

brainWAVES



The Newsletter of the Brain Foundation

SUMMER 2020-2021

2020 should have been an amazing and major milestone in the history of the Brain Foundation as we celebrated half-a-century of funding research into brain disorders, diseases, and injuries. Instead, it has been one of the most challenging in our 50-year history. The devastating bushfires, followed by COVID-19, followed by new levels of unemployment have had a major impact on our donations, events and our ability to fund new research projects.

However, these setbacks don't change the fact that; "chances are you or someone you love has been touched by a brain disease, disorder or injury" ...It might be Dementia, Migraine, Tumour, Concussion or one of hundreds of others. Our research must continue to find better treatments and cures to help those we love.

Inside these pages we showcase recent medical breakthroughs, applaud our fabulous fundraisers, update you on our most recently funded research projects...and much more.

If you know someone touched by a brain disease, disorder or injury you can help us help them by donating today. Every donation, no matter how small is greatly appreciated.

From all of us at the Brain Foundation and its division Migraine & Headache Australia our very best wishes for Christmas and the holiday period.

Trevor Thompson
C.E.O.



Trevor Thompson

OVER **\$9,000,000** HAS
BEEN GIFTED TO OVER **470**
RESEARCH PROJECTS
IN THE LAST **50 YEARS**

Celebrating
50 YEARS
OF RESEARCH

• MAKING A DIFFERENCE SINCE 1970 •

\$5,000,000 IN **GRANTS**
GIVEN FROM 2010 TO 2019
WE CAN'T WAIT TO SEE WHAT THE
COMING DECADES HAVE IN STORE

COVID & Brain Health

There's no question that COVID-19 has impacted all of us in some form. Regardless of whether you or someone you know has contracted the virus, it's turned our lives upside down. We may be distanced from loved ones, anxious over work stability, or finding that life plans have had to be put on the back burner as a result of the pandemic.

Stay-at-home orders have encouraged behaviours such as increased screen time, less time socialising with friends and family, and changes to diet, sleep, or exercise routines. All of these factors can influence our brain health and wellbeing. Brain health affects the rest of our body, and vice versa. Limited socialising may accelerate dementia, and changes to exercise could limit a patient's rehabilitation after stroke.

Conference calls may seem like a great solution for everything from first dates to work meetings, but for someone living with migraine, the screen time could trigger an attack. A recent survey of 711 patients conducted by Migraine & Headache Australia showed that 52% of people had more frequent migraine attacks, and 40% had more intense pain¹. As with many other people living with neurological disease, disorders and injury, we saw clearly in the data that the pandemic has been an especially difficult period.

The good news is that there are several steps you can take over the coming months to help lessen the impact of COVID on your brain health.

1. Safeguard your mental health. Stress and depression can have serious impacts on brain function, and finding strategies to address this can be key in how you cope with the combined stress of a brain condition and a pandemic. Medicare offers 10 subsidised sessions with a counsellor or psychologist, or up to 20 sessions

if you're in an area affected by extended lockdowns (like Victoria). If in doubt, seek support for mental health and wellbeing.

- 2. Take breaks from screen time.** Whether it's working from home or monitoring the news, you are probably spending a lot more time staring at screens. The lines between work and play have blurred with increased working from home. In addition studies have shown that constantly reading news stories can increase stress levels². The 20-20-20 rule is a helpful guide to give your eyes a break, and take a moment to focus on something other than your screen. Every 20 minutes, stare at something 20 metres away for at least 20 seconds. If possible, try to go for a short walk to break up your day and get some exercise in as well.
- 3. Manage your sleep routine.** You may find yourself experiencing sleepless nights more often than usual at the moment. Continuous sleep deprivation can affect cognitive function, particularly attention and working memory³. Good sleep hygiene can help with this - for example, avoid blue light at night, and set a regular time to wake up (yes, even on weekends!). Also, try to get outside early in the day, for example a morning walk or eating breakfast outside. Sunlight helps with your body's sleep regulation, and if you've been mainly inside during COVID, this could be the missing piece that has disrupted your sleep.

The impact of this pandemic has been especially hard on our community. Hopefully, with things starting to look positive in Australia as we head into summer, a return to normal will be on the horizon.

¹ Dr. B. Jenkins & Migraine & Headache Aust. COVID survey. 2020.

² American Psychological Association. APA Stress in America Survey. 2017.

³ P. Alhola & P. Polo-Kantola. Sleep deprivation: Impact on cognitive performance. 2017.

Recent medical breakthroughs

Air pollution linked to Alzheimer's

New research has found that children and young adults exposed to lifelong air pollution could be at a higher risk for Alzheimer's and Parkinson's disease. Distinctive nanoparticles associated with vehicle pollution were found within the brainstem, alongside markers of these neurodegenerative diseases.

