the NeuRA magazine

News and breakthroughs from Neuroscience Research Australia • neura.edu.au

Issue 49 | Winter 2025

FIVE MINUTES *with* Professor Eva Feldman

NEWS IN BRIEF:

- *'Forever' chemicals in the brain*
- *New guidelines for older drivers*
- *Giving Day gratitude*

The low down on back pain treatments

FROM AI TO TELEHEALTH AND BEYOND:

how tech is transforming research

NeuRA
Discover — Conquer — Cure

Technology is changing our daily lives and it's also presenting new opportunities for our researchers. This latest edition of *the NeuRA Magazine* again showcases the important work our researchers continue to do, as well as the changing landscape they work within.

We've seen improvements from our clinics and labs to the way we connect with and assist our community, plus the development of new diagnostic tools and treatment options. While I'm excited about the opportunities of technology as a researcher, as Institute Director, I'm excited to share some of the innovative work underway here at NeuRA.

As we continue in our mission to be a world-leading medical research institute, the role of NeuRA's supporters and philanthropists is vital. This edition you'll see an update on our recent Giving Day. I'd like to thank all of you who participated in making this event a success. I'd also like to thank every one of you who continues to support NeuRA and the work we're doing. We appreciate funds to support our students or purchase new equipment, the generous bequests and all the donations that enable us to continue our work.

Every donation contributes to the research our teams do and our efforts to improve the health and lives of those living with brain and nervous system disorders – as well as discover solutions for neurodegeneration, mental health and healthy ageing.

Warm regards,

Professor Matthew Kiernan AM
CEO, Neuroscience Research Australia

Above: *Professor Sylvia Gustin with the Pain and Emotion Therapy Program she developed with Dr Nell Norman-Nott.*

Welcome to NeuRA Magazine's Winter Edition!

In this edition, we're pleased to share some of the latest research and updates from NeuRA and its researchers.

This includes the Sydney Brain Bank research that identified perfluoroalkyl and polyfluoroalkyl substances (PFAS) in the brain, new guidelines for older drivers, and finding out about a promising new schizophrenia medication.

In our feature story, we examine the increasingly important role technology is playing in our research, from the laboratories to the products being developed to improve your health and wellbeing. We talk to researchers about how it's changing their work and what it means for us as we seek to live longer, healthier lives.

Low back pain is a leading cause of disability globally and many different treatments are recommended. NeuRA researchers share their findings on most effective approaches, but also call for more research into the effectiveness and safety of what's being recommended. We also feature a Q&A with world-leading authority in neurodegenerative diseases, Professor Eva Feldman, from the University of Michigan.

We hope you enjoy this issue and these insights into our research. We look forward to your feedback. •

New guidelines for older drivers and passengers

Researchers from the Transurban Road Safety Centre at NeuRA worked with The George Institute for Global Health and Occupational Therapy Australia to develop 'Vehicle Safety for Older Drivers and Passengers Guidelines' – the first of their kind in Australia. NeuRA Senior Research Fellow, Professor Julie Brown, said the guidelines provide practical, actionable advice for health and road safety professionals to help ensure safe and comfortable travel for older individuals.

"Mobility is critical to independent and healthy ageing, and the primary means of transport for most older Australians is the car," Prof Brown said. However, older drivers face significant risks on the road, and continue to be over-represented in crash statistics. Each year, approximately 175 Australians aged 65+ lose their lives in car crashes, and over 4,000 are hospitalised.

The guidelines are practical and evidence-based, designed for allied health and road safety professionals to assist older drivers and passengers. They also note risks associated with using comfort accessories added to a vehicle, such as cushions or seat pads. •

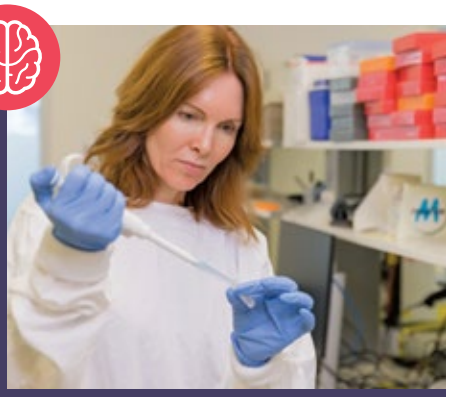
The guidelines are available at **https://www.georgeinstitute.org/our-research/research-projects/vehicle-safety-for-older-drivers-and-passengers**

'Forever' chemicals found in human brains

They're useful manmade chemicals used in products from food packaging and cookware to firefighting foam and furniture, but now PFAS chemicals have been detected in human brains and researchers are working to understand the impact.

