brainWAVES

The Newsletter of the Brain Foundation

Winter 2023

I am delighted to report that applications for our 2023 research grants are streaming into our office everyday from researchers across Australia. Applications close 9th June and will be evaluated by an independent Scientific Committee made up of some of the leading medical minds in the country.

Sadly however, no matter how many dollars the Brain Foundation raises each year it's never enough to fund all of the dedicated researchers who apply for our grants. You can help change this by simply passing on this newsletter to your friends, family, colleagues and employer who may not be aware of the Brain Foundation or the work we do.

If you know someone with a brain disorder, disease or injury please help us, help them by donating or spreading the word about our work. Thank you.

Trevor Thompson
CEO

Brain Awareness Week 2023

Every year we host Brain Awareness Week to help people learn about their brain health and to raise awareness about the impact of brain diseases, disorders and injuries. From March 13-17 we shared new researcher videos, fact sheets, patient stories and more to celebrate the week.

The week began with a live online webinar on Understanding Brain Health and Dementia Risk, hosted by Associate Professor Greg Sutherland (University of Sydney). It was a fantastic presentation covering some of the key questions about brain health - plus many more questions from the audience. Some of the audience members asked about long Covid, migraine & dementia, fish oil supplements, and more.

If you missed Brain Awareness Week this year, you can visit our website to catch up on the resources. You can learn about…

- The relationship between brain health and dementia
- What it's like to live with an invisible disability (patient story)
- Patient support organisations
- Researcher videos about stroke, dystonia, concussion, motor neurone disease, and acoustic neuroma

THANK YOU TO EVERYONE WHO PARTICIPATED IN BRAIN AWARENESS WEEK, AND A SPECIAL THANKS TO THE NEUROLOGISTS WHO CONTRIBUTED THEIR TIME & EXPERTISE TO MAKE THESE VIDEOS.

Brain Awareness Week

March 13-17 2023 | Learn about the brain from experts

If you missed out this year, make sure you're subscribed to our email list to stay in the loop for future events!

You can read more about Brain Awareness Week (including how to access this year's resources) on page 6.

OVER 140 GRANTS HAVE BEEN GIVEN TO AUSTRALIAN RESEARCHERS SINCE 2013. YOUR GENEROSITY IS HELPING TO FUND NEW RESEARCH AND MOVING US TOWARD A CURE IN MANY BRAIN DISEASES, DISORDERS AND INJURIES.

OVER 50 YEARS OF RESEARCH

• MAKING A DIFFERENCE SINCE 1970 •

Contact the Brain Foundation
PO Box 579, Crows Nest NSW 1585
Telephone: 02 9437 5967 or 1300 886 660
Email: info@brainfoundation.org.au
Visit our websites brainfoundation.org.au and headacheaustralia.org.au

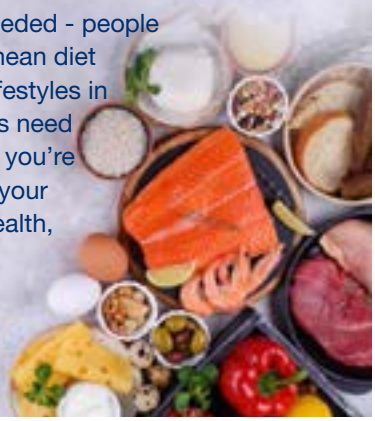
News

Mediterranean diet may lower dementia risk by a quarter, study suggests

A study suggests that eating a Mediterranean diet may lower dementia risk regardless of genetic risk factors. The Mediterranean diet consists of nuts, seafood, whole grains and vegetables.

The researchers examined data from over 60,000 people in the UK Biobank (an online database of medical and lifestyle records). They found that over the course of nearly a decade, people who followed a strict Mediterranean diet were 23% less likely to develop dementia compared to those who ate differently.

More research is still needed - people who follow a Mediterranean diet usually have healthier lifestyles in general, so other factors need to be considered. But if you're interested in improving your overall health & brain health, the Mediterranean diet could be a good place to start.



Source: The Guardian

Australian first clinical trial for fatal childhood brain cancer

Diffuse Intrinsic Pontine Glioma (DIPG) is the most aggressive of all childhood cancers, and one of the only cancers that has no effective treatment. Children are usually given 12 months to live after diagnosis - and this heartbreaking news is given to around 20 Australian children each year.

