Specific marker of DEMENTIA IN PD

Genetic sequences to MENTAL ILLNESS

Books for BRAINS

IMPROVING COGNITION in DOWN SYNDROME
Message from our EXECUTIVE DIRECTOR

The proposed Medical Research Future Fund (MRFF) represents one of the most important and far-sighted initiatives in our nation’s history. It will put medical research funding on a secure footing by ensuring that Australia stays at the leading edge of medical science, with untold benefits to our health, our economy and our longevity.

Australia is a world leader in health and medical research. Our discoveries are well documented and include a vaccine for cervical cancer, the bionic ear and a cure for most peptic ulcers. However, these achievements are only the tip of the iceberg, with thousands of other Australian discoveries having led to improvements and transformed the world’s health.

The expenditure from the National Health and Medical Research Council (NHMRC) is only $37 per person annually, significantly lower than the US and UK. What is missing in Australia? We lack a major independent fund – an Australian equivalent of the UK’s Wellcome Trust or the Howard Hughes Medical Institute in the US.

There are no countries in the world that have good health outcomes without strong medical research strengthening their healthcare. Thus, it is critical that Australia has a homegrown capacity to address the health priorities that are relevant to our country, and just as importantly take advantage of innovations from elsewhere.

We recognise that some aspects of the proposed MRFF are not supported by all in the community, but there can be no denying the value of health and medical research. With key legislation facing a Senate vote in coming weeks, it is imperative that we see the MRFF established, as it will underpin a new era of Australian excellence in research with benefits for the entire community’s health for generations to come.

This is an opportunity Australia cannot afford to miss.

Professor Peter R Schofield PhD DSc
Executive Director and CEO

About NeuRA
NeuRA (Neuroscience Research Australia) is a not-for-profit research institute based in Sydney, Australia. Our vision is to prevent and cure disease and disability of the brain and nervous system through leadership and innovation in neuroscience research. Find out more at neura.edu.au or call 02 9236 5800.

IN BRIEF

PERSONALITY AND GENES INFLUENCE COGNITION

PhD student Ashley Skilleter has investigated the interaction between individual genetic differences and personality traits in cognitive function. Ashley and her colleagues measured probabilistic association learning, which is the cognitive ability to infer the likelihood of an event happening based on previous information – for example, the likelihood of needing an umbrella when the last few days have been rainy. The team found that healthy people who have a certain variant in the BDNF gene, which is related to brain development, and also display high levels of schizotypal personality traits, are likely to perform worst on the cognitive test. This study contributes to the understanding of how changes in the BDNF gene impact on particular brain functions, and how these changes may interact with other risk factors to lead to schizophrenia.

TINY BRAIN LESIONS COULD AFFECT FALLS RISK

Prof Stephen Lord and Dr Alfred Wong discovered that high Pulse Wave Velocity (PWV) is a risk factor for falls in the elderly. PWV measures the stiffness of the arteries that can be caused by long term or untreated high blood pressure. It’s thought that high blood pressure may lead to small lesions on the brain and therefore affect cognition and balance. The findings indicate good long-term management of blood pressure may help minimise falls risk in later life.

TESTOSTERONE HELPS BRAIN GROWTH IN ADOLESCENCE

Adolescent males have an increased risk of developing schizophrenia. Dr Tertia Purves-Tyson has conducted a neuroendocrinological study investigating how testosterone modulates brain development. She found that a surge in testosterone at puberty could support the capacity of the brain’s neurons to respond to dopamine, which is a major neurotransmitter implicated in schizophrenia pathophysiology. In contrast, she found that the female sex hormone, estradiol, had less impact on dopamine in the brain. These data may help to understand sex differences in schizophrenia, which often first appears during adolescence.

specific marker of dementia in Parkinson’s disease

Parkinson’s disease patients who also have dementia show different brain changes to Parkinson’s patients without dementia. Prof Glenda Halliday and colleagues have identified losses in neurons that carry the neurotransmitter acetylcholine, particularly in the hippocampus, one of the brain’s memory regions. In addition to increased buildup of Lewy bodies, a pathological hallmark of Parkinson’s, these changes distinguish the particular type of dementia that occurs in Parkinson’s patients from other types of cognitive impairment.

