Faculty of Health and Medical Sciences

2018

Honours and Higher Degree by Research Opportunities

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Study with us and open the door to a range of rewarding career opportunities. Become a part of a community of alumni that includes Nobel Prize winners, pioneering researchers and world-renowned leaders in health. Our research programs are held in high regard, their quality and impact respected by peers and the community.

**Why study Honours or a Higher Degree by Research?**

Studying Honours or a Higher Degree by Research can provide you with the skills and experience to pursue different career opportunities, particularly a career in research. Employers recognise that the research ability and broad range of transferable skills which University of Adelaide graduates possess equip them well for challenging and diverse roles in industry, government and business, as well as in research and academic organisations. By undertaking a research degree with us, you will be involved in discovery, innovation and cutting-edge research. Our strong focus on addressing global challenges creates a highly stimulating setting for our postgraduate students interested in changing the world.
Applying for Honours

3 easy steps in applying for Honours

1. Identify an area of interest
Discover current research opportunities in this publication, or browse our research areas on the Faculty of Health and Medical Sciences website.

2. Complete the relevant form
To initiate an expression of interest, download and complete the relevant form according to the instructions for the honours program you wish to undertake.

3. Submit
Submit your completed expression of interest, a copy of your academic transcript, and any other additional documents required to fhsresed@adelaide.edu.au

Further information

The University offers scholarships to undergraduate students. These scholarships, as well as many others funded by industry and non-profit organisations, are available to potential and currently enrolled students.

Students enrolled in the Bachelor of Medicine and Bachelor of Surgery degree at the University of Adelaide will need to apply for a leave of absence and supply a banding letter. Students can request this by emailing fhsassessment@adelaide.edu.au

Are you currently studying at another university?
If you are completing undergraduate studies at another institution, you will need to provide a copy of your academic transcript once your final results are available.

Closing deadlines and next steps

You are strongly encouraged to apply by 30 November 2017 (unless a due date is specified). All other applications will continue to be accepted up until mid-January. Please be aware that many scholarship closing dates are earlier than November.

Once final results for the semester are available (in July or December), Honours coordinators will finalise their recommendations for honours projects. Successful students will then be emailed with instructions to submit a formal application for admission to the honours degree via a university internal transfer or, for external applicants, via SATAC.
Applying for a Higher Degree by Research (HDR)

1. Determine what type of HDR you wish to apply for, and check the entry requirements
   Information on the different degrees and their eligibility is available on the Degree Finder website at adelaide.edu.au/degree-finder
   Information on scholarships is available at adelaide.edu.au/scholarships

2. Secure a supervisor
   Before applying online, you need to secure the support of a supervisor and postgraduate coordinator with your proposed school. Note that this can take weeks or months, so ensure that you start this process well before any scholarship closing dates.
   To secure a supervisor email your initial inquiry to fhresed@adelaide.edu.au. The Office of Research Development and Research Education can advise you on preparing the necessary documents, and liaise with the relevant postgraduate coordinator on your behalf. This is a highly competitive process, and we are aiming to help you present the strongest possible application to attract potential supervisors (note that each school has different internal processes, so students are discouraged from directly contacting supervisors).
   The postgraduate coordinator will assess your portfolio, and determine if your application is suitable for circulation to potential supervisors. Most successful applications typically demonstrate excellent academic transcripts, publications in respected international journals, high scoring English proficiency tests and a draft research proposal that fits well within the school’s research strengths.
   A list of postgraduate coordinators is available at adelaide.edu.au/graduatecentre/staff/postgraduate-coordinators/pgc-list

3. Refining your research topic and supervisor interview
   After circulating your portfolio to the academic staff within the school, supervisors who are interested in your portfolio will contact you directly. The supervisor will discuss your research topic with you, and will book a time to interview you (either in person or via Skype). If the supervisor then agrees to support your application, you will receive written confirmation to proceed with your application.

4. Apply online
   Having secured the support of your school, supervisor and postgraduate coordinator, the next step is to formally apply online through the Adelaide Graduate Centre at adelaide.edu.au/graduatecentre/admission
   Note that domestic and international scholarships have specific closing dates. You will be required to upload many of the documents that you have previously provided to the school, referee reports, and the written confirmation from your supervisors that they have agreed to support your project.

5. University ranking and award
   Scholarship applications undergo ranking and selection through a series of faculty and university selection panels. There is intense competition for scholarship places, so preparing a compelling application (per steps 1-3 above) is essential. The administration and admission of HDR students is managed through the Adelaide Graduate Centre adelaide.edu.au/graduatecentre/admission

Further information
Please direct all inquiries to fhresed@adelaide.edu.au
International study opportunities for PhD students

In 2015, the University of Adelaide and our priority partners, Nagoya University (Japan) and the University of Freiburg (Germany) signed formal agreements to offer Joint PhD programs in the area of medical and biomedical research. In these programs, PhD students are enrolled in both the University of Adelaide and the respective partner university and will be supervised by experts from each university. At PhD completion, students will receive a jointly awarded PhD degree.

Students undertaking the joint PhD program will spend most of their candidature at the University of Adelaide and at least one year under academic supervision within the School of Medicine, Nagoya University or International Spemann Graduate School of Biology and Medicine at the Albert-Ludwigs-University/University of Freiburg. All instruction is undertaken in English.

For more information, visit:
adelaide.edu.au/graduatecentre/new-developments/hdr-programs/joint-nagoya
Cancer Biology and Clinical Oncology
Cancer is a general term for more than 100 diseases that are characterised by the abnormal growth of cells. Cancer affects a large portion of Australians, with one in two diagnosed by the age of 85.

Our cancer biology research seeks to understand the fundamental mechanisms by which cancers arise, progress and respond to treatment.

Clinical oncology consists of three primary disciplines: medical oncology (the treatment of cancer with medicine, including chemotherapy); surgical oncology (the surgical aspects of cancer, including biopsy, staging, and surgical resection of tumours); and radiation oncology (the treatment of cancer with therapeutic radiation).

Understanding the causes of cancer will enable the development of innovative approaches to treat both liquid cancers (leukaemia and myeloma) and solid cancers (breast, prostate, ovarian and gastrointestinal cancer).

Researchers across the faculty are focused on:
• identifying the molecular and cellular basis of cancer
• developing preclinical models that closely resemble human cancer
• understanding the mechanisms involved in cancer spread and resistance to chemotherapy
• identifying novel biomarkers for detection of cancer
• developing and evaluating new drugs to treat cancer.
Liver Metastasis Research Group

Basil Hetzel Institute for Translational Health Research; The Queen Elizabeth Hospital, Woodville

Liver Metastasis Research Group takes advantage of expertise in cancer research, immunology and cell biology to address the urgent clinical need of early detection, risk prediction and treatment of liver metastases in patients with colorectal cancer. Being a small group with clear translational research focus on development of predictive and therapeutic biomarkers, we apply a straightforward bed-to-bench-and-back approach utilising high-throughput methods for target discovery in cancer patients’ blood and tissue samples. Our technology platform includes state of the art proteomic techniques.

