

THANK YOU for powering MS research in Australia



Thanks to you, we can look back on a fruitful and exciting year in MS research. Research almost entirely funded by generous people like you.

You are currently powering 47 incredible research projects which will help take away the power that MS has over people's lives. You'll be able to read about your impact shortly in our upcoming Progress Impact Report.

In the meantime, we've been speaking to people like you – our donors and fundraisers fuelling MS research, the researchers hard at work, and people living with MS whose lives are constantly being transformed by that research. People like Lauren (pictured) who has been living with MS for six years and for whom research breakthroughs mean hope for a life free from MS.

No matter how you support MS research, we are united in our pursuit of a world free from MS. It is this unity

Cont. on pg 7



THE MAY 50K RAISES OVER \$6.6 MILLION FOR MS RESEARCH

YOU HELPED US RAISE A RECORD-BREAKING \$6.6 MILLION FOR LIFE-CHANGING MS RESEARCH!

This year marked the much anticipated second year of MS Research Australia's community fundraising initiative, The May 50K – a virtual fitness and fundraising challenge, encouraging Australians to walk or run 50km whilst raising funds for life-changing MS research. 2020 was off to a difficult start for many as the catastrophic bushfires were quickly followed by the COVID-19 pandemic, forcing people into isolation and leaving uncertainty around how The May 50K would unfold.

Turns out, not even a global pandemic can stop our Kiss Goodbye to MS supporters! Leveraging the virtual nature of the campaign, The May 50K continued, enabling supporters to get out walking, running and fundraising. These incredible efforts culminated in over \$6.6 million for MS research – more than three times the total funds raised in 2019!

You have shown us once again your unwavering commitment to ensuring that we WILL leave MS where it belongs, behind us.

OVER 36,000 AUSTRALIANS SIGNED UP – THAT'S MORE PEOPLE THAN THE 25,600 AUSTRALIANS LIVING WITH MS.

Seeing the challenge being embraced on such a scale, going well beyond the MS community was truly remarkable, with nearly half of all participants having no personal or direct connection to MS.

During a time of global uncertainty, The May 50K proved to be a perfect way for many Australians to stay connected and look after their physical and mental well-being, whilst working towards a common goal – accelerating research into prevention, better treatments and a cure for MS.

We also saw 433 workplaces embrace The May 50K and raise over \$800,000 for life-changing MS research. We were so pleased to see our workplace legends embrace the challenge as a pillar for unity whilst many were working from home.

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MS ORGANISATIONS TO 'SPEAK WITH ONE VOICE'

A WORD FROM MS AUSTRALIA PRESIDENT
ASSOCIATE PROFESSOR DES GRAHAM



Australians living with multiple sclerosis (MS) will be represented by a single national body after the MS Australia Board endorsed an independent expert's recommendation to bring MS Australia and its research subsidiary MS Research Australia closer together.

Given the tough operating market for not-for-profits following a series of major structural and regulatory reforms, the MS Australia Board requested the governance review to identify ways to better meet the current and future needs of people living with MS.

Associate Professor Des Graham, MS Australia's President, said MS Australia needed to evolve to be as successful in the future as it has been in the past.

"MS organisations must speak with one voice whether it is about care, research or advocacy – too often in the past, we have competed against each other to deliver our common goals," he said.

"It is critical that every dollar we spend supports the current and future needs of Australians living with MS and research. We must move to a structure that allows us to operate in the most efficient way and delivers the care, research and advocacy that people living with MS deserve."

Effective Governance, the pre-eminent governance advisory firm in Australia, reviewed MS Australia's operations and provided recommendations to strengthen the operation of the organisation, including:

- Formally bringing together MS Australia and MS Research Australia as a fully integrated organisation under one CEO and Board;
- Undertaking a recruitment process to identify a CEO to head the newly focussed MS Australia;
- Moving to ensure the MSA Board reflects the necessary skills to reflect MS Australia's priorities – care, research and advocacy, as well as other governance requirements; and
- Reviewing MS Australia's 2020 – 2025 strategic plan.

Associate Professor Graham said the changes would make it a stronger and more efficient organisation but would not change MS Australia's commitment to supporting people living with MS or research.

