Associate Professor Udantha Abeyratne
Associate Professor Craig Hukins; Doctor Vinayak Swarnkar

Brain Asynchrony in Sleep Apnea
($317,301- The University of Queensland)

Our research project
Over 1.5 million Australians experience sleep disorders costing the country billions of dollars per year. About 800,000 of these suffer from Obstructive Sleep Apnea (OSA). OSA results in significant neuropsychological impairment with downstream effects such as impaired driving with a 2-7 fold increased risk of motor vehicle accidents and reduced productivity. Worker fatigue and accidents arising from OSA is a substantial problem to Australian industries such as mining and transportation. About 28% of transport drivers suffer from OSA.

Even though such neurobehavioral manifestations are consequences of OSA there are no simple tools to measure them in current clinical practice. Neurocognitive tests have demonstrated impairments notably in vigilance (such as reaction times) and executive function in patients with OSA. These tools remain in the domain of research and are not useful in routine practice. There is a great need for an objective, simple and reliable measure of neuropsychological impairment in OSA, which would be suitable for routine clinical use.

The target in this project is to validate an objective and easy to implement measure of neuropsychological impairment using the electrical activity of brain, electroencephalography (EEG) data acquired in a standard sleep diagnostic study using innovative techniques we have developed.

Potential outcomes of the research
The primary outcome of this research will be a tool to study the neuropsychological severity of OSA. The project will deliver validated mathematical algorithms, software implementation, measurement protocols and performance statistics. Another outcome of this project may provide enabling technology to directly assess neuropsychological impairment in drivers suffering from OSA.
Doctor Mark Adams
Professor Kenneth O’Byrne; Associate Professor Derek Richard; Professor David Neil Watkins

Improving treatment of non-small cell lung cancer: suppressing cell division cycle associated protein 3
($194,445 - Queensland University of Technology – Institute of Health and Biomedical Innovation)

Our research project
Cisplatin-based chemotherapy regimens are currently the most effective first-line therapy for non-small cell lung cancer (NSCLC). However, chemoresistance poses a major therapeutic problem. To improve patient outcomes, novel drug targets and approaches are required.

This study will establish the worth of suppressing the molecule cell division cycle associated protein 3 (CDCA3) in non-small cell lung cancer (NSCLC). Preliminary data indicate that expression of cell division cycle associated protein 3 (CDCA3) is associated with poor NSCLC patient outcome. CDCA3 is also a novel participant in preserving NSCLC tumour cell viability and proliferation and depletion of this protein enhances tumour cell sensitivity to cisplatin. This project proposes to improve patient outcomes by suppressing the protein CDCA3 in tumours directly (RNAi) or indirectly by blocking phosphorylation using first in-class kinase inhibitors. The group will employ in vitro and in vivo NSCLC models to evaluate whether suppressing CDCA3 alone or in combination with chemotherapy prevents tumour progression.

Potential outcomes of the research
Lung cancer is the leading cause of cancer-related deaths accounting for over 1.5 million deaths worldwide. Non-small cell lung cancer (NSCLC) is the most common subtype of lung cancer. Whilst survival rates have marginally improved the Australian 5 year survival rate of 14% remains poor. The outcome of this project will determine the therapeutic or prognostic potential for CDCA3 as a companion diagnostic in NSCLC.
Associate Professor Adrian Barnett

Meta-research: Using research to increase the value of health and medical research
($631,370 - Queensland University of Technology)

Our research project
Improving the return on investment in health and medical research will produce more and faster discoveries that enhance the lives of all Australians. Many problems in the research process are well known and have been pervasive for decades. Associate Professor Barnett will use the research process to improve the research process. The aim is to improve Australia’s health and medical research workforce and the quality of the research they produce, creating benefits in multiple fields that last long into the future.

Potential outcomes of the research
This research concerns the essential technical work that underpins all research, covering statistics, bureaucracy, data management and peer review. Improving these fundamental aspects of research has the potential to create wide-reaching and long-lasting benefits. With 85 cents in every dollar invested in health and medical research currently wasted, there is tremendous potential to improve practice and increase the return on investment.
Doctor Helen Barrett

Maternal Metabolism in diabetes in pregnancy

($189,384 – The University of Queensland)

Our research project

In Australia, approximately 6% of women have diabetes in pregnancy and are at increased risk of complications, both for themselves and their infants. One of those complications is babies being born large, which puts babies at higher risk of problems at birth such as shoulder dystocia, jaundice and health issues later in life including obesity and metabolic disease. Current management for women with diabetes in pregnancy focuses on maternal diet, weight gain and blood glucose levels. However, women can struggle to reach the recommended degree of blood glucose control, and even with close blood glucose control, babies can still be born large.

We do not yet know if we should be trying to manage other parts of the mother’s metabolism eg ketones, lipids. This fellowship will focus on what influences the “non-glucose” parts of maternal metabolism, and how that relates to foetal growth. It will look at how the faecal microbiome links to maternal metabolism, and at how maternal ketones and lipids relate to pregnancy outcomes.

Potential outcomes of the research

The rates of diabetes in pregnancy are increasing, with the population having higher rates of obesity. The research undertaken aims to bring new knowledge, increase understanding of how important “non-glucose” metabolism may be in pregnancy, and help us consider if we should try and treat those aspects of metabolism during pregnancy for women with diabetes. The ultimate aim is to help women with diabetes have healthy pregnancies and babies.
Professor Perry F Bartlett

Doctor Fatima Masrallah; Doctor Daniel Blackmore; Doctor Dhanisha Jhaveri

Exercise reverses cognitive decline in aged animals by growth hormone stimulation of neurogenesis in the hippocampus

($696,409 - The University of Queensland – Queensland Brain Institute)

Our research project

The production of new neurons in the hippocampus plays a critical role in learning and memory. With increasing age, this production slows down and is associated with cognitive decline. However, the stem cells that make new neurons are present, and we have discovered that exercise activates these cells, leading to renewed neuron production and reversal of cognitive decline. The group will explore how this process is regulated in order to develop strategies to reduce cognitive decline in humans.

Potential outcomes of the research

These studies will provide a clear understanding of how exercise regulates neurogenesis and cognitive function, and form the basis to optimise the use of physical exercise as a therapy to treat/delay cognitive decline in humans. Also, it will provide biomarkers which will be used to determine the optimum amount of exercise required for beneficial effects, as well as a putative pharmacological therapy to treat/delay cognitive decline in sedentary individuals.
**Associate Professor Antje Blumenthal**

**Professor Jennifer Stow**

**Innate immune signaling in Mycobacterium tuberculosis infection**

($562,857 - The University of Queensland – Diamantina Institute)

**Our research project**

Tuberculosis bacteria are well adapted to survive inside the host organism by high jacking immune cells that are otherwise well equipped to kill bacterial pathogens. This project will determine the functions of a novel immune sensor that detects the present of tuberculosis bacteria. Specifically, this research will elucidate which immune cell functions are governed by this immune sensor and how this is regulated at the molecular level. Outcomes of this project will enhance understanding of the interactions between tuberculosis bacteria and immune cells and the mechanisms that help control this devastating infection.

**Potential outcomes of the research**

Globally, tuberculosis kills 1.5 million people every year. Improved diagnostics, an effective vaccine and novel treatment options for tuberculosis are global priorities. Their development requires the detailed understanding of how tuberculosis-causing bacteria are controlled by the immune system. Characterising the functions of pathogen sensors in health and disease is increasingly exploited for tailored vaccine and adjuvant formulations as well as therapeutic interventions in immune-mediated pathologies. The research outcomes from this project may inform the development of vaccine and immune-based therapies for tuberculosis.
Professor Roslyn Boyd
Professor Iona Novak; Professor Euan Wallace; Professor Nadia Badawi; Associate Professor Michael Fahey; Professor Stephen Rose; Professor Paul Colditz; Professor Jenny Ziviani; Associate Professor Catherine Elliot; Professor Ngaire Stott

Australasian Cerebral Palsy Clinical Trials Network (AusCP-CTN): optimising interventions and effective services for children with Cerebral Palsy
($2,499,287 - The University of Queensland)

Our research project
Cerebral Palsy (CP) is the most common childhood physical disability (1 in 500). While the brain injury is static, disability can be progressive and therefore the burden is immense (0.14% GDP, $1.47b p.a.). This CRE will improve the health outcomes of all infants and children with CP by earlier detection and determining the best interventions to guide clinical practice. The main research objective is to improve early detection and develop and test new interventions to improve physical, cognitive, psychological and health outcomes in an Australasian Cerebral Palsy Clinical Trials Network (AusCP-CTN).

The AusCP-CTN CRE aims to: a) identify CP earlier, then fast track children to neuroprotectants, better rehabilitation to optimise neuroplasticity and improve health outcomes; b) Use common neuroimaging, health economics, and patient reported outcomes to customise interventions for each patient; c) increase capacity building with high quality training of the next generation of Australian research/clinical leaders in CP; d) develop new international clinical practice guidelines to ensure that new knowledge is translated into clinical practice and to increase our collaborations nationally, internationally and with consumers to inform the NDIS.

Potential outcomes of the research
The Australasian CP Clinical Trials Network has a work plan to uplift earlier detection of cerebral palsy, fast track children to multi-site randomised clinical trials of new neuroprotectants and to develop and test new rehabilitation. Knowledge translation studies will ensure effective transfer to enhanced clinical practice. The CRE will overcome known barriers to implementation, developing international clinical practice guidelines guided by a consumer network. The changes in outcomes of children with CP due to the new clinical trials will be tested in Australian Cerebral Palsy Register (ACPR).
Doctor Andrew Brooks
Doctor Manuel Fernandez-Rojo; Professor Elizabeth Powell

HLA-G/H2-Bl is Critical for Regulating Inflammation in the Liver
($500,967 – The University of Queensland - Diamantina Institute)

Our research project
The key factor to induction of liver fibrosis, progression to cirrhosis, and hepatocellular carcinoma is inflammation. Liver transplant and liver regeneration following liver resection are also dramatically impaired by elevation of inflammation. The group have identified a potent anti-inflammatory protein, HLA-G, that is critical for regulating post-surgical inflammation in the liver. The group will determine if HLA-G can reverse and/or block liver fibrosis and modify HLA-G for improved clinical potential.

Potential outcomes of the research
Liver disease has been rapidly increasing in industrialised countries with estimates in 2012 of 5.5 million Australians to be affected by Non-alcoholic fatty liver disease (NAFLD), a health cost of treating liver disease of $432 million, and productivity impacts of liver disease estimated as $4.2 billion. The impact of inflammation in NAFLD and in liver surgery is a major clinical concern. The group propose that HLA-G will have significant therapeutic benefits in these clinical situations and have a major impact in reducing the burden of liver disease.
Professor Matthew A. Brown

Solving the causes of and development of new therapies for ankylosing spondylitis and related diseases.
($863,910 - Queensland University of Technology)

Our research project

Ankylosing spondylitis (AS) is a common form of immune-mediated arthritis affecting primarily the spine and pelvis, with similar prevalence to type 1 diabetes (0.55%). It causes substantial morbidity and increased early mortality. There are no treatments for AS which induce disease remission or stop the progression of spinal fusion ('ankylosis') which is the major cause of disability in the disease. Uniquely amongst common rheumatic diseases, there are no effective oral disease-suppressing treatments suitable for long term therapy. There is thus a major unmet therapeutic need in this condition.

