Research Honours 2020
This booklet contains a list of available research projects in the School of Medicine, the Wicking Centre and the Menzies Institute for Medical Research for 2020
CONTENTS

HONOURS COURSES OVERVIEW .............................................................................................................. 5
COURSE OBJECTIVES .............................................................................................................................. 5
PROJECTS .................................................................................................................................................. 5
SCHOLARSHIPS ......................................................................................................................................... 5
YOUR APPLICATION TO DO HONOURS .................................................................................................. 5
STUDENT EXPECTATIONS ....................................................................................................................... 6
COURSE COORDINATOR .......................................................................................................................... 6
ADDITIONAL CONTACTS .......................................................................................................................... 6

PROJECT OUTLINES .................................................................................................................................. 7

COGNITIVE FUNCTION, SOCIAL RELATIONSHIPS AND CAUSATION: AN EXPLORATION OF DATA FROM THE
TASMANIAN HEALTHY BRAIN PROJECT .................................................................................................. 7
LOOKING FOR A PRE-CLINICAL DEMENTIA BIOMARKER USING MOVEMENT ANALYSIS ..................... 7
ANTIBIOTIC RESISTANCE IN PSEUDOMONAS AERUGINOSA .................................................................. 8
COCHRANE REVIEW: INTIMATE PARTNERS (FATHERS/PARTNERS) VERSUS OTHER HEALTH PROFESSIONALS
AND LAY SUPPORTS FOR EXTENDING THE DURATION OF BREASTFEEDING ........................................... 8
SUSTAINABLE ENVIRONMENTS AND/OR SUSTAINABLE HEALTHCARE .................................................. 8
INVESTIGATING SYNAPTIC DEFICIT IN ALS ............................................................................................... 8
PROTON PUMP INHIBITOR (PPI) USE IN OLDER AGED CARE RESIDENTS WITH DEMENTIA .................... 9
PROFILING THE MOLECULAR BASIS OF RESPONSE TO CANCER TREATMENT ..................................... 9
IDENTIFICATION AND FUNCTIONAL ANALYSIS OF NOVEL GENES FOR INHERITED PAEDIATRIC CATARACT ... 10
ENHANCING NEUROGENESIS TO PROMOTE RECOVERY FOLLOWING TRAUMATIC BRAIN INJURY .......... 10
DOES OBESITY CONTRIBUTE TO WORSE OUTCOMES FOLLOWING TRAUMATIC BRAIN INJURY? .......... 10
AMYLOID PATHOLOGY IN DEMENTIA ....................................................................................................... 11
DRUG DISCOVERY IN OBESITY RESEARCH: ASPERULOSIDE A NEW COMPOUND IMPORTANT FOR WEIGHT
LOSS. ........................................................................................................................................................... 11
OBESITY RESEARCH: CAN OUR MICROBIOME INFLUENCE OUR FEEDING REWARD CIRCUITRY AND
INCLINATION FOR PHYSICAL ACTIVITY? ................................................................................................. 12
PATTERNS, PREDICTORS AND CARDIOVASCULAR HEALTH IMPACTS OF TRANSPORT-RELATED PHYSICAL
ACTIVITY DURING ADULTHOOD ........................................................................................................... 12
HEALTH BY STEALTH: A RANDOMISED CONTROLLED TRIAL PROMOTING PHYSICAL ACTIVITY BY TARGETING
PUBLIC TRANSPORT ................................................................................................................................... 12
GASP: CHANGING THE GAME FOR GIRLS IN ACTION SPORTS .................................................................... 13
THE IMPACT OF THE UNDERSTANDING DEMENTIA MOOC: ATTITUDES TO DEMENTIA ...................... 13
THE IMPACT OF THE UNDERSTANDING DEMENTIA MOOC: CHANGING BEHAVIOURS ......................... 13
DEMENTIA LITERACY RESEARCH ........................................................................................................... 14
INVESTIGATE COMMUNITY AND OUT OF HOSPITAL MANAGEMENT OF ANAPHYLAXIS TO INFORM BEST
PRACTICE GUIDELINES WITHIN A MULTI-DISCIPLINARY HEALTH CARE ENVIRONMENT ...................... 14
BARRIERS AND ENABLERS FOR BRAIN HEALTHY BEHAVIOURS ............................................................. 15
UNRAVELLING THE GENETICS OF PROSTATE CANCER ........................................................................... 15
UNDERSTANDING CELLULAR IMMUNITY TO INFLUENZA IN CHILDREN ................................................. 15
INVESTIGATING THE ROLE OF CHRONIC CMV INFECTION ON IMMUNOSENSIGENCE AND DECLINING RESPONSES TO VACCINATION IN ELDERLY TASMANIANS

PROTEINS ON THE MOVE: MAPPING INTERCELLULAR PROTEIN TRANSFER TO UNDERSTAND IMMUNE EVASION BY CANCER CELLS

USE OF END TIDAL CO₂ (ETCO₂) WAVEFORM CAPNOGRAPHY FOR EVALUATION AND MONITORING IN SPONTANEOUSLY VENTILATING PATIENTS

PARAMEDIC DIAGNOSTIC ACCURACY IN GERIATRIC PATIENTS WITH COMPLEX CO-MORBIDITIES

BUILDING A STATISTICAL MODEL TO PREDICT WHEN IT IS SAFE TO RETURN TO SPORT FOLLOWING INJURY

UNDERSTANDING THE HEALTH IMPACTS OF THE HAZELWOOD COAL MINE FIRE

HEALTHY LANDSCAPES, HEALTHY PEOPLE? UNDERSTANDING THE INTERSECTION OF URBAN GREEN SPACE, THE MICROBIOME, AND HUMAN HEALTH IN HOBART

SEASONAL PATTERNS OF POLLEN AND ALLERGIC RESPIRATORY SYMPTOMS IN THE TROPICS – WHICH POLLENS MATTER IN THE TOP END?

IS IT POLLEN OR IS IT FUNGI? DETERMINING THE CAUSES OF ALLERGIES IN TASMANIA

CHRONIC KIDNEY DISEASE IN TASMANIA

TREATMENT OF VIRAL PNEUMONIA

IMUNE MODULATION BY VIRUS-ENCODED TNF RECEPTOR HOMOLOGS

DEVELOPING A BLOOD TEST TO PREDICT BRAIN-HEALTH OUTCOMES FOLLOWING TRAUMA

DEVELOPING THERAPIES FOR NEURODEGENERATIVE DISEASE AND INJURY

NUTRITION IN AGED CARE

CHARACTERISATION OF OLIGODENDROCYTES DIFFERENTIATION AND MYELIN PRODUCTION IN THE SOX10ICRE MICE

DEVELOPMENT OF A NOVEL MODULAR OPTOGENETIC AND CHEMOCREDOGENETIC NEURONAL ACTIVITY REPORTER

BIOENGINEERING AAV FOR RETINAL GENE EDITING

A GENOME-WIDE SCREEN TO IDENTIFY NOVEL THERAPEUTIC TARGETS FOR EYE CANCER

ANALYSIS OF HOST/TUMOUR INTERPLAY IN DEVIL FACIAL TUMOUR DISEASE (DFTD)

DISCOVERING NEW EPIGENETIC MODIFIERS OF BRAIN CANCER

DISCOVERING THE TARGETS OF NEURAL STEM CELL TRANSCRIPTION FACTORS

INVESTIGATING THE EFFECT OF MODIFYING THE TIMING OFamyloid beta expression IN A FLY MODEL OF ALZHEIMER'S DISEASE

SHORT TANDEM REPEATS IN MULTIPLE SCLEROSIS

POST HOC ANALYSES OF THE ASPREE CLINICAL TRIAL

DEMENTIA CASE-FINDING IN GENERAL PRACTICE WITH AN EMPHASIS ON REVERSIBLE CAUSES OF MEMORY LOSS

PAIN PHENOTYPES AND LONG-TERM HEALTH OUTCOMES IN PATIENTS WITH KNEE OSTEOARTHRITIS

AN EVALUATION OF THE CORRECT USE OF PAEDIATRIC RESTRAINT SYSTEMS FOR CHILDREN TRANSPORTED VIA AMBULANCE

AN EVALUATION OF THE PREPAREDNESS OF AUSTRALIAN AMBULANCE SERVICES AND/OR PARAMEDICS TO MANAGE MASS CASUALTY INCIDENTS

UNDERSTANDING HYPOTHERMIA AND HYPOXIA IN UNSTABLE NEWBORNS BORN IN THE OUT-OF-HOSPITAL SETTING
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNDERSTANDING FAT CELL DEVELOPMENT</td>
<td>27</td>
</tr>
<tr>
<td>DECIPHERING THE LINKS BETWEEN OBESITY AND CANCER</td>
<td>28</td>
</tr>
<tr>
<td>QUALITY ASSESSMENT OF BLOOD PRESSURE MEASUREMENT DEVICES</td>
<td>28</td>
</tr>
<tr>
<td>STUDYING THE BEHAVIOUR OF INDUCED PLURIPOTENT STEM CELL DERIVED OLIGODENDROCYTES FROM PEOPLE WITH MULTIPLE SCLEROSIS</td>
<td>28</td>
</tr>
<tr>
<td>DO PERICYTES REGULATE BLOOD FLOW AND METABOLISM IN HEALTHY AND INSULIN RESISTANT SKELETAL MUSCLES?</td>
<td>29</td>
</tr>
<tr>
<td>DOES RHPON2 THERAPY PROTECT PBMCS FROM THE ADVERSE EFFECTS OF PSEUDOMONAS AERUGINOSA QUORUM SENSING MOLECULES?</td>
<td>29</td>
</tr>
<tr>
<td>INVESTIGATION OF AN EMERGING LUNG PATHOGEN</td>
<td>30</td>
</tr>
<tr>
<td>PHYSICAL ACTIVITY, FITNESS AND BLOOD PRESSURE</td>
<td>30</td>
</tr>
<tr>
<td>ALZHEIMER’S DISEASE- STRESS NEUROBIOLOGY</td>
<td>30</td>
</tr>
<tr>
<td>OPTIMIZING CLINICAL PLACEMENTS IN MEDICAL EDUCATION</td>
<td>31</td>
</tr>
<tr>
<td>THE ROLE OF PERICYTES AND VASCULAR FUNCTION IN HEALTH AND DISEASE</td>
<td>31</td>
</tr>
<tr>
<td>EPIGENETIC SIGNATURES OF CANCER, HEALTHY BRAIN AGING AND ALZHEIMER’S DISEASE</td>
<td>32</td>
</tr>
<tr>
<td>THE ASSOCIATION OF ADIPOSITY WITH COGNITIVE DYSFUNCTION IN PEOPLE AGED IN THEIR 40S</td>
<td>33</td>
</tr>
<tr>
<td>NEUROPEPTIDE REGULATION OF ANIMAL GROWTH AND BODY SIZE</td>
<td>33</td>
</tr>
<tr>
<td>DETERMINING THE ROLE OF NEUROPEPTIDE Y IN MOTOR NEURON DISEASE IN DROSOPHILA MODELS</td>
<td>33</td>
</tr>
<tr>
<td>MECHANISMS OF DUST INDUCED OCCUPATIONAL LUNG DISEASE</td>
<td>34</td>
</tr>
</tbody>
</table>
HONOURS COURSES OVERVIEW

The Honours course provides students with the opportunity to undertake further training in research in biomedical sciences, clinical sciences, health services and population health. This is a one-year long program of advanced study that includes the development of skills in understanding scientific literature in biomedical and health fields, as well as the student’s aptitude in scientific writing and presentation. The critical element of the Honours year across all programs is the focus on students undertaking a major research project, which involves learning research skills, conducting research on a relevant biomedical or health area and completing a thesis detailing and discussing their findings.

The Honours year in the School of Medicine/Menzies Institute for Medical Research/Wicking Centre research program is available to UTAS students who have completed an undergraduate degree in the BSc, BMedRes, BBiotech, BBiotechMedRes (or similar), three years of the MBBS program or a Bachelor of Paramedic Practice. Students from other institutions can also apply to do the program where they have completed similar degrees.

COURSE OBJECTIVES

Students will undertake a supervised research project with an emphasis on advanced disciplinary knowledge, the use of a specialised laboratory, fieldwork and/or statistical techniques relevant to their chosen research area, planning and conducting a scientific investigation and effective communication of research findings. Students will also gain experience in scientific writing and oral presentations. By the completion of the program, students should be able to write a scientific report to a standard acceptable for submission to a peer-reviewed journal and deliverable at a relevant conference or scientific meeting.

PROJECTS

Students can undertake projects, depending on their interest and academic background, in a broad range of areas including:

- Biochemistry
- Physiology
- Anatomy
- Neuroscience
- Genetics
- Microbiology
- Pathological sciences
- Population and public health
- Clinical trials
- Paramedic practice

An outline of available projects that the College of Health and Medicine (CoHaM) is offering in 2020 is contained in this booklet. If you cannot find a suitable project in here or have a desire to undertake a project in a certain area or with a certain researcher, it is worthwhile contacting that researcher to discuss your idea. Often more projects are available but have not been listed.

SCHOLARSHIPS

There are a number of scholarships available to students undertaking research in the College of Health and Medicine (administered by the Scholarships Office). Scholarships are awarded based on academic merit and/or financial need.

Many of these scholarships are made possible by generous donations from Tasmanian businesses and individuals. Scholarships recipients may be encouraged to engage with the donors throughout the period of support, which has proven in the past to be a great way to provide direct support and feedback for both students and donors.

Further information on the availability, eligibility and how to apply is provided at the Scholarships and Bursaries website.

