

# AT A GLANCE

#### WHO WE ARE

Monash University's Department of Neuroscience is the first university academic department in Australia dedicated to developing and providing solutions for patients with neurological conditions. Established in early 2018, the Department partners closely with the Alfred hospital (Melbourne, Australia).

With more than 140 clinicians, researchers and students involved across 20 critical areas of neuroscience, our pioneering research takes a **bedside-to-bench-to-bedside** approach to directly improve outcomes for patients. This integrated way of solving major challenges in neurological diseases is due to our strong collaborations with healthcare providers. These local, national and international partnerships give us the opportunity to work closely with clinicians and patients to translate findings from the lab into clinical trials or treatments that will have tangible health benefits for people and communities.

#### **OUR FOCUS**

Neurological conditions affect a growing number of people worldwide, accounting for one third of all diseases. They are one of the largest contributors of 'healthy life' lost, known as disability adjusted life years, and are the second leading cause of death. This is a huge challenge confronting Australia's health system and society, costing approximately \$45.5 billion each year.

The total burden of disease for neurological conditions has risen substantially over the last decade, particularly in the older age group. In 2011, the proportion of total burden for Australians aged 65 years and over was 11%, the third highest disease group.

### Neurological conditions we focus on

Brain tumours, dementia, epilepsy, headache, movement disorders, Multiple Sclerosis, neuromuscular disease, neuroopthalmological conditions, pain, spinal cord injury, stroke, traumatic brain injury.

## FAST **FACTS**









## OUR IMPACT

### EXCEPTIONAL RESEARCH, GLOBAL LEADERSHIP

The department is led by Professor Terence O'Brien, the Van Cleef Roet Professor of Medicine (Neurology), Director of Neurology, Alfred Health and Program director of Alfred Brain.

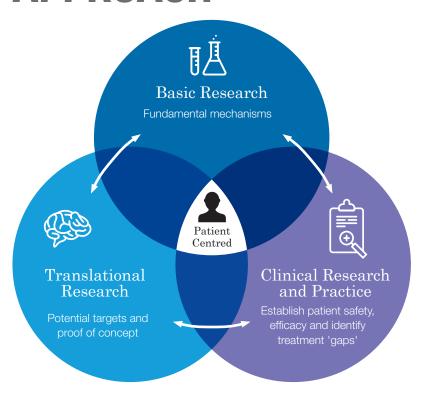
Professor O'Brien leads a talented and dedicated team of researchers, researcherclinicians and students in the Department of Neuroscience and at The Alfred. Specialists in a diversity of disciplines and disease areas undertake research into understanding the physiological mechanisms of the healthy brain and what goes wrong in disease states. Our expert research leaders play a strong role in providing guidance and mentorship for our next generation of young researchers to facilitate new discoveries to translation for improved treatments and practices.

For more information about all our teams, please visit our website:

monash.edu/medicine/ccs/neuroscience



### OUR **APPROACH**



As a University Department, we are uniquely positioned within one of Australia's leading specialist hospitals, The Alfred in which we apply a **'whole pipeline'** approach to enable integration of all our work.

This includes identifying gaps in current clinical care for patients, generating knowledge through basic research, engineering and developing findings into treatments (translational research), conducting clinical trials, making health evaluations, and assessing cost effectiveness of treatments, to ensure the best possible patient outcomes.

We are able to meet patients' needs by providing access to all the latest translational neuroscience research outcomes in just **one location**.

Our goal is to improve human health and wellbeing for people with brain diseases by providing improved therapies as a result of advanced research training and collaboration.

### OUR CASE STUDIES



### CELL RECEPTOR PLAYS A KEY ROLE IN INFLAMMATION

Dr Mastura Monif and her research team investigate neuroinflammation which occurs in several neurological conditions including Multiple Sclerosis, autoimmune encephalits and brain tumours. Neuroinflammation involves the activation of immune cells in the brain. Her research has identified, a particular cell membrane receptor, namely P2X7R, which plays a key role in neuroinflammation.

Using translational bed (hospital) to bench (laboratory) techniques their hope is to unravel the role of innate immunity, and neuroinflammation in various brain diseases, and to uncover the link between the peripheral and central immune responses.

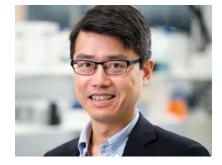
The ultimate aim is to translate their laboratory findings back to the hospital setting to improve treatments and provide advancements in patient care.



### CONCUSSION RECOMMENDATIONS FOR ATHLETES

Professor Sandy Shultz is running a world first trial involving amateur male and female footballers to understand when it is safe to return to play. Mild traumatic brain injuries (mTBI), such as concussions, are a common and serious medical condition worldwide. Of particular concern, repeated mTBIs are associated with lasting neurological damage and disease, with no interventions known or available to prevent these consequences.

Associate Professor Shultz's overarching research goal is to better understand mTBIs and to identify means to improve their clinical management.



### EPILEPSY TREATMENTS REQUIRE A PARADIGM SHIFT

Professor Patrick Kwan is an internationally recognised clinician-scientist with a particular interest in epilepsy. His research covers a broad spectrum including treatment outcomes, pharmacogenomics, health economic analysis and neurobionics. His team was among the first groups to identify HLA-B\*15:02 as a strong genetic predictor of carbamazepine-induced severe skin reactions in Asians.

This finding resulted in an US Food and Drug Administration recommendation and drug label change. He has played an instrumental role in developing health policy in adopting pharmacogenetic testing, and led post-policy health economic evaluation. His research has highlighted that despite the introduction of many new antiepileptic drugs over the last two decades, the overall outcomes of people with newly diagnosed epilepsy has not changed very much.