The specific aims of this fellowship are to: 1) better clarify the genetic risk factors involved in AS, including those influencing the risk of developing disease, of complications of the disease such as anterior uveitis, and of disease severity such as the development of spinal ankyloses; 2) determine the molecular mechanisms by which genetic variants associated with AS operate to cause disease; 3) develop therapies based on this information; 4) determine how intestinal bacteria are involved in AS, and whether manipulation of the gut microbiome has therapeutic potential in the disease; and 5) develop and validate in the general population, genetic risk prediction methods for AS.

Potential outcomes of the research

In addition to greatly improving understanding of the basic causes of AS and related diseases such as psoriasis and inflammatory bowel disease, this research program will lead to the identification of new therapeutic targets, develop treatments against established targets, and develop genomic tests enabling either early diagnosis and treatment, or potentially, preventative therapy of this disabling condition.
**Doctor Leila Cuttle**

**Better healing for children’s burn injuries**

($425,048 - Queensland University of Technology)

**Our research project**

Children’s burn injuries are distressing, costly and too common. This work will firstly investigate what heat conditions are required for burn injuries to occur, which is important for developing effective legislation and product safety to prevent burns. Secondly, the biological processes occurring in burn tissue will be investigated using burn blister fluid collected from children. Proteins which are related to good healing outcomes in the patients (faster healing, no surgical grafting or scarring) will be identified as potential therapeutics. Proteins related to poor healing outcomes will be identified as potential diagnostic indicators of outcome, enabling treatment to be optimised from initial patient presentation. Finally, through this project, information on the benefits of burn first aid treatment and strategies to prevent burn injuries will be widely circulated through a smartphone app “Cool Runnings” for a national public health campaign.

**Potential outcomes of the research**

This work will decrease the number of burn injuries by: 1) educating the public in how to prevent burn injuries and apply correct burn first aid treatment and 2) providing data and evidence for burn prevention legislation and product safety. This research will also help to identify potential diagnostic markers and therapeutics which will enhance the speed and quality of wound healing.
Associate Professor Janet Davies

Associate Professor Bircan Erbas; Professor Connie Katelaris; Associate Professor Ed Newbigin; Professor Alfredo Huete; Doctor Elizabeth Ebert; CIG van Klinken; CIH Haberle; Dr Danielle medek; Associate Professor Paul Beggs

AusPollen: Implementation of a standardized national pollen alert system for better management of allergic.

($1,279,129 - Queensland University of Technology)

Our research project

Hay fever and asthma attacks triggered by grass pollen regularly affect up to three million Australians. The total societal cost of asthma and allergies was estimated at $30 billion per annum (Australasian Society of Clinical Immunology and Allergy, access Economics Report, 2007). Despite the high prevalence, medical and socioeconomic burden of allergic rhinitis and asthma, Australia is one of the few developed countries without a national pollen monitoring program until. The goal of the AusPollen Partnership is to provide allergy and asthma patients with accurate, relevant, localised information on pollen levels in the air. The team will implement a standardized pollen monitoring network in four major cities through collaboration of public, private and academic partners who bring data, analytical and clinical skills to the project. Smartphone technology will be used to personally deliver the information directly to patients and clinicians who assist them to better and more economically manage their condition. The AusPollen project is designed to test the value of providing localised pollen information and education materials to individual asthma or allergy sufferers. The AusPollen Partnership will lead to reduced symptoms and improved quality of life of patients by empowering them to self-manage their condition by making timely decisions about use of preventative medicine and avoidance strategies.

Potential outcomes of the research

The AusPollen Partnership will establish the inaugural national pollen monitoring program. This study will evaluate whether providing pollen alert information enables people to better self-manage pollen allergies to improve quality of life and lower the medical and socio-economic burden of the prevalent chronic inflammatory diseases of hay fever and allergic asthma. The outcomes will pave the way for development of ongoing operational pollen monitoring and forecast services to help meet the needs of patients with hay fever and asthma.

The use of pollen count and forecast information provided by smart phone Aps will be measured over the course of the project. Changes in awareness of allergy triggers and before and after access of AusPollen pollen information services will be evaluated.
Associate Professor Stacey Edwards
Associate Professor Juliet French; Associate Professor Fares Al-Ejeh; Associate Professor Alison Dunning

High-throughput identification and evaluation of new breast cancer genes from GWAS
($841,075 – QIMR Berghofer Medical Research Institute)

Our research project
Recent studies have identified DNA markers within the human genome that are associated with an increased risk of breast cancer. Most of these markers are located in noncoding regions, therefore the key genes driving risk are not known. This proposal will identify the target genes at all breast cancer risk regions and assess how specific markers affect disease risk. Understanding how DNA variation contributes to breast cancer will provide new avenues for prevention or treatment.

Potential outcomes of the research
Breast cancer is a major health problem and understanding the genetic basis of this disease is crucial for predicting risk and developing effective targeted therapeutics. This project will leverage strong genetic data and innovative technologies to identify new genes that contribute to breast cancer development. The outcomes will represent a major breakthrough in research as the protein products of these genes may provide new, more effective drug targets to prevent or treat breast cancer.
Doctor Stuart Ekberg

Talking about Troubles: A comparison of everyday and therapeutic talk
($312,000 - Queensland University of Technology - Institute of Health and Biomedical Innovation)

Our research project

Psychotherapy is an established approach for treating mental distress, but the precise ways in which therapy differs from supportive conversations with family or friends remains unclear. This project aims to understand this difference by closely comparing how personal troubles are discussed by therapists and clients in psychotherapy and by friends and family in everyday conversations. Using next-generation text analytic software and conversation analysis, an interrelated series of studies aims to identify therapeutic ways of discussing personal troubles and their association with therapeutic outcomes. Understanding this association will enable therapists to use communication practices that are most likely to benefit clients.

Potential outcomes of the research

Over four million Australians (or 17.5% of the population) suffer from a mental health condition. This project aims to equip psychotherapists to support clients in overcoming their mental distress. The project aims to do this by determining how the details of psychotherapeutic interactions are associated with positive client outcomes such as reduced distress. Identifying these links means clear and specific advice can inform evidence-based psychotherapeutic practice.
Professor David Evans
Professor George Davey Smith

Development and application of a Mendelian randomization framework aimed at dissecting the biological basis of ankylosing spondylitis and other complex diseases

($279,666 – The University of Queensland - Diamantina Institute)

Our research project

Ankylosing Spondylitis is a debilitating, common inflammatory arthritis which causes progressive fusion of the spine, decreased quality of life and reduced lifespan. There is no known cure. Genome-wide association studies (GWAS) conducted by the group have identified many of the genetic loci currently known to underlie Ankylosing Spondylitis and led to advances in terms of understanding and treating the disease. However, despite this success, the identity of specific molecular biomarkers that mediate the relationship between genotype and disease remain largely unknown. The identity of these intermediate biomarkers is crucially important, since not only do they provide a more complete understanding of how Ankylosing Spondylitis arises, but they also represent excellent targets for pharmacotherapies. The aim of this project is to identify genes and molecular biomarkers that causally affect risk of Ankylosing Spondylitis, utilizing a framework based on the principles of Mendelian randomization. The group’s approach involves generating optimal sets of genetic variants that index thousands of molecular biomarkers, and using these sets of variants to determine whether the molecular biomarkers in question causally affect risk of Ankylosing Spondylitis.

Potential outcomes of the research

The findings of this research will elucidate the mechanisms underlying Ankylosing Spondylitis pathogenesis, reap rich rewards in terms of understanding the relationship between genetic variation, gene expression/methylation and Ankylosing Spondylitis, and identify molecular targets that can be manipulated by pharmacotherapies. In addition, the method we espouse will serve as a blueprint for future large scale studies involving thousands of potential biomarkers.
Professor David Evans

Professor John Miles; Professor George Davey Smith; Doctor Nicole Warrington

Using Methods in Genetic Epidemiology to Elucidate the Relationship between Viral Infection and Risk of Autoimmune Disease

($622,445 - The University of Queensland - Diamantina Institute)

Our research project

Autoimmune diseases represent a significant source of morbidity and mortality and are a major financial burden to the economy. Evidence has emerged from cohort studies and animal models of disease of a link between viruses and many autoimmune conditions. The overall aim of this project is to investigate a possible causal link between six ubiquitous human viruses and the development of four autoimmune diseases using a statistical genetics methodology that is robust to confounding and reverse causality, and will be able to provide evidence in favour or against a role of viral infection in disease aetiology. The approach involves finding genetic variants associated with antibody response to viral infection and determining whether the same variants also affect risk of autoimmune disease using a technique called Mendelian randomization.

Potential outcomes of the research

Should the results be consistent with a causal relationship, the group expect that approaches aimed at controlling viral infection through vaccination, antiviral drugs or treatment with virus-specific T cell infusions may become effective treatments or preventative strategies against autoimmune diseases in the future. Equally important, should the group find no evidence for a causal relationship, then results would suggest that expensive clinical trials involving anti-viral agents and/or vaccines to these pathogens are unlikely to succeed and shouldn’t be conducted - potentially saving hundreds of millions of dollars by avoiding costly studies likely to fail.
Maternal vitamin D supplementation in a maternal immune activation model of schizophrenia: mechanisms of prevention
($523,364 - The University of Queensland – Queensland Brain Institute)

Our research project
Maternal infection and vitamin D deficiency during pregnancy increase the risk of children developing schizophrenia. We model these risk factors in pregnant mice. Offspring produce schizophrenia-like behaviours. When pregnant mice with experimental inflammation are treated with the hormonally active form of vitamin D this completely abolished all schizophrenia-like behaviours in offspring. The team wants to firstly understand this mechanism, and then replicate using a form of vitamin D safe-to-use in humans.

Potential outcomes of the research
This work may have important implications in formulating supplementation guidelines for Vitamin D in pregnant women to prevent both short-term (Autism) and long-term (Schizophrenia) psychiatric illness
Professor Darryl Eyles

Doctor Oliver Howes

A new animal model of the prodrome in schizophrenia. Enhanced Dopamine in Prodromal Schizophrenia (EDiPs)

($571,990 - The University of Queensland – Queensland Brain Institute)

Our research project

Psychiatrists now recognize a pre-symptomatic stage is present in people at risk of developing schizophrenia. Using new brain imaging techniques it is now known that some of these individuals have changes in a major neurotransmitter, dopamine, prior to being diagnosed. The group has developed a new model in animals, which recreates these exact same changes at a comparable age. The group wants to now understand what the broader effects in the brain are and try and block these changes in dopamine with new drugs.

