



Brain Health Research Centre

Te Pokapū Rakahau Hauora Hinekaro

Newsletter October 2016

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Research to maximise quality of life for premature babies

Babies born very prematurely, between 22 and 28 weeks, now have a 90% survival rate. This is an incredible step forward in preserving life, but unfortunately it is now being realised that there are lifelong impacts of this success. Between 50-70% of these premature babies may develop behavioural and memory deficits, both of which will impact their quality of life. Associate Professor Dorothy Oorschot, a neuroscientist in the BHRC, believes that these deficits are due to damage caused by repeated oxygen deprivation.

When a baby is born extremely prematurely, not only are their lungs usually not well developed, but the part of their brain that controls their breathing is also not fully

functioning. As a result, some of these babies will become oxygen deprived multiple times a day. Damage is being done, and Assoc. Prof. Oorschot and her team are working on ways to minimize that damage.

The research team have worked with neonatal physicians to develop a new treatment that could protect premature babies from on-going post-birth brain damage. The team have produced some promising results, and by continuing their partnership with physicians they believe the work could significantly improve the lives of some of New Zealand's most vulnerable children.

For more information on this research keep an eye on our website.

Brain in brief

The brain is a highly complex and intricate tapestry of cells. It is always changing, always developing. At birth we have around one hundred billion neurons, but our brains are only around a third of their final size. New connections are formed, and insulation laid over connections which need to work faster. Our brains reach their adult size at around adolescence but they continue to fine tune, strengthening the connections we use and stripping away anything we do not, for the rest of our lives.



Healing from Stroke

As part of the Brain Health Research Centre's annual 'Hot Topic' lecture Dr Andrew Clarkson presented his work on improving recovery from stroke. Dr Clarkson and his team are developing new treatments with the aim of helping people to recover fully from stroke. He does this by trying to help the cells which are unaffected by the stroke to grow and form new connections, this would allow them to take over some of the function of the damaged area.

Stroke causes a massive death of brain cells which, literally, results in a physical hole in the brain. In theory, if you can increase the connectivity of the cells around this damaged area the impact that the damage has on the individual should be reduced.

He and his team are testing a combination of chemicals that cause new connections to form. Early results found that this combination impacted the recovery of mice who had been affected by stroke. While this isn't a cure it does provide hope that even if a stroke has severely impacted an individual's life there are possible pathways that will lead to the regain of at least some of the functions that were lost.

To learn more about Dr Clarkson's lecture go to: tinyurl.com/BHRC-Stroke



Mārama

Brain Health Research Centre members Dr Louise Parr-Brownlie and Dr Stephanie Hughes have founded a new viral vector and optogenetics platform called Mārama. The platform is funded and operated through Brain Research New Zealand.

Optogenetics is a technique that uses light to activate nerve cells. It sounds simple enough, but these nerve cells don't naturally respond to light. Normally, nerve cells are activated by chemicals called neurotransmitters. These neurotransmitters are released by other nerve cells and allow messages to be communicated between cells.

In order to activate a cell using light you need to insert a light-sensitive receptor. This is a very difficult process, which is where Mārama comes in. These light-responsive elements are delivered to the brain using modified viruses, generated by Mārama. This

platform provides not only the resources to complete experiments using viral vectors and optogenetics but also the expertise of both Dr Hughes and Dr Parr-Brownlie.