The brainstem controls many of the body's key functions, including swallowing, balance, consciousness, and cardiac and respiratory function. While causality between the particles and molecular damage needs to be confirmed by future research, this study has provided a number of hypotheses to be tested. Prof Barbara Maher (Lancaster University, UK) was particularly concerned by the types of metals in the nanoparticles (iron & aluminium), as it is unlikely that those materials could exist harmlessly in such a critical area of the brain.

The study was published in the journal *Environmental Research* and was carried out by an international team of researchers. The subjects of the study were residents of Mexico City who had suddenly died, aged 11 months to 27 years old.

Source: *The Guardian*

'I feel like I have dementia': Brain fog plagues COVID survivors

There have been an increasing number of COVID survivors that report cognitive symptoms continuing long after their recovery. It can include memory loss, confusion, difficulty focusing, dizziness and grasping for everyday words, which has started to impair their ability to work and function normally.

Scientists aren't sure what causes brain fog. The complications are inconsistent; people who were only mildly ill from COVID-19 have experienced neurological issues. Scientists think that it could occur due to an overactive immune system, or inflammation in blood vessels leading to the brain.

A survey from Survivor Corps has confirmed the prevalence of neurological symptoms following COVID, and hopefully further research can identify the mechanisms involved and help to treat this problem for COVID 'long-haulers'.

Source: *The New York Times*

New blood test to detect Alzheimer's

A team of scientists have found a way to test for a key protein that indicates someone may be susceptible to Alzheimer's disease, or other neurodegenerative diseases. The blood test is quick and inexpensive compared to current methods, and has an incredible 96 per cent accuracy.

This will allow doctors to begin addressing neurodegenerative diseases decades before symptoms appear. Recommending lifestyle changes to prevent dementias can be life changing, and could help millions of Australians whose lives are affected by these diseases.



Source: ABC

Genetic testing helps researchers to shrink or stabilise childhood tumours

A life-saving program uses genetic testing to find treatments that shrink or stabilise aggressive tumours in children. The ZERO Childhood Cancer program has led doctors to suggest alternate treatments, with incredible results. In 30 per cent of cases they have seen the tumours shrink, and in some cases completely disappear; in another 40 per cent of cases, they have seen the tumours stabilise and stop growing for a prolonged period of time.

Genetic testing is incredibly important for cancer treatments, as it allows doctors to make decisions based on genetic biomarkers associated with the tumour, rather than having to rely on the location of the tumour alone.

Image: Thomas Ebney has been fighting a brain tumour since he was two years old, and the ZERO trial found him a medication that is allowing him to live a normal life as an eight-year-old.

Source: *Sydney Morning Herald*



Fabulous Fundraisers



You can watch the full video of our "e-handover" on our Facebook account

Trigeminal Neuralgia \$10k

We were thrilled to hear from Skye and Peta from Fighting Trigeminal Neuralgia, when they called to tell us that they had raised \$10,000 to support research into this rare pain disorder. Trigeminal Neuralgia (TN) causes pain predominantly on one side of the head when the trigeminal nerve has been impaired, and the effect it has on a patient's life can be debilitating.

Unfortunately we couldn't receive the cheque in person, but just like many other times during the pandemic, Zoom conferencing came to the rescue!

WE ARE SO THANKFUL FOR PETA AND SKYE'S HARD WORK, AND HOPE THAT WITH FURTHER RESEARCH, A TREATMENT CAN BE FOUND FOR TRIGEMINAL NEURALGIA.

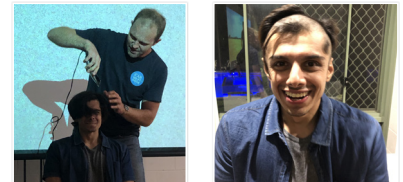


Macquarie University \$25k

A huge thank you to Macquarie Neurosurgery, who have donated \$25,000 to the Brain Foundation. In a year that has been hard for researchers and not-for-profits, we are so grateful for such generous contributions towards our next round of research grants.

Mullets are a thing of the past!

Thanks to Cameron Beach and all at his workplace - a decision to 'update' their hair styles was a bonus for us. Cameron has been at this for a few years now, growing a mullet so he can shave it off to raise funds. Suits us!



Migraine World Summit 2020

Every year, the Migraine World Summit interviews leading migraine experts, doctors and specialists from around the world. This year they reached over 130,000 participants across the globe to address topics and questions suggested by the patient community. In mid-March, as the coronavirus pandemic was taking off, it was fantastic to have an event that provided resources and community to so many people. Migraine World Summit also helps to raise funds for their non-profit partners, and we are so happy to receive these funds to continue our work to support patients.