Potential outcomes of the research

This model will allow the group to test various pharmacological agents that may block or delay the onset of schizophrenia. Any repurposed agent that is successful will go into clinical trials.
Doctor Manuel Ferreira

Doctor Simon Phipps; Professor Philip Thompson; Doctor Antiopi Varelias

Validation of PAG1 as a new risk gene with therapeutic potential for asthma

($687,436 – QIMR Berghofer Medical Research Institute)

Our research project

Control of asthma symptoms remains suboptimal in Australia, leading to a significant burden to the individual and healthcare system. New treatment options that allow patients to achieve and maintain good asthma control more efficiently are needed. Recently, we identified a genetic mutation in the PAG1 gene, a gene involved in the immune system, whose expression is increased in asthma sufferers. These results indicate that increased expression of PAG1 might have a pro-inflammatory effect in asthma. In this project, the role of PAG1 will be further evaluated and how it contributes to asthma development and its potential as a novel therapeutic for asthma.

Potential outcomes of the research

About 10% of adults and children suffer from asthma in Australia and for >60% of these their asthma symptoms are not well controlled. Asthma exacerbations are a significant burden to the Australian healthcare system and cause of mortality, with 30,500 emergency admissions and 350-400 deaths reported annually. Validating PAG1 as a novel drug target for asthma will not only expand our therapeutic repertoire but also promote the design of other studies characterising the molecular pathways dysregulated in asthma.
Associate Professor Juliet French  
Associate Professor Stacey Edwards; Doctor Fares Al-Ejeh; Doctor Alison Dunning

Identifying novel long-noncoding RNAs involved in the development of breast cancer  
($785,203.50 - QIMR Berghofer Medical Research Institute)

Our research project

The majority of a person’s DNA produces RNA molecules that were previously believed to be nonfunctional. However, it is becoming clear that these RNA molecules form a new class of genes called noncoding RNAs that do not make protein. Several studies have shown that noncoding RNAs play important roles in human development and disease. While it is generally accepted that non-coding RNAs are functionally significant, the scope and function of these molecules in cancer is still not well understood. Recent studies have identified regions within the human genome in which DNA sequence variations are associated with an increased risk of breast cancer. The aim of this proposal is to identify and characterise the noncoding RNAs that are produced from these DNA regions and determine whether they modulate breast cancer risk. Understanding how sequences variations that alter noncoding RNAs contribute to breast cancer will provide novel avenues for therapy.

Potential outcomes of the research

This project will identify new genes which when altered contribute to the development of breast cancer. It is anticipated that the potential discovery of novel RNA genes that influence breast cancer development will reveal entirely new avenues for breast cancer therapeutics. Functional RNAs show promise as therapeutic targets as unlike mRNAs, noncoding RNAs display remarkable cell type-specific expression, making them excellent candidates for safe therapeutic targets with minimal side effects.
Associate Professor Coral Gartner
Professor Mark Boyd; Professor Billie Bonevski; Professor Charles Gilks; Professor Ron Borland; Doctor Ryan Courtney; Doctor Linda Cobiac; Professor Hayden McRobbie, Doctor Peter Baker, Professor Jochen Mueller

A Pragmatic Randomised Clinical Trial of Nicotine Vaporisers added to Smoking Cessation Treatment for Priority Populations Living with Comorbidities
($1,499,145 - The University of Queensland - School of Public Health)

Our research project
Smoking is a leading cause of early death for people with certain health conditions because they are more likely to smoke and are also at greater risk of tobacco-related disease.

These smokers also have very low success rates when they attempt to quit smoking, even when using the best available therapies. Internationally there is growing interest in the use of nicotine vaporisers, such as e-cigarettes as a way to quit smoking, particularly for those smokers who find quitting very difficult.

This clinical trial will test whether encouraging people living with Hepatitis C Virus, people on opiate substitution therapy and people living with HIV who smoke to use nicotine vaporisers long-term, in addition to current smoking cessation treatments, will help them to stay abstinent from smoking.

Potential outcomes of the research
Smoking is a leading cause of preventable death for priority populations with comorbidities (HIV, Hepatitis C and Opiate dependence) due to their high smoking prevalence, greater vulnerability to tobacco-related disease and low quit rates with current cessation therapies. Our study will determine the effectiveness, safety and cost-effectiveness of nicotine maintenance in addition to standard cessation treatment for people living with comorbidities.
Professor Jürgen Götz
Professor Frederic Meunier

Tau and ITS master regulator Fyn in Neurons
($758,742 - The University of Queensland - Queensland Brain Institute)

Our research project

Neurons are highly compartmentalized cell-types. In neurodegenerative diseases such as Alzheimer’s disease, the protein Tau that serves a distinct function in one cellular compartment (the axon) accumulates in a massively phosphorylated form elsewhere (somatodendritic compartments and their spines) which is believed to impair neuronal functions. The group will investigate how Tau is distributed in health and disease, and determine how this distribution is regulated.

Potential outcomes of the research

Understanding the mobility, interactions and subcellular targeting of Tau and its mediator Fyn will facilitate the development of therapies for AD and related Tauopathies.
Professor Len Gray
Associate Professor Anthony Smith, Professor Jenny Whitty, Ms Elaine Pascoe, Professor Geoffrey Mitchell, Professor Trevor Russell, Associate Professor Nicole Gillespie, Doctor Oscar Whitehead

Exploring the Value of Telehealth in Primary Care: A Controlled Trial within the Royal Flying Doctor Service
($465,164.50 – The University of Queensland – Centre for Online Health)

Our research project
Every year the Royal Flying Doctor Service (RFDS) conducts thousands of ‘fly-in fly-out’ (FIFO) primary care consultations in Australian remote communities. This grant will allow the researchers from the Centre of Research Excellence in Telehealth at The University of Queensland, to work with RFDS to trial telehealth modalities to deliver primary health services to enhance response time and accessibility. GP and nurse telehealth clinics will be offered, initially in parallel to fly-in clinics which run weekly, fortnightly or monthly. Telehealth will be introduced in one site per month with a total of 16 sites. We will examine health service data over 24 months to study patterns of use before and after introducing telehealth at each site, as well as patient and staff satisfaction. The study includes a health economic component. The cost of fly-in clinics is very high because of the cost running aircrafts and the travel time for staff.

Potential outcomes of the research
This partnership provides a unique opportunity to explore the optimal approaches to configure telehealth in primary care, and to understand the potential for cost efficiencies and improvement in the patient experience.

These questions are difficult to explore in primary care settings funded through the Medical Benefits Schedule, which provides no source of funding if standard consultations are substituted by telehealth interactions. RFDS is block-funded and can make substitutions without cost penalties – thus policy-informing outcomes are likely for this project.
**Professor Lyn Griffiths**

**Associate Professor Rod Lea; Associate Professor Zameel Cader; Doctor Larisa Haupt**

Identifying novel gene mutations for molecular diagnosis of Familial Hemiplegic Migraine

($623,460 – Queensland University of Technology)

**Our research project**

Familial Hemiplegic Migraine (FHM) is a severe subtype of migraine that is characterised by severe migraine, weakness, paralysis of half the body (hemiparesis) and in some cases coma. FHM exhibits significant symptomatic overlap with episodic ataxia type 2 (EA-2) spinocerebellar ataxia type 6 (SCA-6) and a stroke-like disorder (CADASIL). It is often difficult to differentiate FHM from these related disorders based on clinical symptoms and hence the molecular diagnosis can be important for clinicians to distinguish FHM in order to ensure appropriate clinical response and treatment.

This project aims to identify novel FHM genes by undertaking Next Generation Sequencing (NGS) of 209 FHM patient samples. The group will test the pathological relevance of detected novel mutations by functional analysis in human cell models and using patient-specific stem cell techniques. Using whole genome NGS technology to identify novel mutations will assist in the design and development of a comprehensive approach to diagnose and differentiate this severe neurological disorder.

**Potential outcomes of the research**

The identification of causal FHM mutations can be immediately translated into lab-based diagnostics within our accredited diagnostics laboratory, which already offers testing services for severe migraine and stroke related disorders. The team are well placed to translate the outcomes of this research into faster, more comprehensive and cost-effective diagnostics to clinicians and patients. The use of comprehensive functional analyses will also improve the group’s understanding of the pathology of FHM and may assist with better drug development.
Doctor Ashraful Haque
Doctor Sarah Teichmann; Doctor Motoko Koyama

Using single-cell genomics to resolve functional diversification by CD4+ T cells in vivo
($1,048,069 – QIMR Berghofer Medical Research Institute)

Our research project
During immune responses, individual CD4+ T cells multiply and produce hundreds of descendants, with close relatives within a family often developing very different skills. How such differences emerge from one ancestor remains unclear. This project will use new methods to look at individual CD4+ T cells in unprecedented detail, allowing us to see how close relatives begin to grow apart. Using these methods may find novel ways of educating CD4+ T cells to prevent infectious and immune-mediated diseases.

Potential outcomes of the research
This project will identify new genes involved in the regulation of CD4+ T cell diversification. These novel molecular targets will help tailor CD4+ T cell responses to improve immunity against infectious diseases such as malaria, or to regulate immune-pathology in diseases such as Graft Versus Host Disease. The cutting-edge technology employed here will also provide an entirely novel platform for discovery research in cellular biology.
**Professor Nicholas Hayward**  
Doctor Nicola Waddell; Mr John Pearson

Towards better treatments for acral melanoma through functional genomics  
($1,456,823 - QIMR Berghofer Medical Research Institute)

**Our research project**

Acral melanoma is an uncommon melanoma subtype with bad prognosis that has been poorly characterised at the molecular level. The project will conduct a comprehensive analysis of acral melanoma at the DNA, RNA and protein levels. Through subsequent functional follow-up studies of key drivers of this cancer type we will identify novel drug targets to treat this disease.

**Potential outcomes of the research**

In Australia, melanoma is the fourth most common cancer, accounting for $>10\%$ of all cancer diagnoses, of which $\sim10\%$ are acral melanoma. Acral melanomas contain mutations in key genes that confer sensitivity to TGA/FDA approved agents therefore identifying new therapeutic targets is essential for treatment. This project will identify new driver mutations, functionally characterise and evaluate the cellular effects of these mutations for future targeted drug design, and further our understanding of the molecular pathology underlying acral melanomas.
Associate Professor Massimo Hilliard
Professor Frederic Meunier

Understanding axonal fusion: an alternative mechanism to repair injured axons.
(S648,447 - The University of Queensland)

Our research project

Being able to repair an injured nerve by stitching the two damages sections back together is an incredible challenge in neurosurgery, and a highly-desired outcome for the surgeon as well as for the patient suffering a spinal cord or peripheral injury. We have discovered molecules that mediate nerve repair by favoring the reconnection of the two separated fragments. We will study how they function, and if they can be applied to repair injured mammalian neurons.

