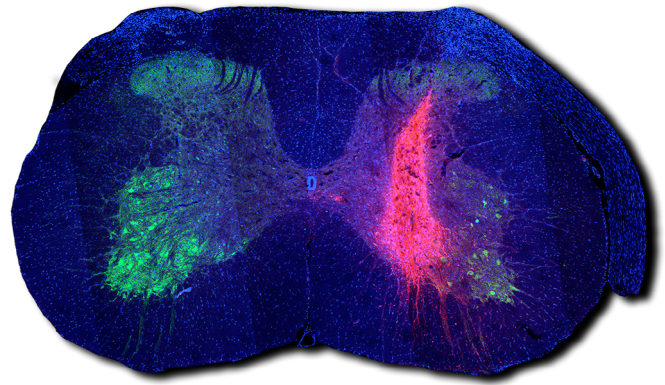
What is your most surprising finding?

In Parkinson's disease research, it has long been established that stem cells must form the cell type lost in the disease in order to replace those cells and effectively restore function to the patient. A surprising finding in this area has been that stem cells can also provide therapeutic benefit by protecting the host cells from degenerating. For MND, this means that it may be valuable to transplant suitable stem cells in a relatively non-invasive way, in order to protect the patient's own cells and significantly slow the degenerative process.

How did you identify that stem cell therapy may be beneficial for MND?

We use a rat model of MND, in which a progressive loss of spinal motor neurons is associated with a continuing decline in movement in much the same way that occurs in MND. We found that transplanting human cells into these rats could significantly slow the development of these movement-related symptoms.

FIGHT MND.



Stem cell graft (red) in rat spinal cord.

What do you find exciting about your stem cells approach?

We are only just beginning to realise the potential for stem cells for therapeutic application in the central nervous system. The fact that stem cells have shown so much potential while we still have so much to learn about how to harness and apply this potential means that there is tremendous scope for developing therapies. It also means that we need to take a rigorous and methodical approach to preclinical research to establish evidence-based procedures that can be translated to clinical practice. I have no doubt this is achievable.

How will this funding impact on your research?

This will have a tremendous impact on the capacity to push forward our aspiration to establish a stem cell therapy for MND. There is a lot of preclinical work to do in this area and the rate-limiting factor is overwhelmingly the ability to support talented researchers to undertake the work. This funding will allow a postdoctoral scientist that might have otherwise been drawn to another field to remain dedicated to pursuing the establishment of a stem cell therapy for MND. It will undoubtedly move us closer to realising this goal.

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Stem cells have the potential to treat neurological conditions such as MND, but their capacity to do so in preclinical models of MND remains poorly explored. Also, the best stem cell type and the most optimal way to deliver stem cells for therapeutic benefit in MND requires investigation.

OBJECTIVE:

This IMPACT project aims to establish preclinical efficacy for stem cell therapy in a model of MND and provide the framework for a well-rationalised clinical trial for MND patients.

OUTCOMES:

- Build solid preclinical evidence for therapeutic efficacy of stem cell therapy in a preclinical model of MND.
- Identify the best kind of stem cell for treating MND and establish the optimal route of delivery in a preclinical model of MND.
- Develop a thorough understanding of the mechanisms underlying the beneficial effects of stem cell therapy in a preclinical model of MND.
- Advance the pathway to a well rationalised, evidence-based stem cell clinical trial for MND patients.