FIGHT MND.

Researcher.

PROF AARON RUSSELL

IMPACT Project.

IDENTIFYING BIOMARKERS FROM EXTRACELLULAR VESICLES FOR EARLY DETECTION, DISEASE PROGRESSION AND THERAPEUTIC EFFICIENCY IN MND

Priority Area.

DISEASE BIOMARKERS

Prof Aaron Russell

Where do you work?

I work at Deakin University in the School of Exercise and Nutrition Sciences. My research is conducted within the Institute for Physical Activity and Nutrition (IPAN).

Can you summarise your research background and experience?

I have a PhD in Exercise Physiology/Molecular Biology from Deakin University and have worked in Switzerland, the USA and Australia. Over the past 20 years my research has focused on understanding the molecular mechanisms regulating skeletal mass during exercise and disease. More recently my attention has shifted to understanding how cells communicate with each other in healthy and disease conditions, with a specific interest in MND.

What drew you to search for a cure for MND?

My interest in MND research has evolved over time as I gradually became aware of friends and family of friends who had been impacted by MND. I felt that my skill set would add an alternative approach to investigating the mechanisms of the disease. Also, the passion and collegiality of discovery and clinical MND researchers, both in Australia and internationally, has drawn me to this field.

What is the current focus of your research laboratory?

My research team is focused on understanding the intracellular mechanisms that enable communication between different cells and tissues. Specifically, we are interested in the communication between neurons and muscle. We want to know how the connections between neurons and muscle is perturbed in MND and what interventions we can use to delay, slow and stop this from happening.

Tell us a little bit about the unique feature of the MND model your project is using?

We are using an inducible TDP-43 mouse model. This allows us to determine when the disease will commence, follow its progression, as well as reverse the disease pathology. This means we can analyse tissue and plasma samples at distinct time points to look for changes in potential biomarkers of disease on-set, progression and reversal. Measuring and comparing changes in these targets in plasma samples from patients with MND enhances the translatable potential of our work.

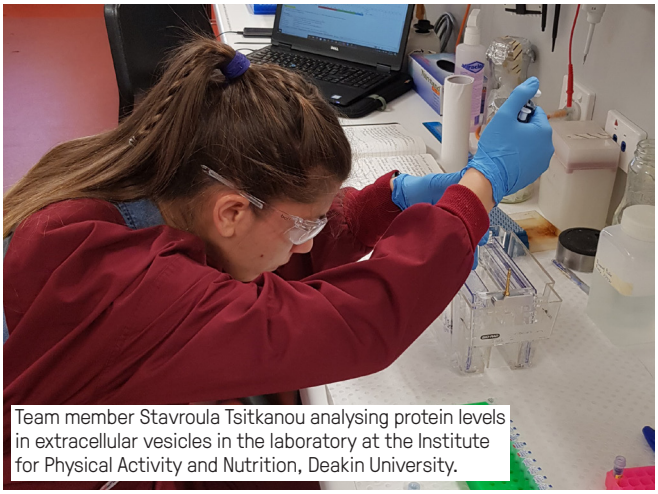
FIGHT MND.

Your project is developing new biomarker profiles. How will this benefit people living with MND?

We hope that the new biomarker profiles identified will allow us to predict disease on-set at an early stage. The biomarker profiles could also be used in current clinical trials as a measure of treatment responsiveness, and therefore improve the likelihood of current trials being successful. Additionally, the biomarker profile observed during the reversal stage may identify new targets for therapeutic manipulation.

How will this funding impact on your work?

I am extremely grateful, and thank the FightMND army for this funding. Without it, I could not complete this work in such a relatively short timeframe.



Team member Stavroula Tsitkanou analysing protein levels in extracellular vesicles in the laboratory at the Institute for Physical Activity and Nutrition, Deakin University.

The IMPACT Project

A major stumbling block in developing a cure for MND is a lack of reliable biofluid biomarkers for diagnosis and prognosis of the disease. It is also hard to know if treatments are actually reaching their intended targets. A recently developed preclinical model of sporadic MND may provide a solution owing to its unique properties in which MND can be precisely initiated, halted, and reversed. This allows researchers to know exactly when to look for early diagnostic biomarkers before symptoms appear, prognostic biomarkers as MND progresses, and biomarkers of recovery that may assist in quickly recognising if drugs designed to treat MND are effective.

This project will measure and compare changes in proteins found in the blood of the new preclinical model of MND, and MND patients, to try to identify ways to accurately detect MND and pinpoint how long a person has lived with MND. The research team will assess a small component of blood called extracellular vesicles, which carry materials released from cells in the body, including proteins, lipids and metabolites. They will analyse the levels of specific proteins in extracellular vesicles using the latest proteomics and bioinformatics technologies, to determine the health status of motor neurons.

OBJECTIVES

- To establish a biomarker profile of MND onset, progression and recovery in a new preclinical MND model, and a biomarker profile in MND patients before symptoms appear and during disease course.

OUTCOMES

- A suite of new biomarker signatures for use in current and future clinical trials to accurately measure treatment responsiveness.
- Improve clinical trial outcomes by enabling the identification of MND patients with a similar prognostic outlook.