THE UNIVERSITY OF SYDNEY

Brain Matters

Using Our Brains Donor Program

Issue 38 January 2024

From the director, Associate Professor Greg Sutherland

As we reflect on 2023, I am pleased to report that it was a very productive year for the team at the NSW Brain Tissue Resource Centre (BTRC). Our achievements this past year have been significant, and your support as donors has been integral to our success. Importantly, the bank had its funding renewed by the US agency, National Institute of Health (NIH). This funding will underpin much of our operations for the next five years as we continue to recruit individuals with a history of alcohol use disorder along with other neuropsychiatric illness and neurologically healthy people via the Using our Brains program.

Each year the BTRC team attends the Research Society on Alcohol annual meeting. In 2023 Julia Stevens and I attended the Seattle meeting where we presented on the utility of genotyping data from our donors, and the advances we have made in multi-target imaging of brain tissue which is featured in the current newsletter. During this meeting Julia and I also visited the Allen Brain Institute, located in Seattle, and met one of their Directors, Professor Ed Lein. The Institute is at the forefront of cellular characterisation of the human brain, and we have now established a valuable collaboration with their brain bank at the University of Washington. Another highlight was that one of our long-term team members, Caine Smith completed his PhD. Caine used a technique called mass spectrometry to show how alcohol changes the nature of lipids in the human brain. Luckily, he is continuing with us in 2024 and will be helping me ramp up our research by applying the latest molecular techniques to human brain tissue.

The other highlight for me in 2023 was attending the Shanghai Forum, where I was among a group of academics from the University of Sydney that was hosted by Fudan University. I presented how we are using brain tissue to look at the links between alcohol misuse and dementia. This potential association is a hot topic worldwide now, with both NIAAA and the National Institute of Ageing working together to support projects in this area. Indeed, my research group has two ongoing projects with teams at the University of North Carolina and Brown University in Rhode Island to do just that.

One of the important things I do each year is to attract new donors among the public. During Brain Awareness Week in March, I combined with the Brain Foundation to present a webinar on “Everything you need to know about brain banking”. I also presented a webinar for an international biobanking society called ISBER. ISBER are holding their conference in Melbourne in April 2024 and BTRC will be well represented as invited speakers and conducting a workshop on internationalising brain banking.

Lastly none of this work could happen without the support of yourselves and our donors and their families. Your gift is making incredible advances in our knowledge of the brain and the diseases that affect it. Thank you for your continued interest in our work and please spread the word about becoming a donor.

Warm regards,
Greg

In this issue:

Highlights from 2023

Grant success

The US based National Institutes of Health (NIH) has renewed USD2.5 million in funding for the NSW Brain Tissue Resource Centre (BTRC), which administers the Using Our Brains donor program. The BTRC facilitates domestic and international research projects investigating the effects of alcohol on the brain and other neurological and psychiatric disorders. This funding will ensure the continued Using Our Brains donor program until at least 2028.

Image left: Julia Stevens and Greg Sutherland attending the Research Society on Alcohol annual conference in Seattle, Washington.

Image below: Greg presents a talk to the Shanghai Forum, a meeting between Fudan University and the University of Sydney.

Brain donation is a noble gift, offering hope and advancing neurological research for future generations

Abbiategrasso Brain Bank

Image from left to right: Emanuele Tino Poloni (Director, Abbiategrasso Brain Bank), Xhulja Profka, Mauro Ceroni, Mario Novelli (NSW BTRC), Annalisa Davin, Antonio Guaita (Director, Fondazione Golgi Cenci)

In August last year, Mario, a member of our team, had the opportunity to visit the Abbiategrasso Brain Bank (ABB) located about an hour from Milan, Italy. ABB focuses on studying the aging brain. It is situated on the same hospital grounds where *Camillo Golgi* once worked and discovered the neuronal silver staining technique, a discovery that earned him a Nobel Prize. As Italy's first brain bank, ABB collaborates closely with patients, doctors, and researchers to enhance understanding of brain aging in both health and disease. Mario's visit provided valuable insights into the operations and processes of another brain bank. It also laid the groundwork for potential future international partnerships, specifically in the handling and utilisation of brain tissue for various research endeavors.

Recent Publications

The BTRC has contributed to hundreds of publications over 20 years, resulting in 750 research publications. Here are a few research outputs from 2023, which demonstrate the breadth of work undertaken by the researchers we support both locally and internationally.

- "Associations of psychiatric disease and ageing with FKBP5 expression converge on superficial layer neurons of the neocortex". Matosin, N., et al., (2023). Published in *Acta Neuropathologica*.
- "Chronic alcohol metabolism results in DNA repair infidelity and cell cycle-induced senescence in neurons." Sun, J., et al. (2023). Published in *Aging Cell*.
- "Perturbed iron biology in the prefrontal cortex of people with schizophrenia" Lotan, A., et al. (2023). Published in *Molecular Psychiatry*.

Research focus: Multi-target imaging of human brain tissue

This year, under the supervision of A/Prof Greg Sutherland, Hao finished his honours dissertation which focussed on Alzheimer's disease (AD). He made headway in understanding the progression of Alzheimer's disease (AD), a widespread brain disorder that targets memory and cognitive functions. This study shed light on the role of glial cells, including astrocytes and microglia, which are crucial in the brain's response to Alzheimer's.

Hao employed cutting-edge imaging techniques to examine brain tissue samples, focusing on the distribution and quantity of glial cells in individuals with Alzheimer's compared to those without the disease. This approach allowed for a detailed observation of the location and interaction of Alzheimer's-related proteins and various brain cells.