YOUR APPLICATION TO DO HONOURS

To apply to do Honours, students should have completed three years of a relevant undergraduate degree with a credit average, or equivalent. It is a good idea before you apply to do Honours to identify a project that appeals to you and to make contact and discuss the project with the supervisor. Once you have decided to apply, go to: http://www.utas.edu.au/research/degrees/apply-now for information on the application process.
To be successful in your application to study for Honours you will need to satisfy the Honours Coordinator that you have a suitable project that constitutes the workload of an Honours thesis and that it can be accomplished within the time frame. In addition to this, the coordinator will need to be assured that the appropriate supervision is in place. Your application will also be judged on your past academic performance.

All students need to apply online (eApplications) AND complete the Honours Expression of Interest (EOI) application form that will be made available in MyLo.

For MBBS students EOs are requested by 10th Sept 2019, due to forward planning considerations. MBBS students should enrol in the Bachelor of Medical Science with Honours (M4N).

Paramedic students should enrol in the Bachelor of Paramedic Practice with Honours (M4P).

Undergraduate science students should enrol in the Bachelor of Medical Research with Honours (M4G), Bachelor of Biotechnology and Medical Research (K4L) or the Bachelor of Science with Honours (S4E), as appropriate.

STUDENT EXPECTATIONS

The course extends from late February (semester 1 commencement) to late October or mid-July (semester 2 commencement) to April the following year.

Attendance requirements will be dictated by the nature of the research, for example, whether the project is being undertaken within a hospital or within a laboratory. Attendance requirements are to be agreed upon between the student and supervisor. There is an expectation, despite the nature of the project, that the minimum time required to successfully complete the Honours year is a minimum of 40 hours per week, equivalent to a standard full-time working week.

The University and the CoHaM acknowledges that students are involved in extra-curricular activities and is generally supportive of student’s activities. The College must be confident that these activities do not significantly impact on the student’s ability to complete the requirements of the Honours year.

For additional information regarding Honours contact Dr Louise Roddam, the Course Coordinator.

Projects listed in this book are available currently (as of August 2019). If you are interested in an area of research carried out by a Division of Medicine, Menzies or Wicking researcher that does not appear in this document, it may be worthwhile approaching them directly to see if they are considering supervising Honours projects in 2020.

COURSE COORDINATOR

Dr Louise Roddam: Louise.Roddam@utas.edu.au
Telephone: (03) 6226 4889

ADDITIONAL CONTACTS

Dr Kathryn Ogden: Kathryn.Ogden@utas.edu.au
(Launceston) Telephone: (03) 6324 5043

Dr Peter Lucas: P.V.Lucas@utas.edu.au
(Paramedic Practice) Telephone: (03) 6226 6952

Dr Nick Cooling: Nick.Cooling@utas.edu.au
(MBBS and International) Telephone: (03) 6226 4663

Dr Anna King: A.E.King@utas.edu.au
(Wicking, lab-based) Telephone: (03) 6226 4817

Dr Andy Flies: Andy.Flies@utas.edu.au
(Menzies Institute for Medical Research) Telephone: (03) 6226 4614
PROJECT OUTLINES

COGNITIVE FUNCTION, SOCIAL RELATIONSHIPS AND CAUSATION: AN EXPLORATION OF DATA FROM THE TASMANIAN HEALTHY BRAIN PROJECT

Supervisors: Dr Jane Alty and Ms Katherine Lawler

Project Description: The opportunity to prevent or delay the onset of dementia is of great significance given the increasing prevalence of dementia worldwide. Social isolation has been identified as a potentially modifiable dementia risk factor, based largely on data from a systematic review and meta-analysis of longitudinal cohort studies with a search conducted in 2012. However, despite attempts to control for reverse causation, the question remains as to whether increasing social isolation increases dementia risk or whether people begin to withdraw socially as cognitive function declines.

Data will be drawn from the Tasmanian Health Brain Project (THBP). The THBP is a prospective longitudinal study with over 450 participants, investigating the effects of university-level education in later life. One of the THBP aims is to determine whether university education in later life and the subsequent increase in socialisation is a factor in reducing age-related cognitive decline. This honours project will seek to identify the association between cognitive function, which may be impacted by the education intervention, and factors related to social relationships. Outcomes may help plan future dementia risk reduction programs.


Key Techniques: Statistical analysis of a large data set, including examining association between variables. Results may also be compared and combined with previous meta-analyses.

Location: Wicking Dementia Research and Education Centre, Medical Science Precinct, Hobart.

Contact: Jane Alty: jane.alty@utas.edu.au or +61 (0)4 7373 2562
          Katherine Lawler: katherine.lawler@utas.edu.au or +61 3 6226 4881

LOOKING FOR A PRE-CLINICAL DEMENTIA BIOMARKER USING MOVEMENT ANALYSIS

Supervisors: Dr Jane Alty, Ms Katherine Lawler, Dr Michele Callisaya

Project Description: Dementia is the greatest health challenge of the 21st century. The pathological brain changes of dementia begin decades before people develop memory problems and other cognitive symptoms. There is an urgent need to find clinical methods for identifying people at this early 'silent/non-cognitive' stage of dementia as drug trials comprising people with less brain pathology are more likely to result in new effective treatments. There is emerging evidence that physical movements subtly change many years before the cognitive symptoms of dementia occur, and therefore detailed movement analysis may potentially detect people with dementia at a much earlier stage. This study will involve using accurate non-invasive movement sensors to measure changes in walking patterns and hand movements in healthy older adults who are part of the Tasmanian Healthy Brain Project (THBP); this prospective longitudinal study of more than 450 participants comprises 8 years of detailed cognitive, genetic and clinical measures. This multi-disciplinary honours project, co-supervised by a neurologist and physiotherapists, will seek to identify the association between movement and cognitive function. The results will lead to journal publications and there is the potential for further longitudinal assessments.

Key Techniques: Detailed analyses of human movements and cognition. Statistical analysis of a data set, including examining associations between variables. Writing of journal papers and conference presentations.

Location: Wicking Dementia Research and Education Centre, Medical Science Precinct, Hobart.

Contact: Jane Alty: jane.alty@utas.edu.au or +61 (0)4 7373 2562
          Katherine Lawler: katherine.lawler@utas.edu.au or +61 3 6226 4881
          Michele Callisaya: michele.callisaya@utas.edu.au
ANTIBIOTIC RESISTANCE IN PSEUDOMONAS AERUGINOSA

Supervisor: Mark Ambrose, PhD

Project Description: Pseudomonas aeruginosa causes severe infections in people with cystic fibrosis and weakened immune systems. Eradication of this organism using currently available antipseudomonal drugs is complicated, however, by its ability to accumulate mutations that confer resistance during the antibiotic treatment. Furthermore, the mechanism(s) responsible for generating and fixing antibiotic resistance mutations in this organism are poorly understood, thereby limiting the design of more effective targeted therapies. In this context, work in this laboratory demonstrated that stationary phase cells of P. aeruginosa undergoing selection accumulated antibiotic resistance mutations via a SOS-type mutation generation pathway whose expression was dependent upon the metabolic state of the bacterial cells themselves, and importantly subject to glucose-repression. The Honours project will explore further the regulation of antibiotic resistance mutations in P. aeruginosa using specific gene-knockout strains and a metabolomic approach.

Key Techniques: Mutation detection assays, gene expression analysis (qRT-PCR), metabolomics.

Location: School of Medicine, Hobart (City) Campus  Contact: Mark.Ambrose@utas.edu.au

COCHRANE REVIEW: INTIMATE PARTNERS (FATHERS/PARTNERS) VERSUS OTHER HEALTH PROFESSIONALS AND LAY SUPPORTS FOR EXTENDING THE DURATION OF BREASTFEEDING

Supervisors: Dr Jennifer Ayton, Dr Sue Pearson

Project Description: The primary aim of this review is to determine the effectiveness (positive or negative) of intimate partners (fathers/partners) as the primary supports for the breastfeeding mothers compared to other professional and lay supports.

Key Techniques: Meta-analysis and systematic review.

Location: Hobart  Contact: Dr Jennifer Ayton: jennifer.ayton@utas.edu.au, School of Medicine/Public Health

SUSTAINABLE ENVIRONMENTS AND/OR SUSTAINABLE HEALTHCARE

Supervisor: Dr Silvana Bettiol

Project Description: Project proposals developed around the theme - sustainable environments and/or sustainable healthcare. For example:

- Develop sustainability criteria or sustainability guidance for health practices and services.
- Explore current sustainable toolkits available to health professionals and practice

Key Techniques: Multimethod research design; systematic reviews.

Location: Hobart  Contact: Dr Silvana Bettiol  Phone: 6226 4826

INVESTIGATING SYNAPTIC DEFICIT IN ALS

Supervisors: Dr Catherine Blizzard and Professor Tracey Dickson

Project Description: Amyotrophic lateral sclerosis (ALS) is an invariably fatal neurodegenerative disease that involves rapid loss of motor neurons in the brain and spinal cord, paralysis and death within 3-5 years from diagnosis. There are currently no cures or effective treatments.

Recent clinical evidence has shown that altered excitability is the earliest detectable change in the motor cortex of patients with ALS. We believe that changes in synaptic plasticity may be an underlying cause to this altered excitability.

We have identified that dendritic spine (the site of the excitatory synapse) density and turnover is severely altered
in mouse models of ALS. Our evidence suggests that the AMPA receptor subunit GluR1 at the dendritic spine might play an important role in this pathology. The localisation of GluR1 at the spine is essential for the plasticity of the synapse. AMPA receptors modulate calcium influx at the dendritic spine in response to external stimuli, and their alteration at the dendritic spine may underlie the perturbed excitability observed in ALS. This honours project will identify role that the AMPA receptors play in the onset and progression of ALS, contributing to our understanding of the disease and potentially identifying new therapeutic targets to tackle this devastating disease.

Key Techniques: Working with mouse models of disease, immunohistochemistry, 2-photon microscopy.
Location: Medical Science Precinct Contact: Catherine.Blizzard@utas.edu.au

PROTON PUMP INHIBITOR (PPI) USE IN OLDER AGED CARE RESIDENTS WITH DEMENTIA

Supervisors: Dr Juanita Breen, Associate Professor Lyn Goldberg

Background Information: Proton pump inhibitors (PPIs) are prescribed in older residents of aged care homes at high rates and for extended durations.

“Observational studies have suggested that 40% to 60% of PPI prescriptions for older people may be inappropriate. PPIs are generally safe and well tolerated, with adverse events occurring at a rate of 1–3%, and serious adverse events are uncommon. However, potential adverse events include community acquired pneumonia, Clostridium difficile-associated disease, hip fracture, and vitamin and mineral deficiencies. A potential association between PPI use and electrolyte imbalance, particularly that of magnesium, has been described in the literature.¹

Recent observational studies have suggested that PPI use may also be associated with dementia. It has been demonstrated that PPIs increase deposition of amyloid protein in mouse brains, a known contributor to Alzheimer’s disease in humans. PPIs have also been identified as a potential factor in the development of vitamin B12 deficiency, a factor that may also contribute towards the development of dementia. The findings of case studies and small observational studies have suggested a link between PPI use and acute cognitive impairment (CI).”²,³

Given the proposed association of PPI use and dementia/CI possible areas for enquiry are
- How often are PPIs used in people with dementia or CI residing in aged care homes?
- Is the rate of use higher in people with dementia than in people without dementia?
- What do current guidelines advise about PPI use in people with dementia?
- How can de-prescribing of these agents be promoted – what techniques can be used to encourage de-prescribing? What are the barriers encountered?

Some references to examine:

Setting: A sample of aged care homes Contact: Dr Juanita Breen at Juanita.Breen@utas.edu.au

PROFILING THE MOLECULAR BASIS OF RESPONSE TO CANCER TREATMENT

Supervisor: Dr Kate Brettingham-Moore

Project Description: Many cancer therapies operate by inducing DNA damage to kill cancer cells however in cases of treatment resistance cells repair damage to survive treatment. Therefore, there is a distinct need to identify potential predictive markers for treatment response to help improve patient outcomes. To elucidate mechanisms of treatment resistance and identify cellular markers with functional significance, this project will profile prostate cancer cell lines with varied response to DNA damage. It will investigate the short and longer term impact of DNA damage to potentially identify molecular drivers responsible for treatment resistance.

Key Techniques: Cell culture, immunofluorescence staining, transcriptional and epigenetic profiling.
Location: Medical Science Precinct, Hobart Contact: kate.brettinghammoore@utas.edu.au
IDENTIFICATION AND FUNCTIONAL ANALYSIS OF NOVEL GENES FOR INHERITED PAEDIATRIC CATARACT

Supervisor: Professor Kathryn Burdon

Project Description: Paediatric cataract is an opacity of the lens of the eye in children. Cataracts in children are not as easily treated as they are in adults and can lead to lifelong visual impairment or blindness. In many cases, the disease is inherited as a monogenic disorder. Our research aims to find the genetic variants that cause paediatric cataract. We have used whole exome and whole genome sequencing in families with the disease and identified variants in several genes that are likely to be involved in cataract development. These genes require functional evaluation to prove a role for the gene in lens biology.

In this project, we will use CRISPR/Cas9 gene editing to knockout a candidate gene called PRX in zebrafish embryos. The gene-edited fish will then be assessed for cataract formation and compared to wildtype fish.

Alternatively, for a student more interested in genomics and bioinformatics, the project could focus on the analysis of whole-genome sequencing data in our human cataract families to identify genes and mutations that are likely to cause the disease, validating these variants in the lab and screening the gene in other cataract patients.

Identifying the genes involved will improve genetic testing and genetic counselling for this disease.

Key Techniques: CRISPR/Cas9 gene editing, zebrafish embryo microinjection, DNA extraction and sequencing, microscopy, statistics, bioinformatics.