Carl presenting the cheque from Migraine World Summit to Trevor



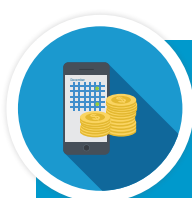
Sutherland Girl Guides Brain Tumour fundraiser

Support comes our way because people are touched by brain disease every day. It is a sad fact that many families will be affected by one of the many diseases and disorders of the brain.

Earlier this year, the girls at Sutherland Girl Guides raised funds to support a member whose grandfather had a brain tumour. When talking about it, three members of this small group had family members who suffered from brain tumours. Getting the information about how many people are affected out to the community is one of the hurdles we face. These girls have done a wonderful job doing just that. Thank you.



Trevor, Gillian, group leader and the girls



Regular Giving

Would it suit you to make smaller but more frequent donations?

We can help you. Either sign up using our online Donation form – see our web site, or you can make a direct debit. Ring us for our bank details. Regular donations can be made to a specific area of research.

Migraine & Headache Australia Updates

Migraine & Headache Awareness Week

14th-18th September 2020

This year, we had our first ever digital Headache Awareness Week, and we're pleased to share that it was a huge success. This year's event more than doubled in size versus last year, with over two thousand people taking part in the live webinars.

During each webinar there were hundreds of great comments, questions and points from participants. It was great to see everyone connecting and supporting one another.

If you missed the webinars, or you wanted to share them with a friend or family member, they have been published on our website – you can find them on the event page.

The topics covered included:

- Latest Research In The Field - Dr Peter Goadsby
- COVID's Impact On Headache & Migraine - Dr Bronwyn Jenkins
- Patient Panel – Living With Migraine - hosted by Sophie Scott (ABC Health Reporter), joined by Rick Morton, Fiona Jeffrey & Jessica Munro
- PBS Submission Process & Update - Jo Watson (Deputy Chair of PBAC)
- New Treatments - Dr Elspeth Hutton
- Other Headache Types - Dr Michael Eller



Speakers from top left Dr. Peter Goadsby, Dr. Bronwyn Jenkins, Sophie Scott, Dr. Elspeth Hutton, Dr. Michael Eller and Jo Watson.

THANK YOU TO EVERYONE WHO PARTICIPATED. WE WOULD ALSO LIKE TO THANK OUR EXPERTS, SPECIALISTS, HOSTS AND PANELISTS FOR THEIR PARTICIPATION.

Event feedback from participants

"Just a HUGE thank you. Thirty years ago I thought my life was over when there was no one I could find to help me. Went to many charlatans and wasted an enormous amount of money. Thought I would never have a 'normal life'. I am so grateful that you provide a point for those with migraine to start somewhere and to find help. I am forever indebted. Thanks to every single person involved there."

- Leanne B.

"Thanks to your webinars I found my headache type - medication overuse headache. I tried everything over the last 15 years and nothing worked! I am now in withdrawal and getting there slowly, with less headaches and less pain in my ear and neck. Very grateful to you!"

- Heather R.

"Thank you - these resources are invaluable for self education so we can help ourselves best deal with migraine impacts. Most GP's have no real idea and no significant help except prescription writing. And I have a very good GP, but she still doesn't really have much background."

- Kate W.

MIGRAINE &
HEADACHE
AWARENESS
WEEK 2021

If you missed this year's Migraine & Headache Awareness Week, it will happen again next year from the 20th - 24th September 2021.

Pop the date in your diary now!

New Treatment Updates

If you have kept up with new migraine treatments in the past couple of years, you've probably heard about CGRP (calcitonin gene-related peptides) antibodies, a new class of preventive medication. These treatments act by releasing a monoclonal antibody that specifically targets molecules released during migraine to help prevent attacks. A recent study about their efficacy reported that 79.2% of people found that the drug improved their migraine (Eli Lilly 2020). Three drugs have been approved for use in Australia, however none have been listed on the Pharmaceutical Benefits Scheme (PBS) despite several being recommended for listing.

Galcanzumab - Emgality® manufactured by Lilly

In July 2019, the Pharmaceutical Benefits Advisory Committee (PBAC) recommended the inclusion of Emgality® (galcanzumab) on the PBS for people with chronic migraine who have unsatisfactorily tried at least three prevention therapies. Emgality® was the first medicine of its class to have received a positive recommendation from the PBAC.

To date, a PBS listing has not been possible because the PBAC recommendation would require Emgality® to be funded from within a risk-share arrangement which includes a strict financial cap (or limit).

Lilly prepared another submission this year to provide Emgality® to episodic migraine patients. This submission was presented at the November PBAC meeting. We will know the results of this meeting in mid to late December.