Findings from the study revealed that the arrangement and quantity of microglia and astrocytes in the brain are closely linked to the severity of Alzheimer's. This correlation provides new insights into how these cells affect the progression of the disease. The study confirms patterns in Alzheimer's progression and spread previously documented in literature, demonstrating the effectiveness of this novel imaging technique in analyzing brain tissues affected by Alzheimer's.

This research offers a promising direction for better understanding the complex dynamics within the brain as it battles Alzheimer's. Additionally, this technique of imaging multiple targets in one image is an advancement of our own laboratory's capabilities.

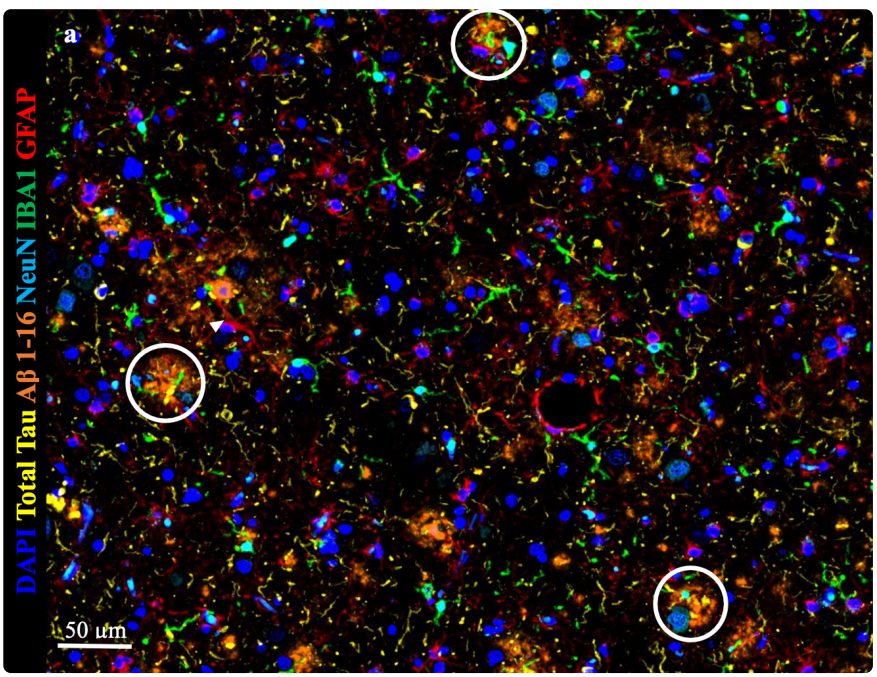

Image: Multiple targets (each shown in a different colour) in the brain, showing their spatial relationship to each other. Yellow and orange entities represent Alzheimer's disease pathology, whereas light blue, green, and red entities represent various brain cell types. Image credit: Haotong Nguyen-Hao.

Students that completed projects this year

Students within our associated research lab, Sydney Brainomics, completed the following degrees this year:

Caine Smith, Doctor of Philosophy
Caine's thesis, titled *Lipidomics of Alcohol-Related Brain Injury*, explored the effects of chronic alcohol drinking on the brain using a variety of laboratory and data science techniques including mass spectrometry, molecular biology, histo-chemical, and bioinformatics. A finding from his work highlighted the importance between liver health and brain health, in the context of alcoholism.

Haotong Nguyen-Hao, Bachelor of Medical Science (Honours)
Hao's dissertation (highlighted in Research focus), was titled *Unifying tissue microarray (TMA), multiplex immunofluorescence (mIF), and a semi-automatic cell and spatial quantification system for Alzheimer's disease neuropathology assessment.*

Caleb Hur, Bachelor of Medical Science (Honours)
Caleb's dissertation was titled *A spatiotemporal atlas of Alzheimer's disease—toward automated quantification of AD pathology.*

Farewell Ali

This past August we farewelled Ali, who has been the Using Our Brains Donor Program coordinator. She joined us a week before the initial COVID-19 lockdown in 2020. In addition to administering this program, she was also heavily involved in the *Perceptions of Brain Donation* survey, which has been accepted for publication and is in press. We wish her all the best of luck in her future endeavours.

Annual update 2024

The annual update is attached to this newsletter, either electronically (if you are receiving this by email) or in paper form (if this was posted to you). Please make sure to fill this in and send this back to us, and write your next-of-kin details in the appropriate field (even if you have previously done so). Please also let us know how you would like to receive these updates in the future (either electronically or via post), there is a tick-box option in the Annual Update form that you have received. If you change to the online version, your answers from previous years will be pre-filled and you can either confirm these answers or select “Edit” to change. Please let us know if this is your preference.

Recruitment 2024

If you would like a poster or brochures for your workplace or community group to advertise the Using our Brains donor program, please contact us. Similarly, if you would like Greg to present to your rotary, workplce or community group please contact us.

Connect with us

To connect with us on X (formally Twitter) scan the QR code:

You can also find us on facebook and instagram (@usingourbrains)

Image: The UoB team walked the city2surf last August to raise awareness about brain donation. Several fellow city2surfers asked us questions about brain donation, or just wanted to have a chat about their personal experiences regarding their own brain.

In Memoriam

The Using our Brains Donor Program would like to acknowledge the generosity shown by our donors and their families. It is an act of great foresight and kindness to give at a time of loss, so that others may be helped in the future. To the families of donors that have pass away this year, the Using Our Brains Donor Program would like to extend our sincere sympathy and gratitude. Over the years, friends and families of donors have given memorial donations to the Using our Brains Donor Program in lieu of flowers. If you would like to donate to our research program, please contact us for details.

For more information

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