Lead researcher: Dr Ehud Hauben
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Honours project opportunities

- Development of predictive biomarkers of metastatic colorectal cancer: a prospective clinical study
  Method: standardised collection, and processing and analysis of prospective patient samples and clinical data.
  Ultimate goal: diagnose early, determine risk, and prevent liver metastasis.

- The association between HLA-G expression and response to treatment in colorectal cancer
  Hypothesis: HLA-G levels can predict response to treatment in bowel cancer patients.
  Methods: analytical and functional ex vivo assays.
  Ultimate goal: diagnose early, determine risk, and prevent liver metastasis.

- Imaging biomarkers for prediction of metastatic risk in colorectal cancer patients
  Aim: determine the association between hepatic fat content and metastatic progression by retrospective analysis of liver imaging data from colorectal cancer patients.
  Ultimate goal: diagnose early, determine risk, and prevent liver metastasis.

Higher Degree by Research project opportunities

- The immune cell compartment in liver metastasis
  Hypothesis: resident and peripheral immune cells either permit or resist hepatic invasion and growth of circulating tumour cells.
  Methods: analytical and functional assays to compare the frequency, phenotype and function of various immune cell subsets in liver biopsies and blood samples from bowel cancer patients who do/don’t develop liver metastases.
  Aim: characterise the immune cell compartment in colorectal liver metastasis.

- Development of targeted nanoparticles as preventative therapy for liver metastasis
  Aim: construct and validate targeted porous silicon nanodiscs as vehicles to manipulate the expression of therapeutic targets in bowel tumours and in liver tissue

Research areas
Cancer biology and clinical oncology
Immunology and infection
Innovative therapeutics

More information
basilhetzelinstitute.com.au/profile/ehud-hauben/#about

Liver Metastasis Research Group: Zinaida Tvorogova, Dr Chandra Kirana, Dr Ehud Hauben and Dr Kevin Fenix.
Myeloma Research Group

South Australian Health and Medical Research Institute (SAHMRI)

So, what does the Myeloma Research Laboratory do? Our laboratory studies the molecular and cellular basis for the development of the bone marrow cancer, multiple myeloma.

Myeloma is characterised by the clonal proliferation of malignant plasma cells (an immune cell type that normally protects us against infection). Myeloma is the second most common blood cancer, with over 100,000 people diagnosed worldwide each year. Despite recent advances in treatment, myeloma remains almost universally fatal with a 10-year survival rate of approximately 17%.

The main clinical manifestations of myeloma are the development of osteolytic bone lesions, bone pain, hypercalcaemia, renal insufficiency, suppressed immunoglobulin production and increased BM angiogenesis (blood vessel formation). Most, if not all, cases of myeloma are preceded by a premalignant (asymptomatic) monoclonal gammopathy of uncertain significance (MGUS) stage. However, the intrinsic genetic factors which trigger the progression from this asymptomatic stage of the disease to overt malignant myeloma remains to be determined. Moreover, recent studies suggest that the bone marrow microenvironment plays a central role in disease progression.

Using state-of-the art genomics, in vitro models of cancer development and preclinical models of disease, our laboratory is focused on identifying the key genes which are responsible for disease progression and the role played by the bone microenvironment in disease development and relapse. We believe that these approaches will enable us to identify new molecular markers of disease risk and to design drugs against novel therapeutic targets.

In addition to myeloma, our group also investigates how nutrient-sensing pathways in the skeleton control bone mass and systemic glucose metabolism. Osteoblasts, the cells that form bone, have recently been shown to secrete factors that circulate in the blood stream and act on tissues remote to the bone to control metabolism and reproductive function. These remarkable developments in the fields of skeletal biology and endocrinology have important implications in the study of diseases which impact on skeletal health including osteoporosis and type 2 diabetes. Using sophisticated genetic models, our laboratory is studying the function of key insulin-responsive pathways in osteoblasts in order to gain important insight into how the skeleton regulates global energy metabolism.

Lead researcher: Professor Andrew Zannettino
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Honours project opportunities

> Hidden burden: RNA editing mutations in multiple myeloma

Multiple myeloma is an incurable cancer caused by the uncontrolled proliferation of antibody-secreting plasma cells. It is a genetically complex disease with each patient harbouring a different combination of mutations at the DNA level, including single nucleotide variants, copy number abnormalities and chromosomal translocations.

Ten percent of patients have loss of function mutations in the gene encoding the nuclear antigen SP140. We have recently described a mutation resulting in a premature stop codon in mouse SP140,
Cancer Treatment Toxicities Group

University of Adelaide North Terrace Campus; Adelaide Health and Medical Sciences (AHMS) building

The Cancer Treatment Toxicities Group is made up of four collaborative research laboratories: the Gastrointestinal Pathophysiology Lab (Lab Head Bowen), the Gut Microbiome Lab (Lab Head Gibson), the Clinical Pharmacogenomics Lab (Lab Head Coller) and the Mucositis Lab (Lab Head Keefe).

The group’s broad research interest is in toxicity of cancer treatment, particularly of the gastrointestinal tract, and how it links to other toxicities such as pain and cognitive decline. The laboratory work investigates chemotherapy, radiotherapy and targeted therapy-induced whole gut damage, and the efficacy of new agents in prevention and treatment.

We also have ongoing patient studies looking to determine the risk factors associated with poor treatment outcomes and how to better predict side effects.

Lead researchers: Associate Professor Joanne Bowen and Dr Janet Coller
Email: joanne.bowen@adelaide.edu.au

Honours project opportunities

> Role of TLR4 on cancer treatment toxicities

Chemotherapy drugs used to treat cancer commonly cause damage to the normal gastrointestinal lining, leading to adverse symptoms such as intestinal inflammation and ulceration. There are currently no effective preventative strategies and a lack of understanding surrounding the mechanisms initiating damage. Recently, the innate immunity receptor, Toll-like Receptor 4 (TLR4), has been proposed to play a role in chemotherapy-induced gastrointestinal damage. As such, this project will investigate the effects of TLR4 gene deletion, both globally and restricted to the intestinal epithelium, on the development of gastrointestinal inflammation in response to chemotherapy.

Project aims: This project will use TLR4 knockout mice treated with irinotecan to measure effects on intestinal damage.

Research techniques include: histological analysis, immunofluorescence, real time PCR and small animal handling. Results of this study will provide direct evidence of TLR4 signalling in mediating this important side effect of therapy.
Also available as a PhD or Masters project.

> Gut microbiome composition as a predictive marker for cancer treatment outcomes

Patients with cancer are at high risk of microbiome dysbiosis (lack of bacterial diversity and/or overabundance of pathogenic species) due to frequent hospital visits, surgery, chemotherapy and radiation treatment, other medications (notably prophylactic antibiotics), changes in diet, and the presence of cancer itself. Having a diverse gut microbiota is considered protective against chemotherapy-induced bacteraemia, and preclinical work points to bacterial diversity as a key determinant of tumour response and intestinal inflammatory injury. Thus the objective of this project to explore links between microbiota, inflammatory responses, and chemotherapy treatment.

Research techniques include: mouse models of colon cancer treated with chemotherapy, bacterial gene sequencing, and patients trials analysing longitudinal changes in microbiome following different cancer therapies.
Also available as a PhD or Masters project.