Per- polyfluoroalkyl substances, also called PFAS and 'forever' chemicals, have been studied by researchers at the Sydney Brain Bank at NeuRA, the Queensland Alliance for Environmental Health Sciences at the University of Queensland and the UNSW School of Biomedical Sciences.

"This study was important to enhance our understanding of PFAS accumulation in the brain, which will help us evaluate potential health effects,



including those related to neurodegenerative diseases," said Director of the Sydney Brain Bank at NeuRA, Dr Claire Shepherd.

"Results showed the total number of carbons of the individual PFAS is a key factor in determining the brain-to-blood concentration rations. We need to better understand individual PFAS, as their properties can influence how they behave in the human brain."

The study was published in *Environmental Science and Technology*. •

Giving Day Gratitude

NeuRA held its second Giving Day at the end of March, with the 24-hour campaign raising $555,000 to support research into brain and nervous system disorders.

Fundraising Director, Karl Kinsella, thanked all those involved in making the day a success.

"Donations help NeuRA's scientists continue their work, investing in the future, speeding up discoveries and providing certainty for researchers to plan for tomorrow," he said.

"We were pleased to be able to share some stories about people's personal connections to brain health and their belief in the power of research. Alongside this, we were pleased to have researchers and NeuRA staff able to speak with some of our supporters.

"Thank you to everyone who participated in Giving Day, and thank you to everyone who continues to support our work. Your donations bring us closer to our goal of transforming the lives of people living with neurodegenerative or mental health conditions, including dementia, motor neurone disease, schizophrenia and bipolar disorder." •

AI, APPS AND OPPORTUNITIES as technology accelerates our research

Technology has long been a key tool in our quest to better understand the brain, plus diagnose, treat and prevent the conditions that affect it.

Now though, its rapid evolution and vast applications are providing new opportunities for our research teams and – ultimately – the people we're working to help.

"Talk of technology and artificial intelligence (AI) can put some people on edge, but it's applying science for a practical purpose," said NeuRA CEO and Institute Director, Professor Matthew Kiernan, AM.

"Technology is a game-changer for neuroscience with benefits including the ability to analyse large data sets, collaborate globally, develop precision medicine, plus improved imaging and diagnostics. This is all good news for our patients and the community.

"For example, AI is allowing researchers to go back and analyse blood samples that were collected in a UK study over about 20 years. That's a massive job and would have a huge timeline and price tag if you were going to get an individual to do it, but with the support of technology, we have all this additional data about Alzheimer's disease and for researchers working on a diagnostic test."

Also in the lab, upgraded technology can make a huge difference, with the precision and accuracy of tasks, but also the speed at which they can be completed. Recently donations to NeuRA enabled the replacement and update of a qPCR machine, a critical piece of equipment for gene expression and genotyping studies.

"This equipment will help us identify the underlying neurobiology of neurological and neuropsychiatric disorders, and to discover new treatment targets, develop biomarkers for diagnosis and/or to predict treatment response," said Head of NeuRA's Preclinical NeuroPsychiatry Laboratory, Dr Tertia Purves-Tyson.

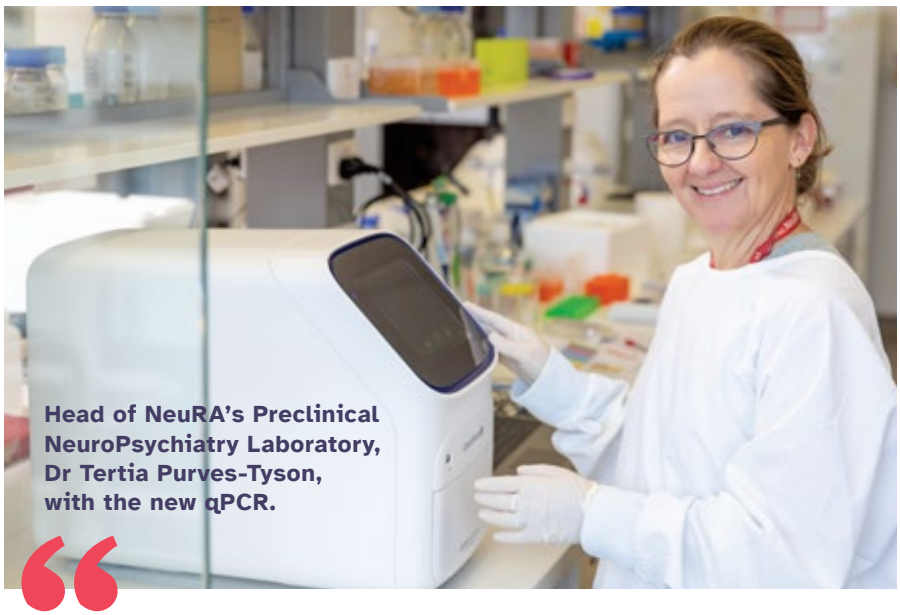
"Thanks to this donation we were able to replace old equipment, and the upgrade will also improve the precision, accuracy and efficiency."

