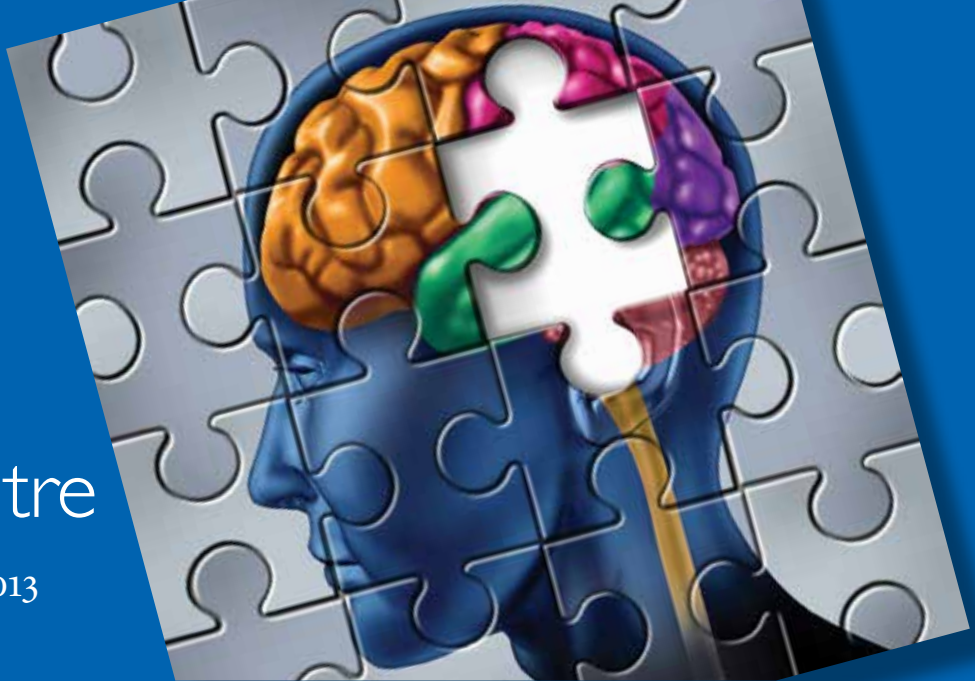


Brain Health Research Centre

NEWSLETTER DECEMBER 2013

IN THIS ISSUE

NEWS IN BRIEF

PhD student wins Runner-up in inaugural science writing prize

Congratulations to BHRC student Brigid Ryan who was placed runner-up in the Otago Medical School Research Society (OMSRS) Science Writing Prize 2013. Competing against 27 entries, Brigid's article 'How are memories stored in our brains?' won a prize of $250. The article described how memories are stored in the brain under normal conditions, in order to understand the brain is affected by dementia.

Movement disorders: A new discovery changes our understanding of the cerebellum

For Dr Ruth Empson, the cerebellum is the most fascinating and organised part of the brain. The cerebellum plays an essential role in motor control and may also participate in language. When it is functioning normally, it contributes to coordination, precision and accurate timing of movements. Head trauma, a tumour, or stroke can affect the cerebellum resulting in a loss of coordination, or 'ataxia'. Ataxia can also result from a hereditary gene mutation and occur in disorders such as cerebral palsy and multiple sclerosis.

Dr Empson works in the Department of Physiology, and has been studying the cerebellum for nearly a decade. She is one of the few cerebellum researchers in New Zealand and so she brings a wealth of knowledge and experience to the Brian Health Research Centre.

In this recent work, Dr Empson has shown that key synaptic connections between nerve cells in the cerebellum require the action of a molecular 'pump' that pumps sodium in and calcium out of the brain cells. Unexpectedly though, Dr Empson and her PhD students Chris Roome and Emmet Power found that the pump momentarily reverses direction when the cerebellar brain cells receive sensory stimulation. The pump switches direction for only a fraction of a second, but this is sufficient to change the properties of the synaptic connections. This discovery has changed the way that researchers understand how the pump works in the brain and how future studies in movement disorders will be conducted.