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"It’s a big commitment for us to be in the study, but it’s worth every minute of it."

An Australia-wide sponsored clinical trial, in collaboration with researchers in the US, is focused on improving memory, language and learning in people with Down syndrome. The study seeks to develop a drug that will significantly improve the quality of life for people with this chromosomal abnormality.

In every cell in the human body there is a nucleus, where genetic material is stored in genes. Genes carry the codes responsible for all of our inherited traits and are grouped along rod-like structures called chromosomes.

Typically, the nucleus of each cell contains 23 pairs of chromosomes, half of which are inherited from each parent. Down syndrome occurs when an individual has a full or partial extra copy of chromosome 21.

This additional genetic material alters the course of development and causes the characteristics associated with Down syndrome. A few common physical traits of Down syndrome are low muscle tone, small stature, an upward slant to the eyes, and a single deep crease across the centre of the palm - although each person with Down syndrome is a unique individual and may possess these characteristics to different degrees, or not at all.

The Compose (Cognition and Memory in People with Down Syndrome) Trial is assessing the safety and potential efficacy of a compound called BTD-001. This compound was first discovered in the 1920s, and was used for decades to treat a variety of disorders such as respiratory conditions and dementia. New research from Stanford University showed BTD-001 improved memory in a mouse model of Down syndrome. The purpose of this current study for researchers is to measure the compound’s potential for enhancing cognition in people with Down syndrome, the purpose for the families involved in the study is personal.

SUí WATTS WANTS TO IMPROVE HER MEMORY

21-year-old Suí Watts from Taree is dedicated and passionate. She has Down syndrome but that hasn’t impeded her progress as an international equestrian and dressage competitor. She is a study participant.

Suí is not the only one excited about a potential breakthrough that could see her achieve even more in life. Her mother, Janett Watts, who travels the eight-hour round trip to take part in the study with her says, “We’re so excited that’s why we don’t mind the commute.”

Suí loves going for the visits - she gets really excited. Her mother, Janett Watts, who travels the eight-hour round trip to take part in the study with her says, “We’re so excited. We’re so willing to give it a go and try anything to help our Luke.”

Traveling from Leeton in NSW to NeuRA is the Hevern family. 15-year-old Luke is participating in the study and enjoying the experience according to his mother, Sharon. “Luke loves the NeuRA team. They’ve been so warm and kind to him and make the tests fun.”

What does this family want from the study? “At the moment, Luke has a kindergarten reading level and can count up to 20 or 30 at best. We want to help Luke in any way we can so if he could one day read a book or be able to work out how to use money, that would help him become an independent adult. At the moment he’s in year ten and struggling.”

“We’re excited by the study. We’re so willing to give it a go and try anything to help our Luke.”

Sharon is looking forward to the outcome and feels hopeful about the future. “We felt we had nothing to lose by signing Luke up and he is actually taking the medicine himself which is really good to see. He loves the process and being able to remember to do it. All we want for him is to have the best chance of an independent life, to be able to have a job, maybe even have his own family one day. We believe this study could work.”

The study is on-going and NeuRA is seeking people with Down syndrome aged 13 to 35 to participate. There are around six million people with Down syndrome worldwide. If you would like to take part in the Compose study, contact Karen Burton on k.burton@neura.edu.au or to donate to support the research, please go to neura.edu.au/donate.

ACEMobile App
dementia diagnostic tool

NeuRA’s Prof John Hodges and colleagues at Plymouth University in the UK have developed a new, free app for dementia assessment called ACEMobile. The tablet-based app is created from Prof Hodges’ original validated Addenbrooke’s Cognitive Examination, or ACE. This clinical questionnaire is considered a superior diagnostic tool for dementia. Using the ACEMobile app does not require clinicians to have learned the manual for the full ACE test, meaning that more junior clinical staff can easily and reliably administer the test.

