PhD projects

Menzies welcomes highly motivated individuals thinking of pursuing a career in medical research.

The following PhD projects are available by application. Please contact the supervisor to inquire or apply.

We have five research themes:

PHPCHS = Public Health, Primary Care and Health Services

BHD = Brain Health and Disease

CHD = Cardiorespiratory Health and Disease

MHD = Musculoskeletal Health and Disease

GAC = Genetics and Cancer

***** Please Note *****

The first 5 projects listed are categorised as 'Priority Projects'

A student who is awarded a University of Tasmania scholarship and is undertaking one of these priority projects will be awarded a top-up from Menzies to the value of $7,500 for each year of candidature up to 3.5 years.

Theme	Supervisor	Title	Project Descripton	Essential Criteria
BHD	Professor Tracey Dickson Tracey.Dickson@utas.edu.au	Microfluidic models of the central nervous system - deciphering the code of synapses, cells and circuits in health and disease	Understanding the organisation, structure and cellular mechanisms that underpin the complexity of the human brain remains one of the biggest challenges of science - in particular, the jump from understanding the workings of an individual cell to how groups of these cells interact to make up a functioning system. This PhD project (funded through the ARC Discovery scheme) will utilise microfluidic models to fill these gaps and to examine how individual cells types contribute to the function of central nervous system networks. Recent evidence highlights the importance of cellular networks in normal CNS functioning, and as pathways for the spread of neurodegenerative diseases including Parkinson's disease and Motor Neuron Disease. We have developed microfluidic platforms for primary cell culture, which enable us to create networks comprising molecularly defined populations of primary neurons and glia. Using these networks we can systematically challenge or perturb cellular physiology to determine how differential vulnerability and network configuration impacts neuron/glia and axon/glia signalling, under normal physiological conditions and in response to stress. These platforms will have subsequent application to revealing the critical mechanisms underlying numerous neurodegenerative diseases, with capacity to upscale for high throughput screening, and commercial application.	
PHPCHS	Professor Ingrid van der Mei Ingrid.vandermei@utas.edu.au	Improving the quality of life of people with MS	The Australian Multiple Sclerosis Longitudinal Study is a study with around 3,000 people with MS. It collects data on symptom severity, quality of life, work productivity, sleep, comorbidities, lifestyle and other factors. The study can answer questions such as: "How do MS symptoms change over time?"; "To what extent do sleep problems in people with MS impact quality of life?"; "What percentage of people has severe pain and are lifestyle factors associated with levels of pain?". The research has an overarching aim to improve people's quality of life. You will develop statistical skills to analyse the data and write publications. There will also be an opportunity to be involved in the translation of evidence into practice by assisting in the development of online resources for people with MS.	
CHD	Dr Martin Schultz Martin.Schultz@utas.edu.au	Understanding the role of fitness in determining the cardiovascular risk associated with exercise BP: the EXERcise stress test collaboratION (EXERTION).	