Location: Medical Science Precinct (Menzies)  Contact: Kathryn.Burdon@utas.edu.au

ENHANCING NEUROGENESIS TO PROMOTE RECOVERY FOLLOWING TRAUMATIC BRAIN INJURY

Supervisor: Nicole Bye

Project Description: Traumatic brain injury (TBI) is a devastating condition that constitutes a major health and socio-economic burden world-wide. Many neuroprotective strategies have been employed to improve outcome, with little success.

Recent research has shown that limited regenerative responses can take place in the adult brain after trauma. One potentially important regenerative process is neurogenesis: the production of new neurons from neural stem/progenitor cells that reside in specific brain regions. While neurogenesis is stimulated after TBI, most of the new neurons die shortly after generation, presumably due to the pathological environment in which they were formed.

The brain’s inflammatory response following injury is likely responsible for both stimulating neurogenesis and ultimately killing the new cells. Neuroinflammation involves activation of CNS microglia and astrocytes and infiltration of immune cells, with subsequent expression of numerous cytokines and growth factors. With this project, we will identify cellular and molecular components of neuroinflammation that are responsible for mediating neurogenesis, though treating mice subjected to TBI with anti-inflammatory compounds targeting specific glial populations, or with selected growth factors to augment beneficial inflammatory factors. These studies will also identify whether manipulating inflammation to enhance neurogenesis can promote recovery following TBI.

Key Techniques: immunofluorescence, microscopy, image analysis.

Location: Medical Science Precinct  Contact: nicole.bye@utas.edu.au

DOES OBESITY CONTRIBUTE TO WORSE OUTCOMES FOLLOWING TRAUMATIC BRAIN INJURY?

Supervisors: Nicole Bye, Sharn Perry, Vanni Caruso

Project Description: Traumatic brain injury (TBI) causes immediate tissue damage, but also ongoing neurodegeneration that persists for months and contributes to motor and cognitive dysfunction. There are many pathological processes driving this continuing cell death, with neuroinflammation and impaired sensitivity to the neuroprotective actions of insulin playing dominant roles. Interestingly, obesity causes low-grade neuroinflammation and insulin resistance within the brain, which has led us to propose that these injury

10
mechanisms may be exacerbated following TBI in obese versus normal-weight patients, contributing to greater neurodegeneration and worse outcomes. In this project, we will begin to test this hypothesis by comparing pathological and functional outcomes between obese and normal-weight mice subjected to TBI.

To do this, we will initially need to identify and establish motor, behavioural and cognitive tasks that can be performed equally well by uninjured obese and normal-weight mice. Next, we will confirm that mice have an impaired ability to perform these tasks after being subjected to TBI using a controlled cortical impact model of unilateral focal brain injury. We will then test our hypothesis by using these tasks to compare functional outcome between normal-weight and obese mice across a two-week time course following TBI. The extent of inflammation and neurodegeneration in the brains of these mice will then be assessed using immunohistochemistry.

**Key Techniques:** Mouse motor, behavioural and cognitive testing; brain tissue slicing; immunofluorescence, microscopy and image analysis.

**Location:** Medical Science Precinct  
**Contact:** nicole.bye@utas.edu.au

**AMYLOID PATHOLOGY IN DEMENTIA**

**Supervisors:** Alison Canty, Anna King

**Project Description:** Dementia, more specifically Alzheimer’s disease, is one of the leading causes of death in Australia. Characterized by progressive cognitive decline, the pathological hallmarks of Alzheimer’s disease include deposition of amyloid plaques in the brain, neurofibrillary tangles and synaptic loss. To understand the mechanisms of the disease process, a range of animal models have been established to model different components of the disease process. We have recently established a tissue bank of brains from the APP/PS1 mice, a well known mouse model of amyloidosis. Plaques are first detected from about 4 months of age in the mouse and build up over time across the brain. This project will explore the time course of plaque deposition over time, through different regions/functional areas of the brain, and correlate this with other markers of interest in the brain over time, such as changes in neuronal elements including axons and synapses or other cell types such as microglia. There is some flexibility in this project to follow up any specific areas of interest.

**Key Techniques:** Immunohistochemistry, epifluorescence and confocal microscopy, imaging, image analysis.

**Location:** Medical Science Precinct (Hobart)  
**Contact:** Alison.Canty@utas.edu.au

**DRUG DISCOVERY IN OBESITY RESEARCH: ASPERULOSIDE A NEW COMPOUND IMPORTANT FOR WEIGHT LOSS.**

**Supervisors:** Vanni Caruso, Cameron Randall, Mohammed Salahudeen, Muhammed Ishaq

**Background:** The real challenge for the cure of obesity is the sustainability of weight loss, and recent improvements in the understanding of peptidergic signalling of hunger and satiety have opened up new strategies for pharmacological interventions. Drug discovery and simulations models can aid in the understanding of the complex interactions between brain circuitry, feeding behaviour and weight loss.

**Methods:** We have exclusive access to a unique metabolite extracted from Eucommia leaves (*Eucommia ulmoides*, Oliver) named asperuloside (ASP). Our *in vivo* study (mouse) has shown very promising anti-obesity properties supporting preliminary results (Fujicawa et al). Our new investigations indicate also changes in the dopaminergic and melanocortinergic circuitry suggesting a key role of ASP in the reward mechanisms of food intake. Further studies are now needed to elucidate the safety and mechanism of action of the compound under chronic administration for the effective and safe treatment of obesity.

**Aims:** For these reasons, this project aims to investigate brain changes occurring in feeding reward circuitry following drug administration, and to bridge the gaps between research and clinical practice.

**Key Techniques:** Gene expression studies (RTqPCR), Immunohistochemistry, evidence-based approach and pharmacoepidemiology.

**Location:** Hobart, Medical Science Precinct  
**Contact:** Vanni Caruso, vanni.caruso@utas.edu.au
OBESITY RESEARCH: CAN OUR MICROBIOME INFLUENCE OUR FEEDING REWARD CIRCUITRY AND INCLINATION FOR PHYSICAL ACTIVITY?

Supervisors: Vanni Caruso, Cecilia Kitic, Muhammed Ishaq

Background: Changes in gut microbiota are increasingly associated with obesity and feeding behaviour disorders. Recent evidence suggests that obesity-associated microbiota contribute to dysregulation of food reward signalling and control of appetite. It is known that several neurotransmitters regulating food intake in the hypothalamus also modulate the activity of dopaminergic neurons involved in feeding reward processes. Ingestion of palatable food has been shown to release dopamine in the striatum proportionally to the levels of pleasure derived from eating the food. In addition, changes in dopaminergic signalling in the striatum of obese individuals have been correlated with reduced physical activity and impaired microbiota. This project will contribute to understand the interactions between exercise, our gut microbiome and the brain changes that may occur during development of obesity.

Aim: Given that changes in the microbiome may exert beneficial effects on our neurobiology and physical exercise, we aim to target the effect of microbiome for new anti-obesity therapies.

Methods: To explore the effects of microbiome on physical activity and feeding behaviour, we will use a mouse model of voluntary exercise. We will perform faecal transplant from high volume voluntary exercising mice to lower exercise mice to investigate whether microbiome influences the activity of neurotransmitters involved in feeding behaviour and physical activity.

Key Techniques: Gene expression (RTqPCR), Immunohistochemistry, enzyme-linked immunosorbent assay (ELISA).

Location: Hobart, Medical Science Precinct  Contact: Vanni Caruso, vanni.caruso@utas.edu.au

PATTERNS, PREDICTORS AND CARDIOVASCULAR HEALTH IMPACTS OF TRANSPORT-RELATED PHYSICAL ACTIVITY DURING ADULTHOOD

Supervisors: Verity Cleland (plus others, depending on the topic chosen)

Project Description: Despite well-established benefits and decades of individually-targeted programs and campaigns to increase physical activity (PA), less than half of the Australian adult population are active at recommended levels, with little change in prevalence over time. Efforts to increase PA through the promotion of leisure activities appear to have had limited impact, suggesting a need to target other domains of PA, such as transport-related PA. A focus on healthy travel behaviours – walking, cycling, public transport – provides an under-explored opportunity to increase PA. Using existing data from a 30-year longitudinal cohort study, there are opportunities for up to two Honours students to work on projects that aim to: 1) establish cardiovascular health impacts of transport-related PA; 2) identify patterns and predictors of transport-related PA.

Key Techniques: Students with an interest in public/population health, epidemiology, health behaviour/promotion, psychology, education or sports science are encouraged to apply. You will learn how to use the Stata statistical software package, gain an understanding of introductory-level biostatistics, and get the opportunity to work with data from an internationally unique study.

Location: Medical Science Precinct  Contact: verity.cleland@utas.edu.au

HEALTH BY STEALTH: A RANDOMISED CONTROLLED TRIAL PROMOTING PHYSICAL ACTIVITY BY TARGETING PUBLIC TRANSPORT

Supervisors: Verity Cleland (plus others depending on the topic chosen)

Project Description: Evidence from randomised controlled trials (RCTs) examining the effectiveness of strategies that aim to increase physical activity (PA) by targeting public and active transport use is relatively limited. Findings have been mixed at best, and very little cost-effectiveness information is available. Further, in a worldwide review of PA intervention scale-up (i.e. integration of research findings into practice/policy), no examples relating to transport systems were found, considered one of the best investments for encouraging PA. Using preliminary data from a randomized controlled trial that uses an incentives-based strategy to increase public transport and physical activity use, there are opportunities for up to two Honours students to work on projects that involve: 1) a process
evaluation to understand and improve trial implementation, 2) an economic evaluation to understand the costs and benefits of the trial, 3) preliminary analyses relating to the impact of the trial intervention on behaviour and health outcomes.

**Key Techniques:** Students with an interest in public/population health, epidemiology, health behaviour/promotion, psychology, education, transport, planning, geography or sports science are encouraged to apply. You will learn how to use the Stata statistical software package, gain an understanding of introductory-level biostatistics, and be exposed to a competitively-funded research project.

**Location:** Medical Science Precinct  
**Contact:** verity.cleland@utas.edu.au

---

**GASP: CHANGING THE GAME FOR GIRLS IN ACTION SPORTS**

**Supervisors:** Verity Cleland, Meredith Nash

**Project Description:** Compared with boys, girl’s physical activity (PA) declines more with age. One factor potentially contributing to these declines are feelings of breaching gender boundaries when playing ‘masculine’ sports. The traditionally masculine ‘action’ sports mountain-biking, surfing and skateboarding are three such sports that are exploding in popularity. In 2020, surfing and skateboarding will join mountain-biking by becoming Olympic sports. Yet these sports remain male domains, as both risk and sport are associated with masculinity. Subsequently, women and girls are under-represented in these activities at all levels, women rarely win the same prize money as men and are highly sexualised in media reporting. Understanding the factors that enable women to participate in these action sports may provide insights into what works to attract and retain women, because the barriers to participation may be even greater than in other traditional female-dominated sports. There is an opportunity for an Honours student to conduct a project that aims to identify the enablers and barriers to girls’ participation in three emerging action sports through: 1) a desktop review of participation rates and equity-related policies in these three sports; and/or 2) in-depth interviews and/or focus groups with girls, boys, parents, officials, board/committee representatives, and other key stakeholders.

**Key Techniques:** Students with an interest in public/population health, sports science/management, sociology, gender studies, health behaviour/promotion or psychology are encouraged to apply. You will learn how to collect, manage and analyse qualitative research data and use the NVivo qualitative data analyses software package.

**Location:** Medical Science Precinct  
**Contact:** verity.cleland@utas.edu.au

---

**THE IMPACT OF THE UNDERSTANDING DEMENTIA MOOC: ATTITUDES TO DEMENTIA**

**Supervisor:** Dr Kathleen Doherty (Kathleen.Doherty@utas.edu.au)

Improving understanding and awareness of dementia is central to reducing stigma and improving care for people living with dementia. We wish to determine the attitudes towards dementia of people who undertake the Understanding Dementia MOOC and examine whether this is related to knowledge of dementia, experience or demographic characteristics. Further, we wish to determine if participating in the UDMOOC changes attitudes of participants toward dementia. This mixed methods project will include selection of appropriate survey instruments, survey of MOOC participants and statistical and thematic analysis of responses. This work will help elucidate ways to change attitudes to dementia in order that stigma can be reduced.

---

**THE IMPACT OF THE UNDERSTANDING DEMENTIA MOOC: CHANGING BEHAVIOURS**

**Supervisor:** Dr Kathleen Doherty Kathleen.Doherty@utas.edu.au

The impact of an educational intervention can be measured at multiple levels, ultimately for the Understanding Dementia Massive Open Online Course, the most important impact relates to improving the lives of people living with dementia. Participants in the UDMOOC often report that they implement changes in their behaviour when working or caring for people with dementia as a result of completing the course. This project will explore these behaviour changes and compare and contrast the types of changes implemented by those who work with people with dementia compared to those who are family carers. This project will use large datasets of participant response data, structural topic modelling and thematic analysis and framework analysis to explore these issues.
DEMENTIA LITERACY RESEARCH

Supervisors: Dr Kathleen Doherty Kathleen.Doherty@utas.edu.au and Professor Fran McInerney Fran.Mcinerney@utas.edu.au

Health literacy has been defined as “the skills, knowledge, motivation and capacity of a person to access, understand, appraise and apply information to make effective decisions about health and health care and take appropriate action” (Australian Commission on Safety and Quality in Health Care, 2014). Dementia literacy is a relatively new term and its definition might specifically include the ability to recognise and understand the causes of dementia, sources and utility of information about dementia, knowledge of and access to professional help, and the capacity to take appropriate decisions and actions. The health literacy environment can be seen as “the infrastructure, policies, processes, materials, people and relationships that make up the health system and have an impact on the way that people access, understand, appraise and apply health-related information and services” (ACSQHC, 2014).