"MS Australia and the state and territory MS societies will continue to engage with people living with MS, their families and carers; the research community; and other partners and supporters as we always have – with a focus on delivering improved outcomes and ensuring a better quality of life for those living with MS," Associate Professor Graham said.

"We remain committed to increasing funding for MS research to record levels and providing certainty to our researchers around their research and career paths. The highly regarded governance and processes provided by the Research Management Council which oversees research strategy and funding allocations will continue to operate in the way it always has."

Under its new governance model, MS Australia will be responsible for national and international relations while the state and territory MS societies will be responsible for fundraising within the states and territories.



MS Research Australia currently funds 47 ongoing research projects covering a range of MS research priorities, including causes and prevention, better treatments and cures through repair or regeneration of cells. Each year, researchers that are funded by MS Research Australia provide a report detailing their progress.

None of this research could be possible without the ongoing support of the MS community, donors, funding partners and State MS Societies. In particular last month MS Limited provided a funding boost of \$1 million to support further research into myelin repair and neuroprotective research that will pave the way to end MS forever.

ENHANCING MYELIN REPAIR USING BRAIN STIMULATION

Associate Professor Kaylene Young, who received a MS Research Australia Project Grant, with funding support from the Trish MS Research Foundation, has been looking at the use of a non-invasive

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Associate Professor Kaylene Young

technique to increase the production of cells that produce myelin in the brain. The technique, called repetitive transcranial magnetic stimulation (rTMS), is being tested in laboratory models for its ability to re-wrap nerve fibres in myelin and to promote lesion repair in the brain.

Associate Professor Young and her team have found that rTMS increases the number of new myelin producing cells added to the brain and spinal cord and increases the rate of myelination as a result of improved survival of these cells. She is now in the process of determining whether it enhances myelin repair in three different laboratory models of MS.

Associate Professor Young and her team are looking to move this therapy into clinical trials. If these experiments are successful, rTMS may be used as a therapy to repair existing damage in both relapsing forms of MS and progressive MS.

COPPER AS A POTENTIAL THERAPEUTIC TARGET FOR PROGRESSIVE MS

Associate Professor Peter Crouch, a recipient of an MS Research Australia Project Grant, with funding support from the Trish MS Research Foundation, is focusing on the role copper may play in the development of progressive MS, and its potential as a therapeutic target. Copper is an essential element needed by all forms of life and changes in its levels can have serious consequences for health. This is particularly true in the brain and spinal cord where changes to copper levels cause the dysfunction and death of nerves.

MS RESEARCH AUSTRALIA FUNDED RESEARCH MAKING EXCELLENT PROGRESS

Associate Professor Crouch and his team have analysed the changes in myelin in laboratory models of MS and have shown that these changes respond to treatment with a copper drug. Their analysis of tissue from people with MS also supports these findings.

The team have analysed the levels of genes involved in copper handling, myelin production and the immune system and found changes in progressive MS. They have also determined that the distribution of copper in human spinal cord tissue is affected in progressive MS. Additionally, they have looked at the changes in these genes in laboratory models of MS to find how their copper drug will effect the differences seen in progressive MS.

This work is a promising indication that the copper drug could eventually be taken forward for testing in people with MS.

RESEARCH INTO CAUSES AND PREVENTION OF MS AND BETTER TREATMENTS FOR MS

Several projects funded by MS Research Australia have been focusing on finding better treatments for MS. **Professor Georges Grau** has been focusing on characterising the immune cells in three groups of people – people with MS having treatment, people with MS not having treatment, and people without MS. This work will allow an accurate snapshot of the immune cells present in each group and will hopefully identify differences that could be used to develop new treatments for people with MS that mimic the immune cell profile of people without MS.

Associate Professor Ollie Jay is developing simple interventions for preventing heat-related fatigue in people with MS while they exercise. He has previously shown that drinking cold water reduces the sensation of fatigue, allowing people with MS to continue exercising for longer periods. His work will result in clarity on ways people with MS can combat heat-related fatigue.