Fremanezumab - Ajovy® manufactured by Teva Pharmaceuticals

On Friday April 24th 2020 the PBAC delivered a positive recommendation for Ajovy® to be listed on the PBS for the prevention of chronic migraine. Teva have said that they will continue to work closely with the government to enable eligible patients to have access to Ajovy® via the PBS. It's unclear when an agreement will be reached as no dates have been confirmed so far. In the meantime, Ajovy® is available privately by prescription.

Erenumab - Aimovig® manufactured by Novartis

Aimovig® withdrew their application for PBS coverage in October 2019, after the application and negotiation for PBS coverage broke down. Aimovig® is available privately by prescription.

Government spend for migraine

We are excited to announce that the government has allocated \$600,000 towards migraine in this year's budget. The money has been funded to address "the improvement and management of migraine", and it is the first time migraine has ever been included in the budget.

This announcement comes after our January 2020 submission to the Australian Treasury Department which proposed a chronic migraine strategy. The submission outlined where the gaps are in current migraine management and methods for

addressing these issues including several funding proposals. These were to:

1. Improve the quality use of medicines by migraine sufferers
2. Improve the workplace productivity of people with migraine
3. Take initial steps towards a Migraine Centre of Excellence to train healthcare professionals
4. Conduct an epidemiological study to understand the impact of migraine in Australia, to prioritise focus areas and maximise impact
5. Improve access to effective medications to prevent migraine

The Department of Health has not yet announced how the money will be allocated, but we are hoping that it will allow us to make a start on some of these proposals. Regardless, this is a huge win for migraine patients in Australia, and we are looking forward to seeing the benefit in our community.



JOIN MIGRAINE
AND HEADACHE
PRIVATE SUPPORT
GROUP ON
FACEBOOK TODAY

Connect with other headache and migraine patients.

Join the community to keep up to date with news and latest events. Share, listen and learn from others.



Migraine & Headache Australia support @ facebook - [Facebook.com/groups/headacheaustraliasupportgroup/](https://www.facebook.com/groups/headacheaustraliasupportgroup/)



Follow us on Twitter @HeadacheAus and



Instagram [headacheaustralia](https://www.instagram.com/headacheaustralia)

And of course, don't forget to register on our **National Headache Register** to receive all the latest up to date news.

ARE YOU A
HEADACHE
REGISTER
MEMBER?

Our Register Members receive regular email updates of current information as we receive it. We send information about new research trials that you can choose to be involved with.

All donations made by Register Members go only to Migraine and Headache research. Your email address is required. Register at [headacheaustralia.org.au](https://www.headacheaustralia.org.au)



Disclaimer: Headache Australia is not a medical office and cannot offer medical advice. We stress the importance of discussing any issues you have with your medical practitioner.

Aneurysm

Stroke vs Aneurysm: What is the difference?

A stroke and an aneurysm are not the same thing. They are two very different medical health problems. Stroke is a process or an event that happens in your body, while an aneurysm is a problem with a person's anatomy (anatomical abnormality).

Signs and symptoms may differ between a burst aneurysm and a stroke. A sudden, extreme headache accompanying a burst aneurysm is the one symptom that is noticeably different.

It is important to call for an ambulance if a person has any of these symptoms as both can be life-threatening.

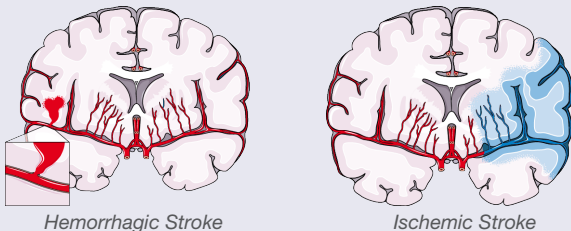
They are a medical emergency.

Symptoms of a stroke

Ischemic stroke: An artery is blocked, and blood supply no longer reaches all the parts of the brain.

Hemorrhagic stroke: A blood vessel bursts or leaks, and blood enters parts of the brain where it would not normally be.

Most strokes happen because of a blocked artery.



A person who is having a stroke may experience:

- Drooping on one side of the face
- An inability to lift the arms
- Weakness or numbness in one arm
- Slurred speech or inability to talk
- Complete paralysis of the body along one side
- Sudden vision disturbance
- Dizziness
- Confusion or difficulty understanding other people
- Loss of balance or coordination
- Difficulty swallowing

A good way to recognise if someone is having a stroke is to remember F.A.S.T.

F = face drooping

A = arm weakness

S = speech difficulty

T = time to call an ambulance

Symptoms of an aneurysm

An aneurysm is a bulge in an artery. It bulges because of a weakness in an artery wall. This makes the artery open to further weakening, and it could burst. Aneurysms vary in shape, size, and location. Aneurysms can affect any blood vessel. The most important aneurysms affect the biggest artery leaving the heart and the arteries in the brain.

Aneurysms that have not burst do not tend to produce symptoms. Symptoms are likely to appear only if the size of the bulge is large. Then the aneurysm has a high risk of bursting.