Thankfully, hope is being provided through a clinical trial at the Kids Cancer Centre at Sydney Children's Hospital (Randwick). They are trialling a new cell therapy called CAR-T to genetically modify the patient's own immune cells, which teaches the cells to target the tumour. Researchers hope this will successfully treat the cancer without damaging healthy cells.

The trial is called 'Levi's Catch' and is named in memory of 8-year-old Levi, who passed away with DIPG in December 2018.

A photo of Levi, who the trial is named after.
Source: Sydney Children's Hospitals Network

Researcher shows that a brain molecule could potentially halt MS

A researcher at the University of Alberta has found that a molecule called fractalkine could potentially halt or even reverse the effects of multiple sclerosis (MS).

MS is an autoimmune disease in which the fatty lining of nerve cells (myelin) is eroded, leading to nerve damage. MS attacks also damage oligodendrocytes, a cell that produces myelin, meaning that the nerve damage can't be repaired.

Dr Anastassia Voronova injected fractalkine into mice with chemically induced MS and found that it increased the number of new oligodendrocytes. When the damagedoligodendrocytes are replaced, they can make new myelin, repair nerve damage, and halt disease progression. She will also be studying fractalkine in other neurodegenerative diseases.

Dr Anastassia Voronova is leading the research into fractalkine.
Source: University of Alberta

Traumatic brain injuries under the microscope

People who sustain a traumatic brain injury (TBI) may soon know if they are likely to develop long-term memory impairment or Parkinson's disease, thanks to a University of Adelaide study.

Researchers are currently recruiting people who have had a concussion or a more severe head injury for the FIND-TBI study. They will use brain scans and other tools to compare the brains of TBI sufferers against healthy individuals and people with Parkinson's disease.

The project lead, Associate Professor Lyndsey Collins-Praino (2018 Brain Foundation grant recipient), says the "most important thing to appreciate is that traumatic brain injury is not an acute event, it is an ongoing disease". This study is particularly timely in light of the recent senate inquiry into concussion in sport, and we look forward to seeing the results.

Source: University of Adelaide

Fundraisers

In memory of Melissa Leaudais

Melissa Leaudais (17/11/1975-10/09/2021) died after suffering a brain aneurysm. We would like to celebrate her life and thank Lainie Mackay for hosting a fundraising event, which raised over $5,000 in her memory.

"Mel was one of a kind, she was a super special kind of human who devoted her working adult life to disadvantaged kids. I miss her every day." - Lainie Mackay.

Melissa and Lainie

Tyler James Osmond

Tyler James Osmond, aged 9 years, sadly passed away suddenly from an Arteriovenous Malformation (AVM) in 2021. Like so many people, his family hadn't heard of an AVM before his tragic loss, and are keen to raise awareness in his memory.

Tyler's cousin, Sarah O'Donald, is an online artist currently living in Scotland. As a fundraiser for the Brain Foundation, she held a 6-hour charity livestream on Twitch (@sezza). Sarah painted one of Tyler's Pokemon cards, and through generous donations from her subscribers and guests, she raised $7,300! Thank you for helping us raise awareness and much-needed funding for AVM research.

What is AVM?

AVM is a rare cerebrovascular disorder in which a tangle of blood vessels irregularly connects arteries and veins, which disrupts blood flow & oxygen circulation. These tangles can weaken and rupture causing a stroke. It is a devastating disease that needs much more research, so that people can be diagnosed earlier and receive more effective treatments.

Arthur with his daughter, Beryl

Arthur Dingle's 80th birthday

Arthur Dingle celebrated his 80th birthday in January, and asked his loved ones to support research into Alzheimer's disease in lieu of gifts.

It was a fantastic day, with over 200 friends and family members joining the festivities. They even organised a woodchop on the day to celebrate him, because Arthur's family is the largest competing family of woodchoppers in Australia.

Thank you to the Dingle family & the Mount Perry community for choosing to support Alzheimer's research at this wonderful event.

Brendan with Trevor and Anniek

170km for AVM

On Saturday the 15th of April, Brendan Wyatt ran an incredible 170km to raise awareness & funds for Arteriovenous Malformation (AVM) in memory of Lily Pacheco. Brendan is a physio for the Macarthur FC Bulls and he became friends with Lily through her husband, Ulises Dávila (MFC Bulls captain).

Starting in Avalon at 2am, Brendan reached Wollongong 17 hours and 20 minutes later, breaking David Goggin's record (a famous runner). This was a huge physical achievement, but even more important was the impact of Brendan's fundraising. He appeared on news programs & podcasts to help raise awareness for AVM, and raised over $19,300 for research. Thank you so much Brendan!