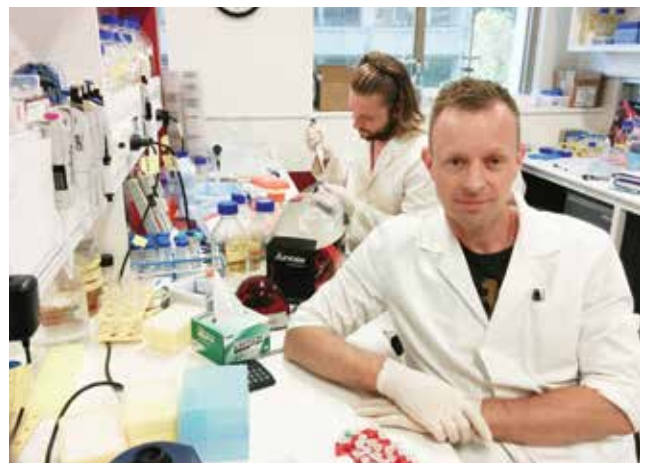
“ MS RESEARCH AUSTRALIA CURRENTLY FUNDS 47 ONGOING RESEARCH PROJECTS COVERING A RANGE OF MS RESEARCH PRIORITIES... ”

Dr Yuan Zhou is looking into causes and prevention of MS by investigating some of the genes linked to the development of MS to determine their effect on the clinical course of the disease. He is creating a mathematical formula that includes genetic and environmental risk factors that can better predict the clinical course of MS and a person's treatment response.

Dr Grant Parnell has also been focusing on causes and prevention of MS by looking at how MS risk genes respond to vitamin D. He has found that the activity of two MS risk genes, as well as other genes, are influenced by the presence of vitamin D, and is investigating how they influence the function of immune cells. It is hoped that alternative strategies can be identified to gain benefits from the vitamin D pathway to promote a tolerant immune system.