Dr Empson is now continuing to identify how early changes in cerebellar connections may underlie the progression to ataxia. Her research will study the onset of a genetic form of ataxia, called spinocerebellar ataxia. Dr Empson's research has been recognised by the University through her recent promotion to Associate Professor.

Where are they now?

Find out where your PhD can take you

Chris Roome completed his PhD in Physiology in 2011 under the supervision of Dr Ruth Empson. He is now a Postdoctoral scientist at the Okinawa Institute of Science and Technology, Japan, where he is working in the Optical Neuroimaging Unit under Dr Bernd Kuhn. The Unit is developing sophisticated new genetic and optical tools to measure cell activity in the brain.

Dr Ruth Empson and PhD student Chris Roome.

Targeting L-arginine to promote healthy ageing

L-arginine is a very versatile amino acid with a number of associated molecules that serve multiple functions in human health. It plays an essential role in muscle building, and is necessary for healthy functioning of the heart and many other organs in the body. Dr Ping Liu is a Senior Lecturer in the Department of Anatomy, and is investigating the role of L-arginine metabolism in Alzheimer's disease. Her preliminary work shows that the concentrations of L-arginine and its associated molecules change in the brain and blood during ageing, and when a person is affected by Alzheimer's disease. Dr Liu is particularly interested in agmatine, a by-product of L-arginine, which has been shown to be a 'novel neurotransmitter' and to have multiple functions in promoting brain health. Current research suggests that agmatine treatment improves learning and memory ability, and is neuroprotective in a number of disease models. Dr Liu's research group is actively investigating exactly how agmatine participates in learning and memory processes, and is exploring whether agmatine has therapeutic potential for Alzheimer's disease. Dr Liu is also looking at other derivatives of L-arginine, which are hoped to extend the life span and improve health.

NEWS IN BRIEF

Grant successes

Congratulations to the following BHRC members who have recently received research grants:

- Otago Medical Research Foundation, Professor Ian McLennan and his colleague Dr Megan Wilson
  'The molecular factors underlying male susceptibility to neurological disorders and injury'.
- Otago Community Trust Grant, Professor Cliff Abraham and Dr Joanna Williams
  'Defining novel contribution to microRNA to long term memory mechanisms'.
- The Maurice and Phyllis Paykel Trust, Dr Joanna Williams
  'Dynamic regulation of histone deacetylases in response to the LTP-model of memory'

BHRC Deputy Director John Reynolds with Alzheimer's Society Otago Chairwoman Lyneta Russell and Manager Julie Butler.

$50,000 Donation for Alzheimer's biomarker study

October was Alzheimer's Disease Awareness Month, and to mark this Alzheimer's Society of Otago generously gifted $50,000 to the Brain Health Research Centre. The funds had been given to the society as a bequest for research purposes. This donation will support studies within the Centre that aim to identify biomarkers or proteins in the blood that are diagnostic of Alzheimer's disease. BHRC Deputy Director Associate Professor John Reynolds, plus Dr Ping Liu and Diane Guévremont, who are involved in the biomarker study met with the Board to explain the significance to the ongoing research that their donation will make. The Brain Health Research Centre is very grateful for the Society's very generous support. It was a wonderful end to our 2013 year which had a focus on Alzheimer's.

Ever wondered why boys develop slower than girls? Or why some brain disorders have a gender bias?

Professor Ian McLennan, world expert on the Anti-Müllerian hormone on the brain, explains.

Have you ever noticed the difference in development between boys and girls? Or wondered why boys may be slower to walk and talk as toddlers, or why girls have their growth spurt before boys? BHRC member Professor Ian McLennan, from the Department of Anatomy, investigates these questions as well as working to understand why some brain disorders are more prevalent in one gender.