Ladies in the Field

Dozens of local artists & business owners from Tambo QLD came together for Ladies in the Field, a weekend-long event raising money for brain tumour research. From the 24th - 26th of March, people could join pilates classes, resin workshops, wine tastings, painting workshops and more.

The event brought the community together for a fantastic weekend, and raised $28,000 for research. Thank you so much to the Tambo community & the organisers of Ladies in the Field!

Some of the amazing organisers: Cynthia Still, Selena Still, Selena Loxley, Lucien Duffy & Sophie Still.

Migraine & Headache Australia Updates

Shades for Migraine

Coming up soon is the 2023 Shades for Migraine awareness initiative and competition in June. Migraine & Headache Australia is joining forces with global advocacy groups to generate awareness and raise funds for migraine research.

Here's how you can participate in the event and be in the running to win some exciting prizes:

- Put on your shades on or around June 21st to show you care for people living with migraine.
- Take a photo of yourself in your sunglasses and don't forget to get your family, friends and co-workers in on the fun.
- Post your photo with the hashtag #ShadesForMigraine #MHA and challenge 3 friends to take part!

Participating in Shades for Migraine will help raise much-needed awareness for migraine. Plus, all entries will go into a draw to win one of several migraine pamper packs (worth several hundred dollars each). Subscribe to the newsletter to be notified when we share more details!

One of last year's winning entries, from Alison

New treatment update: Gepants

A new type of migraine treatment may soon be available for Australians living with migraine.

Gepants are a class of drugs specifically designed to treat migraine attacks when they occur by targeting the calcitonin gene-related peptide (CGRP) pathway. They work in a similar way to the CGRP monoclonal antibodies such as Emgality, Vyepti and Ajovy. The difference is that the monoclonal antibodies are preventive medications, and gepants are primarily acute medications (although research has shown that some variants are effective as a preventive).

Two gepants are on the July 2023 Pharmaceutical Benefits Access Committee (PBAC) agenda for PBS listing. Atogepant for migraine prevention in people with highly episodic or chronic migraine and rimegepant for acute treatment in people who have not responded adequately to at least 2 triptans.

We recently encouraged members of the community to join us in making submissions to the PBAC, calling for these medications to be approved in Australia. We hope that we can share a positive outcome in the coming months.

An image of the American branding & packaging. Please note this may differ significantly from the Australian product.

Migraine & Headache Awareness Week 2023

Migraine & Headache Awareness Week is returning in 2023 from the 4th - 8th of September.

Over 4,500 people joined our expert webinars last year featuring leading specialists to learn all about the latest research and treatment updates - and we're looking forward to an even bigger year ahead. Make sure you're signed up to the Migraine & Headache Australia newsletter or social media to receive updates about the speakers, topics, and session times.

Migraine & Headache
Awareness Week
4-8 September 2023

Migraine World Summit

2023 brought us another incredible Migraine World Summit. Tens of thousands of people tuned in from all over the world to learn from top doctors, researchers and specialists in the field of migraine & headache.

Thank you for your support and participation in this event, which has raised over $2,700 in donations to Migraine & Headache Australia.

If you missed the live event in March, you can access 8 of the recordings online for free.

What is hemiplegic migraine?

Hemiplegic migraine (HM) is a rare migraine disorder characterised by a specific type of aura. It affects 0.01% of the 1 billion people worldwide who have migraine.

Migraine aura is a collection of fully reversible neurological symptoms that many people with migraine experience before or during an attack. In typical aura, the symptoms affect one or more of a person's visual, sensory or language and speech functions. But in HM, the aura also affects a person's motor function.

The term 'hemiplegia' is derived from Greek - 'hemi' meaning 'half', and 'plegia' meaning 'to strike' or 'stroke'. As the name suggests, hemiplegic migraine symptoms are often experienced on one side of the body, and are stroke-like. In addition to motor weakness, symptoms during an attack can include confusion and speaking difficulties.

This stroke-like aspect of HM can be dangerous. Because these symptoms are similar to those for stroke, seizures and other potentially serious neurological conditions, there's a risk that what you think is a HM attack is actually something more serious. Proper diagnosis of HM is therefore critical for the right migraine management, care and treatment, and to rule out other causes.