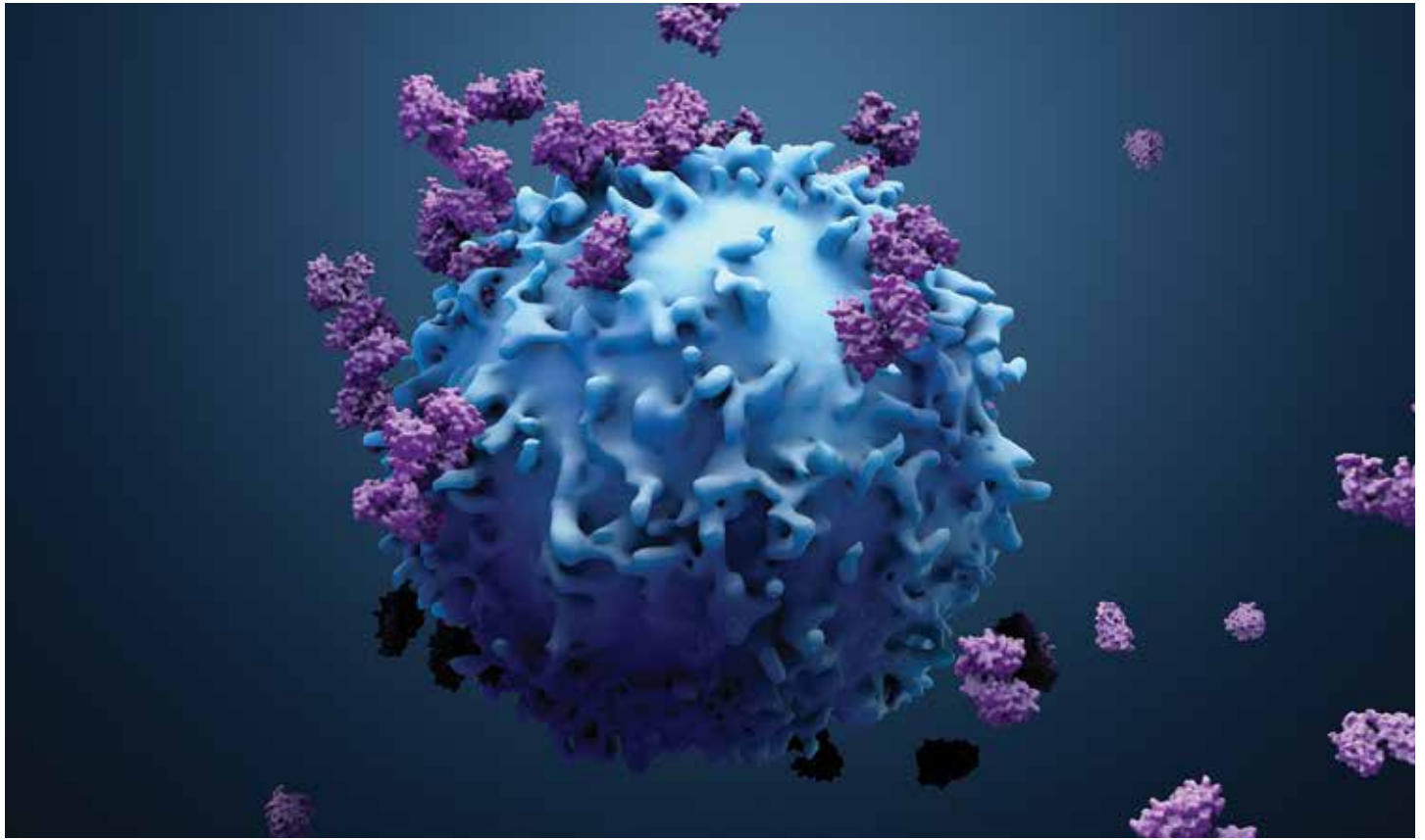
MORE INFORMATION

Full details on the progress of all projects we are currently funding can be found at www.msra.org.au/projects.



Associate Professor Peter Crouch

CUTTING-EDGE TECHNOLOGIES HELP DISCOVER UNKNOWN CELLS IN THE HUMAN BODY



The human body is made up of many different types of cells. The exact number of types is unknown, and more and more subtypes of cells are being discovered as technology gets better. MS Research Australia funded researchers have been using the latest technologies, which is giving them unprecedented insights into changes in particular subtypes of immune cells that occur in people with MS.

The invention of the microscope back in the 1600s gave scientists the ability to see cells for the first time, and over the years, microscopes have become better and better. They have allowed scientists to discover and characterise hundreds if not thousands of different types of human cells based on how they look and function. Now, newer technologies known as flow cytometry and mass spectrometry, have pushed the boundaries even further – splitting types of cells down further and further and finding new populations of cells never known to exist before. Why is this important? Well, some of these subpopulations of cells might be the cells that are causing disease and therefore accurate targeting of these cells may result in more specific treatments with fewer side effects.

WHAT DID THE SCIENTISTS DO?

A group of researchers at the University of Sydney, including MS Research Australia funded researchers, have been busy delving into the immune system to see what cell types they could discover using the latest flow cytometry and mass spectrometry techniques. They have been examining and characterising the proteins on the surface of B cells, a type of immune cell, and have made some exciting discoveries.

WHAT DID THEY DISCOVER?

They have found nine distinct types of IgG3+ B cells. In other words, they found a specific subtype of B cell – one which makes antibodies of the class IgG3 – and also managed to characterise nine distinct types of these cells. They have catchy names like CD21+CD24+CD27-CD38- B cells, which denotes the presence or absence of the various receptors on the surface (CD21, CD24, CD27 and CD38 are names of cellular receptors). Receptors allow the cell to communicate with and bind to molecules surrounding it, such as antigens, the molecules that cause an immune response.

The scientists have recently published their findings in the journal *Clinical and*

Translational Immunology. They have shown that some of these subtypes of B cells change depending on whether someone has MS or not. They also discovered these changes were more marked in people that have active MS, compared to those with inactive MS. Changes in B cells were also seen if people have been exposed to narrowband UV radiation. Studies have shown that sun exposure or exposure to narrowband UV radiation may reduce the risk of people developing MS and reduce the risk of disease progression.

WHAT DOES IT MEAN?

These findings highlight the exciting possibility new technologies provide, and that measuring these B cells may help us understand when a person with MS might develop active forms of the disease and how various treatments might be working, including UV radiation therapy.

So, in summary, the group has identified previously unknown subsets of cells which correlate with MS attacks on the central nervous system, suggesting that some of these subtypes of cells are potential targets for highly targeted therapies which could impact the progression of MS.

PROTEINS ON PRECURSOR MYELIN PRODUCING CELLS ARE IMPORTANT FOR THEIR SURVIVAL

RESEARCHERS ARE INTERESTED IN VOLTAGE GATED CALCIUM CHANNELS, BUT WHAT ARE THEY?