## THE FACTS

\$45.5

Estimated financial cost of neurological conditions and mental illnesses in Australia

168,177

Estimated number of years of life lost in Australia from neurological conditions in 2015

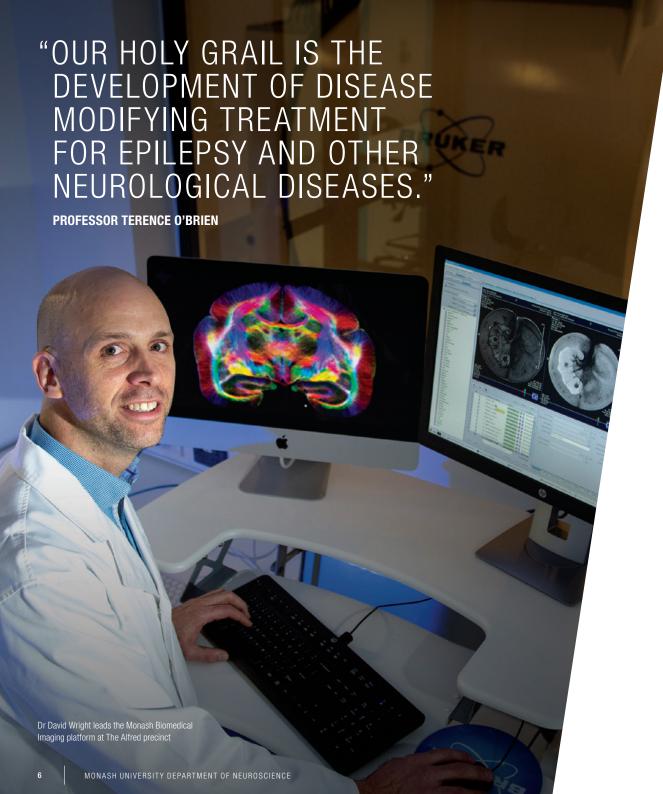
17,480

Estimated number of deaths in Australia from neurological conditions in 2015

1/3

Estimated number of Australians affected

Source: AIHW, Double and Richards, MJA 2017



### OUR **FACILITIES**

### CUTTING EDGE, STATE-OF-THE-ART PURPOSE BUILT NEUROSCIENCE RESEARCH FACILITIES

New purpose-built state-of-the-art basic neuroscience laboratories have been built in 2018 to investigate novel targets for the treatment of brain disease and to undertake pre-clinical testing of new therapies.

#### ADVANCED PRE-CLINICAL IMAGING FACILITY

This advanced facility is approximately 260m<sup>2</sup> in size and houses an array of state-of-the-art equipment including:

- 9.4 Tesla Magnetic Resonance Imaging (the most advanced in Australia, \$4.5 million)
- Positron Emission Tomography/X-ray Computed Tomography (PET-CT)
- Ultra high resolution Computed Tomography (CT) with optical imaging (FLECT)

This comprehensive suite of imaging equipment facilitates innovative research into functional and structural studies of the brain.

### 'FIRST-IN-DISEASE' CLINICAL TRIAL FACILITY

The Clinical Trials Facility is embedded in the Neurology Ward at The Alfred with the capability for overnight and multi-day stays, multiple modalities for physiological monitoring, and a focus on early-phase trials.

Totalling six in-patient beds, an Epilepsy Monitoring Unit has been built alongside the Clinical Trials facility, providing one of the most advanced units with the largest capacity in Australia.

### OUR **PARTNERSHIPS**

#### LOCAL COLLABORATIVE PARTNERSHIPS

In addition to our partnership with The Alfred, our department has several multidisciplinary collaborations within the Alfred precinct, including:

- Haematologists interested in treatments for stroke,
- Cardiologists interested in connections between heart and brain disorders at the Baker Institute,
- Psychiatrists interested in mental health co-morbidities of neurological diseases at Monash-Alfred Psychiatry Research Centre, and
- Engineers from Monash Institute of Medical Engineering working to develop new devices to better diagnose and treat brain diseases.

We work with Nucleus Network who conduct first-in-human studies and facilitate testing of novel treatments developed in our neuroscience laboratories. We also partner with the School of Public Health and Preventive Medicine to understand the frequency and risk factors of brain diseases, as well as the costs associated with providing health treatments.

Further afield, the department maintains extensive collaborations with clinical and basic neuroscience researchers at other Monash campuses, the University of Melbourne and other Victorian universities, The Royal Melbourne Hospital and other Melbourne health care providers, and The Florey Institute of Mental Health and Neuroscience.

Clinicians and researchers in the department also have strong partnerships with consumer support organizations, including Epilepsy Action, Epilepsy Australia, MS Australia, MSBase, The Stroke Foundation, Dementia Australia, Brain Injury Australia, Traffic Accident Commission, Neuroscience Trials Australia. Brain Foundation and Parkinson's Victoria.

### NATIONAL AND INTERNATIONAL COLLABORATIVE PARTNERSHIPS

Researchers in the Department of Neuroscience have developed strong relationships with collaborators across the world, including undertaking joint projects, grant applications, and supervising doctoral and postdoctoral students.

The Department currently has more than 20 international students, clinical and research fellows, and senior academic visitors.



Collaborative sites with joint publications and/or grants with Department of Neuroscience researchers



### **FURTHER INFORMATION**

Whether you want to research, invest, study or donate, we'd be delighted to hear from you.

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All information is correct at time of printing.

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