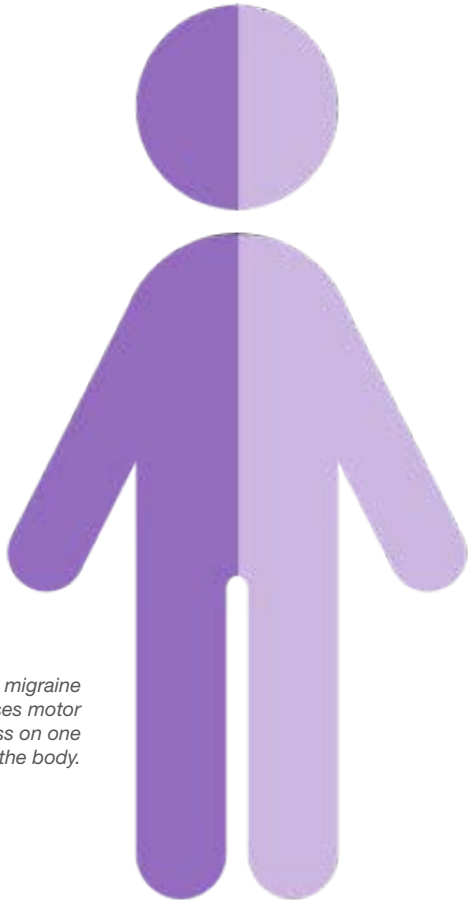
Classic migraine vs hemiplegic migraine

While there are many similarities between classic migraine & hemiplegic migraine, there are a few factors that are specific to hemiplegic migraine.

- **Genetic causes.** Three genetic mutations have been directly linked to HM. HM is categorised into two types - familial hemiplegic migraine (FHM) or sporadic hemiplegic migraine (SHM). FHM runs in families and is genetically inherited. In SHM, the person has no known family history.
- **Triggers.** Triggers vary significantly from person to person, but people with HM seem to be more susceptible to stress, sunlight/bright lights, intense emotional influences, sleep disruptions, and viral illness (in children).
- **Pattern of attacks & phases.** Typical migraine with aura has a predictable pattern - an aura phase followed by headache. This is not the case in HM. Attacks, and phases of the attacks, can vary in severity and duration. For example, headache might occur before the aura, or might not occur at all. The aura phase also lasts longer than in typical migraine with aura. It usually lasts an hour but can take several days or up to a week to fully resolve.
- **Symptoms.** HM attacks always involve weakness on one side of the body. Weakness can be mild to severe and may affect all or just part of one side of the body (eg, hands, hand and arms or the face). Sometimes it can manifest as paralysis down one side of the body.
- **Treatment.** Some migraine medications are generally not used for HM. There are concerns about triptans (an acute medication) and beta blockers (a preventive) because they constrict the blood vessels. There is a small risk that this increases the risk of stroke, and stroke symptoms can be masked in people with HM.

You can read our full article about hemiplegic migraine at:

https://headacheaustralia.org.au/headachetypes/hemiplegic-migraine/



Hemiplegic migraine causes motor weakness on one side of the body.

Join the support group on Facebook & follow us on social media to connect with other patients, keep up to date with news, and discover upcoming events

Facebook.com/groups/headacheaustraliasupportgroup/

@migraineandheadacheaustralia

Disclaimer: Migraine & Headache Australia is not a medical office and cannot offer medical advice. We encourage you to discuss any issues you have with your medical practitioner.

Brain Awareness Week 2023

Learn about brain disorders, diseases & injuries

During Brain Awareness Week this year, we hosted a live webinar and shared six videos created by brain researchers to help people learn more about the diseases, disorders and injuries that can affect your brain.

The topics covered included:

- **Understanding Brain Health & Dementia Risk**
  - A/Prof Greg Sutherland
  [webinar]
- **Stroke Research Update – Improving Treatments & Patient Outcomes**
  - Dr Daniel Beard
- **What is Motor Neurone Disease?**
  - Dr Frederik Steyn
- **Dystonia – A Review & Update**
  - Dr Joel Maamary
- **What is Traumatic Brain Injury**
  - Dr Jamie Beros
- **Concussion and the Brain – Research Update**
  - Dr George Opie
- **What is Acoustic Neuroma?**
  - A/Prof Rebecca Lim

If you missed Brain Awareness Week and wanted to catch up on any of these resources, they are uploaded to our website. You can find them in our menu under 'Resources', or at

brainfoundation.org.au/brain-awareness-week/baw-2023/

Speakers from top left to bottom right: Greg Sutherland, Daniel Beard, Joel Maamary, Frederik Steyn, Jamie Beros, George Opie, Rebecca Lim.