An exaggerated BP response to clinical exercise testing has been shown to be a risk factor for the development of cardiovascular disease morbidity and mortality. Cardiorespiratory fitness may influence the acute BP response to exercise and its subsequent association with cardiovascular outcomes. The relationship between exercise BP and fitness suggests there may be both pathological and physiological pathways to generating exaggerated exercise BP. Physiological insight to the cardiac structure and function that underpins these differential BP responses to exercise, as well as the associated longer-term cardiovascular risk is lacking. The Exercise stress Test collaboratION (EXERTION) is a collaborative study established by the supervisory team to enhance clinical understanding of abnormal exercise BP. A very-large database of clinical exercise stress test data from multiple locations around Australia has been pooled and linked to administrative health datasets to enable exploration of the associations between test variables and cardiovascular outcomes. This dataset provides the means to explore the following questions which will form the basis of this PhD program: 1. How is the blood pressure response to clinical exercise testing influenced by functional/aerobic capacity? 2. Does the association between exercise BP, cardiac structure and function differ by level of functional/aerobic capacity? 3. Does the association between exercise BP, cardiovascular events and mortality differ by level of functional/aerobic capacity?	
PHPCHS	Dr Kylie Smith k.j.smith@utas.edu.au	Promoting healthy eating in Tasmanian school canteens.	Poor diet is an important risk factor for cancer. Improving diet quality in adulthood can reduce the risk of cancer but greater benefits may occur if healthy diets begin and are sustained from childhood. However, most Australian children do not have a healthy diet. On average, 40% of children's daily energy comes from discretionary foods, those that contain little nutrition and are high in saturated fat, sugar or salt, and only 2.5% of children eat the recommended amount of fruits and vegetables. Schools provide an ideal setting for promoting healthy eating due to the large amount of time children spend at school during a period when eating behaviours are being developed. This research aims to identify and evaluate strategies for school canteens that encourage healthy eating and make healthy choices easy for children. It will involve working with managers from the school canteen to increase the availability and promotion of healthy foods. This project with be conducted in collaboration with colleagues from the Tasmanian School Canteen Association and Public Health Services, Department of Health.	Must be able to obtain a Working with Vulnerable People Card (including a police check). Excellent Communication Skills
GAC	Professor Eric Moses Eric.Moses@utas.edu.au	Dynamic scanning of whole-genome sequence to identify regulatory rare variants for cardiovascular disease.	Cardiovascular disease is the leading cause of death internationally as well as Australia. Increased risk for cardiovascular disease is known to have a large genetic component and an increased understanding that rare variants play an important role in its development. Traditional single marker tests for rare variants have limited power and variant set-based analyses are commonly used to assess rare variants. However, these existing approaches require the pre-specification of genetic regions to analyses and hence are not directly applicable to many non-coding regions in the human genome. This project leverage new bioinformatic methods for dynamic scanning of whole-genome sequencing studies to identify to detect potential regulatory variants associated with cardiovascular disease. This project will involve bioinformatic analysis of approximately 1000 whole-genome sequences and their association with 600 lipidomic species in a large Australian familial cohort. Advanced computational biology and bioinformatic skills will be used to identify potential rare regulatory variants associated with cardiovascular disease and leverage with international cohorts to assess their validity. The candidate can expect to gain skills in sequence analysis and bioinformatic analysis of whole-genome data. This project can be tailored to suit the interests of the applicant focusing on bioinformatics or advanced statistical analysis, or a combination of both.	Applicants must be able to demonstrate strong research and statistical skills. Previous experience with the R statistical package and Linux operating systems.