Potential outcomes of the research

Injuries to the peripheral or central nervous system often leave permanent and highly-debilitating damage to the affected patients. More than 10,000 Australian are currently living with a spinal cord injury, and 350-400 new cases are diagnosed every year. These studies aim to determine whether axonal fusion, an alternative modality of nerve repair observed in invertebrates, can be applied to mammalian neurons. The results of this study have the potential to lead to novel and more effective treatments to repair injured neurons.
Doctor James Hudson

Using human 3D engineered heart tissue for discovery of novel biology and novel therapeutics
($430,999 - The University of Queensland)

Our research project

Tissue engineering strategies can promote advanced maturation of human pluripotent stem cell (hPSC) derived cardiomyocytes and provide an in vivo-like model of human heart tissue in terms of both biology and function. However, the fabrication of engineered heart tissue (EHT), culture protocols and analysis methods using organ baths is costly, labour intensive, and the multiple handling steps induce variability. Together these factors limit the use of EHT for high-throughput screening applications. While attempts have been made to miniaturise and semi-automate the production and analysis of EHT, the published approaches are still and have only been successfully miniaturised to 24-well plate formats. In order to address these limitations, our group has generated a new 96-well EHT micro-platform (termed the Heart-Dyno), which has the capacity for full automation and reduces the cost of EHT production. The goal of this project is to further develop this platform and conduct proof-of-principle studies to facilitate the implementation of this platform for experimental screening applications in the lab, but also to enable translation to other academic labs and industry. Additionally, the Heart-Dyno will be used in this proposal for biological and therapeutic target discovery purposes.

Potential outcomes of the research

The goal of this project is to develop a model of miniaturised 3D human heart tissue for research into cardiac biology and also drug discovery applications. This will hopefully result in better, cheaper drugs in the future with less reliance on animal testing.
**Professor Dietmar W Hutmacher**

Professor Christian M Langton; Associate Professor Travis J Klein; Professor Yin Xiao; Doctor Roland Steck; Professor Hao Wang; Professor Lindsay Brown; Doctor Roey Elnathan; Professor Andreas Oechsner; Professor David Lloyd; Professor Saso Ivanovski

A High-Resolution X-Ray Microtomography System for Southeast Queensland
($508,910 – Queensland University of Technology)

**Our research project**

There is an unmet need for 3D imaging of engineering materials and biological tissues at a sub micro-meter level in Southeast Queensland. The Scanco Medical µCT50 high resolution x-ray microtomography system enables researchers to pursue the aim to non-destructively visualise and quantitatively characterise a diverse range of samples that are of complex architecture or composition. The versatile system offers a high spatial resolution (down to 0.5 microns voxel size) and a large sample size (up to 100 mm in diameter). It allows for the detailed characterisation of microscopic structure such as tissue engineering scaffold structures, bio composites (e.g. bioglass particles incorporated in composite scaffolds), characterisation of volume and structure of cancellous bone, or determination of cell densities throughout a tissue using contrast methods.

**Potential outcomes of the research**

The use of this state-of-the-art equipment will increase awareness and foster new collaborations among researchers and analytical experts. The Scanco Medical µCT50 system will enhance the quantitative imaging capability at a sub micro-meter level, thereby advancing the boundaries of scientific discoveries, increasing research productivity, grant incomes, and intellectual property development, as well as assisting in the education and training of researchers.
Doctor Graham Johnson
Doctor Seweryn Bialasiewicz; Professor Caroline Duchaine; Doctor Julian Tang

Modulating room air humidity to degrade airborne respiratory viruses
($303,000 – Queensland University of Technology)

Our research project
We will investigate the role of saline deliquescence and efflorescence during the interaction of ambient humidity with human respiratory aerosol in controlling airborne virus infectivity. The findings will be used to develop indoor air humidity control guidelines targeting the vulnerabilities of the viruses to minimize airborne infection.

Potential outcomes of the research
Directly and indirectly, viral respiratory infections cost communities tens of billions of dollars annually. This project will investigate whether indoor environmental conditions can be manipulated to attenuate airborne virus infectivity. The project aims to resolve current conflict in the research community over the effect of humidity on airborne viruses.
Doctor Susan Jordan
Professor Sallie-Anne Pearson; Doctor Nirmala Pandeya; Doctor Louise Stewart; Associate Professor Michael Coory; Associate Professor Katrina Spilsbury; Doctor Peter Donovan

IMPROVE - Investigating Medication re-Purposing to reduce risk of Ovarian cancer and Extend survival
($430,196 - QIMR Berghofer Medical Research Institute)

Our research project
Ovarian cancer is the 6th most common cause of cancer death in women and the proportion of women who die from their disease has not improved substantially over time. This large-scale study will use de-identified data from the Pharmaceutical Benefits Scheme, the Australian Cancer Database and the National Death Index to investigate whether medications commonly used for other conditions can help decrease the risk of ovarian cancer developing or improve survival from ovarian cancer after diagnosis.

Potential outcomes of the research
There is promising potential for existing medicines to be re-purposed for cancer prevention and treatment. However, in the area of ovarian cancer there is a dearth of high-quality, large-scale observational studies to assess associations and aid translation into clinical practice. Our study will address this gap and generate data necessary to inform the development of clinical trials with the potential to provide new prevention opportunities for women at high risk of ovarian cancer, as well as much needed additional treatment options for affected women.
Doctor Colm Keane

Investigating the unique immune microenvironment in Primary CNS Lymphoma (PCNSL)

($267,000 – The University of Queensland – Diamantina Institute)

Our research project

Preliminary research has indicated that PCNSL has unique features which protect it from attack by the immune system. The tumour cells surround themselves in a unique environment that prevents immune cells from recognising them. This research aims to characterise the specific genetic abnormalities associated with the disease and how this impacts the immune responses. In addition, little is known about the exact type of immune cells that surround these tumours and how this might influence outcome. The group aim to identify specific immune pathways that will lead to more specific and successful therapy for this disease.

Potential outcomes of the research

PCNSL is a rare brain tumour accounting for 2% of brain tumours in Australia. Current therapy is very toxic for patients with few long term survivors. Even if treatment is successful, many patients have cognitive impairment related to the effects of chemotherapy and radiotherapy. It is anticipated that identification of new immune pathways will lead to better outcomes with reduced short and long term treatment side-effects. The recent success of immune therapies in other cancers such as melanoma is likely to be replicated in PCNSL but strong data for their use in this disease is currently lacking.
Doctor Shelley Keating

One size does not fit all: personalised exercise strategies to improve cardiovascular and metabolic health in patients with non-alcoholic fatty liver disease.

($318,768 - The University of Queensland - School of Human Movement and Nutrition Sciences)

Our research project

Non-alcoholic fatty liver disease (NAFLD) is characterised by increased deposition of fat within the liver and is an independent predictor of insulin resistance, the metabolic syndrome and cardiovascular disease. With NAFLD occurring in one third of adults in the Western world, including Australia, there is an urgent need to establish effective prevention and treatment strategies to reduce the associated disease burden.

This program of research aims to establish effective exercise strategies for the management of NAFLD which are cognisant of inter-individual responses to intervention, as well as of safety and feasibility in an unsupervised (home-based) environment, and long-term sustainability. It will include the first study to investigate the safety, efficacy and feasibility of high intensity interval training in patients with a progressive form of NAFLD (non-alcoholic steatohepatitis) in both supervised and unsupervised environments. It will also be the first in this field to employ an adaptive treatment strategy design, which modifies treatment, based on an individual’s response to initial intervention, and, will establish the accuracy of cost-effective and easy-to-use parameters for determining response to intervention in clinical practice.

Potential outcomes of the research

Ultimately this program of research will inform the development of exercise guidelines for personalised exercise prescription in patients with NAFLD which can be readily adopted in allied health and medical practice.
A/Prof Kiarash Khosrotehrani

Dr Mathias Francois

Role of resident endothelial progenitor cells in melanoma vascularisation and progression

($922,589 – The University of Queensland)

Our research project

Melanoma is one of the most frequent cancers in Australia and has a propensity to disseminate to other organs irremediably causing mortality. Melanoma growth and progression relies on the proper delivery of nutrients and oxygen as a source of energy for the intense metabolic activity and cell proliferation. This requires the development of new blood vessels to reach different parts of the growing tumour. Another consequence of this tumour-associated blood vessel formation is tumour spread to other organs through these new vessels.

In the present project, thorough experiments have been designed to find precisely, where these new blood vessels developing in melanoma tumours come from. Using complex mouse genetics, we will be able to label existing vessels or blood vessel progenitors to be able to follow their fate within the tumour. Molecular profiling of the source of the blood vessels, as well as proof of concept experiments where the source of tumour blood vessels will be depleted will indicate the potential benefit of therapeutically targeting this source.

This project will significantly increase understanding of melanoma associated blood vessel formation, uncovering progenitor populations essential to this process. This gain in knowledge will lead to future approaches to stop tumour vessel development and consequently tumour spread.

Potential outcomes of the research

This project will open new avenues for targeting tumour vasculature in melanoma but also in a range of other solid cancers to treat advanced cancers and prevent further dissemination of tumours.
Doctor Xiaowen Liang
Doctor Run Zhang

Visualisation and early prediction of ROS-mediated treatment response in liver cancer by a novel nanoplatfor
($334,223 - The University of Queensland – Diamantina Institute)

Our research project
Liver cancer is a major public health threat with high mortality worldwide. Selection of the optimal chemotherapy regimens for patients with liver cancer is challenging since individuals vary in response to chemotherapeutic agents. This critical research aims to develop a novel technology to predict response to anti-cancer treatment early and guide personalised medication. The levels of reactive oxygen species (ROS) in cancer cells correlates with aggressiveness of tumour cells and prognosis of patients. ROS behaviour before and after chemotherapy can be an early indicator of treatment efficacy. This project aims to improve the biostability and tumour targeting efficiency of current ROS-detection probes, which will be employed to visualise ROS mouse tumours before and after chemotherapy using established advanced imaging techniques. A mathematical model will be developed based on experimental data for characterisation and prediction of tumour growth and survival times along with the change of specific ROS levels after chemotherapy. This prediction model will be further evaluated by clinical data and ex vivo experiments using human tumour biopsies, which will provide the potential translational outcomes from bench to bedside.

Potential outcomes of the research
The success of this proposed project will provide a novel technology to enable visualisation and early prediction of chemotherapeutic efficacy, which could guide the personalised and appropriate interventions at the critical early stage of both primary and secondary liver cancer. The developed technique has strong translational value, and could make significant improvements in chemotherapy and improve survival in cancer patients. Such an approach could also be extended to the treatment of other cancers.
**Doctor Barbara Lingwood**

**Associate Professor Michael Stark; Professor Paul Colditz; Professor Ian Wright; Doctor Yvonne Eiby**

A pre-clinical trial of early blood transfusion for improving cerebral oxygen delivery in very preterm neonates.

($970,603 - The University of Queensland – Centre for Clinical Research)

**Our research project**

Lack of adequate oxygen delivery to the brain in the first days after birth is a major contributor to preterm brain injury but current treatments aiming to increase cerebral oxygen delivery do not improve preterm outcomes.