Supporting the patient community

At the Brain Foundation, we fund research into many different types of brain diseases, disorders and injuries. We do a lot to educate people about these conditions, but you might still have questions – for example, questions about NDIS access or finding a support group near you.

That's why we partnered with some fantastic Australian organisations that exist to support the patient community. Each of these organisations offers something different, which complements the work we do at the Brain Foundation.

We also interviewed three people to highlight the patient experience and raise awareness for the impact of neurological conditions on individuals. Andrea Nunn spoke to us about living with an invisible disability, Margot Chiverton shared her story of living with dystonia, and Brianna Ellem spoke about recovering from brain injury. You can read an excerpt of Brianna's story on the opposite page.

Thank you to the National Assistance Card, Brain Injury Australia, the Australian Dystonia Support Group, the NSW Brain Tissue Resource Centre, and the Stroke Foundation. Your support of Brain Awareness Week and the work you do for the patient community is so appreciated.

You can read these patient stories and access our Patient Resources Directory at brainfoundation.org.au/articles/

Recovering from brain injury

Recovering from a brain injury is a difficult process. Brain injuries can cause many different symptoms – you might experience changes in your cognition, emotions, senses, or motor function. There's no 'quick fix' or 'one size fits all' approach to recovery, and everyone will experience it differently.

Brianna Ellem spoke to us about her experience with a brain injury caused by complications of Chiari malformation. She highlighted the impact that brain injury can have on your mental health, and the resources and supports she found helpful in recovery.

Brain Foundation: Can you tell us a bit about your experience with brain injury?

Brianna Ellem: In 2015 I started to get really bad head pain. I've always lived with brain disorders (Chiari malformation, which also caused absence epilepsy) but this was different. My Chiari was getting worse and my brain was pressing against my skull, causing a brain injury. I had an operation in 2016 to try to treat the injury, but I'm still living with complications since the surgery.

For the next two years I was angry, frustrated and depressed. Whenever I spoke to doctors, I felt like I was constantly repeating myself which made me feel crazy. It's been a long journey of recovery ever since.

BF: How did this impact your life?

BE: After the injury, my life changed significantly. I'm now living with all sorts of symptoms that I didn't experience beforehand. My internal 'thermostat' is broken, which means I get headaches from changes in temperature or air pressure.

I've also experienced cognitive changes which make everyday tasks much more tiring than they used to be. I find it hard to motivate myself, stay on task, and process things.

"Thankfully I have found ways to manage these changes. I have gone from surviving to thriving, and I've been able to get back into the workplace and social situations again."

BF: What advice would you give to someone living with a brain injury?

BE: Remember that knowledge is power. Even doctors can get things wrong, so don't always go with the first diagnosis. Talk to other people with similar experiences and get second opinions when you can. If something doesn't feel right, speak up and advocate for yourself when you're speaking to doctors. This goes for support workers and the NDIS as well – don't be afraid to change providers! If you're incompatible with a worker or a support provider, it's best to switch.

Brianna Ellem

Advocating for yourself is important in your personal life as well. Be clear about your limits and focus on what you can do, and communicate that to the people in your life. Try to ditch the guilt and be firm with your boundaries – learning to say 'no' is hard, but it's necessary. At the same time, don't be afraid to accept help when you need it.

It can be tricky at first to find a balance between when you need independence and when you need support. Sometimes people have tried to micromanage me because they think it's helpful, when really I would have preferred to do things for myself. But other times, they've asked for too much from me. I know it's frustrating, but if you keep advocating for yourself, this balance will get easier.

You can read the full interview with Brianna on our website at brainfoundation.org.au/recovering-from-brain-injury/

Advanced MRI to detect disease activity after discontinuing multiple sclerosis therapy

RESEARCH TEAM:

Chief Investigator:

Dr Vivien Li
MBBS(Hons), FRACP
Department of Neurology,
Royal Melbourne Hospital,
Melbourne Health, Parkville, Australia

Co-investigators:

Dr Myrte Strik, University of Melbourne
Dr Scott Kolbe, RMIT University
A/Prof Elaine Lui, Royal Melbourne Hospital

Research

Multiple sclerosis (MS) is an autoimmune disorder of the brain that leads to problems with walking, seeing, sensation, thinking and bladder control. People with MS are able to access many treatments that can reduce the chances of relapses leading to these symptoms but each treatment comes with a range of risks and side effects, so choosing a treatment that is right for each patient can take time. Patients might need to stop or switch treatments due to various reasons including adverse side effects, pregnancy and transition to a more progressive stage of the disease where there are no clinically obvious relapses or inflammation and most currently available treatments have not proven to be effective. Recently, it has been found that patients on certain treatments do not develop a protective immune response following the COVID-19 vaccination, meaning they and their doctors may wish to temporarily stop therapy to be vaccinated.