The app calculates a score for each patient that indicates whether they may be suspected of having early dementia or if there is a certainty of dementia, and also creates a medical report for inclusion in the patient’s records.

Dementia is increasing, due to the growth in the population of people over 70 years of age. Early detection of dementia may be key in ensuring a good prognosis for patients. Access to an early and decisive diagnosis through this tool can now be made anywhere there is an Internet connection. The app will also be welcomed in daily practice by many like-minded clinicians, who can access the app at no cost. Read more at acemobile.org or download it on iTunes.
WHAT IS GRA?
GRA was established in 2006 as a genetic biobank to produce and store cell lines and DNA collected from appropriately consented disease-specific and population-based studies. GRA has been supported by an NHMRC Enabling Grant and by user fees.

WHAT EXACTLY IS A BIOBANK?
A biobank is simply a facility to store a wide array of biological material for use in biomedical research. GRA, being a genetic biobank, stores human genetic material (DNA), the sources of which may include whole blood or its derivatives, saliva and tissue.

HOW DOES GRA FACILITATE RESEARCH?
GRA provides researchers with services such as the production of cell lines (e.g. from white blood cells) and the extraction and processing of nucleic acids such as DNA. No equivalent facility exists in Australia to provide and securely store these resources, which form an essential part of genetic, clinical and epidemiological studies that deliver new knowledge and improved health care outcomes.

WHAT IS THE DIFFERENCE BETWEEN A CELL LINE AND DNA?
Many researchers collect blood or other biological samples for their studies. The cells in these samples contain DNA. However, only a fraction of researchers establish a permanently growing cell line from their samples. Frequently, DNA samples from valuable study populations are exhausted because there are no immortalised cell lines from which additional DNA can be produced.

WHAT CAN DNA TELL US ABOUT OUR OWN HEALTH?
DNA and cell lines from clinical and epidemiological cohorts are a key national resource. GRA leverages clinical-research collaborations by providing unlimited quantities of key biological resources. These provide information about genetic makeup that can be linked with information about clinical characteristics. By bridging the gap between the study of human health and the analysis of related bio-specimens, we will improve the understanding of the causes of many debilitating conditions.

WHAT STUDIES ARE YOU CURRENTLY ASSISTING?
To date, 60 national and international projects have used GRA’s research-enabling capacities, leading to the publication of more than 25 scientific papers. Over 15,000 specimens have been processed, including 11,000 DNA extractions and the establishment of 2,000 cell lines. Research projects include studies of memory, ageing and neurodegenerative diseases including Alzheimer’s disease, fronto temporal dementia, motor neuron disease, and stroke; mental illnesses including bipolar disorder, schizophrenia, Tourette syndrome, depression, and anxiety; and neurodevelopmental disorders such as intellectual disability and cerebral palsy. We also facilitate genetic studies of healthy populations.

HOW MUCH HAS TECHNOLOGY CHANGED THE NATURE OF YOUR WORK?
Technology is forever changing! As genetic analysis techniques become more sensitive, less DNA is needed. Robotic sample processing and liquid handling platforms have eliminated many labour-intensive steps and provide increased speed, precision and accuracy.

Calling for Volunteers
We are looking for people with schizophrenia or schizoaffective disorder who are interested in participating in a trial of transcranial Direct Current Stimulation (tDCS), which involves application of a very weak electrical stimulus to the scalp. tDCS is a safe, non-invasive brain stimulation technique. The study involves four weeks of daily tDCS treatment and three assessment visits. You will be reimbursed for your time. We hope to learn from this trial how tDCS treatment may improve thinking abilities and reduce symptoms that occur with schizophrenia.

For more information, please contact Danielle Weinberg (0399191787; d.weinberg@neura.edu.au) or Dr Tom Weickert (3991 1730; t.weickert@neura.edu.au).