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PHPCHS	A/Prof Amanda Neil Amanda.Neil@utas.edu.au	Impacts of implementing the National Perinatal Depression Initiative in Tasmania	Maternal mental health problems have a significant impact on all aspects of a woman's life, and can profoundly affect their infants, over both short and longer terms. This study will assess whether, and to what extent routine screening for mental health and social problems in pregnancy identifies women in need; provide an idea of who these women are (e.g. if they are young or older), and why they are in need (e.g. high levels of distress); and how many need follow-up care (e.g. from a counsellor). The study will be undertaken with reference to the natural experiment afforded through the regional implementation of the National Perinatal Depression Initiative (NPDI) in Tasmania over 2012-13, fully operational by 2014. In the South, the NPDI comprised screening with integrated care, and in the North, screening supported by a Perinatal Mental Health Co-ordinator (routine screening). This project will first undertake a detailed assessment of the NPDI as implemented in Southern Tasmania, and then assess the comparative impacts of the two implementation modes on maternal and infant outcomes and resource use during pregnancy, at birth, and postnatally through analysis of de-identified linked administrative data.	
BHD	Dr Owen Marshall Owen.Marshall@utas.edu.au	Investigating the epigenetic remodelling events that produce glia and glioma	Glia are a major cell type within the brain that protect, nourish and insulate neurons. Like neurons, glia are formed via differentiation from neural stem cells. Although differentiation is typically associated with epigenetic locks to prevent a reversal of cell fate, some glia can overcome these inhibitions and differentiate to form glioma tumours capable of rapid proliferation and resistance to treatment. Understanding how glioma cells manage to break out of their chromatin environment jail represents a key means to understanding these tumours and to combating their resistance and lethality. However, the epigenetic changes that occur during glial differentiation and glioma de-differentiation remain a mystery. Using the fruit fly as a model organism, together with the Marshall group's cell-type specific Chromatin TaDa system, the project will profile the epigenetic configuration of glial cells within the brain. In order to understand glial differentiation, the binding of the key cell fate determinants and epigenetic factors that trigger gliogenesis will also be investigated. Finally, the project will use a well-characterised and relevant fly model of glioma to understand epigenetic changes occurring in the process of de-differentiation and tumourogenesis.	
GAC	Dr Kathryn Burdon Kathryn.Burdon@utas.edu.au	Identification of genes causing inherited paediatric cataract	Paediatric cataract is a rare eye disease leading to life-long blindness or visual impairment in children. It can be caused by genetic mutations. Many patients do not have mutations in known genes, meaning genetic testing fails to provide an accurate diagnosis. This project aims to identify novel genetic causes of paediatric cataract that will improve the utility of genetic testing and uncover the biology of cataract formation. Our gene discovery pipeline starts with bioinformatic analysis of whole genome sequencing data in families with paediatric cataract. Potentially causative genes are screened in other patients as well as tested for functionality in model systems (cell culture and zebrafish). The candidate can expect to gain skills in sequence analysis and variant interpretation. This project can be tailored to suit the interests of the applicant, focusing on bioinformatics, on functional analysis, or a combination. For a bioinformatics focused student there is opportunity to develop analytical techniques to streamline candidate variant identification in families or for prioritising non-coding variants. A molecular biology focused student will undertake a series of investigations across several model systems gaining skills in experimental design and a broad range of laboratory techniques including gene editing in cells and zebrafish.	
PHPCHS	Dr Jessica Roydhouse Jessica.Roydhouse@utas.edu.au	Supporting Patients with Cancer and their Families: An Evaluation of the Cancer Council Tasmania Model of Supportive Care	A diagnosis of cancer is an extremely stressful and challenging time for patients and families. Australian Cancer Councils aim to provide support to patients and families, including providing information, helplines and peer support programs. Supportive care is a critical component of cancer care and its timely provision can improve quality of life for patients and families at all stages of the cancer journey. Cancer Council Tasmania is unique within Australia in having an innovative supportive care model of care that is based on the Maggie's Centres approach of providing evidence-based supportive care for patients with cancer and their families. Understanding the impact of this model of care on patients, families and staff who provide care is important for expanding the evidence base around supportive care in cancer, and ultimately improving such care for Australians affected by cancer. We therefore propose the following project, which has three aims. The first aim is to determine international and national best practice through a review of the literature on cancer models of care and models of support services in relevant settings. The second is an evaluation of Cancer Council Tasmania model of care design impacts for stakeholders and an evaluation of the use of the model. The focus in this approach is on maximising the participation of all stakeholders while minimising respondent burden. The techniques for this objective include photo elicitation, observation, and emotional touchpoints. The third is an assessment of barriers and enablers to the use of the model of care. The project be guided by an Experience Based Co-Design (EBCD) approach. EBCD is a collaborative approach that is user-oriented and will allow stakeholders (patients, families and staff) to contribute to any refinement of the model of care.	Experience conducting literature reviews: experience with qualitative research.