> Targeting treatments to the inflamed gut using nanoparticles

A major limitation of delivering biological agents via the oral route is the destruction faced through the acid and enzyme rich environments of the stomach and small intestine. As such, conditions characterised by inflammation in the colon, such as radiation-induced colitis, are very difficult to manage. Through our industry collaboration, we are investigating the use of silica nanoparticles as new drug carrier systems, for the improved treatment of cancer therapy associated intestinal injury. We aim to demonstrate that neutralising antibodies loaded into particulate carriers are an effective approach to the treatment cancer therapy-induced colitis.

Research techniques include: mouse and rat models of colitis, live animal imaging, fluorescent microscopy, and mass spectrometer of circulating drug metabolites.
Also available as a PhD or Masters project.

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas
Cancer biology and clinical oncology

Members of the Cancer Treatment Toxicities Group
Aquaporin Physiology and Drug Discovery

The University of Adelaide, North Terrace campus

The water channels known as aquaporins (AQP) are an ancient family found in all the kingdoms of life, from bacteria and plants to invertebrates and vertebrates, and play key roles in water balance and fluid homeostasis across cell membranes. The thirteen classes of human AQPs show tissue specific patterns of expression relevant for health and pathophysiological processes. Our goals are to define the molecular basis of the dual water and ion channel function of aquaporins, to understand the roles of AQP5s in physiological systems, and to build a definitive portfolio of AQP antagonist and agonist compounds as tools for basic research and clinical innovation.

Aquaporins are currently being uncovered as essential components of rapid cell migration in wound healing and cancer metastasis, particularly in aggressive cancers such as glioblastoma and colon cancers. We have shown molecular knockdown or pharmacological blockade of AQP1 can slow or stop aggressive cancer cell movement. Our work over the past decade has challenged the original dogma that the archetypal channel AQP1 is rigid and constitutively open. We have shown that AQP1 is regulated by intracellular signals and serves as a cGMP-gated ion channel as well as an osmotic water channel. Our focus on AQP pharmacology defined the first library of pharmacological agents in the world, based on arylsulfonamide scaffolds showing differential activities on the ion and the water pores.

We are now testing potentially powerful dual therapies for blocking cell migration. We are also defining pharmacological AQP modulators from traditional Chinese and Indian medicinal herbs, identifying the active chemical components and their molecular targets of action on AQP gating domains. Our findings offer exciting translational opportunities for clinical intervention in cancer metastasis, brain oedema, hydrocephalus, and other fluid transport disorders. Our drug agents are currently being tested in vivo in collaborative projects in Australia, Europe and the United States of America (USA).

Lead researcher: Professor Andrea Yool
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Honours project opportunities

> Aquaporin (AQP) channel upregulation is diagnostic of aggressive cancers such as glioblastoma, breast and colon cancer

Selective pharmacological modulators developed by our group are being used to evaluate the dependence of migration on water and cation channel activity in human cancer cell lines which natively express AQP1. New agents targeting migration and metastasis are of substantial interest in cancer therapy and other diseases.

> Discovery of new pharmacological blockers of cancer cell migration from traditional medicinal plants

Alternative herbal medicines from Chinese, Indian, and other cultures are investigated as sources of novel compounds for drug discovery. Methods including cell culture and microscopy are used to analyse the effects of medical herb extracts as tools for controlling cancer cell migration in vitro, and to identify candidate sources of new drug agents for aquaporin channels.

Higher Degree by Research project opportunities

Targeting mammalian aquaporins offers new methods for treating brain injury, stroke, cancer, gastrointestinal, kidney and other diseases. Aims to be selected based on the project include analysis of: (1) molecular structures of permeation pathways, (2) drug docking sites, (3) patterns of AQP expression, (4) mechanisms of regulation of AQP water and ion channel activity, (5) migration assays in cancer cell lines measuring the effects of AQP modulators, and (6) aquaporin new drug discovery and characterisation.

> Molecular mechanisms of action and selectivity of pharmacological blockers of aquaporin channels as anti-cancer agents

Aquaporin channels localised at the leading edges of aggressive glioblastoma, colon and other cancer cells, and are essential for metastasis. This project focuses on the structure and function of mammalian aquaporins, their role in cancer cell migration, and the sites and molecular mechanisms of action of novel aquaporin drugs.

> Discovery and characterisation of pharmacological blockers of aquaporin channels for controlling colon cancer metastasis

Traditional medicinal plants are valuable sources of novel compounds for drug discovery. Methods including cell culture, live-cell imaging, confocal, and molecular biology are focused on the characterisation and mechanisms of action of new aquaporin agonists and antagonists, and testing the effects of the treatments on controlling cancer cell migration in vitro.

> Analysing the water and ion channel functions of aquaporin channels in the invasive pathology of glioblastoma

New AQP drugs that restrain cell migration hold promise for cancer therapy. Methods including molecular biology, protein expression systems, electrophysiology, and immunocytochemistry techniques are focused on the role of aquaporins and the discovery of new agonists and antagonists for controlling migration and thus the lethally invasive properties of glioblastoma cells in the brain.

Research areas
Cancer biology and clinical oncology
Neuroscience, behaviour and brain health

More information
researchers.adelaide.edu.au/profile/andrea.yool

Binding of a new drug AqB011 at the central pore of Aquaporin-1
Reproductive Cancer Research Group

Adelaide Health and Medical Sciences (AHMS) building

The Reproductive Cancer Research Group seeks to understand the mechanisms involved in ovarian cancer spread, resistance to chemotherapy and the identification of novel biomarkers for detection. We are currently studying the interactions between peritoneal and ovarian cancers and the mechanisms whereby extracellular matrix proteins and proteases promote motility and tumour spread of ovarian cancer.

Lead researcher: Dr Carmela Ricciardelli
Email: carmela.ricciardelli@adelaide.edu.au

Honours project opportunities

> Targeting the hyaluronan signalling pathway to overcome chemoresistance

Our recent studies have linked chemoresistance with the production of the extracellular matrix component hyaluronic (HA). We have shown that HA can increase the expression of ABC transporters in ovarian cancer cell lines expressing the HA receptor, CD44, and thereby induce resistance to the chemotherapeutic drug, carboplatin. HA-CD44 interactions have been shown to activate several signalling pathways including the P13K, MAPK and Rho K pathways.

Genes of the P13K/Akt cascade have also recently been shown to induce drug resistance to cisplatin. We plan to determine whether HA treatment activates these pathways in ovarian cancer cells and if specific inhibitors of these pathways can alter ovarian cancer sensitivity to carboplatin.

This project will utilise a broad range of techniques including cell proliferation, western blotting, immunohistochemistry and qPCR.

> Versican as a target to inhibit cancer metastasis

Proteoglycans are major components of the extracellular and have been shown to regulate cell adhesion, cell signalling, apoptosis, migration and invasion. Increased expression of the chondroitin sulfate (CS) proteoglycan, versican in the peritumoral stromal matrix is associated with a poor outcome in many cancers, including breast and ovarian carcinoma.

Although there is the accumulating in vivo evidence that versican is pivotal in promoting cancer cell metastasis in different cancer types, the means of preventing actions of versican in carcinomas have not been explored.