Important research questions include:

• With respect to dementia literacy: how do current understandings of health literacy resonate in Dementia?
• Do experts and consumers think differently about what dementia literacy means?
• What are the infrastructure, policies, processes, materials, people and relationships that should inform dementia literacy models? Does this differ from other models of health literacy? What are the barriers to consumer access to these?

INVESTIGATE COMMUNITY AND OUT OF HOSPITAL MANAGEMENT OF ANAPHYLAXIS TO INFORM BEST PRACTICE GUIDELINES WITHIN A MULTI-DISCIPLINARY HEALTH CARE ENVIRONMENT

Supervisors: Dale Edwards dale.edwards@utas.edu.au and Melanie Blackhall

Research Project Synopsis: Currently the first line of community-based anaphylaxis treatment is the use of an adrenalin auto-injector device to deliver a lifesaving dose of adrenalin. Current ASCIA best practice guidelines suggest the treatment with adrenalin is the first priority and delaying or withholding adrenalin can result in deterioration and death. The purpose of the project is to investigate management of anaphylaxis in the community and ultimately to provide evidence to support current or future guidelines and clinical practice.

This project will explore the incidence of anaphylaxis presentation to ambulance services, and hospital services within Tasmania, the management provided and the health outcomes resulting from these presentations. This will allow the research team to determine the frequency and appropriateness of Adrenalin auto injecting device – in general population.

There are a number of potential opportunities for research within this project including, but not limited to:

• Conduct of a retrospective review of presentations to ambulance services, exploring presentation frequency, management and outcomes;
• Conduct of a retrospective review of presentations to hospital emergency departments, exploring referral pathways, presentation frequency, management and outcomes (including hospital length of stay);
• Review of practice guidelines and protocols for the management of community based anaphylaxis presentations.

By identifying best practice, pre-clinical and clinical teaching practice will be informed across MBBS and paramedic practice degrees. The project will also inform patient education within clinical environment plus preventative health care and clinical protocols.

Student Opportunities: Students will have the opportunity to undertake one of the above suggested studies, or another variant of study within the field of the Allergy and Anaphylaxis Research Group (AARG). AARG is continually developing new projects and submitting funding grants for further research projects, therefore there are a broad range of opportunities for study.

Students should visit the AARG research group page at http://www.utas.edu.au/health/research/groups/allergy-and-anaphylaxis-research-group for further information.
BARRIERS AND ENABLERS FOR BRAIN HEALTHY BEHAVIOURS

Supervisors: Dr Maree Farrow and Dr Shannon Klekociuk

Project Description: It is estimated that addressing modifiable risk factors for dementia could reduce the number of people affected by millions worldwide. The Wicking Dementia Research and Education Centre has developed the Preventing Dementia Massive Open Online Course (MOOC) to educate the community on the latest evidence about dementia risk, and is conducting research to understand community attitudes, motivations and needs. The Centre also has a longitudinal project (Tasmanian Healthy Brain Project) investigating the potential benefits of education in later life. Opportunities exist to join the dementia prevention research program and interested individuals are invited to contact Dr Maree Farrow, maree.farrow@utas.edu.au

Participants of the Preventing Dementia MOOC learn about the risk factors for dementia and the potential for dementia risk reduction. This project will examine how they intend to apply their new knowledge in their own lives, whether they think it is worth the effort, and what they perceive to be the challenges associated with health behaviour change for themselves and the community as a whole.

Location: Medical Science Precinct Hobart – Wicking Dementia Centre

Contact: Dr Maree Farrow

UNRAVELLING THE GENETICS OF PROSTATE CANCER

Supervisors: Dr Liesel FitzGerald and Professor Joanne Dickinson

Project Description: Family history is one of the few consistently identified risk factors for prostate cancer (PrCa). The risk for men with an affected first-degree relative is 2-3 fold higher than those without, and increases up to 18 fold as the number of first-degree affected relatives increases. More than 160 common genetic risk variants have been identified through genome-wide association studies but these variants still only explain a minority of inherited risk and are largely of low to moderate effect size. There is now strong evidence to suggest rare variation is an important causal factor in PrCa and that these variants have a more apparent role in disease risk. Next-generation sequencing has enabled significant success in the discovery of rare genetic variants contributing to prostate cancer in families with a dense aggregation of disease, where rare variants are enriched and there is reduced genetic complexity.

We have generated whole-genome sequencing for several affected and unaffected relatives across multiple Tasmanian PrCa families. The aim of this project is to mine these data to identify candidate rare variants that may increase PrCa risk and validate these variants in our larger germline and somatic PrCa resources.

Key Techniques: A range of laboratory and analysis methods may be used for this project and could include: data mining whole-genome sequencing, linkage analysis, candidate gene literature research, primer design, PCR, Sanger sequencing, sequence analysis, TaqMan genotyping, association analysis (e.g. Genesis), qPCR (gene expression analysis), etc.

Location: Menzies

Contact: liesel.fitzgerald@utas.edu.au or jo.dickinson@utas.edu.au

UNDERSTANDING CELLULAR IMMUNITY TO INFLUENZA IN CHILDREN

Supervisors: Professor Katie Flanagan, Dr Kathryn Ogden, Professor Katherine Kedzierska

Project Description: Seasonal influenza causes up to 500,000 deaths annually with vaccination offering the best protection available. Children 0-4 years of age are particularly susceptible to influenza and suffer more severe infections compared to older children and healthy young adults. However, the mechanisms that underlie disease severity are poorly understood, particularly in children. CD8+ T cells are thought to play a major role in vaccine-induced protection and protection against natural infection, but influenza-specific CD8+ T cell responses have not been fully characterised in children. Influenza-specific CD8+ T-cells localise to lymphoid tissue, including tonsils, but even less is known about tissue-specific immunity in childhood.

We are recruiting children and adults undergoing routine tonsillectomy in Launceston Hospitals and collecting their tonsils and a blood sample. We are investigating immune responses to influenza in these samples to understand the role specific innate and adaptive cell subsets play in increased susceptibility to severe influenza in
younger age groups. There are currently no similar detailed studies of immunity to influenza in children, particularly within the tissues, which makes this a very unique study. A greater understanding of influenza-specific immunity in children will allow us to design better influenza vaccines for this vulnerable age group.

**Key Techniques:** The candidate will be involved in recruiting the children and adults in the study including taking informed consent and collecting the tonsil and blood samples. They will be trained in extracting and storing mononuclear cells from tonsils and blood and will learn cellular immunology assays. There will be an opportunity to work in the Kedzierska lab in Melbourne if the candidate is keen.

**Location:** Professor Flanagan Lab, School of Health Sciences, Launceston, UTAS and Professor Kedzierska Lab, Peter Doherty Institute, University of Melbourne, Melbourne

**Contact:** Professor Katie Flanagan, Launceston General Hospital, Phone 03 6777 4081 Email katie.flanagan@ths.tas.gov.au.

---

**INVESTIGATING THE ROLE OF CHRONIC CMV INFECTION ON IMMUNOSENESCENCE AND DECLINING RESPONSES TO VACCINATION IN ELDERLY TASMANIANS**

**Supervisors:** Professor Katie Flanagan, Dr Kathryn Ogden, Professor Magdalena Plebanski

**Project Description:** This project offers an exciting opportunity to be involved in a large NHMRC funded clinical trial called the VITAL Trial (Vaccine Immunomodulation Throughout the Aging Lifespan) which is studying the aging immune system in unprecedented detail. Experience will be gained in conducting clinical trials in humans as well as laboratory work. Cytomegalovirus (CMV) infection rates are high in older Australians with some studies suggesting that it leads to impaired immunity and responses to vaccination, while others suggest no such effect. This study will analyse the role CMV infection plays in the declining immunity with advancing age (immunosenescence) by analysing for the effect of seropositivity on responses to influenza and diphtheria-tetanus-pertussis (dTap) vaccination. It will further analyse the effect of CMV infection on T and B cell subsets, immune activation and innate and adaptive immune responses *in vitro*. CMV infected and uninfected older adults will further be compared to healthy young adult controls. Overall the project will clarify whether chronic CMV infection causes negative immunological outcomes in elderly Tasmanians. If found, the results can be used to identify strategies to overcome these negative effects including the possibility of CMV vaccination.

**Key Techniques:** The candidate will gain experience in conducting human clinical trials from donor recruitment to sample processing in the laboratory. They will perform CMV IgG assays on serum samples. They will also have the opportunity to learn flow cytometry and cytokine multiplex assays including the option to conduct lab work in Professor Plebanski’s lab at RMIT University in Melbourne. They will gain basic statistical analysis skills by working with the study statistician to analyse their data.

**Location:** Launceston General Hospital and Professor Flanagan’s lab, School of Health Sciences, UTAS

**Contact:** Professor Katie Flanagan, Launceston General Hospital, Phone 03 6777 4081 Email katie.flanagan@ths.tas.gov.au.

---

**PROTEINS ON THE MOVE: MAPPING INTERCELLULAR PROTEIN TRANSFER TO UNDERSTAND IMMUNE EVASION BY CANCER CELLS**

**Supervisor:** Andrew Flies

**Project Description:** The Tasmanian devil facial tumour (DFT) disease has been the primary driver for an 80% decline in wild devils. Recently a second type of transmissible tumour was discovered in wild devils and this second devil facial tumour (DFT2) thus far has proven to be 100% fatal. These two transmissible tumours offer a unique opportunity to learn how tumours avoid being killed by the immune system, and the knowledge we acquire from studying these transmissible tumours could help us to understand cancer and transplant rejection in other species, including humans. Efforts to develop a DFT vaccine have made steady progress but have been hampered by the limited tools available for studying the devil immune system. The goal of this project will be to use intercellular protein transfer (i.e. proteins move from cell-to-cell) assays to identity proteins and mechanism used by tumour cells to evade immune defenses. This project will focus on Tasmanian devils, but will incorporate comparative
analysis using human cells and proteins. Successful completion of the project will result in a deeper understanding of the full life cycle of immunomodulatory proteins and a better understanding of how cancer evades immune defences.

**Key Techniques:** polymerase chain reaction (PCR), overlap-extension PCR, DNA purification, plasmid DNA construction, Gibson assembly cloning, bacterial transformation, DNA sequencing, cell culture, mammalian cell transfection, analysis of receptor-ligand interactions, flow cytometry, immunofluorescence.

**Location:** Menzies Institute for Medical Research, Hobart. **Contact:** andy.flies@utas.edu.au

---

**USE OF END TIDAL CO₂ (ETCO₂) WAVEFORM CAPNOGRAPHY FOR EVALUATION AND MONITORING IN SPONTANEOUSLY VENTILATING PATIENTS**

**Supervisors:** Wayne Harris wayne.harris@utas.edu.au and Dr Peter Lucas

**Research Project Synopsis:** Waveform capnography is widely available to Australian ambulance services. It provides objective evidence of respiratory patterns and ventilation status, while readily detecting apnoea and respiratory depression, prior to reduction in oxygen saturation. Measurement of EtCO₂ in patients with an advanced airway has proven to be an effective, non-invasive indicator of cardiac output during CPR and may be an indicator of ROSC in these patients.

Ambulance services routinely assess respiratory and ventilation status in non-intubated patients via subjective methods with varying accuracy. While some Australian ambulance services mandate waveform capnography for intubated patients and throughout subsequent ventilation, there is little use of this technology in monitoring ventilation status in spontaneously breathing patients.

The proposed study will consist of a literature review and a retrospective analysis of case records, across a determined period, involving adult and paediatric patients presumed to have respiratory compromise from any cause, presenting to Tasmanian public hospitals.

Key data will be collected from these cases via Ambulance Tasmania’s ePCR data warehouse and from DHHS emergency department records. This data will be used to determine the usage of waveform capnography in patients presenting with respiratory compromise to assist in the objective assessment and management of such patients.

**Student opportunities:** Systematic literature review, Involvement in data linkage projects and subsequent analysis, Development of publishable article(s) for peer review, Possibly facilitate change in paramedic practice

---

**PARAMEDIC DIAGNOSTIC ACCURACY IN GERIATRIC PATIENTS WITH COMPLEX CO-MORBIDITIES**

**Supervisors:** Wayne Harris wayne.harris@utas.edu.au and Dr Peter Lucas

**Research Project Synopsis:** Geriatric patients pose complex diagnostic challenges. They commonly have atypical presentations of common clinical conditions due to altered physiology, co morbidities and polypharmacy. Geriatric syndromes in particular generate adverse outcomes in this patient group.

Paramedics routinely assess and manage geriatric patients with varying accuracy. Assessment tools are available but appear to be sparsely utilised, which may impact diagnostic accuracy and limit index of suspicion regarding severity of the geriatrics’ clinical presentation.

The proposed study will consist of a literature review and retrospective analysis of case records, across a determined period, involving geriatric presentations to Tasmanian public hospitals.

Key data will be collected from these cases via Ambulance Tasmania’s ePCR data warehouse and from DHHS emergency department records. This data will be used to determine the diagnostic accuracy of paramedic assessment of geriatric patients presenting with acute and/or chronic medical conditions, who also have a recognised geriatric syndrome.

**Student opportunities:** Systematic literature review, Involvement in data linkage projects and subsequent analysis, Development of publishable article(s) for peer review, Possibly facilitate change in paramedic practice
BUILDING A STATISTICAL MODEL TO PREDICT WHEN IT IS SAFE TO RETURN TO SPORT FOLLOWING INJURY

Supervisory Team: Dr David Humphries, Dr Dawn Aitken

Project Description: Return to play decisions following injury are relatively generic and to an extent rely on the clinical experience of either an individual health care professional or a group tasked with providing guidance to the injured athlete on return to play decisions. Often the standard approach to return to play decision making uses a combination of knowledge of tissue healing biology, a clinical decision regarding the degree of tissue damage in the athlete, and the athlete reaching certain rehabilitation milestones. The aim of this project is to build a statistical model which can be applied to monitor return to sport outcomes and inform the collection of return to sport data into the future.