At NeuRA Imaging, advances in technology supported the development of new brain imaging methods last year. Director and Conjoint Senior Principal Scientist, Professor Caroline Rae, said functional conductivity imaging (FunCI) will assist with studies of the brain, brain disorders and the spinal cord.

"FunCI can detect the entire brain pathway that is involved in a task, not just the changes happening in the brain's cortex," Prof Rae said.

"It combines high-resolution imaging with real-time data on tissue function.

"This could lead to researchers tailoring treatments based on



Head of NeuRA's Preclinical NeuroPsychiatry Laboratory, Dr Tertia Purves-Tyson, with the new qPCR.

> Technology is a game-changer for neuroscience with benefits including the ability to analyse large data sets, collaborate globally, develop precision medicine, plus improved imaging and diagnostics.
>
> – NeuRA CEO, Professor Matthew Kiernan, AM.

how your body is responding in real time, allowing doctors to personalise therapies, provide more precise treatments, faster recovery times and better health outcomes."

While this can be hard for us to imagine, it's not so long ago that the thought of a GP consult via a video call seemed impossible. Yet, telehealth is now used by many professionals to deliver telemedicine, but also support trials.

At the Centre for Pain IMPACT, Senior Principal Research Scientist at NeuRA and UNSW Science, Professor Sylvia Gustin, and Research Fellow and Associate Lecturer at NeuRA and UNSW, Dr Nell Norman-Nott, turned to technology in their quest to tackle the emotional side of chronic pain.

They developed the Pain and Emotion Therapy Program, which used a video-conferencing psychological consult and also a specially-developed mobile app to reshape the brain's perception of pain and promote long-term relief.

"Our Pain and Emotion Therapy Program included an online psychological intervention, with internet-delivered dialectical behaviour therapy or iDBT and self-directed learning via a smartphone app," Dr Norman-Nott said.

"Our research showed that eight guided skills training sessions, complemented by the use of the app, improved emotion dysregulation in individuals with chronic pain compared to usual treatment. More than this, at the 21-week follow-up these improvements were sustained and we also observed a significant, clinically meaningful reduction in pain intensity.

"Technology and online interventions like Pain and Emotion Therapy also address accessibility challenges faced by individuals with physical disabilities or those in rural and remote areas. For our trial, it enabled participants from every state in Australia to take part."

Apps – that is, applications for smartphones and tablets – are increasingly used as a research tool. Across NeuRA research teams are developing and utilising apps for projects from wellbeing to ageing, falls and beyond. While some are for research purposes and able to be used by a select few, others are going live to the public.

Technology is also helping predict serious health risks. Researchers from NeuRA and UNSW developed an AI algorithm that pairs with wearable devices to detect – and predict – health risks.

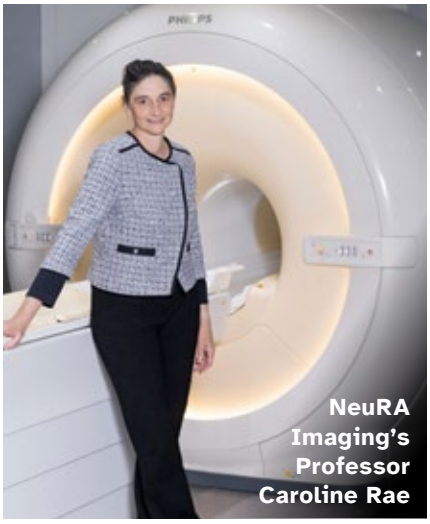
NeuRA Research Fellow and Lecturer in the UNSW School of Health Sciences, Dr Lloyd Chan, developed the gait biomarker algorithm and led research that has shown Watch Walk could identify and predict health risks using data from wrist-worn sensors.