Researchers are interested in a protein called CaV1.2, which is known to be a voltage gated calcium channel. These channels are like little gates on the membranes of cells which can open or close, allowing movement of calcium in and out of cells. These channels are commonly found on muscle cells – one example is heart cells, where the movement of calcium across these channels helps make a heart beat. They are also found on precursor myelin producing cells – these are the cells that go on to form mature myelin producing cells. These mature cells are responsible for producing and repairing the insulating coating on nerve cells in the brain and spinal cord. The calcium channels are thought to allow these cells to detect and respond to activity in the brain.

WHAT IS THE ROLE OF CAV1.2 DURING THE BODY'S EARLY DEVELOPMENT?

CaV1.2 plays a role in converting precursor myelin producing cells to mature myelin producing cells during the body's early development. Removing this channel from precursor cells during development causes reduced myelination in the brain. However, it is not yet known if CaV1.2 plays a similar role during adulthood and remains important to the processes that occur in the adult brain. If it does then this could potentially be manipulated to encourage myelin repair, which is why researchers are keen to find out.

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UNDERSTANDING THE FUNDAMENTAL PROCESS BY WHICH MYELIN IS PRODUCED IN THE BRAIN IS VITAL IN THE HUNT FOR WAYS TO ENCOURAGE THE NATURAL HEALING PROCESS ALREADY FOUND IN THE BRAIN.
”

INVESTIGATING THE ROLE OF CAV1.2 IN THE ADULT BRAIN

A team of researchers led by Associate Professor Kaylene Young, a MS Research Australia funded researcher, investigated whether the behaviour of precursor cells in the adult brain and spinal cord is influenced by CaV1.2 as it is in the developing brain.

Published in the prestigious scientific journal *Glia*, the researchers explored the function of CaV1.2 by looking at changes in the electrical current across cell membranes, both in the presence and absence of CaV1.2. They also followed these cells through the brain to see whether the removal of CaV1.2 stopped them becoming mature cells that ultimately helps myelinate nerve fibres. They did this by using advanced imaging techniques and technologies.

WHAT DID THE RESEARCHERS FIND?

The researchers found that, like precursor cells during the body's early development, CaV1.2 is a major channel or gateway in precursor cells in adults. However, when the cells become mature, these channels aren't needed as much. Removing these channels from precursor cells in adults didn't hamper the cell's ability to continue to divide and increase in number, and didn't affect the number of new mature cells produced or the ability of new mature cells to myelinate. This means that this channel isn't required for myelination of nerves in the brain and spinal cord in adults – the opposite of what happens during the body's early development where removing this channel results in reduced myelination in the brain.



While CaV1.2 didn't affect myelination in the adult brain, the researchers found that it was essential for the survival of the precursor cells in certain parts of the brain, but not all. When the researchers removed the channel from precursor cells, more than 50% of cells were lost from the corpus callosum, a region which connects the two hemispheres of the brain. But cells weren't lost from the motor cortex, which is responsible for voluntary movement, or the spinal cord. Potentially, this could indicate that the precursor myelin producing cells are acting differently in various parts of the brain, or that there are different subtypes of these cells rather than just one type.

WHAT DOES THIS ALL MEAN?

Understanding the fundamental process by which myelin is produced in the brain is vital in the hunt for ways to encourage the natural healing process already found in the brain. Potentially, the repair of this myelin layer on nerve fibers would restore the communication between the brain and the body, and reverse some of the symptoms of MS. This layer is vital in preserving the underlying nerve cells – without it, nerve cells are vulnerable to dying.

The researchers here have discovered some interesting behaviour of the precursor cells, including that they seem to be acting differently in different parts of the brain. More research is needed to determine whether these cells have fundamental differences built into them or whether they are responding to different signals in those areas of the brain.

The research also shows that there are differences between developing brains and older brains. This research is vital in providing us with a better understanding of how precursor myelin producing cells function in adults, moving us another step closer to understanding myelination and therefore a step closer to treatment options to help repair the damage caused by MS.