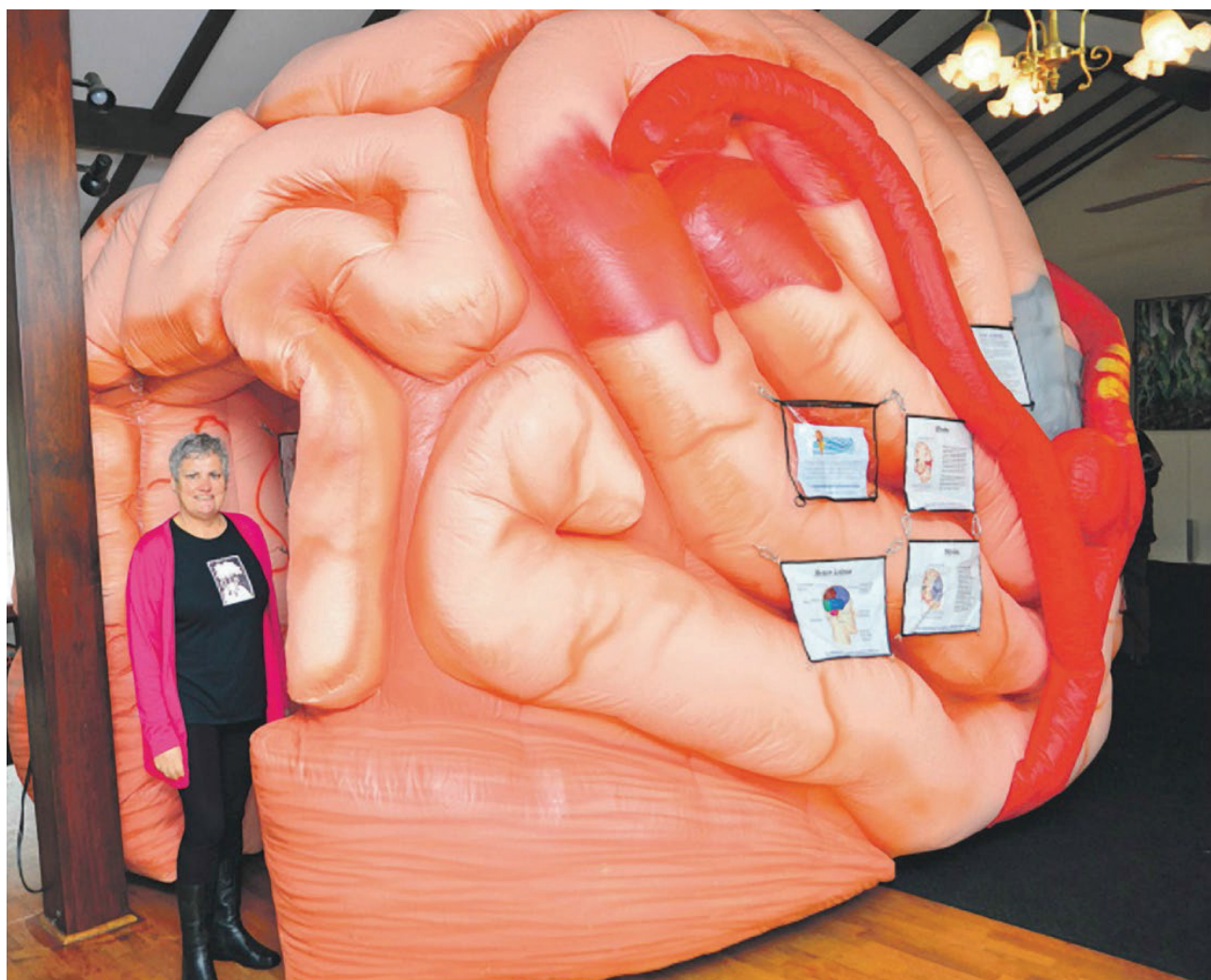
Optogenetics has been shown to be highly useful in experiments requiring precise control over neuron firing. It is able to be used as a kind of cellular on-off switch which, among other things, allows researchers to see exactly what happens when specific cells are activated or turned off.

Mārama shows great promise for assisting the scientific endeavours of researchers in New Zealand. With greater access to this technique researchers can be more specific in how they activate and manipulate the brain, which in turn will give rise to better results.

Bay of Plenty Welcomes Giant Brain

We were invited to take part in two Alzheimer's forums in the North Island recently. Over two days the brain visited Te Whare Wananga o Awanuiarangi, and also acted as a very visual welcome to people attending the 'Living with Dementia' forum in Tauranga put on by Alzheimer's Eastern Bay.

Unlike the rest of the body the brain is intimately connected to our sense of self and our ability to understand the world. The greater our awareness of the brain, the better equipped we are to tackle problems like dementia. Our centre is pleased to be able to provide this learning tool to groups and organisations, and in doing so spark interest in the brain.



Can Ketamine Treat Depression?

Ketamine is an anaesthetic used by both doctors and vets since the early 1970s. Around 16 years ago it became apparent that it may also be capable of relieving the symptoms of treatment resistant depression. This possibility is now being put to the test in the largest clinical study to date.

Professor Paul Glue, a psychiatrist in the University of Otago's Department of Psychological Medicine, is heading up a local centre offering access to the study treatments.

Professor Glue has previously described prescribing ketamine to individuals who haven't responded to other depression treatments, and after speaking with him it is easy to understand why. "It works for about two thirds of people," he says, "It takes around an hour before people start feeling better, and the effects can last up to a week before their symptoms come back."

The researchers are hoping to recruit a total of 200 people in Australia and NZ to take part. Half will be assigned to a control group, and the remaining half will receive ketamine. Participants won't know what group they're in while the 12-week trial is taking place, but all will have access to the ketamine treatment in the last four weeks of the trial.

The researchers will be closely monitoring the study participants, measuring everything from their levels of depression, to side-effects, to liver function. It is important to understand whether ketamine is both safe and effective at the doses suggested. Hopefully the outcomes of these trials will lead to new treatment options.

Clinical Issues: Cannabis and Epilepsy

Dr Paul Shillito, a paediatric neurologist, recently presented a lecture to BHRC researchers. He explained that about 70% of his patients are children with ongoing epilepsy. It was for this reason that he was particularly interested in the 2013 case study of a young girl whose severe seizures had been reportedly cured by medicinal marijuana.