Professor McLennan has been researching the Anti-Mūllerian hormone (AMH) since 2005. He is a world expert on the subject, and has been responsible for producing the entire world literature relating to the influence of AMH on brain development.

Professor McLennan and his research team discovered that AMH plays many roles in regulating the brain and contributes to a gender difference in cognitive and physical development.

To begin with, AMH is a male specific hormone that plays a key role within the first 8 weeks of gestation. In the male embryo, AMH inhibits the development of the Mūllerian ducts, which would develop into the uterus in a female. The hormone continues to be expressed in young boys, and Professor McLennan's work suggests that AMH is responsible for slowing male development by approximately 9 months by the age of 6. Girls do not begin producing AMH until they enter puberty, therefore AMH appears to be the reason why boys, on average, develop slower than girls.

Everyone's brain develops in a unique way. The male brain on average is 11% larger than the female brain. This may explain why males need to develop more slowly than females. Professor McLennan speculates that if AMH slows male development, then boys with low levels of AMH may develop quicker and be at higher risk of developing autism, which is characterised by a fast developing brain.

In adults, AMH is produced in the brain and from both the male and female reproductive systems. When women enter menopause the ovaries cease to produce AMH. Whilst AMH disappears in older women, in elderly men the hormone is abnormally regulated and can either by completely absent, or at unusually high levels. Professor McLennan's lab is currently working to understand how AMH plays a role in determining why males or females are more likely to have certain neurodegenerative brain conditions. In particular, he is interested in discovering whether the female bias in disorders, such as Alzheimer's and Parkinson's disease, could be the result of the lack of AMH after menopause.

Professor McLennan's expertise in this field is a real achievement for New Zealand research on the world stage. We look forward to more exciting results as the studies into AMH on the brain continue.

The BHRC is extremely grateful for the ongoing support of the Neurological Foundation of New Zealand

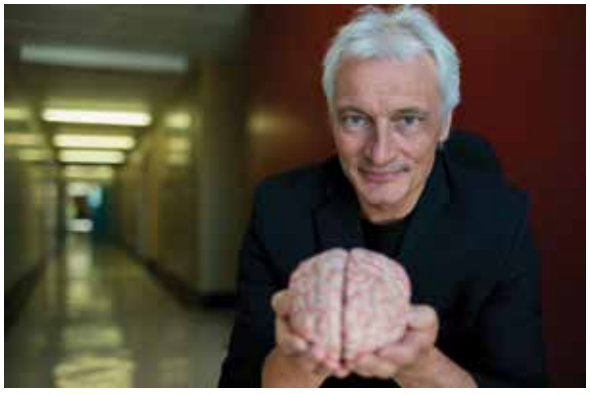
Every year the Neurological Foundation provides funding to scientists and clinical researchers all over New Zealand to enable them to continue work into vital research. $1.8 million was awarded in grants and educational fellowships during the year, as well as projects at the Universities of Otago, Auckland, Canterbury and Victoria, including:

- Controlling behavioural impulsivity in Parkinson's disease
- Reducing inflammation in multiple sclerosis
- A drug to limit damage after stroke
- Treatment of dyskinesias in Parkinson's disease

People in Otago and Southland will be familiar with the work of the Neurological Foundation in the development of Professor Dirk De Ridder's appointment to the Neurological Foundation Chair of Neurosurgery in Dunedin and the appointment of Dr Reuben Johnson as Senior Lecturer.

In addition, funding from the Foundation continues to support Professor Alan Barber's appointment to the Neurological Foundation Chair of Clinical Neurology in Auckland. All of these Clinical researchers are focused on forging linkages between neurosurgeons and neurologists in hospitals and neuroscience communities in universities throughout New Zealand. These close collaborations are key to undertaking innovative clinical research involving patients, which will become the treatments and recovery strategies in the future.

The BHRC is grateful to the Foundation for its support of the Centre and for the crucial research grants provided to our researchers and many others across the country.