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PHPCHS	Dr Jessica Roydhouse Jessica.Roydhouse@utas.edu.au	Support for Survivors and Patients with Cancer: Developing Guidelines for Workplace-Based Approaches	A substantial proportion of cancer survivors are under 65 years of age. Many survivors will aim to return to work after completing treatment, or continue to work during treatment. There have been several intervention studies, most of which are survivor-focussed and relatively few of which have been conducted in Australia. Another important gap is the relative lack of research in this area with male survivors. Although employer accommodation and support are important for survivors who seek to return to work, most studies have evaluated the perspective of survivors rather than employers. Additionally, patients with cancer and cancer survivors may experience multimorbidity, which presents additional challenges that need to be considered as part of return to work and work maintenance strategies. We therefore propose the following project: 1) a literature review and evaluation of studies that examine employer perspectives for supporting cancer patients to return to work or maintain engagement in work during treatment, including assessing how or if multimorbidity is addressed; 2) the evaluation of male survivor and employer perspectives regarding return to work and work engagement during treatment; 3) develop a theory of change, including barriers and facilitators for returning to work and maintaining work; and 4) the establishment of expert consensus-based guidelines for employers through a Delphi panel that will include employer and survivor representatives.	Experience conducting literature reviews: experience with qualitative research approaches, including interviews and focus groups
GAC	Dr Alex Hewitt Alex.Hewitt@utas.edu.au	Understanding genetic diversity within haematopoiesis	Bone Marrow Failure Syndromes (BMFS) are a rare and heterogenous group of diseases that have in common an inability of the bone marrow to produce sufficient erythrocytes, leucocytes and platelets to meet physiological demand. They are complex, chronic and debilitating, with significant morbidity and mortality. New therapeutic options are urgently needed. That is why we are seeking highly motivated, talented and enthusiastic candidates for a fully funded PhD scholarship. Using the power of high throughput genotyping and single cell RNA sequencing our team has recently completed a gene-wide association study (GWAS) where we have identified key genomic regions that have a clear effect on gene regulation in blood cells. The laboratory-based PhD candidate would primarily focus on the CRISPR modification of Haematopoietic Stem Cells (HSCs), which will be fundamental for the high-throughput functional validation of putative loci identified through the GWAS-based mapping of bone marrow expression profiles. The cellular assays developed may also provide a robust platform for modelling variants of unknown significance that are uncovered in the clinic in BMFS patients.	
GAC	Professor Jo Dickinson Jo.Dickinson@utas.edu.au	Precision Medicine for Prostate Cancer	In Tasmania, prostate cancer is now the commonly diagnosed cancer (other than non-melanoma skin cancer). Whilst most men survive beyond 5 years, for 30-50% men their disease returns despite primary treatment. Furthermore, the primary treatments of surgery/radiotherapy frequently come at a significant cost to both health services and to quality of life. Whilst gene-based therapies are now delivering significant improvements in treatment options and outcomes for other cancers, we do not yet have a sufficient understanding of the molecular drivers of prostate tumour development to deliver such advances for this cancer. The Tasmanian Prostate Cancer Research Program aims to address this gap. Our team has developed a unique bioresource comprising a large familial and sporadic clinical annotated dataset. This project will apply 'omics' approaches to generate molecular profiles of germ-line and tumour samples to identify putative molecular biomarkers of disease which will then be interrogated using in vitro and xenograft zebrafish models, and validated in clinical datasets. Gaining a better understanding of the molecular basis of prostate cancer and the drivers of tumour development, will reveal the molecular markers needed to deliver precision medicine based diagnosis, prognosis and treatment options for men.	Candidate should have laboratory-based skills in molecular biology.
GAC	Bennett McCommish Bennet.Mccomish@utas.edu.au	Untangling the role of natural selection in shaping geographical patterns of multiple sclerosis prevalence	Multiple sclerosis prevalence shows a heterogeneous geographical pattern, with higher prevalence in populations of European ancestry, increasing with distance from the equator within those populations. This pattern has likely been shaped in part by natural selection. Identifying genes that have undergone selection at MS risk loci will improve our understanding of the causative mechanisms behind the disease. This project will use population genomics to identify functional variation under natural selection at loci associated with MS risk. You will use cutting-edge bioinformatic methods to carry out genome-wide scans for natural selection in population genomic data, and localise MS-related selection by targeting loci known to be associated with MS risk. You will also use a landscape genomics approach to examine the evolutionary causes of the strong latitude gradient in MS prevalence that is observed in some populations. You will use haplotype analysis to test whether specific haplotypes at loci under selection are associated with MS, providing a more detailed picture of the genetic architecture that contributes to risk than we can generate considering only individual variants. This project will also include a laboratory component to validate findings by targeted sequencing in a cohort of MS patients and controls.	
PHPCHS	Professor Ingrid van der Mei Ingrid.vandermei@utas.edu.au	MS WorkSmart	MS WorkSmart is an online program that aims to assist people with MS to maximise their work productivity and remain in the workforce. This online program will be tested in a randomised controlled trial. However, to see whether it is feasible to run such trial, we will first conduct a pilot study, including around 40 people. As a student, you will be able to obtain practical experience with running such a study and analyse the data obtained from the study. You will assess who is likely to participate in this type of program and whether the program results in e.g. improvements in work productivity, a reduction in intention to quit, or a reduction in symptoms.	