Key Techniques: Students from a number of backgrounds are welcome including medical and health sciences, epidemiology, biostatistics/mathematics, allied health, and public health. This project will require a strong understanding of biostatistics. Statistical supervision and training will also be provided.

Contact: Dr Dawn Aitken dawn.aitken@utas.edu.au

UNDERSTANDING THE HEALTH IMPACTS OF THE HAZELWOOD COAL MINE FIRE

Supervisors: Dr Fay Johnston, Dr Shannon Melody

Project Description: A fire in the Hazelwood coal mine blanketed Morwell and the surrounding area in brown coal smoke and ash for six weeks in February and March 2014. In response to community concerns about long-term health effects, the Victorian Department of Health and Human Services commissioned the Hazelwood Health Study. This project will contribute to the early childhood component of this study by conducting a data linkage analysis to explore associations between hospital attendances and how much smoke a child (or, if they were not yet born, their mother) was exposed to. This will help build an understanding of the impact of smoke exposure on early childhood health and development. The student should have a solid grounding in statistical modelling.

Key Techniques: The student will gain skills in data linkage and population-scale epidemiological analysis. Students will develop strong skills in quantitative analysis (using R). This project will suit students with an interest in epidemiology, public health, environmental health and/or biostatistics.

Location: Hobart Contact: Fay.Johnston@utas.edu.au

HEALTHY LANDSCAPES, HEALTHY PEOPLE? UNDERSTANDING THE INTERSECTION OF URBAN GREEN SPACE, THE MICROBIOME, AND HUMAN HEALTH IN HOBART

Supervisors: Dr Penelope Jones, Dr Emily Flies, Associate Professor Fay Johnston

Project Description: There is increasing recognition of the importance of the ‘microbiome’ – including the microbiome of the environment around us - in shaping many aspects of human health. We are also beginning to understand that urbanisation and land use change are impacting health – potentially by altering the microbial communities to which we are exposed.

Urban green spaces may provide city-dwelling humans with the opportunity to be exposed to biodiverse environmental microbiomes, which may mitigate some of the negative urban health impacts. But we need a better understanding of how different types of green space support biodiverse environmental microbiomes, and whether this is one way that green space can contribute to community health and wellbeing. This project will make an important contribution in this area by:

1. Assessing the microbiome of the soil and air across multiple types of parks and green space in Hobart.
2. Analysing the relationship between green space type and environmental microbiome composition and diversity.
3. Considering the likely implications for human health, with a focus on allergies and asthma, two forms of disease that have been clearly linked to environmental microbiome exposure.

Key Techniques: The project will involve the collection of air and soil samples for metagenomic analysis, statistical analysis of the results, and interpretation of potential implications for the relationship between green space and
human health. Statistical analysis will be conducted using R. The project will suit a student with an interest in transdisciplinary approaches to public health, environmental health and/or epidemiology.

Contact:  Penelope.Jones@utas.edu.au

SEASONAL PATTERNS OF POLLEN AND ALLERGIC RESPIRATORY SYMPTOMS IN THE TROPICS – WHICH POLLENS MATTER IN THE TOP END?

Supervisors: Dr Penelope Jones, Associate Professor Fay Johnston, Dr Grant Williamson

Project description: Allergic respiratory disease (asthma and allergic rhinitis) affects millions of Australians: with allergic rhinitis (hay fever) alone affecting over 20% of the population. We know that pollen is a major trigger, but different pollen types will be important in different regions. At the moment, a major gap in knowledge is what triggers allergies and allergic asthma in the tropics, such as the Top End.

We now have an opportunity to look at this question by combining pollen monitoring and novel smartphone technology. Our team recently launched the AirRater smartphone app in the Northern Territory, and have also commenced pollen monitoring. The AirRater app collects symptom data, which you will be asked to analyse together with the pollen monitoring data to test which types of pollen are driving asthma and allergy symptoms in the Top End. You will:

1. Count the number of different types of pollen on daily microscope slides from Darwin; and
2. Analyse associations between pollen abundance and asthma and allergy symptoms reported by users of the ‘AirRater’ app.

This will provide an important new platform for understanding the role of pollen in asthma and allergies in tropical Australia.

Key Techniques: The student will gain skills in both microscope identification and the statistical analysis of epidemiological data. Students will develop strong skills in quantitative analysis (using R) and an appreciation for the challenges and opportunities in utilising crowd-sourced symptom data: a rapidly emerging field. This project will suit students with an interest in epidemiology, public health, environmental health and/or biostatistics.

Location: Hobart  Contact: Penelope.Jones@utas.edu.au

IS IT POLLEN OR IS IT FUNGI? DETERMINING THE CAUSES OF ALLERGIES IN TASMANIA

Supervisors: Associate Professor Fay Johnston, Dr Penelope Jones, Dr Grant Williamson,

Project Description: Fungi are known to be a major trigger for allergies and asthma, yet across Australia a paucity of fungi-based studies means that we have very little understanding about their contribution to asthma and allergy symptoms at a population scale: in particular, how they compare to and/or interact with pollen and smoke as asthma and allergy triggers. This project will provide the first systematic analysis of the contribution of fungal spores to asthma and allergies by:

1. Counting the number of allergenic fungal spores on daily microscope slides (previously collected for pollen analysis by the ‘AirRater’ project); and
2. Building a model that tests associations between fungal spore abundance and asthma and allergy symptoms reported by users of the ‘AirRater’ app.

This will provide an important platform for understanding the role of fungi in asthma and allergies in Tasmania, and the degree to which they should be prioritised in clinical and public health settings.

Key Techniques: The student will gain skills in both microscope identification and the statistical analysis of epidemiological data. Students will develop strong skills in quantitative analysis (using R) and an appreciation for the challenges and opportunities in utilising crowd-sourced symptom data: a rapidly emerging but challenging field. This project will suit students with an interest in epidemiology, public health, environmental health and/or biostatistics.

Location: Hobart  Contact: Penelope.Jones@utas.edu.au
CHRONIC KIDNEY DISEASE IN TASMANIA

**Supervisor:** Professor Matthew Jose

**Project Description:**

**Background:** Tasmanians have the highest rate of chronic kidney disease (CKD) among non-Indigenous Australians, yet overall they access treatment (dialysis or kidney transplantation) far less than other states. This discrepancy between the high rates of kidney disease and low access to treatment is well-established, but the factors that contribute to it are not. We believe there are significant geographic and gender inequities that contribute to reduced access.

CKD is seen in over 20,000 Tasmanian adults and is managed in the community by their local doctor. Dialysis and kidney transplants are managed in major Tasmanian hospitals (Hobart, Launceston and Burnie). In Tasmania, existing data indicates that there is a major gender imbalance in accessing treatment. In the community, there are 80 Tasmanian males with chronic kidney disease for every 100 Tasmanian females, yet 150 Tasmanian males access treatment for every 100 Tasmanian females that access treatment.

This project will identify geographic and gender inequities in access to treatment for Tasmanians living with chronic kidney disease. We will use a data linkage approach, linking together data that already exists in different databases. We will take a community-approach, considering who and where people with CKD live, then compare this to existing health services.

**Key Techniques:** Use of data linkage dataset, Statistical analysis, Working with people affected by kidney disease

**Location:** Hobart  
**Contact:** Professor Matthew Jose, Matthew.Jose@utas.edu.au

TREATMENT OF VIRAL PNEUMONIA

**Supervisor:** Associate Professor Guna Karupiah

**Project Description:** Viral infection-induced pneumonia is a consequence of an over-exuberant immune response associated with dysregulated inflammatory cytokine production. There is currently no specific treatment available for this condition, including influenza pneumonia. The available antivirals against influenza A virus (IAV) are effective and control infection only if treatment is commenced within 48 hours of onset of symptoms.

We have developed a novel regime for treatment of influenza pneumonia (and one other viral pneumonia) in mice. Our unpublished results indicate that a combination of an antiviral plus a second compound is very effective in reducing viral load, lung pathology and increases the survival rate even if treatment is started late after onset of symptoms. This project will investigate the mechanisms through which the combination therapy overcomes viral pneumonia and will assess the effectiveness of additional compounds. This project will utilize influenza A virus and a poxvirus and wild type mice.

**Key Techniques:** Handling mice for animal experiments; assessment of clinical signs and symptoms in mice; techniques in cellular immunology; virology; molecular biology and histology.

**Location:** Hobart  
**Contact:** Guna.Karupiah@utas.edu.au

IMUNE MODULATION BY VIRUS-ENCODED TNF RECEPTOR HOMOLOGS

**Supervisor:** Associate Professor Guna Karupiah

**Project Description:** Tumor necrosis factor (TNF) is a type II transmembrane cytokine (mTNF) expressed on activated cells and cleaved by a metalloproteinase to yield the soluble form (sTNF). Many viruses have evolved strategies to counter the host TNF response, indicating the importance of this cytokine during viral infections.

Poxviruses encode TNF receptor (vTNFR) homologs of the extracellular domain of mammalian TNFR, which can potentially subvert, dampen or evade the host immune response. Cytokine response modifier D (CrmD) is a vTNFR homolog secreted by ectromelia virus (ECTV), an orthopoxvirus closely related to variola virus (smallpox virus) and a natural mouse pathogen. ECTV causes a disease termed mousepox in mice and is the best small animal model to
study poxvirus pathogenesis and immunity to generalised viral infections. TNF is known to be critical for recovery of the host from respiratory ECTV infection. We therefore investigated the function of vTNFR using a deletion mutant virus lacking CrmD (ECTVΔcrmD). Whereas the normally resistant wild type (WT) mice recovered from ECTVWT infection, they succumbed to mutant virus infection with severe lung inflammation and immunopathology. This project will investigate the mechanisms through which CrmD protects the host and will utilize novel, genetically engineered mutant viruses to address the questions. The results are expected to have implications on how inflammation during viral infections may be treated, resulting in better health outcomes.

**Key Techniques:** Handling mice for animal experiments; assessment of clinical signs and symptoms in mice; techniques in cellular immunology; virology; molecular biology and histology.

**Location:** Hobart  
**Contact:** Guna.Karupiah@utas.edu.au

---

DEVELOPING A BLOOD TEST TO PREDICT BRAIN-HEALTH OUTCOMES FOLLOWING TRAUMA

**Supervisors:** Associate Professor Anna King, Dr Jess Collins, Dr Jane Alty (MD), Professor James Vickers

**Project Description:** The prevalence of cognitive impairment or dementia is set to increase substantially throughout the world with the ‘aging’ of the global population and there is an urgent need to understand environmental factors that contribute to cognitive decline as well as identify those at risk. It is known that a trauma later in life can lead to cognitive impairment in a proportion of individuals, however there is currently no reliable way of predicting cognitive decline and little understanding of the contribution of different types of trauma to this.

Over the last few years there has been progress in the development of techniques to measure low levels of proteins in the blood (biomarkers), which can be used as surrogate markers of brain health. In particular a biomarker known as NFL is showing great promise as a biomarker of neurodegeneration. We are able to measure this biomarker and others using Single Molecule Array (SIMOA) technology. The overall aim of this project is to measure blood biomarkers in individuals who have spent time in the intensive care unit, focusing on traumatic brain injury, stroke and sepsis. Blood biomarker measures will be correlated to cognitive function tested at specific timepoints after the trauma.

**Contact:**  
Anna King ([a.e.king@utas.edu.au](mailto:a.e.king@utas.edu.au)) or Jess Collins ([Jessica.Collins@utas.edu.au](mailto:Jessica.Collins@utas.edu.au))

---

DEVELOPING THERAPIES FOR NEURODEGENERATIVE DISEASE AND INJURY

**Supervisors:** Associate Professor Anna King, Dr Rachel Atkinson, Dr Jaqueline Leung

**Project Description:** Neurodegenerative disease, such as those that cause dementia, are currently one of the greatest health burdens in society. The clinical symptoms of neurodegenerative disease result from degeneration of neurons in the brain. We have created a model of nerve cell degeneration in the retina, an easily accessible outgrowth of the CNS. This model allows specific analysis of neurons in the retina, their projections in the optic nerve and their synaptic connections in the brain. To induce neurodegeneration, we use a drug called kainic acid, which caused neurodegeneration through excitotoxicity. Our studies suggest that proteins called neurofilaments, key components of the cytoskeleton, are implicated in the neurodegeneration process and nerve cells may be protected in the absence of these neurofilament proteins, raising the question “Are neurofilament proteins a therapeutic target for neurodegenerative disease and injury?” In this project we will use gene manipulation and biochemical techniques, proteomics and live cell imaging mice to map the breakdown of neurons and investigate whether kainic acid alters the expression of neurofilament proteins (protein and mRNA) or alternatively if it alters the transport of neurofilament proteins along the axon. We will also develop antisense therapy to determine if knockdown of neurofilament is a neuroprotective strategy.

**Contact:**  
Anna King ([a.e.king@utas.edu.au](mailto:a.e.king@utas.edu.au))
NUTRITION IN AGED CARE

Supervisor: Dr Emma Lea

Project Description: Well-balanced and consistent nutrition is vital for older people's quality of life, positive health outcomes, and maintenance of independence. Yet research suggests that the majority of Australians with dementia in residential aged care are malnourished or at risk of malnourishment. Studies have been conducted in this setting to look at those factors that may improve nutrition care for residents with dementia, such as changes to dining practices and type of food provided. However, despite a desire to deliver the best possible care, care staff rarely have the formal knowledge or capacity to translate evidence into reform of care practices to deliver better outcomes for residents. This project will look at key strategies that can be used to improve care in this setting, linking to the Wicking Centre’s MENU nutrition study currently being undertaken in two aged care facilities. This project will include a literature review and analysis of existing qualitative and quantitative data from the MENU study on nutrition in aged care for people living with dementia.