Anyone with a diagnosis of a brain aneurysm who develops symptoms should seek medical help as soon as possible, as treatment may prevent a burst.

A burst aneurysm in the brain usually causes:

- An extreme "thunderclap" headache
- Vomiting
- Stiff neck
- Sensitivity to light
- Collapse, seizure, or coma

An intact brain aneurysm may produce symptoms such as:

- Vision problems, such as double vision
- Pain above or around the eye
- An enlarged pupil in the eye
- Weakness or numbness of the face
- Headaches
- Loss of balance
- Speaking difficulties
- Problems with thinking

Survival of both depends on a number of factors, including age, general health, and how quickly the person receives medical care.

BRAIN
ANEURYSM
SUPPORT
AUSTRALIA

This site is for all who are survivors, sufferers, know someone suffering, or supporting someone with an Aneurysm, to share their story and support.

<https://www.facebook.com/basa.com.au/>

We hope we can help in some small way.

Surviving my aneurysm

Just like many brain disorders or diseases, aneurysms can irreversibly change a person's life. Andy Carter experienced this in 2013, when she was diagnosed with three aneurysms and had to undergo surgery as part of her treatment. Her story explores the impact that this had on her life and family, and the coping mechanisms that helped her through it.

Brain Foundation (BF): Can you tell us a bit about your story and how you found out you had aneurysms?

Andy Carter (A): In November 2013, I noticed a pulling and flickering sensation around my eye. I was working a full-on job at the time, styling the pantry in the Masterchef kitchen. My days were long and they started at 3 or 4am, so I put it down to stress but went to the GP just in case. She sent me to the hospital, and initially they gave me a different diagnosis, but I was back within 24 hours with a horrific migraine, leading to my diagnosis. I was lucky that they caught them early, and I found an incredible neurosurgeon. He was kind but very pragmatic which I loved, and I felt like I was in good hands with him.

Unfortunately, the initial coiling procedure failed, and I had to schedule a craniotomy for six weeks later. It was daunting to know they would be operating on my brain. Luckily, the surgery worked and they were able to clip 2 of the 3 aneurysms, but I was quite jarred by the experience afterwards.

BF: How did you cope with the aftermath of surgery?

A: It took a long time to process all of it. Basically, from the minute you step out of the hospital doors, your recovery is your own. For me personally, I didn't feel like I knew what my options for support were. When I first came home from the hospital I had the support of my mum and sisters from WA, and then they left, and it felt like I just had to go 'back to normal' – but life wasn't normal. The doctors tell you beforehand what happens during surgery, but I didn't know I would wake up every day afterwards with a migraine – even to this day, though it's not as bad. And there's so many other psychological side-effects, as well.

I pretended I was fine for the first year, but I wasn't aware of so many things in my life. I wasn't aware of myself as an individual and a young mum; I had to change my whole way of life and I didn't know how to do that. When I went for a check up after a year and saw the scans of my skull, that was quite triggering, and I couldn't keep pretending it was fine. It brought up a lot of post-traumatic stress (PTSD), and I sort of wasted away as a person, which in turn had a huge fallout on my family and my two daughters.

I'M FASCINATED WITH MY BRAIN'S CAPACITY TO BE RETRAINED WITH DAILY NEUROPLASTICITY TOOLS



BF: What was the process of recovering from that realisation and getting to where you are now?

A: Once I hit that low point, I had to start finding myself again. My mental health declined and the fallout was fight or flight on my physical body. Luckily, my mum and sister helped me through the process of finding a psychologist and the right mental health team who were a great fit for me. He introduced me to meditation and yoga as part of the treatment plan for PTSD.

It was the most beautiful insightful path to learning firstly about exactly what had happened to my brain and body and then to understand how to reconnect them, by just being the best version of myself as I could be. No matter what else is going on in the world, as mad as it is – and look where we are now – you can still be kind to yourself and others, and connect to your roots.

My one constant where I gained almighty courage, persistence & strength came from my family and where I grew up, in the Pilbara region of WA. My Mum and Dad are both amazing people and were very connected to the community, and I have so much respect for them. They raised four children in the searing Marble Bar & Port Hedland heat, adversities at their doorstep. Our rare & unique childhood was engulfed with love, nature & adventures.

BF: What advice would you give to someone if they were diagnosed with aneurysm or about to have brain surgery?

A: It's certainly not a hopeless diagnosis in this day and age – it's a standard surgery, so that isn't the complicated or difficult part of it. It's the after-effects, which I guess is true for many surgeries. It impacts your life so much, and it doesn't just happen to you, it happens to your whole family. So then it's important to bring beautiful things into your life to outweigh the bad – even just waking up with a smile one day, which doesn't happen straight away. But it's such a beautiful feeling when you start to realise that these little moments of happiness are coming back into your life.