It was reported that Charlotte Figi, a young American girl, had gone from up to fifty grand mal seizures per day to just four per month after the treatment. It wasn't a hoax. Her case has been exhaustively monitored to ensure its credibility. Sadly despite the rush of families moving to American states that have legalised marijuana, no one has recovered quite as well as Charlotte Figi did.

Dr Shillito explained that the anti-epileptic element was believed to be a compound called CBD which is only found in cannabis. However, the compound has received very mixed results in clinical trials. Almost 80% of the children in a recent trial experienced side-effects including drowsiness, anorexia, diarrhoea, fatigue, and convulsions. Nine of the 138 children went into a state of ongoing seizure, called status epilepticus. CBD also interferes with the breakdown of other anti-epileptic medications, and so it was unclear whether it was the CBD having an effect or if the children who did respond were simply responding to what was effectively a higher dose of their normal medication in their systems.

The jury is still out on whether medicinal marijuana, or even a pure form of CBD, can help children with epilepsy. Until we have more conclusive evidence clinicians like Dr Shillito will be keeping an eye on clinical trials.

News in brief | Scholarships

This year we have the opportunity to offer three scholarships: one summer research scholarship, and two PhD scholarships. The summer research scholarship is worth \$5000 and enables a 3rd or 4th year student to complete a research project over the summer break. The Roche Hans Möhler Scholarship provides \$10,000 for a PhD student to extend their project by 6-months. The Helen Rosa Thacker Scholarship provides \$5000 to a New Zealand born male completing a PhD in neurological research.

Visit our website for more information.



Message from our Director

Professor David Bilkey

Well, I'm back in New Zealand after several months away in Europe on research leave, primarily at the University of Freiburg. As beautiful a city as Freiburg is, it was lovely to return home to see Dunedin in the springtime. It was also great to catch up with some of our researchers and to hear about the work that had been going on over the last few months. It was particularly exciting to see some of the progress that has occurred in research that is aligned to our neurodevelopmental theme for 2016. You will see several stories related to this theme in this newsletter, including a brief outline of Associate Professor Dorothy Oorschot's work that looks at how we can improve the outcome for babies that are born extremely premature. One significant aspect of this work is that it has been built on an interaction between lab-based researchers and clinicians. This reflects the third part of the triangle that I mentioned in the previous newsletter. Then I was focused on the lab-based researcher

to -theoretician link that I was exploring in Freiburg. Here it is the lab-researcher link to clinicians that is important and that will hopefully pay off in terms of better outcomes for the youngest and most vulnerable members of our community. There are many projects of this type currently being conducted within the BHRC and we work actively to encourage them, for example, by running a regular seminar series where lab researchers and clinicians present on topics of overlapping interest. Furthermore, in this vein it is pleasing to have new BHRC members Dr Max Berry and Associate Professor Lynette Sadlier from the Wellington campus on board. Both of these researchers have strong clinical links and we look forward to working with them in the future.

Welcoming new members to the BHRC!

Two researchers from the Department of Paediatrics and Child Health, at the University of Otago Wellington campus, have joined the Brain Health Research Centre.

Associate Professor Lynette Sadlier is an epilepsy researcher and paediatric neurologist. She heads the Wellington Epilepsy Research Group (WERG) focusing on identifying new genetic epilepsy syndromes and refining the understanding of established syndromes.

Dr Max Berry is a neonatologist and senior lecturer in the Department of Paediatrics. Her research focuses primarily on the impact of preterm birth on later development. Much of her work focuses on the later development of the heart, however she has also examined the impact of preterm birth on blood flow in the brain.

We look forward to the opportunity of working with them over the coming years and welcome them to our centre.

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Supported by:



Insightful Queenstown

A huge thank you to the researchers and students who presented on behalf of the Brain Health Research Centre at the Queenstown inSight festival. The week of events, organised by locally based Catalyst Trust, was aimed at increasing awareness in the Lakes district of the progress in neuroscience. The talks given by our members focused on the interaction between society and brain health.

PhD student Blake Porter and post-doctoral fellow Calvin Young covered the fun stuff. Blake gave a brief talk about the Disney-Pixar movie ‘Inside Out’ and whether it had accurately depicted memory and personality. Calvin discussed new technology which allows people to control objects with their minds!

Researchers Dr Ruth Napper and Professor Cliff Abraham, however, explored the broader interactions of the brain and culture. Dr Napper discussed the impact of the New Zealand drinking culture on brain development, drawing from her ongoing research into fetal alcohol spectrum disorder. Professor Abraham covered current research around Alzheimer’s disease and how it will affect our aging population.

We’re very proud of the quality of the lectures provided by our members and are looking forward to working with Catalyst Trust again in 2017.

Help us to help you

The Brain Health Research Centre has over 200 researchers all based at the University of Otago. Supporting our researchers keeps your donation in Otago and helps our team continue their work. There is so much about the brain that we are still finding out. Your donation helps us unlock those mysteries.



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