This study we will evaluate using in vitro and in vivo cancer models whether selective versican inhibition by versican siRNA, in addition to drugs known to inhibit versican synthesis; genistein, budesonide, formoterol and montelukast, can inhibit cancer invasive behaviour and block cancer metastasis.

> Role of ADAMTS1 and ADAMTS4 proteases in cancer metastasis

Metastatic spread to the lymph node and bone is the most significant cause of relapse and mortality in prostate cancer patients. The molecular processes which mediate metastasis of cancers to the bone have been a strong focus of recent research. The Adamts (adomalyalin-thrombospondin) proteases are a family of metalloproteinases involved in extracellular matrix (ECM) processing. Adamts1 and Adamts4 are major bone matrix remodelling proteases.

Substrates include versican a prominent stromal matrix component associated with breast and prostate tumour progression. A recent report links Adamts1 to the bone metastatic gene signature.

This project will focus on Adamts1 and 4 for which there growing evidence of a role in prostate cancer progression. This project will utilise a broad range of techniques using including immunohistochemistry, motility, adhesion and invasion assays and an in vivo animal model of prostate cancer.

Higher Degree by Research project opportunities

> Exploring ovarian cancer-peritoneal cell interactions

Ovarian cancer spreads by detaching from the surface of the ovary and attaching to and invading the mesothelium which lines the organs of the abdominal cavity including the omentum. Unlike other cancer types it rarely spreads via the bloodstream. Once the ovarian cancer cells adhere to the mesothelium, they can invade through the peritoneal cell layer and gain access to local organs, like the bowel, and form secondary tumors which eventually results in the death of the patient. A greater understanding of these processes will lead to the discovery of novel molecular targets to block this critical step of ovarian cancer metastasis.

This project will identify specific alterations in the metastatic peritoneal microenvironment involved in the first steps of ovarian cancer metastasis using Maldi tissue imaging and characterise the function of key molecules using in vitro and in vivo models.

> Novel mechanisms of acquired chemotherapy resistance in serous ovarian cancer

Ovarian cancer is the most lethal gynaecological cancer and ranks as the fifth most common cause of cancer-related death in women in the Western world. Each year over 1,500 women are diagnosed with ovarian cancer and approximately 1,000 women die from this disease in Australia. The standard treatment for advanced ovarian cancer is surgery followed by chemotherapy. Although patients initially respond to this treatment, most patients relapse and develop resistance to chemotherapy and eventually die from the disease.

Development of chemoresistance is the main factor contributing to ovarian cancer death. The molecular pathways associated with acquired carboplatin resistant in serous ovarian cancer cells are poorly understood. Links have been demonstrated between chemoresistance and the activation of cancer stem cells, epithelial mesenchymal transition (EMT) and non-coding RNA pathways. A greater understanding of these pathways and mechanisms in a 3D model systems will lead to the identification of novel treatment strategies that can overcome chemotherapy resistance.

Research areas
Cancer biology and clinical oncology

More information
researchers.adelaide.edu.au/profile/carmela.ricciardelli
Leukaemia Research Group

South Australian Health and Medical Research Institute (SAHMRI)

Chronic myeloid leukemia (CML) had a survival rate of less than five years because it transformed into a more aggressive, fatal acute leukemia.

The Tyrosine kinase inhibitor (TKI), imatinib, heralded a new era in targeted therapy for CML, yet some patients still have adverse leukemia-related outcomes. Transformation to an acute leukemia still occurs in around 5-10% of patients, and 15-20% either fail to respond to imatinib therapy or lose response. The second generation TKIs are more potent than imatinib and can reduce the risk of these adverse outcomes but they are generally more toxic. High risk relapsed B-precursor Acute Lymphoblastic Leukaemia (B-ALL) is one of the leading causes of non-traumatic death in children whereas in adults the disease is high risk. Next Generation Sequencing has identified many genetic lesions in ALL.

Our research is centred around providing a precision medicine approach, based on genomics, bioinformatics and functional screening for CML & high risk ALL and to ultimately provide a screening paradigm broadly applicable to other cancers. In CML we are developing this approach for critical upfront identification of high-risk CML patients and their vulnerable secondary pathways, allowing the application of novel therapeutic combinations. In high risk ALL the focus is to develop biomarkers for therapeutic triage and monitoring in high-risk patients. This will be achieved with systematic exploration of genomics and concomitant disease biology, which will inform biomarker development. This, together with existing strengths in the study of druggable targets, will inform therapeutic strategy. The ultimate aim is to ensure therapeutic impact is maximized for all patients diagnosed with high-risk CML and ALL. The research will develop the knowledge to translate genomic technology into clinical practice so patients and their families benefit.

Lead researcher: Professor Deborah White
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Honours project opportunities

- Cloning novel Mixed Lineage Leukaemia (MLL) fusions and functional characterisation and resistance studies
  Recent advances in genomic profiling have defined Acute Lymphoblastic Leukaemia (ALL) as a heterogeneous disease with multiple subgroups characterised by distinct genetic alterations. The presence of chromosomal rearrangements of the MLL gene in ALL patients is associated with extremely poor prognosis. Using transcriptomic analysis we have identified a number of poorly characterised MLL fusions in patients with ALL. This project aims to clone full-length MLL fusions from patient material into mammalian expression plasmids. This will allow future in vitro characterisation and assess therapeutic responses. This project will involve a range of molecular biology and cloning techniques including primer design, PCR Sanger sequencing, bacterial work and tissue culture.

- Generation of resistance to combinations of the new anti-leukaemic agent ABL001 and imatinib or dasatinib using BCR-ABL1+ cell-lines
  Phase I clinical trials for the treatment of CML are currently underway using ABL001, an allosteric inhibitor, alone and in combination with ATP-competitive tyrosine kinase inhibitors (TKIs: imatinib, nilotinib or dasatinib), to inhibit the constitutively active tyrosine kinase Bcr-Abl. Generation of resistant cell lines in the laboratory setting provides a useful tool for predicting and studying patient responses in vivo. In this project, BCR-ABL1+ cell lines will be exposed long term to gradually increasing concentrations of ABL001 in combination with dasatinib or imatinib. Mechanisms of resistance will be interrogated during resistance development and once overt resistance is observed.

Higher Degree by Research project opportunities

- Using in vivo modelling to reverse/prevent disease resistance in patients with high-risk ALL treated with targeted therapies
  Relapsed Acute Lymphoblastic Leukaemia (ALL) is a significant medical problem in children and adults. Recent advances in genomic profiling techniques highlighted the genetic heterogeneity of the disease; subgroups of patients harbouring a diverse range of genetic abnormalities exist. The incorporation of clinically available drugs, with known safety profiles, into current therapeutic regimens will transform outcomes for patients with high-risk subtypes of ALL. However, resistance to such targeted therapies will likely occur in a percentage of patients and in vivo modelling of resistant disease and investigations of new therapeutic strategies (combination therapy, novel drugs as they become available) is critical to proactively avoid resistance in children. This project will use patient derived xenograft (PDX) mouse models to aid the development of novel therapeutic approaches, which will likely yield superior clinical management of patients with the highest risk disease.
  Project aims:
  1. To establish in vivo models of resistance using primary cells from patients with high-risk ALL
  2. To determine baseline patient sensitivity to anti-leukemic agents in vitro
  3. To determine the efficacy of therapeutic approaches in mouse models developed in Aim 1

- Determining the prerequisites for the achievement of treatment-free remission in Chronic Myeloid Leukaemia (CML) to aid the development of new therapeutic approaches
  Tyrosine kinase inhibitors (TKIs) are used in the treatment of CML. Many patients will eventually achieve a stable complete molecular response (CMR) and approximately 40% of these patients can cease TKI therapy and remain in CMR, or treatment-free remission (TFR) long-term. Why the remaining 60% of patients relapse rapidly when TKI therapy is ceased remain undetermined, but likely hold the key to understanding and maximising TFR, one of the biggest challenges for CML clinicians today. The aims of this project are 1. to determine any difference in the quantity or quality of residual leukaemic cells in patients with stable CMR who relapse when they cease TKI therapy compared to patients who achieve TFR 2. Whether these patients have different immune responses 3. Whether CMR and subsequent TFR are associated with specific genomic features.