Above all, the thing is to always reach out. I wanted to touch base and try to give hope to people who have been in that state of hopelessness. I've been on that cliff edge, but focusing on connection is so important. It can be a lonely, isolating place in your own head. Looking back, I should have asked for family support at that crucial time, but I was almost 'ashamed' to speak up. It's easy to be misunderstood with an ABI (acquired brain injury), so having gentle, kind connections with your support team is important.

However, with knowledge comes power. I'm fascinated with my brain's capacity to be retrained with daily neuroplasticity tools, and I'm currently studying a Diploma in Positive Psychology (Langley Institute). Learning more and developing kind connections with people has led me to find myself again, and I can hold my loved ones close once more.

Healthy Brain

How fit is your brain?

Give these brain games a go to give your mind a workout!



Sudokus

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MEDIUM

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HARD

2020 Wordsearch

T	I	G	E	R	K	I	N	G	Z	M	O
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R	R	S	S	C	O	E	R	G	I	I	O
I	N	T	N	V	O	I	F	K	I	G	R
N	M	R	L	I	M	K	T	C	R	R	O
E	M	O	I	O	T	M	A	S	K	A	N
T	S	K	X	D	C	K	N	E	Z	I	A
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X	C	N	M	G	E	S	N	N	W	O	U
Z	I	A	K	M	I	O	K	C	A	N	S
N	N	O	C	O	I	T	C	I	E	N	K
G	E	H	O	M	E	Z	I	Z	F	K	K

Home

Vaccine

Netflix

Zoom

Tiger King

Lockdown

Mask

Coronavirus

Migraine

Stroke

Quiz

1. What soft drink is commonly used in a Shirley Temple?
2. Which three countries end with the letter "M"?
3. What vegetable is the basis of the soup borscht?
4. Calculate the mean, median and mode of 4, 9, 4, 6, 2, 8, 7. Which is highest?
5. Which are the first and last names of the four main characters in TV's Seinfeld?

SUPPORT
GROUPS WE
CAN SUPPORT

Are you part of a support group for another neurological condition that you would like to share with other sufferers?

Please let us know so that we can publish the details.

No one should have to go it alone. Being with others with the same condition offers a great deal of comfort and support!

Solutions on back page

Gene-editing to Reveal Regulators of Protein Aggregation and Toxicity in Motor Neuron Disease and Frontotemporal Dementia

Research

Motor neuron disease (MND) is characterised by the degeneration of motor neurons in the brain and spinal cord that leads to muscle weakness, wasting, and paralysis. It is an inevitably lethal disease with a lifetime risk of ~ 1 in 400 Australians. Interestingly, some people with MND also develop frontotemporal dementia (FTD), suggesting that the two diseases are related. Frontotemporal dementia (FTD) is characterised by the loss of neurons in the brain, which causes changes in personality, emotional state, and language difficulties, accounting for 1 in 20 cases of dementia. The incidence of both of these diseases is increasing and there are no effective treatments that slow or stop the progression of either of these diseases.

One of the first events, at the molecular level, involved in 97% of MND and 50% of FTD cases is the abnormal build-up of a protein called TDP-43 in motor neurons. TDP-43 proteins stick together to form toxic clumps and over time the accumulation of these TDP-43 clumps leads to the death of neurons in MND/FTD. Therefore, one potential therapeutic strategy is to prevent this toxic process of TDP-43 clumping. Unfortunately, there is currently a limited understanding of how TDP-43 clumps in neurons and why it is toxic. The primary aim of this project is to identify the cellular pathways that increase or decrease TDP-43 clumping and its associated toxicity to neurons. This project will use revolutionary gene editing technology to scan every gene in the human genome to identify the genes involved in triggering TDP-43 clumping. This is extremely important because it will broaden the scope of new therapeutic targets to treat people living with MND and FTD. This approach has great potential to put us on the path towards more effective treatments for people living with MND and FTD.

Outcome

The Brain Foundation Research Gift has enabled our lab to screen the function of ~20,000 genes in cells. The samples from these screens have been sequenced and analysed to generate “top hit” lists. This dataset has revealed that there are hundreds of genes that may play a role in protecting cells from TDP-43 toxicity. In addition, there are other genes that demonstrated involvement in inhibiting and enhancing the formation of TDP-43 clumps. The next step is to test each gene individually to determine which is the most effective at enhancing survival of cells. The best genes will become lead candidates for future therapeutic targeting studies for treatment of motor neuron disease and frontotemporal dementia.

Thank you very much to the Brain foundation and its supporters for the generous award of this research gift.