CONTINUED FROM PAGE 1

THE MAY 50K RAISES OVER \$6.6 MILLION FOR MS RESEARCH



Kerrie Newton, Kiss Goodbye to MS ambassador

TOGETHER, WE RAN, WALKED AND CYCLED 50 LAPS AROUND THE WORLD.

The May 50K participants smashed their individual challenge goals and covered over two million kilometres – that's 50 laps around the world! Supporters honed in on their creativity to complete the challenge in isolation, from running in their backyards or walking 50km in a single day, to rocking a banana costume to inspire donations or running 500km across the month.

Our Kiss Goodbye to MS Ambassador Kerrie Newton, who lives with primary progressive MS (PPMS) and does everything from a wheelchair, was one of our most creative participants as she clocked 50km by arm cranking in her living room – for the second year in a row. It was Kerrie's determination that motivated 681 people to join 'Team Kerrie' and collectively raise over \$200,000 for MS research!

IN 2020, THE MAY 50K WENT GLOBAL.

Following the success of The May 50K 2019 in Australia, our global colleagues from the Multiple Sclerosis International Federation (MSIF) decided to pilot The May 50K globally this year. We welcomed nearly 13,000 participants from the UK, Canada, Ireland and the USA to the global challenge. It proved a huge success, with the four countries raising a collective \$1.26 million for vital MS research and access to treatment in their home countries. Undertaking global collaboration is just one way MS Research Australia can increase funding for MS research and change the lives of people living with MS across the globe.



THANKS TO YOU, OUR MS RESEARCHERS CAN CONTINUE THEIR INVALUABLE WORK. THANKS TO YOU, THE FUTURE OF THE 25,600 AUSTRALIANS LIVING WITH MS IS IN GOOD HANDS.



THANK YOU FOR CHANGING THE LIVES OF PEOPLE LIVING WITH MS.

As The May 50K 2020 draws to a close, we'd like to thank our passionate participants and their donors for showing incredible generosity and commitment during this challenging time. The success of The May 50K is a testament to your determination to help us leave MS where it belongs, behind us.

Thanks to you, our MS researchers can continue their invaluable work. Thanks to you, the future of the 25,600 Australians living with MS is in good hands.

Stay tuned for The May 50K 2021! We're already counting down the days...

To register your interest for The May 50K 2021, please head to: www.themay50k.org/register-interest-2021



Olive, Roger and Susan Williams, The May 50K participants

CONTINUED FROM PAGE 1

THANK YOU FOR POWERING MS RESEARCH IN AUSTRALIA

that empowers us and fuels our progress and passion – we hope you feel the same.

This is our community. We'd like to share some of their thoughts with you...

BREONY WANTS TO THANK YOU.

"Medical research is hard work. The researchers work long hours. While the setbacks can be heartbreaking, the breakthroughs make it worthwhile in the long run. I know that one day the research that is being done today will change the treatments and options available for myself and so many others in the future.

So much of the money to fund these breakthroughs comes from those in the community, so to the donors towards MS Research Australia, I thank you. To those who've created fundraisers amongst the MS community, thank you. And to all of those out there who have chosen to commit their hard earned dollars to the cause of MS research, I thank you."

Breony, living with MS for 4 years



WHY CORY DONATES.

"One of the things you face right from the beginning is the feeling of losing control of what's happening in your life. One reason I started donating and raising money for MS research was that it gave me a sense of control. I couldn't control what was happening to me, but I could control what I was doing about it – to hopefully help myself, and many others also living with MS.

Research gives people hope. And gives them the feeling that it's not the end.

Things don't always have to be the way they are today, nor do they have to be spiralling in a downward direction. We can take control of how we're contributing to the experiences of other people and help scientists make progress."

Cory, living with MS for 16 years



Ms Alice Saul, MS Researcher

WHAT ALICE ACHIEVES, BECAUSE OF YOU.

Alice Saul is working on a project investigating the role of diet in MS.

She's focusing on dietary patterns, implications of diet quality and inflammation, to determine whether MS outcomes such as disability progression, relapses and symptom severity are impacted by diet.

"I've experienced first-hand the impact that MS can have on individuals and their families. I understand the challenges that MS presents and I'm passionate about making a difference in the lives of others.

I'm a lucky recipient of an MS Research Australia grant and I'd like to take this opportunity to thank all the donors who have made my work possible."