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GAC	Dr Guei-Sheung Liu Gueisheung.liu@utas.edu.au	Using eye drop-based, switchable gene therapy as a non-invasive controlled intervention in neovascular blindness	Vision loss from neovascular eye diseases is a global health concern that significantly impacts on the quality of life of patients and is a major burden on the healthcare system. Advancements in anti-VEGF therapies have revolutionised the treatment of neovascular eye diseases by preserving and even restoring vision in patients, but significant improvements in long-term efficiency with a less invasive procedure are still needed for better clinical outcomes. This research will directly address this need by using a long-lasting anti-VEGF gene therapy with an eye drop-based switch mechanism to tailor the level of therapeutic anti- VEGF protein in the back of the eye. By appropriately timing bursts of anti-VEGF gene therapy in patients whose disease course fluctuates over time, this approach will reduce the risks associated with continuous inhibition of VEGF in long-term treatment. This project will fundamentally change the long-term management of neovascular eye disease by doing away with frequent intraocular injections by a retinal specialist. The candidate can expect to gain skills in genetic engineering, viral vector technology and nanotechnology. In collaborations with laboratories in University of Melbourne and Monash University, the candidate will undertake a series of investigations across in vitro cell culture and in vivo animal models of ocular neovascularization for validating the novel eye-drug tunable anti-VEGF gene therapy.	Experience in basic molecular biology or genetic research. Able to conduct animal study, in particular working with rodent/s (mouse and rat)
PHPCHS	A/ Prof Verity Cleland Verity.Cleland@utas.edu.au	Developing benchmarks and a smart online tool for assessing walkability in regional and rural communities: Supporting rural Australians to live healthy, active lives	Regular physical activity plays an important role in maintaining good health and preventing many conditions like heart disease, type 2 diabetes and high blood pressure. Physical activity is lower, and rates of these conditions tend to be higher, in rural than urban Australia. The built and natural environments in which we live, work and play can influence how active we are, yet research into environmental influences on physical activity is mostly from urban settings. This research suggests more 'walkable' environments support physical activity, but currently there are few user-friendly tools to measure walkability in rural communities. It is also unclear what 'level' of walkability is important in rural areas, as no benchmarks exist. The project will develop walkability benchmarks for rural communities, and will co-design with community members, practitioners and policy makers a practical and scalable tool. This tool will enable rural communities to identify and prioritise aspects of the local built environment that impact on walkability and physical activity. Using Citizen Science and co-design approaches the research team will work closely with local leaders and residents in rural Tasmanian communities during data collection, analysis and interpretation to identify potential areas for change in the community.	
CHD	A/Prof Seana Gall Seana.Gall@utas.edu.au	Heart Health in Women: Role of Physical Activity to Prevent Cardiovascular Disease	Gender plays a major role in modulating the development of cardiovascular disease. Yet, women are underrepresented in clinical trials that aim to prevent heart disease, and outcomes are rarely specified in sex-specific terms. Physical activity levels play a key role in preventing the development of many chronic diseases like diabetes, cancer and cardiovascular disease. In a broader context, physical activity levels in women could produce different long-term CVD outcomes to men. Our group has extensively studied female athletes and physiological remodelling in response to lifetime exercise training. Extending work into physical activity rates and physiological response in a population-based cohort would enable our work to extend beyond physiological mechanism, to a translatable population-based approach. Our research has two separate aims: • Gender-specific risk factors (e.g disorders of pregnancy, high parity) accelerate CVD development in women. We aim to determine how physical activity acts as a modifier for CVD events after a pregnancy-based event. • Vigorous exercise produces a pronounced central and peripheral physiological adaptations. Female gender may have a protective effect during vigorous exercise. Using the UK Biobank, we will identify rates of women who performed sustained vigorous exercise and determine CVD based events.	
CHD	A/Prof Seana Gall Seana.Gall@utas.edu.au	Examination of health inequalities related to the continuum of care and their impacts on patient outcomes after stroke for Tasmania	"Stroke is a leading cause of death and disability in Australia. Tasmania has the second-highest incidence and mortality rates of stroke. One of the greatest opportunities to reduce preventable death and disability from stroke is to ensure access to treatment as recommended in clinical guidelines. However, treatment and care in Tasmania lag far behind the rest of Australia. There are likely to be modifiable drivers, at the individual and health system level, that contribute to the variations in care and patient outcomes. The project will overcome the existing limitations by undertaking a systematic investigation of the continuum of stroke care and outcomes after stroke at acute and beyond acute settings. By understanding causes for health inequalities in care and patient outcomes, the research outcomes will help mitigate the differences and address the large burden of stroke. The aims of this project are to examine health inequalities related to the continuum of care and their impacts on patient outcomes up to 1 year after stroke for Tasmania, compared to other states, by: 1) investigating the individual-level factors contributing to variations in care and patient outcomes, 2) identifying hospital-level factors contributing to the quality of care, including in-hospital, rehabilitation and after discharge. "	
GAC	Professor Eric Moses Eric.Moses@utas.edu.au	Multi-Omic Biomarker Classification for Cardiovascular Disease Risk Stratification of Women Following Preeclampsia Using Machine Learning	Cardiovascular disease is the leading cause of death for women, including in Australia. The physiological demands of pregnancy offer an early window to the underlying risk of heart disease in women, as both conditions impact on similar metabolic pathways. Women who suffer from the hypertensive disorder preeclampsia during pregnancy have been shown to have two- to eight-fold increased risk for the subsequent development of CVD 10 to 15 years after giving birth. The project will leverage internationally recognized Australian genomic resources on preeclampsia and cardiovascular disease using next-generation sequencing (whole exome, whole-genome) along with whole transcript, and epigenome-wide DNA methylation array data. Advanced statistical methods will be utilized to identify potential genomic biomarkers associated with preeclampsia and are further associated with the development of heart disease later in life. The candidate can expect to gain skills in machine learning, big omic data, and bioinformatics. This project can be tailored to suit the interests of the students focusing on bioinformatics or advanced statistical analysis or a combination of both.	Applicants must be able to demonstrate strong research and statistical skills. Previous experience with the R statistical package and Linux operating systems.