Key Techniques: Literature review, qualitative data analysis (NVivo), quantitative data analysis (SPSS).

Location: Hobart or off-campus
Contact: Dr Emma Lea: Emma.Lea@utas.edu.au

CHARACTERISATION OF OLIGODENDROCYTES DIFFERENTIATION AND MYELIN PRODUCTION IN THE SOX10ICRE MICE.

Supervisors: Jacqueline Leung, Anna King

Project Description: One of the major functions of oligodendrocytes is the formation of myelin, myelin degeneration (or white matter degeneration) has been reported as a pathology presence from both Amyotrophic lateral sclerosis (ALS) and Frontotemporal Dementia (FTD). The accumulation of TDP43 (pathogenic protein contributes to a majority of the sporadic ALS and FTD cases) have also been reported in oligodendrocytes from the human tissues. However, the relationship between the intracellular accumulation of TDP43 and degeneration of myelin is currently unknown.

For this project, we will be utilising the SOX10iCre mice colony and adeno-associated virus (AAV) transduction techniques to generate oligodendrocytes specific expression of TDP43 mutations to investigate the effect of TDP43 on oligodendrocytes in vivo. This animal model will allow us to study changes that occurred when TDP43 are specifically mutated in oligodendrocytes. This project will involve using immunohistochemistry techniques to characterise the expression of oligodendrocytes stage-specific markers to understand if the TDP43 altered the differentiation of oligodendrocytes in vivo. Transmission electron microscopy might also be used to understand myelin changes in the axon bundles from spinal cord tissues.

Key Techniques: Mice handling and AAV transduction, immunohistochemistry, fluorescence microscopy, transmission electron microscopy

Contact: Jacqueline.Leung@utas.edu.au

DEVELOPMENT OF A NOVEL MODULAR OPTOGENETIC AND CHEMOGENETIC NEURONAL ACTIVITY REPORTER

Supervisor: John Y Lin

Project Description: One fundamental question in system neuroscience is to identify the circuit responsible for the performance of a behaviour, which is often achieved with in vivo fluorescent calcium imaging of neurons during behaviour. Calcium imaging can be technically challenging for deep brain structures in freely moving animals. An alternative approach is to have artificial transcription factors or DNA manipulating proteins that can initiate production of a reporter protein when intracellular calcium is elevated during the behaviour. Depending on the reporter, this can be used to identify the cells (via expression of unique markers), or to manipulate these neurons (via expression of toxins, optogenetic or chemogenetic tools). While such systems have been developed previously, they can only be used to identify neurons at one time point. By making system modular, we can engineer new approaches that can be used to identify activated neurons at multiple time points defined by light illumination and administration of a small chemical ligand. This new approach will allow us to test whether the same neurons are
activated during two related but distinct behaviour tasks. Ultimately, we aim to use these tools to test whether memory formation and memory extinction (suppression of established memory) activates the same neurons.

**Key Techniques:** Design and generation of recombinant DNA and recombinant virus, development of cell-based fluorescence assay. Cell line and neuronal culture and transduction/transfection.

**Location:** Hobart, Medical Science Precinct  **Contact:** john.lin@utas.edu.au

---

**BIOENGINEERING AAV FOR RETINAL GENE EDITING**

**Supervisor:** Dr Guei-Sheung Liu

**Project Description:** Widespread gene transfer to the retina is challenging as it requires vector systems to overcome physical and biochemical barriers to enter and diffuse throughout retinal tissue. Adeno-associated virus (AAV) is a safe and effective vector for gene therapy for retinal disorders. However, there is still a need to develop different types of engineered AAVs to ensure that molecular tools reach the correct retinal tissue and cell types. In this project, we will design bioengineering AAV vectors and explore their properties to transduce CRISPR/Cas genome editing tool into the retina toward harnessing them for retinal gene therapy.

**Key Techniques:** cell culture, molecular cloning, histology, imaging.

**Location:** Medical Science Precinct, Hobart  **Contact:** gueisheung.liu@utas.edu.au

---

**A GENOME-WIDE SCREEN TO IDENTIFY NOVEL THERAPEUTIC TARGETS FOR EYE CANCER**

**Supervisors:** Dr Guei-Sheung Liu, Professor Alex Hewitt

**Project Description:** Uveal melanoma and retinoblastoma are a potentially fatal eye cancer. We wish to apply leading genetic techniques to systematically interrogate each gene in the genome, to identify those essential for tumour growth and proliferation. We will then validate the therapeutic potential of these novel targets in a preclinical disease model. This work will provide new insight into the molecular mechanisms of both eye cancers and uncover novel avenues for treating this potentially devastating disease.

**Key Techniques:** cell culture, PCR, histology, imaging.

**Location:** Medical Science Precinct, Hobart  **Contact:** gueisheung.liu@utas.edu.au

---

**ANALYSIS OF HOST/TUMOUR INTERPLAY IN DEVIL FACIAL TUMOUR DISEASE (DFTD)**

**Supervisors:** Associate Professor Bruce Lyons, Dr Amanda Patchett and Dr Ruth Pye

**Project Description:** Devil Facial Tumour Disease (DFTD) is a transmissible cancer responsible for a decline in the wild Tasmanian devil population of over 80%. Until recently, it seemed that the cancer was universally fatal, however recent evidence suggests that a proportion of devils have some degree of DFTD resistance. DFTD regression has also been demonstrated after immunisation and immunotherapy, and interventions that target the immune system could be viable options for protection of the species. DFTD is unique in that the same tumour affects genetically different animals, requiring complex interactions between the DFTD cells and host cells to suppress immune rejection. Studying these interactions will be important for understanding how the immune system can be harnessed to prevent or treat DFTD. The major impediment to studying DFTD has been the lack of devil-specific reagents. However, an increasing number of devil proteins and antibodies are being developed. Technologies such as RNA-sequencing and RNAscope, which measure RNA levels as a proxy of function, can also be harnessed to examine DFTD tumours. This project will integrate these technologies using DFTD samples and cell culture assays, to understand the interplay between DFTD cells and host cells and its relationship to tumour behaviour.

**Key Techniques:** Cell culture, Gibson assembly cloning, RNAscope, PCR, RNA-seq data analysis, flow cytometry.

**Location:** Hobart  **Contact:** Amanda.Patchett@utas.edu.au
DISCOVERING NEW EPIGENETIC MODIFIERS OF BRAIN CANCER

Supervisors: Dr Owen Marshall and Dr Caroline Delandre

Project Description: Glioma is the most common form of brain tumour, and one which is particularly resistant to treatment. The most severe form of glioma, glioblastoma, has one of the worst survival rates of all cancers, with 5-year survival rates of only 5%. Epigenetic changes are known to play major roles in most cancer forms, but remain under-investigated in glioma. We have identified a number of genes encoding epigenetic modifying proteins whose expression significantly changes in glioblastoma tumours. Using a model of glioblastoma in the fruit fly *Drosophila melanogaster*, this project will conduct an RNAi screen of these genes and observe their effects on tumour formation and severity, identifying new potential therapeutic targets for treating the disease.

Key Techniques: *Drosophila* genetics, confocal microscopy, immunohistochemistry, dissection, data analysis using R.

Location: Menzies Institute for Medical Research (MSP)  Contact: owen.marshall@utas.edu.au

DISCOVERING THE TARGETS OF NEURAL STEM CELL TRANSCRIPTION FACTORS

Supervisors: Dr Owen Marshall and Dr Caroline Delandre

Project Description: Neural development is a complex process in which neural stem cells (NSCs) give rise to a large number of highly specific neuronal lineages. A number of key transcription factors are known to be involved in this process, but little is known about their targets or their mode of action. One such family of transcription factors are the bHLH genes that respond to Notch signalling. These are vital for both NSC maintenance and for specifying a subset of neuronal lineages. This project aims to identify the genome-wide binding targets of these transcription factors in NSCs and immature neurons within the brain of the fruit fly, *Drosophila melanogaster*, using the Targeted DamID technique, next-generation sequencing and network analysis. The results will be integrated with existing expression and epigenetics data to gain an understanding of how the brain develops.

Key Techniques: PCR, next-generation sequencing, immunohistochemistry, data analysis using R

Location: Menzies Institute for Medical Research (MSP)  Contact: owen.marshall@utas.edu.au

INVESTIGATING THE EFFECT OF MODIFYING THE TIMING OF AMYLOID BETA EXPRESSION IN A FLY MODEL OF ALZHEIMER’S DISEASE

Supervisors: Dr Owen Marshall and Dr Caroline Delandre

Project Description: Dementia is now the second leading cause of death in Australia, with Alzheimer’s disease (AD) being the most common type. Mouse AD models need several months before behavioural impairments can be observed making them very time-consuming and costly to study. A growing number of groups have turned to the fruit fly *Drosophila melanogaster* as a complementary approach to study the basics of AD in a rapid and cost-effective manner. Within a matter of weeks, expression of the human amyloid beta 42 (Abeta42) peptide (thought to form toxic aggregates in humans) in the fly brain causes amyloid deposits, neurodegeneration, and memory decline as flies become older, reminiscent of symptoms seen in human patients. The current fly AD model expresses Abeta42 throughout the life cycle, while symptoms only appear in older flies. Is the gradual accumulation of Abeta42 important to lead to a disease state? Or could similar symptoms be triggered by expressing Abeta42 only at later stages? This project is set up to assess the effect of modifying the timing of Abeta42 expression on behaviour and the rate of neurodegeneration by using a simple locomotor assay and brain imaging.

Key Techniques: *Drosophila* genetics, dissection, immunohistochemistry, confocal imaging, behavior.

Location: Menzies Institute for Medical Research (MSP)  Contact: owen.marshall@utas.edu.au
SHORT TANDEM REPEATS IN MULTIPLE SCLEROSIS

Supervisors: Dr Bennet McComish, Dr Jac Charlesworth, Professor Kathryn Burdon

Project Description: Multiple sclerosis is a complex disease of the central nervous system that can interfere with the transmission of nerve impulses, and has a strong genetic component. We are currently investigating the involvement of short tandem repeat (STR) sequences in the disease. STRs are highly polymorphic variants that are ubiquitous in the human genome, and specific STR mutations are known to be involved in a number of other genetic diseases, including several neurological diseases with motor involvement. The project involves analysis of STR loci with prior evidence for involvement, and integration of novel data sources such as long-read sequencing and bioinformatics methods to more accurately characterise these repeats.

Key Techniques: Molecular biology techniques including STR genotyping; bioinformatic analysis of high-throughput and long-read sequencing data.

Location: Medical Science Precinct Contact: bennet.mccomish@utas.edu.au

POST HOC ANALYSES OF THE ASPREE CLINICAL TRIAL

Supervisor: Mark Nelson

Project Description: Post hoc analyses of the ASPREE clinical trial. In 2018, ASPREE published three ground breaking papers in one edition of The New England Journal of Medicine (NEJM): Effect of Aspirin on Disability-free Survival in the Healthy Elderly; Effect of Aspirin on Cardiovascular Events and Bleeding in the Healthy Elderly; and Effect of Aspirin on All-Cause Mortality in the Healthy Elderly. The trial’s unique endpoint of ‘disability-free survival’ (life free of dementia or persistent physical disability), measured the efficacy of daily low dose aspirin on functional wellbeing in older people, as well as encompassing the risk-benefit of aspirin.

The trial found that over a median of 4.7 years, low dose aspirin did not prolong disability-free survival for ASPREE participants who were all healthy - free of cardiovascular disease, dementia, significant physical disability and medical conditions requiring aspirin use - at entry into the trial. Major cardiovascular events, including coronary heart disease, nonfatal heart attacks, and fatal and nonfatal ischaemic stroke, were similar between the aspirin and the placebo groups. However, the study showed a higher rate of major haemorrhage, primarily gastrointestinal and intracranial, in the aspirin group.

Key Techniques: Varied.

Location: Menzies Institute for Medical Research Contact: Mark Nelson

DEMENTIA CASE-FINDING IN GENERAL PRACTICE WITH AN EMPHASIS ON REVERSIBLE CAUSES OF MEMORY LOSS.

Supervisors: Dr Kath Ogden and Associate Professor Jan Radford

Project Description: The aims of this project are to conduct a pilot study for a future Tasmanian state-wide study involving the following steps:

- Consult with general practitioners to determine appropriate and feasible methods for encouraging screening for memory loss, especially reversible causes of memory loss. A feature of the screening tools provided will be one for idiopathic normal pressure hydrocephalus (INPH) as a cause of memory loss. This latter tool uses a 7-item triage index test score, developed from previous research by Associate Professor George Razay, sponsored by the Clifford Craig Foundation.
- Trial the use of the screening instruments in a selection of general practices
- Determine the outcomes of use of screening in this sample of practices
- Formulate possible mechanisms for measuring the outcomes of the use of the screening tools in Tasmanian general practices more widely.

This study is an implementation/translational project which will take the outcome of research previously conducted in Launceston into practice in northern Tasmania. There are obvious benefits to the community of Tasmania in identifying cases of dementia, especially those that are potentially reversible such as INPH.
Key Techniques:
• An initial consultative phase, whereby general practitioners and practice nurses will be invited to provide feedback as to mechanisms that could be used to encourage the use of screening instruments.
• One or more methods for implementing the instruments into practices will be developed
• General practices will be recruited to trial the implementation method/s
• Outcomes of its use in these trial sites will be determined using qualitative (interview, focus group with GPs and practice nurses) and quantitative (audited numbers of patients screened, outcomes of screening) methods
• Mechanisms for measurement of outcomes when implemented widely will be developed

Location: Launceston Clinical School Contact: Jan Radford

PAIN PHENOTYPES AND LONG-TERM HEALTH OUTCOMES IN PATIENTS WITH KNEE OSTEOARTHRITIS

Supervisors: Dr Feng Pan, Professor Graeme Jones

Project Description: Pain experience in knee osteoarthritis is similarly individualised and complex; some patients may present with pain that appears attributable to classic signs of joint damage, while others may present with pain due to psychological distress or central mechanisms. We have identified pain phenotypes/subgroups of participants with similar pain-related profiles. However, whether patients with distinct pain phenotypes have a different risk for long-term health outcomes is unknown.