We hypothesise that early transfusion with red blood cells will increase cerebral oxygen delivery by two mechanisms that are additive. Transfusion will increase the amount of blood going to the brain and will increase the amount of oxygen carried by the blood.

This project will determine if blood transfusion is more effective than current treatments for increasing cerebral oxygen delivery and preventing preterm brain injury.

**Potential outcomes of the research**

Long-term disability is common in babies born prematurely. This may be due to insufficient delivery of oxygen to the brain, but currently there is no treatment that increases oxygen delivery to the brain. If early blood transfusion is effective for increasing oxygen delivery to the brain, then this treatment could reduce the rate of disability in babies born prematurely.
Associate Professor Stuart MacGregor
Associate Professor Rachel Neale; Doctor Matthew Law; Doctor Puya Gharahkhani

Which modifiable risk factors actually cause cancer?
($384,076 - QIMR Berghofer Medical Research Institute)

Our research project
Observational studies suggest that modifiable risk factors such as low vitamin D levels, coffee consumption, alcohol consumption and obesity may be important in cancer risk. However, observational studies can only demonstrate association between a risk factor and cancer, and association does not equal causation. We present an alternative approach to help determine which risk factors actually cause cancer.

Potential outcomes of the research
This study will focus on several common cancer types, with particular focus on cancers of the skin, oesophagus and ovary and will determine which modifiable risk factors are important in these cancers. This work will help inform cancer prevention efforts, ultimately reducing the overall cancer burden.
Doctor Donald McLeod

Does Stress cause Graves’ disease?
($565,000 - QIMR Berghofer Medical Research Institute)

Our research project
Graves’ disease is the most common cause of hyperthyroidism affecting more than 1% of the population. It leads to long-term impairments in quality of life and has a 40% higher mortality rate compared with the general population. We know surprisingly little about the causes of Graves’ disease. One possible trigger is stressful life events; however, the relationship is yet to be proven. This study will assess whether stressful life events, specifically military deployment, are associated with Graves’ disease.

Potential outcomes of the research
Identifying an association between military deployment and Graves’ disease will have practical implications for the inclusion of Graves’ disease on the list of medical conditions related to military service. More broadly, high quality evidence demonstrating stress causes Graves’ disease would prompt mechanistic studies and lead to translational opportunities, including the assessment of biomarkers or genetic profiles to predict those patients who are at high risk of stress-induced Graves’ disease.
Doctor Rodrigos Medeiros

Targeting the immune system to develop biomarkers and treatments for Alzheimer’s disease
($1,400,000 - The University of Queensland - Queensland Brain Institute)

Our research project

Alzheimer’s disease is a devastating neurodegenerative disorder that impairs memory and causes cognitive and psychiatric deficits. The disease currently afflicts over 48 million people worldwide, with a new case developing every 3.2 seconds. As current therapies do not treat underlying disease processes, it is very likely that Alzheimer’s will continue to be a clinical, social, and economic problem.

The goal of this project is to understand and discover the causes and conditions that affect the progression of Alzheimer’s disease, and to find ways to effectively diagnose and treat patients. This research will focus on how the molecular and cellular changes that occur in the immune system during ageing contribute to disease progression. This project aims to identify early changes in the signals associated with the inflammatory response that can be detected in the blood, cerebrospinal fluid or brain, which could diagnose at risk individuals before the onset of clinical symptoms. Moreover, this study will investigate if drugs targeting these immunological signals can be used to prevent disease progression, or restore brain function and improve the quality of life of those suffering from Alzheimer’s disease.

Potential outcomes of the research

Advances in diagnostic and therapeutic strategies that lead to even small delays in onset and progression of Alzheimer’s disease would drastically reduce the personal and global burden of the disease. Thus, biomarkers are needed that can detect Alzheimer’s in pre-symptomatic individuals when therapeutic interventions are likely to be most effective. This research is expected to provide sufficient evidence to support the testing of biomarkers and drugs targeting the immune system on Alzheimer’s disease patients, anticipating that these approaches will facilitate the clinical diagnosis and treatment of the disease.
Professor Frederic Meunier

Unveiling the intra and intermolecular steps underpinning vesicular priming
($550,500 - The University of Queensland - Queensland Brain Institute, Clem Jones Centre for Ageing Dementia)

Our research project
The fusion of secretory vesicles by exocytosis underpins neuronal communication. This project will unravel the mechanism that allows secretory vesicles to acquire the ability to fuse with the plasma membrane, a process called priming. Despite considerable efforts focused on elucidating vesicular fusion, the way these vesicles become fusion-competent upon arrival at the plasma membrane remains elusive. This project will make use of single molecule imaging to assess mobility changes of key priming molecules to uncover their diffusional signature during priming. It will therefore build the first comprehensive molecular model of molecular interactions that lead a recently docked vesicle to become fusion-competent.

Potential outcomes of the research
Understanding how vesicles containing neurotransmitter acquire the ability to fuse with the plasma membrane and release their cargo is key to unravelling how the brain works. This project will build the first comprehensive molecular model of the molecular interactions that lead a recently docked vesicle to become fusion-competent.
Professor Frederic Meunier
Doctor Emma Sierecki; Professor Benjamin Cravatt; Doctor David Kvaskoff; Doctor Nicholas Vitale; Professor Pankaj Sah

Unravelling a new fatty acid pathway involved in neuroexocytosis and memory
($539,631 - The University of Queensland - Queensland Brain Institute, Clem Jones Centre for Ageing Dementia)

Our research project
Phospholipids, the principal component of biological membranes, can be cleaved by various phospholipases, thereby releasing free fatty acids (FFAs) and generating lysophospholipids. FFA detection is arduous and very little is known about the precise range of FFAs generated during neurotransmission and memory.

The group have developed two highly sensitive methods for profiling both FFAs and lysophospholipids. Preliminary data reveal that the vast majority of the FFAs generated during neurotransmission and memory acquisition are saturated. Based on a range of molecular to behavioural experiments in rodents, this proposal aims to uncover a novel pathway regulating both neurotransmission and memory acquisition through the generation of specific saturated and unsaturated FFAs in neurons. The aim of this project is firstly to establish the full landscape of FFAs and lysophospholipid changes that occur in response to stimulation in neurons and secondly to establish the molecular mechanism responsible for delivering these changes at the micro-environmental interface between secretory vesicles and the plasma membrane. Finally, to link fear conditioning, a classical paradigm for memory acquisition with changes in both FFAs and lysophospholipids in specific regions of the brain.

Potential outcomes of the research
This study will be the first to unravel changes in the FFAs and lysophospholipids landscapes associated with learning and memory. In addition the novelty of the group’s methods is likely to generate high level of interest in other fields, such as inflammation, cancer and immunity. This work builds on the establishment by the group’s laboratory of the assay capable of detecting free fatty acids, with great accuracy and sensitivity. Using this assay the group have uncovered a completely new pathway highlighting the production of saturated free fatty acids linked to learning and memory. The group will fully define how this pathway is regulated in the brain.
Professor Frederic Meunier
Professor John Cooper-White; Associate Professor Rohan Teasdale; Professor Elizabeth Coulson; Associate Professor Brett Collins; Doctor Geoff Osborne

Unravelling the mechanism coupling synaptic activity with neurotrophin signaling in the nervous system
($640,815 - The University of Queensland - Queensland Brain Institute, Clem Jones Centre for Ageing Dementia)

Our research project

Neurons are highly differentiated and rely on efficient intracellular communication to develop, transmit information and survive for very long periods of time. Although active neurons survive for much longer than inactive ones, the mechanism underpinning the essential coupling between synaptic activity and survival has remained elusive. Using super-resolution imaging and microfluidic chambers to isolate axons from dendrites, the group have uncovered a direct coupling between synaptic activity and the survival signal. The purpose of this project is to establish the molecular mechanism underpinning this coupling and understand how some bacterial pathogens can harness this pathway with devastating effects to the brain. This process is fulfilled by long-range axonal transport. The retrograde pathway relies on microtubule-dependent transport to the cell body of signalling endosomes formed in nerve terminals. It is highly likely that TrkB activation initiates a series of molecular events culminating in the generation of active signalling endosomes within the presynapse whose fate is to be transported to the cell body.

The aims of this project are to: 1) characterise the axonal retrograde carriers transporting cholera toxin and TrkB back to the cell body using microfluidic chambers and state-of-the-art super-resolution microscopy; 2) establish the role of TrkB activation in coupling synaptic activity with the flux of retrograde signalling endosomes; and 3) establish the role of retromer/SNX27 in controlling the coupling of synaptic activity with the flux of retrograde signalling endosomes.

Potential outcomes of the research

Although active brain cells are known to survive for much longer than inactive ones, the mechanism underpinning this essential process has remained elusive. The group have uncovered a direct coupling between neuronal activity and survival signals. The project aims to establish the molecular mechanism underpinning this coupling and understand how neuropathic pathogens manage to harness it with devastating effects to the brain.
Professor Gita Mishra
Professor Shyamali Dharmage; Associate Professor Isabel Ferreira; Associate Professor Jenny Visser; Professor Deborah Loxton; Professor Rachel Huxley; Professor Annette Dobson; Professor Grant Montgomery; Professor Harold David McIntyre; Professor Jenny Doust

M-PreM study: Reproductive factors, from menarche to pre-menopause, and the risk of cardiometabolic and respiratory conditions before menopause
($1,366,831 - The University of Queensland - School of Public Health)

Our research project
Cardiometabolic and respiratory conditions, such as cardiovascular disease (CVD), diabetes, and asthma, show marked sex differences in their prevalence and severity across the life course. Previous studies have typically focused on risk factors for these conditions among postmenopausal women.

This proposed study will map the pathways between female reproductive factors, from menarche and menses through to pregnancy and subfertility, and the risks of cardiometabolic and respiratory conditions among premenopausal women (40-45 years of age), and then determine the role of body size has in modifying these relationships.

The research builds on the unique strengths of the Australian Longitudinal Study on Women’s Health (ALSWH) that has collected two decades of comprehensive survey data with linkage to administrative health service records. The proposed study will collect biomarkers for ovarian ageing and cardiometabolic and respiratory conditions from a large sample of premenopausal women from ALSWH who were born in 1973-78 and will be aged 40-45 years in 2018.

Potential outcomes of the research
With a rapidly ageing population in Australia, age-related chronic diseases present a pressing challenge for public health policy. Given that women are disproportionately represented among the older population, and cardio-metabolic and respiratory conditions show marked sex differences, studies are needed to advance understanding of the role of female reproductive function as well as any modifying role of body size. Importantly this research also shifts the evidence base to earlier in life by identifying the health risks among premenopausal women.
Professor Gita Mishra

Leveraging women’s health data resources to reduce chronic disease risk and extend healthspan
($763,845 - The University of Queensland)

Our research project

As the population ages Australia faces a rising tide of chronic diseases, many of which pose greater risks for women than men, including: depression, asthma, Type 2 Diabetes, cardiovascular disease, and osteoporosis. Women’s reproductive health is often linked with subsequent chronic disease risk and central to women’s use of health services across the lifespan, from fertility issues and pregnancy complications, to the menopausal transition.