Alice, MS Researcher

“RESEARCH GIVES PEOPLE HOPE.”

Research not only gives hope – but confidence. Confidence that there will be a future where MS no longer has an impact on peoples' lives like it does today.

Your compassion is the key driver to achieving great things and transforming the lives of so many.

The result?

Scientists and researchers are now certain that we can stop and reverse the effects of MS – and it's within reach.

We can never thank you enough. Every advancement so far, and every improvement we've seen has been founded in medical research. And behind this progress is someone like you who has funded it.

With your help, it's all possible.

You will soon be able to read more about the research you have enabled in a special report made just for you.

If you would like to help further this progress – please donate now at www.fundmsresearch.org.au/laurens-invisible-disease.



MEET THE RESEARCHER

ASSOCIATE PROFESSOR JUNHUA XIAO



LET'S GET STARTED! TELL US AN INTERESTING FACT ABOUT YOURSELF...

My favourite hobbies are travelling, hiking and drawing.

WHAT INSPIRED YOU TO GET INVOLVED IN MS RESEARCH?

During my PhD study in a field far away from MS (enteric neurobiology), I accidentally discovered a myelin forming protein. This unexpected finding really inspired me moving into the field of myelin biology

where I have worked for over 13 years. My research has since focused on determining the molecular and cellular mechanisms that govern myelin repair in the brain, in particular how we can find ways to enhance our body's capacity to repair the nervous system in MS, stopping or slowing it moving into a progressive phase.

WHAT DO YOU THINK HAS BEEN THE MOST EXCITING DEVELOPMENT IN MS RESEARCH?

Significant research advances have been made in understanding MS neurobiology in the last two decades, in particular new molecules that have been shown to control myelin formation. These findings have been instrumental to recent clinical trials of new MS therapies targeting myelin repair. This demonstrates the importance of continuous basic research discoveries and translating the outcomes for MS drugs development. While this is very exciting, still more must be done for those living with forms of progressive MS as there are limited treatment options – a gap we aim to address.

TELL US ABOUT YOUR CURRENT RESEARCH PROJECT...

MS brains contain both nerve cells and special myelin-producing cells. My research will study how the nerve cell signals influence these special cells to produce myelin in different parts of the brain with myelin lesions, and to discover new molecules for maximising the nervous system repair in MS.

WHY IS YOUR RESEARCH IMPORTANT AND HOW WILL IT INFLUENCE THE UNDERSTANDING AND TREATMENT OF MS?

In MS, the myelin loss impairs nerve cell function by disrupting the passage of electrical impulses along the nerve fibres. This causes a series of clinical disabilities, ranging from impaired vision, to numbness in the limbs, and ultimately paralysis. At early stages of disease, the nerve system has an innate capacity to replace the lost myelin; however this "self-repair" capacity is lost over time and symptoms progressively worsen, dramatically reducing quality of life. It is critically important to prevent myelin loss and nerve damage, for which no specific treatment is currently available.

WHAT DO YOU ENJOY MOST ABOUT WORKING IN THE LAB AND WHAT ARE SOME OF THE CHALLENGES YOU FACE?

Biomedical research solves the puzzles of the human body and its function in health and disease. As a medical graduate I was inspired by fundamental research. Having worked in a laboratory research environment for over 15 years, I am always excited about new findings (or even sometimes "odd" findings which turn out to be extremely interesting later). As a scientist and educator (PhD supervisor and senior lecturer), I also find it particularly rewarding to build up future MS research capacity through training students and young academics and seeing them becoming inspired by MS research.

HELP MS RESEARCH AUSTRALIA FIND A CURE FOR MS

Donate (Donations over \$2 are tax deductible)

To support MS Research Australia's vital work I would like to:

- Make a one off donation of \$
- Make a monthly donation of \$
- Learn more about leaving a gift in my Will
- I have already left a gift in my Will to MS Research Australia

Contact details

Title: First name:

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Email:

Payment method:

- Cheque (made payable to MS Research Australia)
- Direct Debit Request (copy of service agreement can be provided on request)

Financial institution:

BSB number:

Account number:

Account holder's name:

- Credit Card

Mastercard Visa Amex

Credit card number:

Exp: CVV:

Name on card:

Signature:



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