When switching treatments, it may be necessary to wait for a period of time for the previous treatment to wash out before commencing the new treatment. Currently, it is difficult to evaluate the risk to individual patients when stopping or pausing treatment, balancing the potential risks of more relapses or worsening disease whilst off treatment versus side effects of continuing therapy.

This research aims to carefully examine how inflammation in the brain is affected by treatment switching or cessation using the latest brain imaging technologies to identify patients at risk of worsening disease. Participants undergo brain scans at three time points using a 7 Tesla (7T) MRI system which is over twice as powerful as the most powerful scanners available in hospitals. This is compared to scans performed at the hospital which are 3 Tesla (3T). Scans are performed before switching treatment, after commencing the new treatment and then three months later.

Outcome

To date, we have recruited 11 participants with MS, 7 of whom have switched their treatment and 4 controls who have remained on treatment. We are still in the process of recruiting further participants aiming for a total of 20 (with funding from other sources).

10 participants to date are female and average age is 33 for the switching group versus 36 for the control group. In the group of patients who switched treatment, reasons for switching included: ongoing MS disease activity despite their previous therapy (2 participants), development of antibodies that increased risk of a brain infection in people treated with natalizumab (4 participants) and to enable COVID-19 vaccination (1 participant).

We hypothesised that patients switching treatments would be more likely to have either clinical relapses or signs of disease activity (such as new lesions) compared to control participants staying on treatment. We found that this was the case in 2 of 7 switching participants who either experienced a relapse or developed new lesions. These two patients were both switching treatment due to disease breakthrough on their previous treatment. In comparison, the 4 control participants who remained on treatment and 5 participants who switched for reasons other than disease breakthrough did not experience either clinical relapse or new lesions.

In the 2 participants who developed new lesions while switching treatment, we observed a number of changes on different advanced 7T MRI sequences that suggested active brain inflammation and demyelination. Further data collection and analysis are ongoing.

Newborn screening as an intervention for spinal muscular atrophy

RESEARCH TEAM:

Chief Investigator:

Dr Didu Sanduni Kariyawasam
BA, MA, MBBS, FRACP, PhD
Sydney Children's Hospital Randwick
and University of New South Wales.

Co-investigators:

Prof Michelle Farrar, UNSW
Dr Arlene D'Silva, UNSW
Prof Veronica Wiley, University of Sydney
Dr Hugo Sampaio, Sydney Children's Hospital
Mrs Karen Herbert, Sydney Children's Hospital
Nancy Briggs, UNSW

Research

Spinal muscular atrophy (SMA) is a disease that affects thirty newborns in Australia each year. Known as a progressive peripheral nerve disease, it results in irreversible muscle weakness and wasting. In its severest, untreated form, it was known as the leading genetic cause of infant mortality and even in children with milder presentations, significant disability ensues. The therapeutic landscape for SMA is being transformed, with the first disease modifying treatments that may extend quality and quantity of life. In clinical trials, these treatments appear to have the greatest utility and impact when given prior to onset of signs and symptoms of the disease. Subsequently, there is an emerging urgency to diagnose children before symptoms develop. Newborn screening (NBS) for SMA provides a framework for early identification of affected children, facilitating a precision medicine approach to management.

Whilst the literature to date has concentrated on the screening methodologies, clinical processes and short-term outcomes for children and their families screening positive for SMA through NBS programs, there is a distinct lack of evidence on the long-term clinical and patient reported outcomes for this population. Patient reported outcomes are vital as they provide insight into meaningful changes in daily function and wellbeing of children screening positive for SMA.

An NBS pilot program for SMA commenced in New South Wales and ACT in 2018 and our research group previously evaluated the implementation of the program. However, with the above evidence gaps in mind, we conducted a real-world study to investigate the effectiveness of NBS coupled with access to disease modifying therapeutics as an intervention for SMA. We used patient centred measures such as quality of life indices to compare the experience of children diagnosed by NBS to that of children diagnosed by clinical referral. The results of this study will contribute to the decision-making criteria for routine national adoption of newborn screening for SMA in Australia.