The vision for the next five years is to capitalise on expertise gained within life course epidemiology and women’s health with a systematic and integrated approach to understanding reproductive health and chronic disease risk across the lifespan. The aim of the project is to apply cutting edge analytic methods and strengthen evidence for the use of reproductive health services as a platform for timely and tailored preventive strategies to reduce the risk of chronic diseases and extend healthspan (or years spent in good health).

Our group leads the Australian flagship study of women’s health (Australian Longitudinal Study on Women’s Health) that has two decades of data from over 58000 women in four age cohorts that now cover ages 18 to over 90 years. It includes information on health services use, as well data on maternal and child health. This group has formed an international consortium on women’s health that comprises data from over 220,000 women in nine countries. The research program will leverage these unique data resources, as well as enabling additional studies, to transform women’s health policy and the provision of health services.

Potential outcomes of the research

An evidence base that supports a tailored approach to the provision of reproductive and maternal and other health services and that takes on board women’s reproductive history.

An evidence base to guide the use of reproductive health services as a platform for timely and tailored preventive health strategies to reduce chronic disease risk and extend the healthspan, including opportunities for early health surveillance and intervention for women at most risk.
Associate Professor Rachel Neale

Professor Dallas English; Professor Alison Venn; Professor Bruce Armstrong; Professor Peter Ebeling; Professor Michael Kimlin; Associate Professor Jolieke van der Pols; Doctor Leesa Wockner

The D-Health Trial: a large-scale population-based trial of vitamin D supplementation for improving the health of older adults

($$2,591,859 - QIMR Berghofer Medical Research Institute)

Our research project

The D-Health Trial is a randomised placebo-controlled trial of vitamin D supplementation. The primary aim is to determine if 5 years of supplementation lowers the mortality rate and incidence of cancer and improves a number of other health outcomes such as falls, fractures, infection, mood, and cognitive decline. Over 21,000 participants were recruited in 2014 and 2015 and randomised to monthly doses of vitamin D or placebo. Outcomes are measured through self-completed surveys and linkage with health datasets. This research will span 5 years of supplementation and long-term follow-up of mortality and cancer.

Potential outcomes of the research

If vitamin D improves the health of Australians this would indicate that increased use of supplements or more widespread mandatory food fortification would be appropriate. Null results will be equally as important, arguing against population-level intervention.
Professor Linda Richards
Professor Elliot Sherr; Associate Professor Richard Leventer

Astrogial remodelling of the interhemispheric midline is regulated by deleted in colorectal cancer (DCC) signalling and is required for corpus callosum formation ($669,400 - The University of Queensland - Queensland Brain Institute)

Our research project
The integration of information between the brain hemispheres occurs via a large bundle of connecting nerve fibres called the corpus callosum. People with a genetic mutation in DCC display mirror movement disorder and some have a severe brain defect where the corpus callosum fails to form, but at present we don’t understand the function of this gene. In this study the research group will investigate how DCC functions in early brain development to regulate corpus callosum formation and mirror movement disorder.

Potential outcomes of the research
This project addresses an issue of great importance to human health by investigating the basis of a relatively common brain malformation that has an impact on normal childhood development. It will provide several highly significant conceptual advances in the field of brain wiring and the impact of brain developmental disorders in children and adults.
Professor Michael Roberts
Doctor Xin Liu; Professor Darrell Crawford; Professor Colin Pouton; Professor Zhiping Xu and Professor Leaf Huang

Physiologically-based pharmacokinetics and pharmacodynamics of therapeutic stem cells for liver disease
($848,710 – The University of Queensland)

Our research project
This project focuses on the challenging area of effective and optimal dosing cell-based therapy for liver diseases. This project will investigate the fate and therapeutic effects of natural, modified and artificial therapeutic cells in the body and in liver regions using a physiologically-based kinetic model. The key goal is to advance cell therapy by providing a better understanding of dosing guidelines.

Potential outcomes of the research
This work will be the first attempt to relate the effectiveness of stem cell hepatic therapy in animal and published human studies to target tissue exposure and deactivation at other body sites using a physiologically based PK/PD approach. The overall outcome will be to facilitate a more rational approach to new cell-therapies by better dosing strategies based on adjustments for dosing route, organ masses, blood flows, disease and its impact on homing and tissue effects.
Professor Trevor Russell

Doctor Nicole Gillespie; Doctor Nicole Hartly; Professor Deborah Theodoros; Doctor Anne Hill, Professor Len Gray

Predictors of home telehealth adoption in the aging population: Consumer perspectives

($325,255 – The University of Queensland)

Our research project

The ageing population in Australia is poised to significantly impact on health care services through increasing demand and rising healthcare costs.

It is now possible for health services to be provided across the Internet (telehealth) into the aged person’s home. The problem is there has been a slow uptake of telehealth services. What is needed is a clear understanding of aged consumers’ perspectives on telehealth and why they chose to engage in or ignore such services.

This mixed methods research project will combine patient interviews, focus groups and nationwide surveys with advanced modelling to identify significant predictors of the intention of older Australians to adopt home telehealth services. It will also investigate whether these factors vary across key market segments.

Potential outcomes of the research

Understanding consumer preferences regarding telehealth and the factors that drive their intention to adopt this mode of service delivery is critically important in order to develop services to meet the emerging health care challenge. This study will provide critical information to assist in matching the older person’s health needs and expectations with responsive and relevant health services and will inform policy surrounding telehealth implementation.
Professor Pankaj Sah

Unravelling the mechanism coupling synaptic activity with neurotrophin signaling in the nervous system
(S$941,656 - The University of Queensland - Queensland Brain Institute)

Our research project

How the nervous system learns, stores and recalls information are some of the most interesting questions in neuroscience today. The amygdala is critically involved in assigning emotional salience to events through associative learning. Studies generally use fear conditioning, in which an emotionally innocuous stimulus, such as a tone, is paired with an aversive one, typically an electric shock. Subjects learn to respond to the tone with behavioural, autonomic and endocrine responses that are characteristic of defensive responses to an aversive stimulus. This association is rapidly learnt and long-lasting. However, subsequent presentations of the tone that are not paired with the footshock break this association, and lead to a gradual reduction of the fear response through a process known as extinction. A converging literature has shown that three key players in fear learning and extinction are the amygdala, medial prefrontal cortex (mPFC) and hippocampus. Within the mPFC, it is generally accepted that the prelimbic mPFC (the PL) is required for fear expression whereas the infralimbic mPFC (the IL) is required for expression of fear extinction. However, the nature and function of the neural circuits between these three brain regions, and how they modulate activity are little understood. This work will explore ex vivo optogenetics and multi-cell whole-cell recordings in acute brain slices to study the neural circuits between the hippocampus, mPFC and amygdala. The studies will define the neural circuits that mediate fear learning and extinction and pave the way to the design of new therapies to treat a range of anxiety disorders.

Potential outcomes of the research

This work will study the circuits that are involved in fear learning. The results will provide the background to developing more effective therapies for a range of anxiety related disorders such as generalised anxiety and post-traumatic stress disorder.
Doctor David Simmons
Professor Leonie Callaway; Doctor Marloes Dekker; Doctor Dominic Ng

Trophoblast Cell-Cell Fusion in Preeclampsia
($487,273 - The University of Queensland – School of Biomedical Sciences)

Our research project
Cell-cell fusion is relatively rare in biology, but is a critical process for the development and transport capacity of the placenta during pregnancy. Impairments in this process occur in pregnancy complications such as preeclampsia (PE). We have identified a novel pathway regulating placental cell-cell fusion which is also dysregulated in human pregnancies complicated by PE. In the current research project we will investigate the mechanisms by which this novel pathway mediates the cell-cell fusion process, and examine its role in the development of PE.

Potential outcomes of the research
Preeclampsia is a pregnancy-specific disorder affecting up to 8% of pregnancies worldwide (~3% in Australia), and remains a leading cause of maternal and perinatal morbidity and mortality. The current project aims to understand the molecular mechanisms driving cell-cell fusion at the maternal-foetal interface, and how this process becomes impaired in pregnancies complicated by preeclampsia. The goal is to identify novel molecular pathways that can be exploited to promote and maintain healthy placental function in complicated pregnancies.


Professor Mark Smyth  
Doctor Michele Teng

Co-inhibition of adenosine generation and signalling: a new combination cancer therapy  
($587,857 - QIMR Berghofer Medical Research Institute)

Our research project
Cancer is a major killer of Australians and there is a need to develop new combination therapies that halt cancer growth and spread. A metabolic product of cancer called adenosine can be exploited by several different treatment approaches. By both preventing adenosine generation and its effects on immune cells this can together more effectively slow tumour growth and spread. Once an understanding of this process has been elucidated this approach can be quickly brought it to clinical practice.

Potential outcomes of the research
Immunotherapies, using antibodies targeting immunomodulatory receptors, such as Ipilimumab, Nivolumab/Pembrolizumab have been revolutionary in causing long term tumor regression and disease free survival in advanced cancers. Nevertheless there are still a significant proportion of patients who do not respond to current immunotherapies. Potentially, therapies that target adenosine can synergize with current immunotherapies and other anti-cancer drugs to increase response rates in patients.
Professor John Upham

Professor Jodie Simpson; Doctor Chris Grainge

Anti-viral immune dysfunction in severe asthma varies across inflammatory phenotypes
($997,153 - The University of Queensland – Diamantina Institute)

Our research project

Common cold viruses often trigger asthma attacks, but have relatively minor effects on healthy people. Why this happens is not clear. We have identified two different ways in which the immune system can react badly to a common cold virus in people with asthma. Sometime the immune response is too weak with insufficient production of virus fighting interferon proteins. In other instances it seems to be related to excessive production of a protein called IL-33 that causes severe inflammation in the lungs. In this study we will find out more about this problem in a large group of people with severe asthma.

Potential outcomes of the research

Asthma attacks cause over 400 deaths in Australia each year, and are responsible for 1.7% of all emergency department attendances across the nation. The majority of these can be attributed to respiratory virus infections. This study will help to discover improved treatments that can prevent these infections, or halt their progress before they develop into a severe asthma attack.
**Associate Professor Kirsten Vallmuur**

Professor Rebecca Ivers; Professor James Harrison; Professor Luke Nottage; Doctor Ruth Barker

Evaluating consumer product regulatory responses to improve child safety

($403,000 - Queensland University of Technology)

**Our research project**

Consumer product safety regulation operates in a global and ‘virtual’ market, with the growth of online purchasing, limited border protection capacity and increasing distance between suppliers and consumers. This makes monitoring and enforcing product safety much more difficult for regulators, putting consumers at risk. Developing a rapid responsive product safety system that operates across sectors and borders is an international priority. This study will evaluate the congruence of consumer product safety regulator responses and safety incident data for children to close gaps in consumer regulatory practice and safety policy.