Inclusion of brains from people with Alzheimer’s disease and Down syndrome is supported by a NHMRC grant and Melbourne Brain Donation Service (MBDS).

Books for Brains
Laila Hallam’s story
In 2006 my Dad, George Kostakis, was diagnosed with a neurological disease. In 2010, he was finally diagnosed with Multiple System Atrophy (MSA), a progressive, debilitating disease of the brain that left him bed-bound, incapable of moving, and no longer able to speak or chew his food. Ironically though, while his body withered, his mind remained sharp and aware.

As we embarked on this journey of trying to understand what was happening, we searched for any information we could find - firstly on the symptoms, and then once diagnosed, on the disease and its treatments. The prognosis was bleak. The little treatment available was limited to helping manage the symptoms. The disease was considered rare with little known about it, its symptoms or its causes. At this time we made contact with NeuRA, seemingly the only Australian medical research organisation actively researching MSA. This gives us hope.

Dad succumbed to MSA in June 2013. He was just 65 years old. As this horrible disease wasted his body, his spirit remained unbowed. He had few daily pleasures. They included his favourite foods - broken into swallowable tasty morsels, surrounding him with people and activity; and the ritual of having family read the newspaper to him. Reading kept him connected with us, and with life outside his very narrow environment.

When Dad died, family and friends donated generously to NeuRA in his memory to support the research into MSA. The hope is that, one day, a cure will be found. I am a fervent supporter of NeuRA, and am thrilled to be part of NeuRA’s Books for Brains program which brings with it beautiful memories of our reading rituals with Dad - and continues to drive us to support NeuRA to help find a cure for MSA.

You too can support NeuRA’s research and raise funds through reading - anywhere, anytime this October: booksforbrains.com.au.

Include a Charity
NeuRA’s newly named bequest society, Commitment to Cure, participated in Include a Charity week, a consortium of charities who promote the importance of leaving a legacy in your Will. We know the positive contribution a legacy can make to our research. It won’t cost anything now, but it is one of the most powerful ways to support our work into the future. If you have any questions, please contact NeuRA’s Bequest Manager on 1300 880 019 or visit neura.edu.au/legacy.

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A message from the NeuRA Foundation: The NeuRA Foundation may co-operate with other like-minded reputable Australian charities to promote our work to our respective donors.
For instance, if NeuRA does not share your personal information with other charities, please phone us on 1300 880 019 or email us at foundations@neura.edu.au or write to us using the enclosed envelope.

Thank you for generously supporting our research into diseases of the brain and nervous system.

Neuroscience Research Australia Foundation, PO Box 1 1165, Randwick NSW 2031 ABN 57 008 429 96
Brain imaging techniques have advanced rapidly in recent decades, bringing new knowledge about the structure and function of the brain. One of these techniques, called diffusion tensor imaging (DTI), provides a way of visually representing the connections between parts of the brain. Many of the commonly used brain imaging methods are not able to identify the brain ‘white matter’ that forms these connections. DTI relies on measuring the difference in the way water moves through the brain in areas where white matter is present. The movement of the water can be related to the shape and location of white matter ‘tracts’, which help to send signals and information from one part of the brain to another.

Prof George Paxinos of NeuRA has collaborated with Dr Evan Calabrese of Duke University to obtain these magnetic resonance (MR) DTI images. By combining the specialised information that different brain imaging techniques give us, a comprehensive ‘atlas’ of information can be built. Histological pictures of the brain, which are pictures taken with a microscope, can be combined with newer imaging techniques like DTI to obtain anatomical information about, for example, the type of cells present in a particular brain region, as well as other brain regions these cells are connected to.

In this image, neuronal pathways of the human brainstem are shown in different colours. These pathways lead to many other brain regions to regulate breathing, movement and wakefulness, and the brainstem is the origin of ten of the cranial nerves that critically underlie sensorimotor function.