"We have worked hard to develop this algorithm and demonstrate its ability to identify and predict a range of health risks, including dementia, stroke, falls and heart attack," he said.

"Alongside that, we plan to extend the current research to broaden the application of this work, both to frail older people and the younger population."

Watch Walk has now been licensed by Aussie tech brand, Spacetalk Limited, and will be taken global.

"The licensing agreement is the next step for our research, making it accessible to the public," Dr Chan said. •



NeuRA Imaging's Professor Caroline Rae

The low down on low back pain treatments

Director of the Centre for Pain IMPACT, Professor James McAuley

Low back pain is a global issue affecting around 80% of people at some point in their lives. Whilst many treatments are available, NeuRA researchers have found not all are effective.

Many people may reach for medication to ease pain and discomfort, but the recommended first treatments for back pain are actually non-pharmacological and non-surgical.

In fact, Centre for Pain IMPACT Director, Dr Aidan Cashin, recently found only around one in 10 pharmacological treatments were effective.

The systematic review, a collaboration with a number of global institutes and published in *BMJ Evidence Based Medicine*, also found that many offered pain relief that is barely better than placebo.

"The effectiveness of most treatments was uncertain or inconclusive due to the limited number of randomised participants and poor study quality," Dr Cashin said. "We need further high-quality, placebo-controlled trials to understand the efficacy of treatments and remove the uncertainty for both patients and clinical teams."

Dr Cashin's research included medications like non-steroidal anti-inflammatory drugs and muscle relaxants, as well as non-pharmacological treatments, like exercise and massage.

Antidepressants have also been prescribed for back pain, but in another NeuRA study, Doctoral candidate, Michael Ferraro, found they were largely ineffective and may even be harmful.

"We found that one class of antidepressants might provide back pain relief, but the effects are small and come with an increased risk of unwanted side effects," Mr Ferraro said.

"The long-term benefits and harms of most antidepressants for low back pain and sciatica remain unknown. We hope our findings will inform future clinical guidelines and assist clinicians and patients in the treatment decision-making process. Some patients may still choose to trial these medications, but informed discussions about the likely magnitude of benefit and possible risks are crucial.

"It's also important to stress, these findings do not imply that severely depressed people with low back pain and sciatica should not be treated with antidepressants."

What does work?

So, what are the most effective treatments? Well, it depends on the type of low back pain. In the Cochrane Review led by Postdoctoral Research Fellow, Dr Rodrigo Rizzo, and Senior Research Scientist and Director of the Centre of Pain IMPACT, Professor James McAuley, staying active and taking a multidisciplinary approach were found to be key treatments.

"While many non-drug and non-surgical treatments are available, we wanted to see what the evidence actually showed," Prof McAuley said.

"We looked at the likely benefits and potential limitations of non-drug and non-surgical treatments to help clinicians and patients better understand and manage their low back pain."

Researchers looked at evidence for studies that included nearly 100,000 participants, considering pain defined as acute (less than six weeks), subacute (six to 12 weeks), and chronic (longer than 12 weeks).

"Whilst we use the term 'low back pain', there are different types and they require different treatments," Prof McAuley said.

"For example, staying active is beneficial for acute low back pain, helping to reduce pain and improve function. However, if you have subacute low back pain, multidisciplinary therapies are likely to provide better pain relief, but spinal manipulation and hands-on treatment likely didn't improve function.

"For people who have chronic low back pain, acupuncture, exercise therapies and multidisciplinary therapies are likely to improve pain and function, whilst traction likely doesn't improve pain and psychological therapy may reduce pain, but not improve function."

More research for informed decision making

Researchers are now continuing to study the most effective treatments. They have called for further research into currently recommended and prescribed treatments to ensure clinicians and patients are able to make fully informed decisions about the suitability and effectiveness of treatments. •

5 MINUTES *with* Professor Eva Feldman

Professor Eva Feldman is one of the world's leading authorities on neurodegenerative diseases. She is a University of Michigan James W. Albers Distinguished University Professor and Russell N. DeJong Professor of Neurology at Michigan Medicine. She is also the Director of the NeuroNetwork for Emerging Therapies and the ALS Centre of Excellence. Prof Feldman spoke with us during a recent visit to NeuRA.

What is your research focused on?

Our research aims to understand the causes of neurological diseases and develop therapies and prevention strategies. Dementia is a growing global issue, particularly in Australia, due to three key factors: an ageing population, population growth and modifiable risk factors, which account for about 50% of cases. These factors include blood lipids, blood sugar, weight, exercise and blood pressure. While others like smoking, education, and air pollution are also significant, my work is focused on how we can understand and address these modifiable risks.