**Potential outcomes of the research**

This project is the first to quantify the level of congruence between consumer product regulatory practices and child injuries, and compare national approaches. This will provide a more effective and sustainable approach to consumer safety regulatory decision making practices in relation to children in Australia for both rapid response and ongoing monitoring, thus significantly reducing the economic and social burden of child injury.
Professor Penelope Webb
Professor Anna DeFazio; Professor Andreas Obermair; Professor David Smith; Associate Professor Peter Grant; Doctor Vanessa Beesley; Doctor Christina Nagle

The Ovarian Cancer Prognosis and Lifestyle (OPAL) Study: Long-term outcomes
($871,656 - QIMR Berghofer Medical Research Institute)

Our research project
Ovarian cancer affects 1500 women each year in Australia and 5-year survival is 45%. Affected women thus face a poor prognosis and often ask what they can do to improve this. There is no direct evidence whether a woman’s lifestyle might influence her outcomes, although data from breast cancer suggest this is possible. The OPAL Study is following 960 women with ovarian cancer to identify whether lifestyle is associated with long-term survival to provide evidence for women with this disease.

Potential outcomes of the research
Most (75%) women with ovarian cancer have advanced disease at diagnosis and only 20-30% of this group will still be alive 5 years later. Once women finish their treatment they want to know what they should do to reduce the chance that their cancer will return. Identifying important lifestyle factors that may influence ovarian cancer outcomes will be of significant benefit to affected women, their families and healthcare providers.
Rebecca Guy; Associate Professor James Ward; Professor Basil Donovan; Professor Monica Lahra; Doctor Marcus Chen; Doctor Nathan Ryder; Professor David Lewis; Associate Professor Handan Wand; Professor David Paterson

Use of molecular resistance assays to provide alternative oral treatment strategies for gonorrhoea in Indigenous and other high-risk populations; a randomised cluster trial
($828,671 - The University of Queensland – Centre for Clinical Research)

Our research project
Gonorrhoea has now developed resistance to almost all antibiotics that have been used to treat it. In this study, we will investigate a new treatment approach that selects antibiotics on a patient-by-patient basis. New molecular assays will be used to first test if a gonorrhoea strain infecting a patient is susceptible to an antibiotic, and will then be treated on the basis of this result. By doing so, the use of antibiotics will be optimised and will improve treatment strategies for gonorrhoea.

Potential outcomes of the research
The study will provide an invaluable foundation for ongoing management of gonorrhoea and antibiotic stewardship. It will be particularly beneficial for Aboriginal and Torres Strait Islander communities, which are affected by problems of accessibility to both diagnoses and treatment.

The primary endpoint will be the proportion of patients whose gonorrhoea could effectively be treated on the basis of the new molecular test.
Associate Professor Anthony White

Doctor Lezanne Ooi; Doctor Katja Kanninen; Associate Professor Paul Donnelly; Professor Jari Koistinaho; Associate Professor Tarja Malm

Building an immunocompetent Alzheimer’s disease brain-on-a-chip
($458,937 - QIMR Berghofer Medical Research Institute)

Our research project

New human cell culture models of Alzheimer’s disease are urgently needed to help translate drugs into successful patient outcomes. In this proposal an Alzheimer’s disease brain-on-a-chip will be developed that contains the major human brain cell types and neuropathological features of the Alzheimer’s. The applicability of the model for identifying new Alzheimer’s disease drugs and diagnostics will be demonstrated and will show that the model can be readily adopted by Australian Alzheimer’s researchers.

Potential outcomes of the research

Alzheimer’s is the most common form of dementia in the elderly and currently there are no effective treatments. One of the major hurdles facing Alzheimer’s research is the lack of human cell models that recapitulate what is happening inside the brain. Advances in human stem cell technology have allowed Scientists to study neuronal brain cells of Alzheimer’s patients. This has opened up exciting new possibilities in personalized medicine for testing specific drugs on each patient.
Testing the lung microbiome to predict risk of frequent exacerbations in COPD
($666,052 - The University of Queensland)

Our research project
Chronic obstructive pulmonary disease (COPD) is a chronic lung disease of global importance, which causes an estimated $929M of direct health care costs annually in Australia. Exacerbations, mostly due to respiratory infections, are complications of COPD that lead to significant adverse outcomes.

Culture-independent methods can now be extended to identify all the micro-organisms in a sample, by sequencing conserved and variable region genes to characterise the microbiome, which is the community of microbes that share a particular environment.

In small cross-sectional and case-control studies, the lung microbiome in COPD has been observed to be different to non-COPD subjects, and undergoes small alterations during exacerbations. However, the relationship of the lung microbiome with risk of future exacerbations or other markers of long-term decline in COPD is not yet understood, and is the focus of this proposal.

This study will establish the sputum microbiome as a clinically relevant endotype in COPD, by translating knowledge of the microbiome to clinical practice.

Potential outcomes of the research
Chronic obstructive pulmonary disease (COPD) is a disease of global importance. Exacerbations, mostly due to respiratory infection, are complications that lead to significant illness. This study will characterise the communities of microbes in the lung, and use this information to predict frequency of exacerbations of COPD measured over 12 months. This will benefit patients and health care systems by targeting patients who are at the greatest risk of exacerbations, to optimise their therapy.
Professor Patsy Yates

Doctor Kimberly Alexander; Professor Christine Miaskowski; Professor Raymond Chan; Professor Alexandra McCarthy; Associate Professor Steven McPhail; Doctor David Wyld; Doctor Helen Skerman

A sequential multiple assignment randomised trial (SMART) of nursing interventions to reduce pain associated with chemotherapy induced peripheral neuropathy

($713,418 – Queensland University of Technology)

Our research project

Modern chemotherapy treatments can result in damage to the peripheral nerves, resulting in a condition called peripheral neuropathy. This condition is characterised by a range of sensory and functional changes that can cause pain and reduced ability to perform daily activities. This project will test various non-pharmacological pain management measures to determine if they are effective in improving the quality of life of patients who experience this problem.

Potential outcomes of the research

Chemotherapy induced peripheral neuropathy (CIN) is a common problem for patients who have received some of the most commonly used cytotoxic agents in cancer treatment. Prevalence rates have been reported as 60% at 3 months and 30% at 6 months or more post treatment. No effective treatment is available to prevent this condition and there are limited pharmacological options to treat the problem. This study will provide the first systematic and comprehensive evaluation of the impact of non-pharmacological interventions on CIN related impairments. The interventions are able to be self-administered and will have minimal cost.
Doctor Meihua Yu

Engineered Spiky Silica Nanoparticles as Effective Immune Adjuvants by Activating Inflammasome and Enhancing Cellular Uptake
($318,768 - The University of Queensland - Diamantina Institute)

Our research project

The WHO estimates that vaccines prevent 2.5 million deaths every year. Despite such unqualified success, our ability to confer potent immune responses in humans against some of the deadliest infectious diseases remains rather limited. Subunit vaccines comprised of isolated recombinant antigens and adjuvants which boost antigen immunity offer advantages over traditional vaccines, such as reduced toxicity. Improving adjuvant efficiency is an ongoing challenge in vaccine development. This aim of this project is to generate a novel immune adjuvant with potent and lasting immune responses which will be achieved by rationally designing surface topography and pore structure of silica nanoparticles (SiNPs) with spiky morphology. The engineered spiky SiNPs generated in this project are expected to be novel and efficient adjuvants in vaccines with significantly promoted immunity of antigens and low toxicity.

Potential outcomes of the research

Successful completion of this project will have a clinically significant and positive impact through the development of effective nano-adjuvants with desired immune potency and safety, providing utility for infectious disease vaccines and cancer immunotherapies.
**Associate Professor Andrew J. Zele**

Doctor Beatrix Feigl; Associate Professor Dingcai Cao; Professor Jan Kremers

**Melanopsin Function in Humans**

($237,000 - Queensland University of Technology)

**Our research project**

A newly discovered retinal ganglion cell class in the human eye expresses the melanopsin photopigment. Melanopsin signaling controls neural functions for light dependent, non-image forming processes such as entrainment of the body clock to the solar day (circadian rhythms), mood and the pupil light reflex. The role of melanopsin function in image forming vision is largely unknown in humans. This project uses a next-generation optical technology to define how melanopsin controls these neural processes in humans. The outcomes will have fundamental implications for the trichromatic (three cone photoreceptor) theory of colour vision and for understanding human brightness perception.

**Potential outcomes of the research**

Being able to understand how the recently discovered melanopsin photopigment in the human eye controls physiological processes will provide new avenues for using light to increase active participation in society and improve health and well-being. The outcomes will deliver a novel method for use in the early detection of retinal disease, with new opportunities to study non-retinal diseases such as sleep disorders, depression and migraine that have now been associated with altered melanopsin function.
**Doctor Steven Zuryn**  
*Associate Professor Massimo Hilliard*

**Epigenetic determination of neuronal vulnerability and neurodegenerative disease**  
($617,857 – The University of Queensland – Queensland Brain Institute)

**Our research project**

An appropriate balance of stability and reversibility in gene expression programs are needed to specify and maintain cell identity and function; inappropriate expression leads to disease. Cellular stresses, such as proteotoxicity and mitochondrial dysfunction, which are associated with neurodegenerative disorders, are known to interfere with neural gene transcription. This compromises neuron function and viability, potentially promoting the onset of disease symptoms. The group recently discovered that the histone H3 lysine 27 (H3K27) demethylase Jmjd3 and the H3K4 methyltransferase Set1 are necessary to ensure stability and invariant motor neuron physiology. This research will investigate the epigenetic and transcriptional mechanisms underlying this protective role. This project will reveal how neurons counteract neurodegenerative stress to allow sustained functionality, and the molecular targets that need to be exploited in order to prevent or halt progression of neurodegeneration.

**Potential outcomes of the research**

This research could have wide-ranging impacts on how we think about neurodegenerative disease, particularly why some individuals are more sensitive than others. The work is aimed at identifying epigenetic criteria that modify neuronal susceptibility to factors that are believed to cause neurodegeneration. A long-term benefit is the development of potential therapeutic avenues that can treat late-onset neurodegenerative diseases.
Doctor Rochelle D’Souza

Understanding the tumour suppressive function of ephrin A5 signalling in adult brain cancer

$99,692 - QIMR Berghofer Medical Research Institute

Our research project

Glioblastoma (GBM) is the most common primary brain cancer accounting for ~1,000 deaths in Australia each year. GBM is an aggressive cancer with poor survival rates. Our laboratory has shown that the EphA3 receptor, a protein on cells responsible for initiating brain tumour growth, is frequently elevated in GBM, particularly in the most aggressive subtype. EphrinA5 binds to EphA3, leads to its activation causing cell differentiation thus reducing tumour burden making it a potential therapeutic target. This project will investigate the mechanism of these ephrin A5-induced signalling changes in GBM using an innovative mass spectrometry based approach.