Professor Dirk De Ridder

Professor Alan Barber

NEWS IN BRIEF

The 2013 BHRC Lecture: Professor Warren Tate

At the end of each year, the BHRC celebrates the success of one of our distinguished researchers by inviting them to give the keynote address at our end of year function.

This year, the honour was given to Professor Warren Tate CNZM FRSNZ. Professor Tate discussed his research aimed at finding diagnostic and therapeutic molecules for Alzheimer's disease. His lab is particularly interested in sAPPα, a protein that is neuroprotective and helps support memory function. One of Professor Tate's recent studies found that when sAPPα was infused into the hippocampus of memory-compromised animals, it restored memory function. Professor Tate gave a very insightful lecture and we wish his lab group every success for its on-going research on Alzheimer's disease.

L-R BHRC Clinical Director Dr Nick Cutfield and Professor Warren Tate

Looking for speakers for your organisation?

Our scientists and educators are keen to share their work you and have a range of topics that are fascinating. If you would like a speaker for your community group, please contact us on 03 479 4066 or bhrc@otago.ac.nz and we can arrange someone to speak on a topic of interest to your organisation.

CONTACT INFORMATION

Brain Health Research Centre
Department of Psychology | University of Otago
PO Box 56 | Dunedin 9054 | New Zealand
Tel: (+64) 3 479 4066
Email: bhrc-admin@psy.otago.ac.nz

Supported by:

NEUROLOGICAL FOUNDATION OF NEW ZEALAND

biogen idec

Upcoming events

Brain Week 10 – 16 March 2014 – mark your diaries

We have partnered with Otago Museum to bring you a brand new look for Brain Week 2014. Brain Week will be a full week of fun and educational events, with something for all ages to enjoy. The week will include the Neurological Foundation of New Zealand Brain Day on Saturday 15 March.

Neurological Foundation of New Zealand Brain Day 2014 - Dunedin

When: Saturday 15 March 2014
Where: Otago Museum, 419 King Street, Dunedin

More information about Brain Day and events across Brain Week will be announced in our next newsletter and via our website *www.otago.ac.nz/bhrc*

New supporters on board

The Brain Health Research Centre acknowledges the generosity of the community in supporting our research in to new treatments and cures for neurological conditions.

We would like to thank the following groups and organisations for their recent support:

- Clinton Lions Club - $37,000 to support the research of our Neurosurgeons Dr Reuben Johnson and NFNZ Chair in Neurosurgery, Dr Dirk De Ridder.
- Alzheimer's Society Otago, - $50,000 to assist our studies in identifying biomarkers or proteins in the blood that are diagnostic of Alzheimer's disease.
- The Wakatipu Association of Anglican Women - $500
- The National Assistance Fund - $10,000 for neurosurgery research.

Yes, I would like to support the Brain Health Research Centre

I would like to give the following gift:

☐ $25 ☐ $50 ☐ $100 Other $ _____

Title: _____ First Name: _____ Surname: _____

Street address: _____

Suburb: _____ Town/City: _____

Postcode: _____ Ph: _____ Email: _____

☐ My cheque is enclosed made payable to the BHRC University of Otago Foundation Trust,

or please debit my: ☐ Visa ☐ Mastercard

Card number: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ Expiry: ☐☐ / ☐☐

Name on Card: _____ Signature: _____

Gifts of $5 are tax deductible. An official receipt will be issued.
You can also donate online at www.otago.ac.nz/bhrc or phone 64 3 479 4150

Brain Health Research Centre, University of Otago, C/o Department of Psychology, PO Box 56, Dunedin 9054, New Zealand

Brain Health Research Centre
Te Pokapū Rakahau Hauora Hinekaro

☐ I would like to make regular donations by automatic payment

☐ Please accept this one-off gift to support the BHRC

☐ Please send me information on how I can support the BHRC through a gift in my will

Thank you for generously supporting the Brain Health Research Centre