Research areas
Cancer biology and clinical oncology

More information
sahmriresearch.org/our-research/themes/cancer/theme-overview
Dame Roma Mitchell Cancer Research Laboratories

Adelaide Health and Medical Sciences (AHMS) building

The Dame Roma Mitchell Cancer Research Laboratories (DRMCRL) is a leading research centre in Australia with an integrated approach to breast and prostate cancer research that spans basic science to clinical translation.

The lab's research aims to improve disease outcomes for men with prostate cancer and women with breast cancer by understanding how sex hormones (such as testosterone, estrogen and progesterone) control tumour behaviour. This information is used to develop new drugs or treatment strategies that therapeutically manipulate sex hormone action. The DRLMCL has also pioneered the development of unique preclinical models of human breast and prostate cancers, especially ex vivo culture of human solid tumours, to facilitate translation of basic research into the clinic.

The DRMCRL comprises the Prostate and Breast Cancer Research Groups, and employs more than 20 researchers. The Prostate Cancer Research Group is focused on two broad research programs:

1. defining the mechanisms of androgen receptor (AR) action in prostate cancer development and progression, with a view to developing better targeting strategies
2. investigating the role of non-coding RNAs in prostate cancer metastasis and therapy resistance and their potential as biomarkers of disease.

These research programs have identified novel mechanisms of metastasis and resistance to current therapies, and are facilitating the development of a new type of drug to treat lethal prostate cancer.

Lead researcher: Professor Wayne Tilley
Email: wayne.tilley@adelaide.edu.au

Honours project opportunities

Honours projects may be available with this group, please contact the lead researcher(s) for more information.

Higher Degree by Research project opportunities

Breast Cancer Research Group

Lead researchers: Dr Theresa Hickey and Professor Wayne Tilley
Email: theresa.hickey@adelaide.edu.au

We have a reputation for world-class research into hormonal regulation of normal breast tissue and breast cancer (BCa). The DRLMCL is an inspiring place for young researchers wishing to delve into medical research, with strong mentoring support and access to tools, facilities, networks and guidance necessary to embark upon a successful biomedical career. Our research program is funded by grants from the National Health and Medical Research Council (NHMRC), National Breast Cancer Foundation (NBCF) and Movember.

Our group investigates the genetic control of hormone action in the breast, with the aim of developing personalised BCa therapies. We apply clinically relevant models of BCa including primary human tissue, xenografts and transgenic mice. We marry these with cutting-edge molecular techniques (RIME proteomics, transcriptome profiling via microarray and RNA-sequencing, ChIP-seq, real time-PCR, Western blotting, cloning, transactivation assays, gene manipulation and expression systems) to test novel therapies that harness the powerful actions of hormones as targeted BCa treatments.

Research projects:

1. The dynamics of steroid receptor crosstalk between the androgen, estrogen, and progesterone receptors in BCa.
2. The evidence-based application of androgen receptor antagonists/agonists to treat women with BCa.
3. Harnessing hormone action as BCa prevention

Prostate Cancer Research Group

Lead researchers: Dr Luke Selth and Professor Wayne Tilley
Email: luke.selth@adelaide.edu.au

The DRMCRL Prostate Cancer Research Group actively collaborate with local, national and international research groups and clinicians, ensuring our research is competitive on the world stage. Our program is funded by grants from the NHMRC, Movember and United States Department of Defense. The student environment within DRMCRL is exciting and fulfilling, and an excellent base for a career in biomedical research.

Our research is focused on two broad programs: i) defining the molecular mechanisms of androgen receptor (AR) action in prostate cancer (PCa) development and progression, ii) investigating the role of microRNAs in PCa metastasis and their use as potential biomarkers of disease. We utilise clinically relevant models of PCa (xenografts, tissue explants, patient-derived xenografts), cutting-edge genomic/transcriptomic/proteomic techniques and classical molecular biology and biochemical approaches (immunohistochemistry, ChIP transcriptional reporter assays, qRT-PCR and Western blotting).

Research projects:

1. Defining the role of androgen receptor splice variants and gain-of-function mutants in lethal PCa
2. Defining interplay between androgen receptor and other cancer-associated transcription factors in PCa
3. Proteomic identification and characterisation of new androgen receptor co-regulators
4. MicroRNAs as mediators and markers of PCa metastasis

Research areas

Cancer biology and clinical oncology

More information

health.adelaide.edu.au/medicine/drmcrl
Reproductive Cancer Cell Biology
Adelaide Health and Medical Sciences (AHMS) building

The Ovarian and Reproductive Cancer Cell Biology Group is focused on understanding the mechanisms by which hormone signals and tissue structure effect the signals which determine health and function of ovaries. The group seeks to harness this knowledge to improve reproductive health and advance treatments for infertility and cancer and identify novel contraceptives.

We have characterised novel aspects of the molecular control of oocyte development and ovarian function and have demonstrated how environment and lifestyle stressors influence ovarian somatic cell function impacting oocyte and embryo health. The mechanisms by which oocytes and somatic cells communicate to promote healthy oocyte development and elicit protective responses to stress continue to be investigated. This is important for preventing infertility and promoting healthy development which can lead to infertility. Cancers of the reproductive organs are among the most common malignancies. We are focused on understanding the causes and molecular mechanisms of endocrine action in reproductive cancers, seeking to develop new therapies to prevent the initiation and progression of cancers of reproductive organs.

Lead Researcher: Associate Professor Darryl Russell
Email: darryl.russell@adelaide.edu.au

Honours project opportunities
Honours projects may be available with this group, please contact the lead researcher(s) for more information.

Higher Degree by Research project opportunities
HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas
Cancer biology and clinical oncology
Fertility and conception

Immunotherapy and Graft-Versus-Leukaemia Research Group
South Australian Health and Medical Research Institute (SAHMRI)

The Immunotherapy and Graft-Versus-Leukaemia (GVL) Research Group studies the mechanisms of immunogenicity of haematological cancers, and immune responses against leukemia-associated antigens (LAAs) WT1, proteinase 3, PRAME and BMI-1, in chronic myeloid leukaemia (CML), myelodysplasia (MDS) and multiple myeloma. We aim to enhance anti-leukaemia immune responses in the setting of allogeneic stem cell transplantation with the graft-versus-leukaemia effect, or in an autologous setting targeting LAAs. We are also developing chimeric antigen receptor (CAR) T cells for myeloid leukaemia targeting leukaemia stem cells.