This study will take advantage of the Tasmanian Older Adult Cohort Study (TASOAC)-a longitudinal, observational population-based study. The cohort consisted of both men and women and was randomly selected from the electoral roll. A total of 1,100 participants aged 50–80 years (mean age 63 years) were enrolled in the study and the follow-up measures were taken approximately 2.6 (n=875), 5.1 (n=768) and 10.7 years (n=563) later. A wide range of health outcomes data have been collected from baseline to 10.7 years and will be used in the analyses including pain and function, health-related quality of life (HRQoL), falls risk and fractures, and knee replacement surgery from the National Joint Replacement Registry over 13.7-year. This project aims to examine whether participants in distinct pain phenotypes have a different risk of long-term health outcomes.

Key Techniques: Students will gain proficiency in the data analysis for longitudinal study, manuscript and abstract preparation, and conference presentation.

Location: Hobart Contact: Feng.Pan@utas.edu.au

AN EVALUATION OF THE CORRECT USE OF PAEDIATRIC RESTRAINT SYSTEMS FOR CHILDREN TRANSPORTED VIA AMBULANCE

Supervisors: Leigh Parker Leigh.Parker@utas.edu.au and Dale Edwards

Research Project Synopsis: Transport of patients in ambulance vehicles throughout Australia is subject to a number of exemptions under the relevant traffic regulations. In the case of transporting children, there is an exemption for the use of restraints such as seat belts and other restraint systems, despite most ambulance vehicles being fitted with or carrying restraint systems for these occupants. Past research conducted by the University of Tasmania indicates that paramedics have a limited understanding of the types and use of a variety of child restraint models and that some paramedics are reluctant to use a child restraint during ambulance transport regardless of the circumstances. This project seeks to further explore the use of child restraints in paramedic practice.

Student Opportunities:
This project offers several opportunities for Honours students, including:
• A chance to further explore the attitudes, beliefs and self-reported practices of Australasian paramedics towards the use of child restraints in road ambulances.
• A study of how the various types of child restraints influence/do not influence the behaviours of children travelling in a road ambulance.
- A review of how the use of various child restraint systems is taught in Australasian undergraduate paramedic degrees.
- A review of how undergraduates can be taught how to use different types of child restraint, how easily they become proficient and how well they retain their skills
- A chance to explore the expectations of parents whose child is being transported by ambulance
- Comparison of use of paediatric restraints between Australia and the United Kingdom.

Contact: Leigh Parker (Leigh.Parker@utas.edu.au)

AN EVALUATION OF THE PREPAREDNESS OF AUSTRALIAN AMBULANCE SERVICES AND/OR PARAMEDICS TO MANAGE MASS CASUALTY INCIDENTS

Supervisors: Ms Leigh Parker Leigh.Parker@utas.edu.au, Mr Jonathon Sward swardj@utas.edu.au

Research Project Synopsis: There is an ever-increasing risk of mass casualty incidents (MCIs) both internationally and here in Australia. MCIs may be of natural origin (landslides, earthquakes), or have a degree of human involvement (bombings, train collisions). Irrespective of the cause, MCIs involve multiple injured patients, and often overwhelm the required emergency services' resources.

Emergency medical services, including ambulance services and paramedics, play a key role in the management of MCIs. As paramedics are likely to attend these incidents, preparedness is a key component of an MCI being managed successfully. Research into ambulance service/paramedic specific MCI preparedness is scarce, especially in Australia. This project will explore the preparedness of ambulance services/paramedics to attend MCIs.

Student Opportunities: This project offers Honours students several opportunities including:
- A chance to further explore the preparedness of Australasian paramedics for attendance at mass casualty incidents
- A study of how the various ambulance services prepare paramedics to manage mass casualty incidents.
- A review of how mass casualty incident preparedness and response strategies are taught in Australasian undergraduate paramedic degrees.

Location: School of Medicine, Hobart

UNDERSTANDING HYPOTHERMIA AND HYPOXIA IN UNSTABLE NEWBORNS BORN IN THE OUT-OF-HOSPITAL SETTING

Supervisor: Leigh Parker

Research Project Synopsis: The management of the newly born infant in an out of hospitals setting includes a sound understanding of the physiological effects of ambient temperature. This project will investigate the paramedic communities understanding of the connection between, and importance of, hypothermia and hypoxia in the infant born in the out-of-hospital environment and subsequently requiring stabilisation.

Student Opportunities: 
- The exploration of current paramedic clinical management of the newly born infant requiring stabilisation.
- The treatment required or provided in out of hospital birth, including the incidence of such cases.
- The level of documentation recorded, including patient temperature and oxygenation
- The level of equipment and resources available to paramedics in the management of out of hospital child birth.

Contact: Leigh.Parker@utas.edu.au

UNDERSTANDING FAT CELL DEVELOPMENT

Supervisors: Dr Linda Parsons and Professor Coral Warr

Project Description: Obesity is a common disease. The formation and maintenance of fat cells is essential to many
biological processes and when perturbed leads to significant diseases. Despite this basic and clinical significance, understanding of the developmental biology of adipose tissue has languished. This project will use fruit flies (Drosophila melanogaster) to identify the genes involved in fat cell development.

**Key Techniques:** Western blot, molecular biology, quantitative PCR, Drosophila genetics.

**Location:** Medical Science Building, Hobart  
**Contact:** linda.parsons@utas.edu.au

---

**DECIPHERING THE LINKS BETWEEN OBESITY AND CANCER**

**Supervisors:** Dr Linda Parsons and Dr Owen Marshall

**Project Description:** Patients suffering obesity or type II diabetes have a significantly increased risk of also developing cancer and respond poorly to treatment. We have generated unique cancer models in the fruitfly (Drosophila melanogaster) where tumour growth responds to levels of dietary sugar. This project will begin to unravel the growth signaling and metabolic pathways that go awry in cancer patients also suffering type II diabetes and/or obesity.

**Key Techniques:** molecular biology, immunohistochemistry, confocal microscopy Drosophila genetics.

**Location:** Medical Science Building, Hobart  
**Contact:** linda.parsons@utas.edu.au

---

**QUALITY ASSESSMENT OF BLOOD PRESSURE MEASUREMENT DEVICES**

**Supervisors:** Dr Dean Picone, Professor James Sharman and Dr Martin Schultz

**Project Description:** High blood pressure is the leading modifiable cardiovascular disease risk factor. The evidence for cardiovascular risk related to high blood pressure has been derived from research-grade upper-arm cuff blood pressure measurements. However, there has been an exponential increase in the number of blood pressure measurement devices available for purchase, with relatively no regulatory oversight. These blood pressure devices include wrist cuffs and wrist wearables, which are not recommended, but can be used by patients to measure blood pressure at home to confirm clinical decisions on hypertension. Most new blood pressure devices have not been validated for accuracy, which means they are more likely to be inaccurate and contribute to poor management of hypertension.

Our group has several projects available on the quality assessment of blood pressure measurement devices: a) delivery of questionnaires to people purchasing blood pressure devices to understand the key factors in decisions on which blood pressure device to purchase; b) quality testing of patient home blood pressure devices; c) understanding the sales volume of validated versus non-validated blood pressure measurement devices. Prospective candidates are encouraged to contact BP research group supervisors for more details or to discuss other options for related research activities.

**Key Techniques:** Blood pressure measurement, delivery of questionnaires to patients and other clinical stakeholders, statistical analysis

**Location:** Medical Science Precinct, Hobart  
**Contact:** dean.picone@utas.edu.au or james.sharman@utas.edu.au or martin.schultz@utas.edu.au

---

**STUDYING THE BEHAVIOUR OF INDUCED PLURIPOTENT STEM CELL DERIVED OLIGODENDROCYTES FROM PEOPLE WITH MULTIPLE SCLEROSIS**

**Supervisors:** Kimberley Pitman and Kaylene Young

**Project Description:** Multiple Sclerosis (MS) is a disease in which immune cells invade the central nervous system, killing oligodendrocytes. However, it is unclear what causes MS and why the immune system attacks oligodendrocytes. The student undertaking this project will address this question by culturing induced pluripotent stem cells (iPSCs) derived from people with MS and healthy controls. The iPSCs will then be differentiated to generate immature and mature oligodendrocytes, distinguished by performing immunocytochemistry and
Key Techniques: Human stem cell culture, molecular biology, DNA sequencing, immunocytochemistry, light and confocal microscopy, electrophysiology, cellular assays.

Location: Medical Science Precinct  
Contact: kimberley.pitman@utas.edu.au

DO PERICYTES REGULATE BLOOD FLOW AND METABOLISM IN HEALTHY AND INSULIN RESISTANT SKELETAL MUSCLES?

Supervisor: Dr Dino Premilovac

Project Description: Obesity-associated insulin resistance is a characteristic feature of type 2 diabetes and plays a major role in the pathogenesis of the disease. Skeletal muscle insulin resistance is considered to be the initiating or primary defect that is evident decades before β cell failure and overt hyperglycemia develop. Insulin action within skeletal muscles is important because almost 80% of all glucose removal from the blood following a meal occurs in muscles and the transport of glucose into muscle cells is dependent on insulin. As well as having direct effects on muscle cells, insulin also causes vasodilation in the muscle microvasculature to increase blood flow through the capillary network to facilitate increased glucose uptake by muscle cells. Our research has demonstrated that these vascular actions of insulin are lost and contribute directly to the development of insulin resistance in skeletal muscles (1, 2). However, where in the vascular tree insulin acts remains poorly understood.

Pericytes are related to vascular smooth muscle cells and reside only in the capillary network. While pericytes contain the necessary cellular machinery for vasoconstriction and vasodilation, whether they perform these vascular functions to regulate capillary blood flow in skeletal muscles has never been investigated. The aim of this honours project is to determine whether pericytes are needed for insulin’s normal vascular and metabolic actions in skeletal muscles and how pericyte responses change in obesity-associated insulin resistance.

References:

Key Techniques: Animal handling and husbandry, Induction of obesity-associated insulin resistance in rodents, Surgical techniques to isolate blood flow to muscles, Setup and operation of the perfusion cabinet to perform muscle perfusions, Assessing metabolism using radioactive glucose tracing (14C-2DG-glucose), Western blotting, Immunohistochemistry and confocal microscopy

Location: MSP, Hobart  
Contact: Dr Dino Premilovac - Dino.Premilovac@utas.edu.au

DOES RHPON2 THERAPY PROTECT PBMCS FROM THE ADVERSE EFFECTS OF PSEUDOMONAS AERUGINOSA QUORUM SENSING MOLECULES?

Supervisor: Dr Louise Roddam

Project Description: Cystic fibrosis (CF) is an inherited life-shortening condition that results in the build-up of thick and sticky mucus lining the airways that is particularly prone to infection by P. aeruginosa. Despite aggressive antimicrobial therapy this infection is associated with significant lung damage, increased treatment costs, decreased quality of life and increased mortality in people with CF. It is, therefore, clear that new therapeutic strategies are needed to treat these infections.

We have developed an antimicrobial therapy that hydrolyses and inactivates a major bacterial chemical messenger (acyl homoserine lactone, AHL). Treatment of bacteria with rhPON2, decreases biofilm formation and increases their susceptibility to conventional antibiotics.

Additionally, bacterial AHLs freely enter human cells and grossly modulate host gene expression. We recently demonstrated that rhPON2 treatment of respiratory epithelial cells prevents AHL-mediated modulation of
inflammatory pathways and induction of apoptosis. However, bacterial AHLs can also be detected in the blood of CF patients with P. aeruginosa lung infections and therefore may also grossly affect immune cell function. This project will investigate whether our therapy can protect PBMCs from adverse AHL-mediated effects.

**Key Techniques:** Human cell culture, RT-qPCR analyses based on an RNAseq data set, apoptosis assays, DNA damage assays, enzymatic activity assays, LC-MS analysis, FLOW cytometry and ELISAs.

**Location:** Hobart

**Contact:** louise.roddam@utas.edu.au

INVESTIGATION OF AN EMERGING LUNG PATHOGEN

**Supervisor:** Dr Louise Roddam

**Project Description:** There is little doubt that the newly described Pandoraea is an emerging multi-drug resistant pathogen capable of establishing chronic lung infections in people with cystic fibrosis (CF) and contributing to lung damage. However, the virulence arsenal and antimicrobial mechanisms used by this organism are yet to be described. We are in a unique position to investigate the pathogenic potential and antibiotic resistance of this organism based on our recent genome and proteome analyses (the first for this human pathogen) using molecular tools available in our laboratory. Additionally, we have developed a new antimicrobial therapy that has yet to be tested against this organism.

**Key Techniques:** Bacterial culture, human cell culture, biofilm assays, microscopy, genome analysis, PCR and RT-qPCR, apoptosis assays, DNA damage assays, human cell infection studies, enzymatic activity assays and ELISAs.

**Location:** Hobart

**Contact:** louise.roddam@utas.edu.au

PHYSICAL ACTIVITY, FITNESS AND BLOOD PRESSURE

**Supervisors:** Dr Martin Schultz, Dr Dean Picone, Professor James Sharman

**Project Description:** Low cardiorespiratory fitness is one of the strongest and most important risk factors for cardiovascular disease, but accurate estimation without completion of an exercise test is difficult. Equally, physical inactivity contributes substantially to cardiovascular disease risk profiles but is difficult to subjectively quantify via self-report methods and may not correlate with objectively measured physical activity behaviors or cardiorespiratory fitness. To this end, a simple, readily implemented and easy to understand physical activity question/s that can provide distinct information concerning cardiorespiratory fitness, physical activity behaviors and cardiovascular disease risk is desired.