What is the relationship between fats and brain health?

The fats we consume significantly impact brain function. For instance, saturated fats – like those in a fast-food hamburger– cannot be processed effectively by the brain, reducing brain function. In contrast, unsaturated fats, such as those in fish or olive oil, are efficiently converted into energy, improving cognitive clarity.

Simple dietary changes can enhance brain health. Our research has identified specific diets that promote brain function and emphasises how basic science supports these findings.

What role does exercise play in improving brain health?

Exercise has two key benefits for the brain. First, it activates the brain, helping remove metabolic waste or "trash" that can otherwise impair function. Second, exercise stimulates dormant stem cells – present in everyone, regardless of age– leading to the growth of new brain cells. This particularly benefits areas like the hippocampus, crucial for memory and decision-making.

Regular exercise, such as brisk walking, can visibly increase hippocampal size on MRI scans, showing tangible brain improvements.

Obesity is known to cause inflammation in the body, which can affect brain function. How does this inflammation impact our brains?

Excess weight causes the release of inflammatory proteins, which travel to the brain, inflaming brain cells and impairing function. This inflammation directly reduces cognition.

> *"Regular exercise, such as brisk walking, can visibly increase hippocampal size on MRI scans, showing tangible brain improvements."*

Does that mean brain function can improve with weight loss?

Yes. Weight loss, through diet, exercise, or bariatric surgery reduces inflammation and improves brain function, which we can measure via cognitive tests and MRI scans. Preventing obesity early significantly lowers dementia risk.

What actionable tips can you provide to our readers to improve their brain health?

1. **Weight management:** Aim for a healthy BMI and follow recommended diets like the MIND, DASH or Mediterranean diets, which focus on unsaturated fats, balanced protein and reduced starch and salt.
2. **Exercise:** Engage in 30 minutes of brisk walking, five times a week. Add strength training, especially for women, to support bone health.
3. **Blood pressure control:** Follow age-appropriate blood pressure guidelines, which are slightly lower for older adults.
4. **Group activities:** Join group exercise programs which give you the benefits of physical activity with socialising. •

Ask a Researcher

This issue, Dr Tertia Purves-Tyson, NeuRA's Senior Research Scientist and Head of Preclinical NeuroPsychiatry, (pictured) answers a question from one of our schizophrenia research supporters.

Q: I've heard about a newly approved schizophrenia medication in the US called Cobenfy. How is it different to the treatments currently available here?

A: The US Food and Drug Administration recently approved a medication that has a new way of working. Cobenfy, which was formerly known as KarXT, could be a game-changer because it works by activating receptors in the brain called muscarinic receptors. These receptors are reduced in the brains of people with schizophrenia, so the medication works to increase their activity. This is a different neurobiological mechanism from the treatments currently available in Australia.

In the clinical trials, Cobenfy reduced symptoms of schizophrenia, such as psychosis, as well as lack of motivation, decreased experience of pleasure, decreased desire for social contact. The trials showed that Cobenfy was generally well-tolerated, but there are some side effects, such as constipation, indigestion, nausea and vomiting. This is because the receptors involved play a role in gut function and activating them can cause gastrointestinal side effects.

The medications currently available in Australia are D2 receptor-blocking antipsychotics. These essentially only reduce psychosis, but also have severe side effects. They're also only effective in about 60 per cent of people with schizophrenia. Cobenfy might provide benefit to some of these people, when it's made available, but individuals will need to talk to their treating teams.

The Therapeutic Goods Administration (TGA) hasn't yet had an application for Cobenfy to be registered in Australia, but it is hoped that we'll see movement here soon.

As a neuroscientist and researcher in schizophrenia, it's gratifying to see a new drug come to market. It highlights the importance of scientific research, and a great reminder that new knowledge generated in the laboratory will eventually lead to better health outcomes for patients. •

Include NeuRA in your Will

Including a gift to NeuRA in your Will is a powerful way to accelerate research that will transform people's lives. A gift of just 1% of your estate will allow us to deliver world-first clinical trials, effective treatments, early interventions and crucial research that we simply could not do otherwise.

With your gift, we will help people lead happier and healthier lives for longer and we will shape the future of neurological wellness for generations to come.

NeuRA's Philanthropy Team is available to help you to organise a gift in your Will and keep you up to date with NeuRA's research.

Please feel free to phone us on 02 9399 1093 or email bequests@neura.edu.au

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