Lead researcher: Associate Professor Agnes Yong
Email: agnes.yong@sahmri.com

Honours project opportunities
Honours projects may be available with this group, please contact the lead researcher(s) for more information.

Higher Degree by Research project opportunities

Research areas
Cancer biology and clinical oncology

Immunotherapy and Graft-Versus-Leukaemia Research Group: (left to right) Associate Professor Agnes Yong, Dr Amy Hughes, Ms Nadia El Khawanky, Ms Jade Clarson
Cardiac, Respiratory and Vascular Health
Healthy heart, lungs, arteries and veins are vital to overall good health. Despite being largely preventable, cardiovascular disease is one of Australia’s leading health problems, affecting one in six people and accounting for nearly 30% of deaths.

Our researchers conduct interdisciplinary research to understand the mechanisms which underlie the development of coronary heart disease, peripheral arterial disease, and vascular and heart rhythm disorders. Utilising the skills of physicians, bioengineers, research scientists and computational modelers, research is focused on translating biomedical discoveries to clinical practice.

Furthermore, researchers undertake clinical trials and epidemiological studies into cardiovascular disorders with the objective of improving health outcomes for patients.

Researchers across the faculty are focused on:

- understanding the molecular and cellular mechanisms underlying cardiac and vascular disorders including peripheral arterial disease, atherosclerosis and cardiac arrhythmias
- exploring the relationship between atrial fibrillation, blood clotting and stroke
- developing improved cardiovascular imaging and disease detection methods
- understanding the relationship between high density lipoproteins (HDL) and cardiovascular risk
- developing strategies to modify cardiovascular risk through the control of obesity and obesity-related conditions
- applying evidence-based medicine, recommendations and guidelines to target education and improve health outcomes for at risk cardiac patients
- developing new approaches to treat airway inflammation in asthma and chronic obstructive pulmonary disease (COPD)
- developing cell and gene therapy approaches for diseases affecting lung blood vessels (pulmonary hypertension) and lung transplant.
Cardiac, Respiratory and Vascular Health research opportunities

The Health Observatory
Basil Hetzel Institute for Translational Health Research, the Queen Elizabeth Hospital, Woodville; South Australian Health and Medical Research Institute (SAHMRI)

The Health Observatory is a specialist population research centre conducting a number of large scale representative population studies on health surveillance of chronic disease and related factors. The ultimate focus of the observatory is to contribute to positive ageing by improving population health across the life span. The work involves the tracking of population health to identify gaps/targets that can be better addressed through prevention strategies and/or better management of chronic conditions and conditions associated with ageing.

Lead Researcher: Professor Robert Adams
Email: robert.adams@adelaide.edu.au

Honours project opportunities
Honours projects may be available with this group, please contact the lead researcher(s) for more information.

Higher Degree by Research project opportunities

> Sleep medicine and sleep health
The MAILES Sleep Study is one of the largest and most detailed population-based studies of sleep in men in the world, including using home-based full sleep studies and extensive biomedical and psychosocial measures. This ongoing project, involving collaboration with researchers across the University of Adelaide, Flinders University and Sydney University, has current National Health and Medical Research Council (NHMRC) funding to collect follow-up data to examine the longitudinal effects of sleep disorders and sleep disturbance in men on health outcomes, links to other diseases and ways to improve service delivery.

Some current projects include: the relationships between sleep disturbance, inflammation and chronic pain; the influence of dietary patterns on sleep apnoea; the longitudinal effects of sleep apnoea on health; and which moderating factors (e.g. obesity, diet, stress) influence these effects; and more.

> Chronic disease and population health
The North West Adelaide Health Study (NWAHS) is a major South Australian chronic disease cohort study of over 4000 adults that has been in operation since 1999. NWAHS was formulated to provide much needed and unique representative, longitudinal data on chronic conditions and health-related risk factors in South Australia. The study’s focus is on chronic conditions (including bio-medically measured diabetes, asthma, chronic obstructive pulmonary disease, kidney health, arthritis, sleep disorders and self-reported doctor-diagnosed arthritis, osteoporosis, cancer, mental health and cardiovascular disease), and modifiable health-related risk factors (such as smoking, alcohol, physical activity, overweight/obesity, cholesterol and blood pressure).

These variables are examined in relation to the demographic and socio-economic characteristics of participants (such as income, education, work, occupation, country of birth, and marital status). The study also collects information from participants about their health care service utilisation and medications, and links this information with data received from Medicare and the Pharmaceutical Benefits Scheme. Data are also linked to SA-NT Datalink for hospital inpatient and outpatient data as well as the National Death Registry (including deaths related to cancer). A number of projects are available examining the longitudinal time-course of health and chronic conditions.

> Simulation modelling and systems design
Used to predict the implications of making significant changes to the existing health care system, such as with transforming health. The essence of this work is that health service redesign should be tested as rigorously as new treatments or medicines. This advocates acceleration of the redesign of care delivery to patients through well-controlled experiments. Unfortunately, the health service cannot wait until everything is in place and working properly before changes are made. Modelling and simulation makes coordinating this challenge possible. Simulation modelling provides a mechanism to better understand the flow of patients through the system, before changes are made.

Currently available projects include looking at: management of acute and chronic patients at the Queen Elizabeth Hospital (funded by the Hospital Research Foundation), expansion and re-configuration of emergency services at different hospitals, intensive care units, and cardiac care.

A simple visual example created by one of our partners can be seen at: youtube.com/P45WgRlc2sI

> Musculo-skeletal medicine
Supervised by: Professor Catherine Hill
Email: catherine.hill@sa.gov.au

A wide range of human clinical intervention studies in gout, giant cell arteritis and osteoarthritis are ongoing.

In addition, NWAHS has the largest and most comprehensive data on musculoskeletal pain and disability and its impact in Australia. Data analysis is ongoing to support planning of services for musculoskeletal conditions as part of the health reform agenda. International collaborations exist looking at comparisons across countries of foot pain and associated disability.

Research areas
Cardiac, respiratory and vascular health
Men’s health
Musculoskeletal health
Translational health outcomes

More information
basihetzelinstitute.com.au/research/research-theme/chronic-disease/the-health-observatory
Northern Cardiovascular Research Group
Lyell McEwin Hospital

Associate Professor Margaret Arstall is the founder of the newly establish Northern Cardiovascular Research Group, based in the northern suburbs of Adelaide. This team is made up of both clinicians and scientists located at the Lyell McEwin Hospital who work closely with a number of other local research groups. She is also a principal investigator and research leader of the Cardiac Obstetric Researchers of Northern Adelaide (CORONA). Associate Professor Arstall has research interests in:

• Cardiovascular risk, pathophysiology of atherosclerosis, vascular function, and outcomes in women.
• The pathophysiology and pharmacology of oxidative stress in myocardial ischemia, reperfusion and cardiac failure
• Coronary Angiogram Database of South Australia (CADOSA)
• Translational research in resuscitation medicine, including effectiveness research for survivors of out of hospital cardiac arrest and development of systems of care for the deteriorating patient in an acute health setting.