Our group has a range of potential projects that aim to assess the merits of simple physical activity questions in relation to high blood pressure and fitness. Studies may involve analysis of existing data, as well as prospective collection of subjective and objective physical activity measures, cardiorespiratory fitness and blood pressure. Prospective candidates are encouraged to contact BP research group supervisors for more details or to discuss other options for related research activities.

**Key Techniques:** Statistical analysis; blood pressure measurement, assessment of cardiorespiratory fitness, delivery of physical activity questionnaires.

**Location:** Medical Science Precinct, Hobart

**Contact:** Martin.Schultz@utas.edu.au or dean.picone@utas.edu.au or james.sharman@utas.edu.au

ALZHEIMER’S DISEASE- STRESS NEUROBIOLOGY

**Supervisors:** Dr Duncan Sinclair, Dr Tony Cook. Associate Professor Anna King

**Project Description:** Stressful experiences change our brains. This matters enormously as we age- population studies of traumatic events suggest that our resilience influences our risk of Alzheimer’s disease (AD). Mouse models have also shown that stress hormones worsen AD-related brain pathology. Unfortunately, mouse models have limited usefulness since mice and humans respond differently to stress. So the challenge is- how can we
understand what is happening at a cellular level in the stressed human brain and develop drugs to make the aging human brain more resilient?

To answer these questions we are using two types of human neuronal cells in the laboratory - neurons derived from induced pluripotent stem cells (iPSCs) and olfactory neurosphere cells. With these cells we are investigating how stress hormones influence pathological mechanisms in AD, and how pathological proteins in AD influence stress hormone signaling. We are also exploring therapeutic strategies which modulate stress hormone function, in the hope of increasing cellular resilience to AD pathology. This project will allow you to develop transferrable cell/molecular biology skills and utilize a range of in vitro experimental techniques. You will work amongst a team of researchers and students with expertise in neuroscience research and a focus on dementia.

Key Techniques: cell culture, stem cell differentiation and characterisation, translocation assays, cytotoxicity assays, western blotting, quantitative real-time PCR.

Location: Wicking Dementia Research and Education Centre, UTAS Medical Science Precinct

Contact: Duncan Sinclair, duncan.sinclair@utas.edu.au

OPTIMIZING CLINICAL PLACEMENTS IN MEDICAL EDUCATION

Supervisors: Associate Professor Tim Strong, Dr Kathryn Ogden, Associate Professor Jan Radford

Project Description: Clinical placements are essential in medical training. However, there is known variability in the student and supervisor experience of placements. Models of training that best meet student learning and competency objectives have not been extensively examined and are subject to a large variety of contextual factors. Better understanding of which aspects of placements most effectively facilitate learning has potential to guide curriculum development.

This project will explore two areas:

1. What characteristics of placements lead to positive learning experiences?
   • How does context influence these?

2. What is the optimal structure of clinical training for satisfactory learning outcomes?
   • How does this relate to placement duration?
   • What are the benefits and disadvantages of longer vs shorter rotations?
   • Should there be a requirement for consistency of student experience across specialty rotations?
   • What are the benefits and disadvantages of selective allocation of students to different specialty rotations?

The clinical placements studied will be attachments to medical and/or surgical units in the Launceston General Hospital.

Key Techniques: The project will combine quantitative and qualitative techniques, including the Manchester Clinical Placement Index which is a validated measure for seeking feedback from students on placements. This will be used in combination with interviews and focus groups of stakeholders (students, clinicians, academics, patients). A constructivist approach will build an evidence base for active translation of findings to curriculum development.

Location: Launceston Clinical School Contact: Kathryn.Ogden@utas.edu.au

THE ROLE OF PERICYTES AND VASCULAR FUNCTION IN HEALTH AND DISEASE

Supervisors: Dr Brad Sutherland, Professor David Howells, Dr Jo-Maree Courtney

Project Description: Pericytes are contractile cells that are found exclusively on capillaries throughout the body. In the brain, they are responsible for controlling blood flow as well as maintaining blood-brain barrier (BBB) function and aiding the growth of new blood vessels. Recent research suggests that pericytes may play a key role in outcome after stroke. During an ischaemic stroke, the most common type of stroke, a blood vessel becomes blocked and this starves the affected brain of oxygen and nutrients. A key aim for treating stroke is restoring that blood flow.

Recent studies have shown that, after a stroke, pericytes constrict and then die. Because the pericytes die in the constricted state, the capillaries are stuck in their “clamped shut” position and this impedes the restoration of blood
flow to the areas of the brain affected by stroke (Hall et al 2014 Nature 508:55-60). The mechanisms that govern these effects in pericytes are currently unknown and uncovering these could provide a novel therapeutic target for stroke. In addition, changes in pericyte function within the neurovascular unit could provide insight into other neurological diseases such as Alzheimer’s disease that also have impaired vascular function.

Our understanding of pericyte biology within the brain is limited. We offer Honours projects that will use in vivo techniques to determine how pericytes influence blood flow in the brain and maintain the blood-brain barrier. We will use disease models such as stroke or Alzheimer’s disease to uncover the importance of pericytes to the pathophysiology of these conditions. Finally, pericytes are located in the capillary beds of all tissues within the body, and so a comparison between pericytes in the brain and other peripheral tissues will be performed. This research will enhance our understanding of pericytes and determine their roles in the progression of disease, and could potentially give rise to a novel therapeutic target.

**Key Techniques:** In vivo models, pathology, molecular biology, behavioural assessment

**Location:** Medical Science Precinct

**Contact:** brad.sutherland@utas.edu.au, david.howells@utas.edu.au, jomaree.courtney@utas.edu.au

---

**EPIGENETIC SIGNATURES OF CANCER, HEALTHY BRAIN AGING AND ALZHEIMER’S DISEASE**

**Supervisors:** Dr Phillippa Taberlay (School of Medicine), Dr Adele Woodhouse (Wicking Dementia Research and Education Centre), Dr Brad Sutherland (School of Medicine) Andrew Phipps (Wicking Dementia Research and Education Centre)

**Project Description:** Dr Taberlay and Dr Woodhouse are running several large-scale research projects investigating key epigenetic alterations in cancer, healthy brain aging and Alzheimer’s disease. Below we have detailed some of the projects that we have on offer for Honours in 2020. We are flexible regarding Honours project topics and we strongly encourage any students interested in these areas of research (including bioinformatics) to come and discuss our research and possible Honours projects with us.

**A. Novel links between Cancer and Alzheimer’s disease**

Our recent epigenomic data from neurons in transgenic AD mice has uncovered several novel cancer related genes. This project will investigate these unexpected similarities between epigenetic signatures that may link cancer and Alzheimer’s disease.

**Key Techniques:** Fluorescent activated cell sorting, ChIP-seq, bioinformatics, qPCR, immunohistochemistry.

**B. Investigating alterations in genes related to vasculature in Alzheimer’s disease**

A potential cause and contributing factor in Alzheimer’s disease is the narrowing of capillaries and subsequent restriction of blood flow in the brain. Recent epigenomic and transcriptomic data from neurons in Alzheimer’s disease and amyloidosis models have revealed alterations in genes involved in vascular function and angiogenesis. This project will characterize the epigenetic and transcriptomic alterations in vascular-related genes that occur in in Alzheimer’s disease.

**Key Techniques:** Bioinformatics, fluorescent activated cell sorting, ChIP-seq, qPCR, immunohistochemistry.

**C. Three-dimensional chromatin remodeling in cancer cells**

DNA inside cells is highly organized in both 2D and 3D nuclear space to ensure that the epigenome can function properly. We will use *in vitro* prostate, breast and colon cancer models to test whether we can interfere with DNA methylation and modify the 3D genome environment.

**Key Techniques:** cell culture, HiC chromosome conformation, qPCR, nucleosome occupancy and methylation sequencing, data analysis and bioinformatics

**Location:** Medical Science Precinct

**Contact:** Phillippa.Taberlay@utas.edu.au, Adele.Woodhouse@utas.edu.au, Brad.Sutherland@utas.edu.au
THE ASSOCIATION OF ADIPOSITY WITH COGNITIVE DYSFUNCTION IN PEOPLE AGED IN THEIR 40S

Supervisors: Dr Jing Tian, Professor Alison Venn

Project Description: The world is facing a public health crisis of overweight and obesity. Globally, the prevalence of obesity nearly tripled since 1975, with over half of the world’s adults classified as overweight or obese in 2016. The worldwide prevalence of overweight and obesity among children and adolescents has increased more than four-fold, from 4% in 1975 to 18% in 2016. Obesity is even common in Australia. In 2014/15, 63% of Australian adults and 27.4% of Australian children and adolescents were overweight or obese.

Overweight and obesity are associated with an increased risk of dementia – the first leading cause of death among Australian females and the third leading cause of death among Australian males in 2017. Although dementia is more common after the age of 65 years, cognitive decline is evident in people aged in their 40s. However, it is far from clear whether obesity is associated with an impaired cognitive function in people aged in their 40s and how abdominal obesity associates with cognitive function in this age group. This project will use data from a national cohort study – the Childhood Determinants of Adult Health study, to investigate associations between adiposity and cognitive function in approximately 1,500 Australians aged 40-49 years.

Key Techniques: Students will gain proficiency in the data cleaning, analysis and interpretation, manuscript and abstract preparation. Statistical supervision will be provided. A scientific manuscript is intended for submission to a peer-reviewed international journal.

Location: Hobart  Contact: J.Tian@utas.edu.au

NEUROPEPTIDE REGULATION OF ANIMAL GROWTH AND BODY SIZE

Supervisors: Professor Coral Warr and Dr Katherine Shaw

Project Description: Understanding the mechanisms that control growth in animals is of critical importance. Dysregulation of growth in humans underlies many of the major diseases that afflict society, including cancer, growth disorders and obesity. We use the vinegar fly *Drosophila melanogaster* as a model organism for studying the genetic basis of growth control because many of the known growth signalling pathways are conserved between flies and humans, and much of our current knowledge of human growth factors and the signalling pathways they activate comes from studies in the fly. In *Drosophila* we have available many sophisticated genetic and molecular approaches available to study gene function.

In both flies and humans, growth is regulated by neuropeptides in response to environmental cues such as nutrition. Using genetic screens we have identified a number of neuropeptide receptors that control growth and developmental timing in *Drosophila*, all of which have human homologues. Several possible projects are available to characterise the role of these genes, and can be tailored to student interests. We are particularly keen for a student to work on the sNPF gene, the homologue of mammalian neuropeptide Y.


Contact: coral.warr@utas.edu.au  Website: coralwarr.com

DETERMINING THE ROLE OF NEUROPEPTIDE Y IN MOTOR NEURON DISEASE IN DROSOPHILA MODELS

Supervisors: Professor Coral Warr and Dr Katherine Shaw

Project Description: Motor neuron disease (MND) is a common neurodegenerative disease characterised by the selective death of motor neurons and a progressive decline in muscle function. There is currently no cure, and individuals have a median survival of only three years from onset of symptoms. While the majority of MND cases are sporadic, the approximately 10% of familial cases have led to the identification of at least 15 genes linked to MND. Interestingly, these genes act in many different cellular processes, and thus currently an understanding of the molecular mechanisms underlying disease pathogenesis remains elusive. Professor Tracey Dickson’s group has recently shown that alterations in Neuropeptide Y (NPY) are one of the earliest events in MND, but the role of NPY
in MND and where it acts are unknown. In this project we will use *Drosophila melanogaster* to investigate these questions. *Drosophila* is an outstanding model for modelling and studying neurodegenerative disease, including MND. You will utilise the reagents the Warr lab has developed to study the fly homologue of NPY to help determine the mechanism by which it acts in motor neuron function and dysfunction. The findings will provide important understanding of the mechanisms underlying disease pathology and inform efforts underway to investigate the therapeutic potential of NPY.

**Key Techniques:** Immunohistochemistry, RNA *in situ* hybridisation, reporter genes, PCR and cloning, RNA interference, CRISPR/Cas mutagenesis, *Drosophila* genetic experiments, production of transgenic *Drosophila*, behaviour assays.

**Contact:** coral.warr@utas.edu.au  
**Website:** coralwarr.com

---

**MECHANISMS OF DUST INDUCED OCCUPATIONAL LUNG DISEASE**

**Supervisors:** Professor Graeme Zosky

**Project Description:** Occupational lung disease causes a significant burden on the community. This is highlighted by the recent resurgence of coal workers’ pneumoconiosis, an entirely preventable disease that was thought to be absent in the Australian mining community, and the recent spate of cases of fatal silicosis in young workers in the stone benchtop industry, who seem to develop a severe, rapidly progressing form of disease. In order to prevent disease, and treat individuals who develop these debilitating conditions, we need to understand 1) the cellular mechanisms that drive the link between exposure to occupational dusts and chronic lung disease and, 2) how the physico-chemical characteristics of occupational dusts impact on the response.

This project will address these questions by examining the *in vitro* response of a range of relevant lung cell types to occupational dusts with or without a secondary insult (e.g. bacterial infection). The response will be measured with a range of techniques including PCR, oxidative stress assays and ELISA and will make use of the unique suite of occupational dusts we have available. Please note: the specific details of the project can be negotiated on the basis of the interest(s) of the student.

**Key Techniques:** Cell culture, PCR, ELISA, electron microscopy

**Location:** Medical Science Precinct (Menzies/SoM)  
**Contact:** Graeme.Zosky@utas.edu.au