Outcome

The effectiveness of NBS for SMA was compared using motor development milestones defined by World Health Organization Multicentre Growth Reference Study (WHO-MGRS) at two years post diagnosis. Secondary outcomes included mortality, changes in other validated functional motor scores, and the evolution of comorbidities (need for supplemental feeding and breathing support).

Children in the NBS group were on average 8 months younger at diagnosis and therapeutic intervention than those in the clinical referral (comparator) group. The two-year survival rate was similar in both groups (NBS = 93%, comparator = 89%), however there were significant developmental differences in survivors. For survivors, 11 of 14 children walked independently/with assistance in the NBS group, compared with 1 of 16 children in the comparator group. Children in the comparator group were seven times more likely to require supplemental feeding and non-invasive ventilation compared to children in the NBS group.

In conclusion, this study determined that NBS for SMA, coupled with access to disease modifying therapies, effectively reduced the functional burden and associated comorbidities for affected children. This study was the first to provide evidence for the clinical effectiveness of newborn screening for SMA as an intervention, directly compared to traditional (clinical) pathways of diagnosis and management.

Healthy Brain

How does the brain work?

This is the third part of our series about how the brain works. So far we have explained how neurons work, the difference between white and grey matter, and the roles of different regions in the brain. If you missed the previous sections, you can find everything on our website at brainfoundation.org.au/newsletters/

This time we are covering the deeper structures in the brain, such as the hypothalamus and hippocampus. We're also explaining the role of neurotransmitters.

Learning about these structures and neurotransmitters can help you understand how the brain works and how cells communicate, and will hopefully demystify some of the scientific jargon you might see in medical articles.

Hypothalamus

The hypothalamus is a small structure located at the base of the brain. It controls the involuntary physiologic processes (the autonomic system). It plays a crucial role in regulating behaviours such as body temperature, hunger, thirst, sleep, and sexual response. It also controls the release of hormones from the pituitary gland.

Thalamus

The thalamus is located in the centre of the brain and relays sensory information between your body and the cortex. It receives information from various sensory organs such as your eyes, ears, and skin. It plays a role in regulating consciousness, attention, sensing pain, and memory.

Pituitary gland

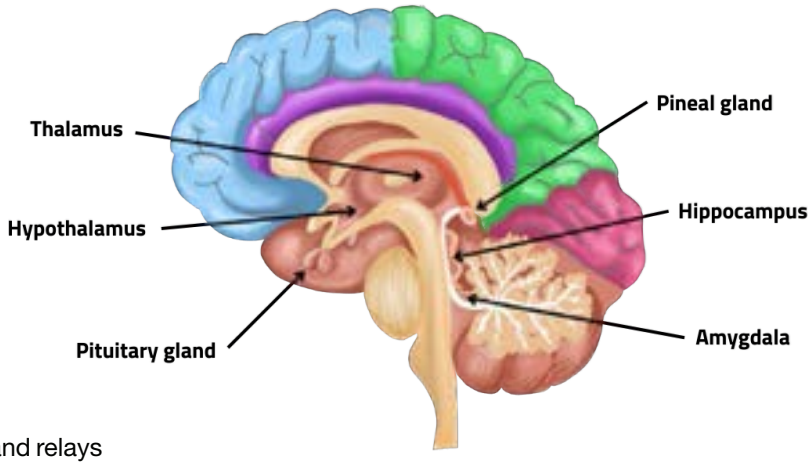
The pituitary gland is a pea-sized gland in the base of the brain. It is also known as the 'master gland' because it controls other endocrine glands in the body, so it is responsible for regulating most of our hormones. It secretes hormones that control sexual development, growth, and metabolism.

Pineal gland

The pineal gland is another small gland deep in the brain. It is crucial for regulating our internal clock because it secretes melatonin. Melatonin is produced when it gets dark, and it is the hormone that controls sleep and wake cycles.

Hippocampus

The hippocampus is a curved structure on the underside of the temporal lobe. It is responsible for forming and storing long-term memories. It also supports learning, spatial perception, and navigation. Research shows that damage to the hippocampus may play a role in Alzheimer's disease.



Amygdala

There are two amygdalae in the brain, one under each hemisphere. They regulate memory and emotions. The amygdala is also associated with the brain's reward system, stress, and the 'fight or flight' response.