RESEARCH TEAM:

Chief Investigator:

Dr Rebecca San Gil

Neurodegeneration and Pathobiology Laboratory,
Queensland Brain Institute, University of Queensland

Co-investigator:

Dr Adam Walker

Neurodegeneration and Pathobiology Laboratory,
Queensland Brain Institute, University of Queensland



Characterising, Understanding, and Treating Balance Impairment in Parkinson's Disease

Research

Impaired balance greatly diminishes quality of life for patients with Parkinson's disease (PD). It causes symptoms such as falls, a sense of unsteadiness when walking and difficulty transitioning between positions such as sitting to standing. Yet, balance impairment in PD is largely unresponsive to current treatments. To develop effective treatments, we need to objectively measure and understand the underlying causes of balance impairment in PD and identify therapeutic targets.

A potential method to measure and characterise balance impairment in PD is to track postural sway. Postural sway is the constant movement in centre of mass which occurs even during quiet stance. This can be captured using 'posturography', which involves standing on a pressure sensitive plate to track variations in centre of pressure. Maintenance of upright stance requires a constant and active process of leg muscle modulation to counteract torque from gravity. However, it was unknown how the brain controls these small movements to regulate postural sway.

An experimental treatment for balance impairment in PD is to implant and modulate a small brain region called the Pedunculopontine nucleus (PPN) with deep brain stimulation (DBS; a brain 'pacemaker'). Neurologist Peter Silburn and Neurosurgeon Terry Coyne in Brisbane, Australia, have been leaders in implanting and investigating this novel therapy. It was hoped, but never proven, that PPN DBS could improve balance in PD. The potential of any therapy to improve balance in PD would be important information, even if only to reveal a viable therapeutic mechanism.

We therefore performed an experimental study, performing posturography on patients with PD with balance impairment, whilst off and on PPN DBS and comparing results to healthy controls. Novel analysis methods using mathematical modelling were applied to measure balance impairment, to characterise how the brain controls postural sway, and to seek a treatment effect of PPN DBS.

Outcome

Our analysis, supported by the Brain Foundation, detected the involvement of two types of brain systems controlling balance; intermittent and continuous. Intermittent control was indicated by the appearance of abrupt redirections of sway (switching behaviour). Continuous control was indicated by the data conforming to a 'Proportional Integral Derivative' model (akin to adaptive cruise control in cars). Both these control systems were abnormal in the patients with PD compared to healthy subjects, and improved towards normal with PPN DBS.

These findings are important, as they demonstrate a novel way to measure and characterise balance impairment in PD. They clarify how the brain controls postural sway and how that control breaks down in PD. Crucially, we found that some of the balance impairment was amenable to reversal, in this study with PPN DBS. Whilst PPN DBS is an invasive treatment that is unsuitable for many patients, these findings highlight a therapeutic mechanism that could be exploited by other treatments. Indeed, our group is now developing a less invasive device to try and emulate this treatment effect.

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A new understanding of increased pressure within the skull in brain diseases

RESEARCH TEAM:

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Research

The skull encases and protects the brain, but after injury, increasing pressure within the skull can worsen injury. As occurs elsewhere in the body, when the brain is injured (from e.g. trauma, stroke or bleeding) swelling occurs. It has been recognised for more than a century that because the skull is basically a 'closed box', swelling causes pressure to rise. However our group made experimental discoveries that showed that pressure within the skull rises even after small stroke without noticeable brain swelling. Critically, we also showed that increasing the pressure after stroke causes reduction in blood flow particularly to the vulnerable brain region immediately surrounding the stroke. Such pressure rise is therefore the likely culprit causing the expansion of stroke that occurs in some patients with initially mild strokes during the first days in-hospital.

We were suspicious that the intracranial pressure rise may be related to increases in the volume of fluid around the brain - the cerebrospinal fluid (CSF). We found that there is a substance within this fluid post-stroke that triggers the pressure rise. Excitingly, our experimental studies also showed that the pressure rise can be completely prevented by a short duration of body cooling.

Dangerous pressure rises are also an important feature of multiple other brain diseases, and existing treatments are limited. As in stroke, causes other than brain swelling have not generally been considered. In this project our aim was to conduct experimental studies to determine the best way to apply cooling, as a precursor to clinical trials; to explore the mechanisms causing the rise, in order to develop additional therapies; to confirm pressure rise in patients with minor/treated stroke; and to determine whether this newly identified mechanism contributes to pressure rise in other brain disorders.