Lead researcher: Associate Professor Margaret Arstall
Email: margaret.arstall@sa.gov.au

Honours project opportunities

> Cardiac Obstetric Registry of South Australia (COROSA)
COROSA is a new collaborative between cardiology and obstetrics at the Lyell McEwin Hospital. We know that women with heart disease are more likely to have pregnancy complications, but we have limited understanding of prevention and treatment techniques for these patients. By creating a registry of medical and demographic information about pregnant women who have heart disease, important advancements may be made towards improvement in patient care and outcomes. Projects can be tailored to suit interests of students.

> Infective endocarditis: a retrospective audit study
Infective endocarditis, an infection of the endocardial surface of the heart, is associated with high morbidity and mortality. This retrospective audit study aims to assess the clinical presentation, clinical features, complications and outcomes associated with infective endocarditis, using a cohort of patients treated at the Lyell McEwin Hospital.

> Pregnancy and heart disease
Traditional risk factors for heart disease include hypertension, diabetes, smoking and obesity. There is clear evidence indicating that pregnancy complications should be counted as equally important risk factors, but they are not routinely considered by clinicians in risk assessments. This project seeks to explore the influence of pregnancy complications on future health of women who present to the Lyell McEwin Hospital with heart disease.

> Cardiovascular assessment in pregnancy with iron deficiency or iron deficiency anaemia
Approximately 25% of Australian women develop anaemia during pregnancy, primary as a result of iron deficiency. Anaemic women may develop cardiovascular complications, in turn resulting in disorders such as preterm birth, low birth weight, perinatal mortality and postnatal depression. Many studies have demonstrated the effects of haemoglobin on cardiovascular and endothelial function; however, few have investigated such changes in iron-deficiency or iron-deficiency anaemia. This study aims to investigate the effect of iron infusion with ferric carboxymaltose on the cardiovascular system in pregnant women.

Higher Degree by Research project opportunities

> Cardiovascular assessment after obstetric complications: follow-up for education and evaluation (COFFEE)
This study is another exciting new collaborative between cardiology and obstetrics based at the Lyell McEwin Hospital. Women who experience complications of pregnancy have an increased risk of developing future cardiovascular disease. The COFFEE study aims to initiate a clinical-based postpartum program for women who have had pregnancy complications. We have a variety of projects available with a strong emphasis on translatable clinical research.

Research areas
Cardiac, respiratory and vascular health
Pregnancy and birth

More information
researchers.adelaide.edu.au/profile/margaret.arstall

The Northern Cardiovascular Research Group
Cardiovascular Pathophysiology and Therapeutics Group

Basil Hetzel Institute for Translational Health Research, The Queen Elizabeth Hospital, Woodville

The Cardiovascular Pathophysiology and Therapeutics Group reflects the combined interests of members of The Queen Elizabeth Hospital’s (TOEH) cardiology and clinical pharmacology groups. This research collaboration has existed for over the past 20 years at TOEH.

We are mainly interested in developing a better understanding of the ‘new’ cardiovascular epidemics of the 21st century, including atrial fibrillation, systolic hypertension, aortic valve disease, stress ‘Tako-Tsubo’ cardiomyopathy and metabolic heart disease. We recognise that these conditions are responsible for impaired quality of life, as well as increased mortality rates. Therefore, we consider the development of effective treatment modalities as a major priority.

Lead Researcher: Professor John D Horowitz
Email: john.horowitz@adelaide.edu.au

Honours project opportunities

- **Impaired platelet autacoidal signalling in patients with coronary vasospasm**
  Supervised by: Dr Y Chirkov, Dr TH Nguyen and Professor J Horowitz
  Angina pectoris is a common and debilitating problem in Western society, usually resulting from narrowings of coronary arteries. However, in a substantial minority of patients, spasm of the large or small coronary arteries is the cause of pain. While this condition can be treated symptomatically, there is no available cure, and many patients have poor quality of life because of frequent and recurrent episodes of pain. We are currently evaluating integrity of signalling pathways related to anti-aggregatory autacoids (e.g. nitric oxide and prostacyclin) in coronary spasm patients, with encouraging pilot results. These ongoing studies may lead to the development of better treatments for this condition.

- **Impact of proton pump inhibitor therapy on vascular endothelial function**
  Supervised by: Dr TH Nguyen and Professor J Horowitz
  Proton pump inhibitors, although used very widely to suppress gastric acid secretion, may not be completely safe for the heart. We will test the hypothesis that these agents increase plasma levels of the nitric oxide synthase inhibitor ADMA (asymmetric dimethylarginine), and therefore impair endothelial function. Experiments will include evaluation of vascular endothelial function and also determination of plasma ADMA concentrations.

Higher Degree by Research project opportunities

- **Impact of B-type natriuretic peptide (BNP) on stabilisation and function of the myocardium**
  Supervised by: Dr S Liu, Dr Y Chirkov and Professor J Horowitz
  We have recently shown that BNP exerts important anti-inflammatory effects, by stabilising white blood cells and diminishing superoxide production. We wish to determine whether this results in limitation of inflammatory change within the heart, and whether this anti-inflammatory effect of BNP is lost in acute heart failure.

- **The heart in stress: Tako-Tsubo cardiomyopathy**
  Supervised by Dr TH Nguyen and Professor J Horowitz
  Tako-Tsubo cardiomyopathy (TTC) occurs mainly in ageing women as a dysfunctional, inflammatory response of the heart to adrenaline. We have partially characterised the chemical signal transduction pathway in TTC, and now seek to evaluate potential therapeutic avenues, using cell culture and intact animal models, essentially to characterize the impairment in post-receptor signaling.

- **Defects in physiological regulation of platelet aggregation: implications in the setting of potential coronary stenting.**
  Supervised by Dr Y Chirkov and Professor J Horowitz
  We are studying regulation of blood clot formation in patients with different cardiac conditions. Blood clots cause heart attacks and strokes. Clot formation can be prevented with special medications (e.g. clopidogrel or ticagrelor), which are used clinically to prevent thrombosis.
  
  Our research is aiming to identify a reason for the frequently occurring less-than-expected response to these medications. We are focusing on platelets because the starting point for blood clot is platelet aggregation. Autacoids, naturally occurring within the organism (e.g. nitric oxide and prostacyclin) which are supposed to control the normal function of platelets, stop working properly in patients with cardio-vascular diseases. It turns out that the platelet adenylate cyclase system is particularly important in predicting responses to clopidogrel and related drugs, implying that defective adenylate cyclase signalling may be the basis for poor patient responses to this class of drugs. We are trying to work out what is going wrong with this regulation and how it could be restored.

Research areas

Cardiac, respiratory and vascular health
Translational health outcomes

Professor John D Horowitz
Translational Vascular Function Research Collaborative

The Translational Vascular Function Research Collaborative undertakes basic, clinical and epidemiological studies into cardiovascular disorders with the objective of improving the health outcomes of these patients. Currently the group focuses upon coronary heart disease and peripheral artery disease, although many principles are applicable to other vascular disorders. We aim to conduct interdisciplinary research using a collaborative approach, with results being directly integrated into clinical practice.