Potential outcomes of the research

The median survival for a person diagnosed with GBM is <15 months and only ~10% of patients survive two years without disease recurrence. This necessitates research into new and more effective approaches to treat this disease. This work will not only characterise the mechanism of action of ephrin A5, a potential therapeutic agent, but may also identify other druggable targets and provide novel therapies, leading to improved outcomes for GBM patients.
Doctor Camille Guillerey
Improving Natural Killer cell responses to immunotherapy in haematological cancers
$100,000 - QIMR Berghofer Medical Research Institute

Our research project
Haematological malignancies are cancers affecting immune cells in the blood and lymphatic organs. They include leukaemia, lymphoma and myeloma. Immunotherapeutic antibodies targeting the immune system may help to eradicate tumour cells and reduce the risk of cancer relapse following conventional treatments. This project will focus on Natural Killer cells, which are blood-circulating immune cells known to be particularly efficient against haematological cancers. Immunotherapeutic antibodies called anti-CD137 mAbs promote Natural Killer cell anti-cancer activity. However, alterations of Natural Killer cell functions are frequently observed in cancer patients. This project will investigate how the presence of tumour may affect Natural Killer cell responses to anti-CD137 mAbs and apply this knowledge to design more effective immunotherapies.

Potential outcomes of the research
Haematological malignancies are a major health problem with approximately 12,500 new cases diagnosed per year in Australia. Immune cells called Natural Killer cells circulate in the blood and are able to recognize and kill tumour cells. Immunotherapy treatments that efficiently boost Natural Killer cell functions will benefit blood cancer patients. This project will provide a better understanding of Natural Killer cell responses to immunotherapy in the context of blood cancer. Such knowledge is necessary to fully exploit Natural Killer cell anti-cancer capacities.
Associate Professor Kiarash Khosrotehrani
Professor David Whiteman; Professor Adele Green; Professor Peter Baade; Professor Peter Soyer; Professor Mark Smithers

Predictors of mortality in thin melanomas
($200,00 – The University of Queensland)

Our research project
Melanoma can be a fatal disease depending on the thickness of the tumour at the time of diagnosis. Even among patients with thin melanomas that represent the largest numbers, the disease can result in mortality. As a result currently a significant proportion of patients who die from melanoma had a thin tumour. This project proposes to identify factors that can predict which patients will succumb to their disease in this largest category of melanoma patients.

Potential outcomes of the research
Identifying melanoma patients at high risk of progression allows targeted specific intervention in terms of surveillance and adjuvant therapy.
Doctor Siok Tey
Associate Professor Glen Kennedy; Professor David Gottlieb

Treatment of chronic graft-versus-host disease with regulatory T cell-directed therapy - insights from gene-marking
($200,000 - QIMR Berghofer Medical Research Institute)

Our research project
Bone marrow transplantation can cure leukaemia and other blood cancers because the donor immune system is very effective at attacking recipient cancer cells. However, the donor immune response can also damage recipient tissues resulting in a complication known as graft-versus-host disease (GVHD). Severe GVHD is life-threatening and greatly reduces the quality-of-life of patients who are already cured of their cancer. This project is a phase I clinical study to investigate the use of an immune cell, known as regulatory T cell (Treg), to treat chronic GVHD. Tregs will be obtained from bone marrow donors, expanded in the laboratory and infused into transplant recipients who have severe chronic GVHD. This study is unique as it will 'gene-mark' the Tregs, which will allow tracking in the recipient, so understand their fate in a real-life clinical setting. This project will also investigate whether certain drugs, such as interleukin-2, given at the same time can make the Treg infusions more effective.

Potential outcomes of the research
Blood cancers represent 10% of all cancers in Australia. Bone marrow transplantation (BMT) is often the only curative therapy for high risk blood cancers, however 40-70% of long term survivors have chronic GVHD with 10-20% developing severe GVHD that is resistant to treatment. Severe chronic GVHD is the main source of late non-relapse death and the main determinant of quality-of-life. This study will lead to better treatment approaches for GVHD patients, with the insights from gene-marking also informing future clinical trials.
**Associate Professor Vicki Flenady**  
Centre for Research Excellence in Stillbirth  
($2,496,348 - The University of Queensland)

**Associate Professor Trent Woodruff**  
Preclinical Development of Complement C5aR Antagonists for the Treatment of Motor Neuron Disease  
($593,326 - The University of Queensland)

**Professor Matthew Cooper**  
Novel NLRP3 Inhibitors for Steroid Resistant Asthma  
($927,117 - The University of Queensland)

**Professor Hayden Homer**  
Nicotinamide adenine dinucleotide (NAD+)-raising agents for improving oocyte quality  
($445,827 - The University of Queensland)

**Associate Professor Mark Smythe**  
Evaluation of the Safety of Lead Compounds for Allergic Asthma  
($310,568 - The University of Queensland)
Doctor Simon de Veer
Expanding the repertoire of immunomodulatory drugs: targeting the melanocortin system using engineered cyclic peptides
($318,768 - The University of Queensland)

Doctor Helen Barrett
Maternal metabolism in diabetes in pregnancy
($189,384 - The University of Queensland)

Doctor Alize Ferrari
The burden and risk factors of depressive disorders in Indigenous Australians: Implications for early detection and prevention
($318,768 - The University of Queensland)

Doctor Fleur Garton
The identification of novel genetic loci and pathways associated with ALS through interrogation of multiple integrated genomics data sets
($318,768 - The University of Queensland)

Doctor Anitha Sudheesh Kumar
Rationally Designed Targeted Core Shell Nano-Construct for Improved Anticancer Effects and Enhanced Bone Fracture Healing in Breast Cancers Metastasised to Bone
($318,768 - The University of Queensland)
**Doctor Larisa Labzin**
Innate immune functions of the intracellular antibody receptor TRIM21
($408,768 - The University of Queensland)

**Professor Jason Roberts**
Redefining antibiotic dosing to reduce bacterial resistance
($474,513 - The University of Queensland)

**Professor David Paterson**
The epidemiology and treatment of infections due to multi-resistant Gram negative bacteria
($271,150 - The University of Queensland)

**Professor David Fairlie**
Modulating Protein-Protein Interactions In Disease
($863,910 - The University of Queensland)

**Professor Richard Lewis**
Discovery and development of novel venom peptide analgesics
($763,845 - The University of Queensland)

**Doctor Kyle Upton**
LINEs of Mutagenesis, Selection and Evolution in Ovarian Cancer and Chemoresistance
($425,048 - The University of Queensland)

Additional National Health and Medical Research Council and Australian Research Council grants commencing in 2017
**Associate Professor Ingrid Winkler**
Mechanisms by which Endothelial Selectins regulate Normal and Malignant Stem Cell fate
($708,742 - The University of Queensland)

**Associate Professor James Fraser**
Microevolution of Cryptococcus neoformans
($774,622 - The University of Queensland)

**Professor Mark Schembri**
Understanding Uropathogenic E. coli-mediated subversion of innate immunity
($932,536 - The University of Queensland)

**Professor Alexander Khromykh**
The role of noncoding viral RNAs in flavivirus infection and exosomal signalling
($683,447 - The University of Queensland)

**Professor Mark Walker**
Worldwide molecular analysis of Streptococcus pyogenes scarlet fever outbreaks
($544,041 - The University of Queensland)

**Professor Geoffrey Faulkner**
Does mobile DNA activity contribute to reproductive failure?
($389,076 - The University of Queensland)
**Doctor Irina Vetter**  
Novel analgesic approaches: harnessing functional interactions between sodium channels and opioids  
($329,076 - The University of Queensland)

**Professor Geoffrey Faulkner**  
Epigenetic signatures of abnormal adult neurogenesis in Rett syndrome  
($869,332 - The University of Queensland)

**Associate Professor Matthew Sweet**  
Combating infectious diseases by harnessing macrophage functions  
($688,152 - The University of Queensland)

**Associate Professor Kiarash Khosrotehrani**  
Modulating skin regenerative responses to improve wound repair and fight carcinogenesis  
($470,144 - The University of Queensland)

**Doctor Jana Vukovic**  
Regulating microglia to combat hippocampal-dependent cognitive decline in ageing  
($493,768 - The University of Queensland)

Additional National Health and Medical Research Council and Australian Research Council grants commencing in 2017
Professor Malcolm Jones
A new animal model for genitourinary schistosomiasis
($395,711 - The University of Queensland)

Associate Professor Benjamin Hogan
Coupling the mechanical, signalling and transcriptional mechanisms that initiate pathogenesis of Cerebral Cavernous Malformation
($1,228,364 - The University of Queensland)

Professor Alpha Yap
A mechanotransduction apparatus to coordinate epithelial collective cell migration.
($994,596 - The University of Queensland)

Associate Professor Vicki Flenady
A national program to address stillbirth
($470,144 - The University of Queensland)

Doctor Kelly Smith
Investigating a novel genetic regulator of cardiac rhythm
($557,101 - The University of Queensland)
Doctor Zhitao Hu
Investigation of the function of the scaffolding protein LIN-2/CASK in cholinergic synapses
($911,656 - The University of Queensland)

Doctor Kate Schroder
A novel mechanism for IL-1β secretion
($608,152 - The University of Queensland)

Associate Professor Philip Stevenson
Targeting myeloid cells to restrict gamma-herpesvirus spread
($643,152 - The University of Queensland)

Professor John Hooper
A novel protease and growth factor regulated signalling system in ovarian cancer
($856,743 - The University of Queensland)

Professor Joseph Lynch
The α5 GABA-A receptor: delineating an emerging therapeutic target
($481,178 - The University of Queensland)

Associate Professor Markus Barth
Improving Human fMRI through Modeling and Imaging Microvascular Dynamics
($486,144 - The University of Queensland)
Doctor Tobias Bald
Targeting immune suppressive neutrophils to improve cancer immunotherapy
($318,768 - QIMR Berghofer)

Professor Michael Breakspear
Brain networks in those at high risk of mental illness
($474,513 - QIMR Berghofer)

Professor Georgia Chenevix-Trench
Breast and ovarian cancer: beyond genome wide association studies
($863,910 - QIMR Berghofer)

Professor Nicholas Hayward
Improving outcomes from melanoma
($863,910 - QIMR Berghofer)

Professor Michael Breakspear
Brain Connectomics in Psychiatry
($763,845 - QIMR Berghofer)

Associate Professor Anthony White
Trace element regulation in neurological disease: From molecular pathogenesis to translational impact.
($631,370 - QIMR Berghofer)
**Professor V. Nathan Subramaniam**  
Liver Injury and Iron Homeostasis in Health and Disease  
($631,370 - QIMR Berghofer)

**Doctor Manuel Ferreira**  
Delivering on the GWAS promise: from genetic discoveries to novel drug targets for asthma  
($697,605 - QIMR Berghofer)

**Doctor Cong Guo**  
Translational Research Platform for Dementia  
($425,048 - QIMR Berghofer)

**Associate Professor Leanne Hides**  
Early interventions for Primary and Comorbid Substance Use in Young People: Engagement, Innovation, Technology and Translation  
($706,370 - Queensland University of Technology)

**Doctor Michael Doran**  
Bridging the fields of cartilage, bone marrow and cancer research  
($470,144 - Queensland University of Technology)
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