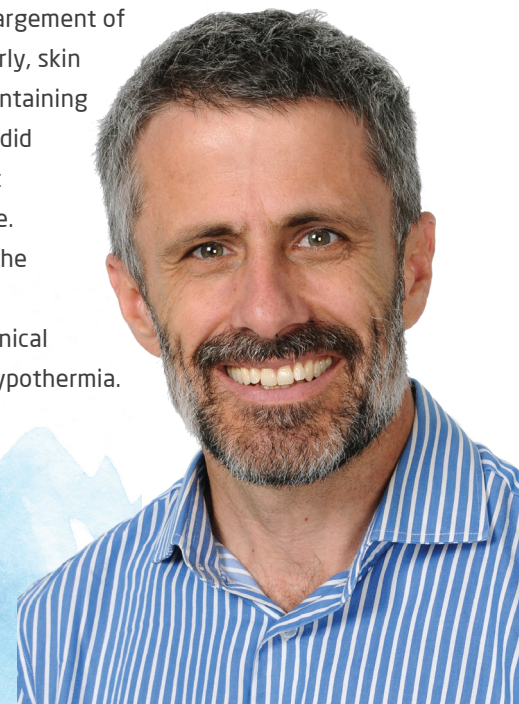
Outcome

We confirmed significant elevation of intracranial pressure in patients with minor symptoms 24 h after stroke.

We found that CSF from patients with bleeding into the fluid around the brain (subarachnoid haemorrhage, or intracranial haemorrhage with intraventricular extension) caused intracranial pressure to rise, but over a completely different time course than for ischaemic stroke.

We were able to measure CSF production with very high accuracy and reproducibility. We showed that a commonly used medication, acetazolamide (used to treat some disorders of intracranial pressure elevation), very consistently halved the CSF productions rate. However surprisingly, other existing and a proposed new medication, thought to act on CSF production, had no effect. This suggests that although multiple pathways may have some effect on CSF production, some are much more important than others.

We tested a gradual cooling protocol over 2 hours to 32.5 °C, achievable in patients. Even when the target temperature was only sustained for 30 minutes, it completely abolished subsequent pressure rise within the skull. Interestingly, a similar cooling protocol, but cooling to 34 °C, only resulted in partial abolition of the intracranial pressure elevation, and did not prevent enlargement of the stroke lesion. Similarly, skin cooling alone, while maintaining body core temperature, did not prevent subsequent intracranial pressure rise. These findings give us the information needed for a rationally-designed clinical trial of short duration hypothermia.



Get Involved

Remembering Darcie

Darcie was a loving and adventurous 18-year-old who completed her HSC last year and had just returned home from a working holiday with elephants in Thailand. She had no known health issues. On the 12th May this year, Darcie suddenly passed away from an AVM (arteriovenous malformation). Our condolences go to her parents; Jane & Gavin, and her brother and sister; Oliver and Charlotte.

Darcie's family and friends, together with Gavin's employer, BGIS, raised funds for research into AVM.

Darcie's story emphasises that brain disorders, diseases and injuries can touch someone we love at any time. Without research there can be no answers.



IN MEMORIAM

A big thank you to the families and friends of the following who donated in memory of their loved ones.

Rhonda CAMPBELL

Dao Hong CHEN

Nicole DALTON

Carmen DEBRINCAT

William DURNELL

Brandon FRAUMANO

Yvonne KASSOUF

Adrian LAZAROO

Darcie LOWE

John Edward MULCAHY

Brenton Bradley MANSER

Rae NEILSON

Ella Audrey STREET

Alan WRIGHT

Did you know that you can remember your loved ones and make a donation to a specific category of research? Please phone if you would like more details or see our online donation form.

PLEASE CONSIDER
US WHEN NEXT
LOOKING AT YOUR
FINAL WISHES

Please contact our office if you would like to have a further discussion or to receive one of our brochures to discuss with your legal representative.

Fundraise for Research

We are often asked "what can we do to fundraise?"

Well, there is no one answer to that question. With the help of fundraising platforms **Everyday Hero**, **My Cause** and **Go Fundraise** you can do just about anything you like.

These sites can direct you to a community event such as a fun run or a swim. These are easy to enter and you can choose to support us. You could also hold your own fundraising event, such as a trivia night - of course, subject to current restrictions, you could experiment with Zoom trivia to connect with friends and family safely. You can speak to our office to get a trivia pack and any information you want to give to friends. If you use one of the platforms mentioned above, all donations and receipts are taken care of for you. Easy!



Healthy Brain Solutions

medium

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7	2	6	5	8	1	3	4	9
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hard

8	6	5	4	2	7	9	1	3
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3	7	4	2	5	6	8	9	1
1	5	8	3	4	9	7	2	6
6	2	9	8	7	1	3	4	5

wordsearch

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Quiz answers

1. Ginger ale
2. Belgium, United Kingdom and Vietnam
3. Beetroot
4. Median, 6 (Mode, 4, Mean, 5.714)
5. Jerry Seinfeld, George Costanza, Elaine Benes, Cosmo Kramer



Thank you for supporting
brain research through the
Brain Foundation

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brainfoundation.org.au/donation
or use the donation form on the letter enclosed.