These structures may be small compared to the cerebrum (the wrinkly outside layer of the brain), but they are essential for human survival. They work together to regulate vital bodily functions, memory, and emotional responses. Dysfunction in any of these structures can lead to a variety of neurological disorders, including memory loss, sleep disorders, and hormonal imbalances.

Neurotransmitter

Neurotransmitters are chemical messengers in the brain. They allow neurons to communicate with each other or with other cells in the body. Neurotransmitters are released out of the axon of a neuron into a small gap between cells, called a synapse, then bind to a receptor on the other cell.

There are at least 100 different neurotransmitters, each with their own specific role. There are three main types of neurotransmitters. **Excitatory** neurotransmitters create electrical signals that encourage the target cell to take action. **Inhibitory** neurotransmitters stop cells from being activated. **Modulatory** neurotransmitters can influence multiple target cells at once, and also regulate the effect of other neurotransmitters.

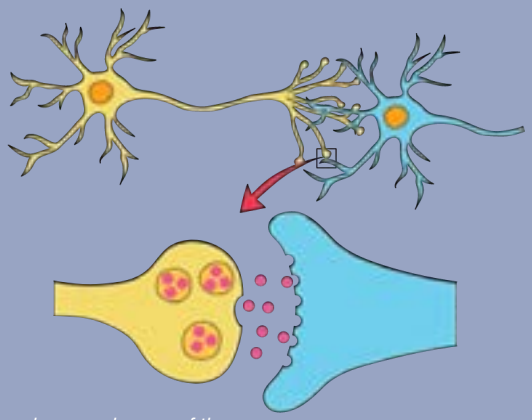
Here are a few examples of some common neurotransmitters.

Acetylcholine: Regulates muscle contractions and is involved in cognitive functions such as memory and learning. Low levels of acetylcholine are linked to memory loss and Alzheimer's disease.

Glutamate: The most common & powerful excitatory neurotransmitter. It has many functions and plays a key role in learning, memory, and mood regulation. Glutamate imbalances are linked to many disorders such as epilepsy, neurodegenerative disease & mood disorders.

Serotonin: An inhibitory neurotransmitter that helps regulate mood, behaviour, sleep, and memory. Low serotonin levels are linked to depression, anxiety, and sleep disorders.

Norepinephrine: An excitatory neurotransmitter that is crucial to the body's stress response. It increases heart rate & blood pressure in response to fear or stress. It affects your alertness, arousal, decision-making, attention and focus. Abnormal levels of norepinephrine are linked to psychiatric disorders and Parkinson's disease.



This diagram shows a closeup of the synapse, where neurotransmitters are released by one cell and received by another cell.

Brain Games

Sudoku

Medium

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

Target

Can you unscramble the letters to find the nine letter word?

For extra points, find as many other words as possible. Other words must be four or more letters and they must use the middle letter.

10 words - good;
20 words - great;
30+ words - terrific!

W	M	R
O	L	A
Y	F	E

Solutions on back page

Get Involved

Shave for Macklin

Macklin was a student at McCarthy Catholic High School (Tamworth) who tragically passed away last year from a brain injury. The loss knocked their whole community.

"Macklin was one of the most compassionate, kind, loving, determined, selfless people you would ever meet. He would always say hello to you or give you an overly enthusiastic handshake," says Hope Madden, one of his peers. "We all miss his contagious smile everyday."

Macklin's friends, family and peer group organised a fundraiser in his memory in which they dyed, shaved, or cut their hair. They raised awareness about brain injuries and the fact that they can strike people of all ages so suddenly. They also raised an incredible $16,200 for aneurysm research. We have highlighted aneurysms in our 2023 research grant guidelines and hope we will receive some high quality applications in this area.

The event has been part of the healing process for their community, and we are so thankful for their support.

IN MEMORIAM

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

Tyler James Osmond
Anne Marie Moore
Gregory Koschel
Lily Pacheco
Alexi Lawes
Kyan Armstrong
Tim Ruddenklau
Aniela "Ciocia" Hedditch
Ken Willson
Rocco (Roy) Perri
Helen Marie Edwards

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.

Healthy Brain Solutions

medium

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

Target:
MAYFLOWER, plus 82 possible words with 4 to 8 letters.

Brain Foundation

Thank you for supporting brain research through the Brain Foundation

To make a donation please scan the QR code
or visit our website **brainfoundation.org.au/donation/**
or use the donation form on the letter enclosed