The research group includes both physicians and medical scientists located at the Basil Hetzel Institute, and the University of Adelaide’s medical school and teaching hospitals. The integrative nature of the group provides a unique opportunity to ensure that innovations are translated from bench to bedside to health outcome, as well as the reverse.

Lead researcher: Professor John Beltrame
Email: john.beltrame@adelaide.edu.au

Honours project opportunities

Coronary haemodynamic studies in patients with microvascular angina

Microvascular angina is a puzzling disorder attributable to coronary microvascular dysfunction. Unfortunately the coronary microvessels are not visible on coronary angiography or other coronary imaging methods and therefore investigating these elusive disorders requires innovative approaches such as assessing the presence of microvascular dysfunction via coronary haemodynamic studies. These invasive studies measure blood flow and resistance within the coronary circulation and therefore provide a unique diagnostic opportunity to assess these patients. More than 50 of these studies have been undertaken at the Queen Elizabeth Hospital with more planned for 2018. This project will provide students with the opportunity to advance their knowledge in coronary microvascular disorders, including obtaining coronary haemodynamic measures during coronary angiography.

Health outcomes in patients with the coronary slow flow phenomenon

The Coronary Slow Phenomenon (CSFP) is a coronary microvascular disorder, first characterised at the University of Adelaide. It is defined angiographically as delayed contrast opacification in the large coronary arteries. Unlike other microvascular disorders, patients present with rest angina. These patients are also frequently disabled by this condition with recurrent episodes of angina, although the risk of cardiac events is low. There is currently no effective treatment for this disabling condition. Adelaide is internationally renowned as the centre of excellence for CSFP research. We have demonstrated the coronary haemodynamic features of the CSFP, providing evidence for coronary microvascular dysfunction. Subsequently, we have conducted therapeutic trials evaluating the benefits of various medical therapies on reducing angina symptoms and improving patient health outcomes.

This project will interface with a randomised, double-blind, placebo controlled clinical trial assessing a novel therapeutic approach for anti-anginal benefit in CSFP patients.

Chest pain: Normal angiography; is it the heart, the brain or both?

Angina, or chest pain, is typically associated with coronary artery disease. However, chest pain may also occur in patients with coronary arteries that appear ‘normal’. These patients with apparent angina and a ‘normal’ angiogram are often told that their chest pain is caused by something other than their heart, but in fact, an unknown number are suffering from cardiac pain of ischaemic origin. This uncertainty causes difficulties in management, and perpetuation of symptoms for patients. Several physical and psychological factors have been studied as suggested causes of chest pain in patients with normal angiography. The correlation between heart function and the emotional state has aroused significant interest however the relationship remains undefined.

This project will provide a direct interface with hospitalised cardiac patients and the ability to evaluate their cardiac and depressive symptoms using standardised diagnostic tools.

Health outcomes in patients with vasospastic angina

Vasospastic angina is a coronary disorder that manifests as recurrent episodes of angina due to coronary artery spasm. The coronary spasm typically responds to nitrate therapy but untreated, it may result in acute myocardial infarction, malignant arrhythmias or sudden cardiac death. Although initially described in 1959 by Prinzmetal (i.e. Prinzmetal angina), the condition has largely been ignored until recently. However, with enthusiasm from organisations such as COVADIS (COronary VAsomotor Disorders International Study group), there has been a significant upsurge of interest in this disorder so that the condition is more often diagnosed.

This project will provide students with the opportunity to advance their knowledge in vasospastic angina by (a) working with an internationally-recognised group in this field, (b) interact with clinical researchers, (c) undertake analyses from an established vasospastic angina registry, and (d) interview affected patients in research studies.

Higher Degree by Research project opportunities

Coronary Angiogram Database of South Australia (CADOSA): Improving health outcomes in patients undergoing coronary angiography

Coronary angiography is the clinical benchmark technique in the assessment of coronary artery disease with more than 6,000 performed in South Australia each year. Despite its diagnostic benefits in identifying the presence of coronary disease, its benefit to the patient has been less rigorously studied and will be the focus of this project. CADOSA is an internationally renowned clinical registry incorporating global links with organizations including the American College of Cardiology National Cardiovascular Data Registry and the International Consortium of Health Outcomes Measurement (ICHOM).
Vasomotor studies of patients with myocardial infarction and non-obstructive coronary arteries (MINOCA)

Approximately 5-10% of patients who experience a myocardial infarct do not have significant coronary artery disease, prompting the clinical question of what is the underlying mechanism? This project will utilise invasive and non-invasive clinical techniques to elucidate potential mechanisms that may be responsible for the myocardial infarct.

Research areas
Cardiac, respiratory and vascular health
Translational health outcomes

More information

Primary Care and Health Services Research Group
The University of Adelaide, North Terrace campus

The Primary Care and Health Services Research Group has experience in developing and conducting clinical trials, cross-sectional and longitudinal studies, analysing large data sets and informing health policy. It regularly recruits patients for long-term studies and collaborates with interstate and international universities. In the last five years we have attracted over $15.4 million in NHMRC grant funding as the lead or co-investigator and over $4.2 million in small and other grants. We welcome interest in any of our described areas of research interest or anything related to primary care, quality of life, epidemiology, general practice, clinical care or health services research.

Lead researcher: Professor Nigel Stocks
Email: nigel.stocks@adelaide.edu.au

Honours project opportunities
Honours projects may be available with this group, please contact the lead researcher(s) for more information.

Higher Degree by Research project opportunities

> General practice epidemiology and clinical practice
Explore any area of clinical general practice using the National Prescribing Service MedicineInsight database, which includes 500 practices across Australia, with over 2000 GPs, representing more than 3.5 million patients of all ages. Qualitative research is also encouraged.

Email: nigel.stocks@adelaide.edu.au

> Quality of life and cardiovascular disease
Evaluating the use of quality-of-life as a subjective indicator of health status change, and a prognostic factor of complications, among patients with cardiovascular disease in Australian general practice. These studies are conducted as a partnership with the Centre of Research Excellence to Reduce Inequality in Heart Disease.

Email: david.gonzalez@adelaide.edu.au

> Cardiovascular disease and obesity prevention
Assessing cardiovascular risk, primary and secondary preventive strategies in Australian general practice. These studies use data from the National Prescribing Service collected by MedicineInsight, which includes 500 practices across Australia, with over 2000 GPs, representing more than 3.5 million patients of all ages.

Email: nigel.stocks@adelaide.edu.au

> Preventive health care
Improving the quality of preventive and other care in general practice via targeted, personalised and automated pre-consultation education, information and advice to patients. Develop and pilot strategies that present relevant information and advice to patients.

Email: oliver.frank@adelaide.edu.au

Research areas
Cardiac, respiratory and vascular health
Nutrition and metabolic health

More information
health.adelaide.edu.au/medicine/disciplines/general-practice
Clinical Pharmacology, Basil Hetzel Institute

University of Adelaide North Terrace Campus; Basil Hetzel Institute for Translational Health Research, the Queen Elizabeth Hospital, Woodville

The Basil Hetzel Institute for Translational Health Research offers a range of postgraduate and honours training opportunities each year for PhD, Masters and Honours students. Being part of The Queen Elizabeth Hospital, researchers can work closely with the hospital's clinical divisions, and this has led to a focus on translational health research, an innovative ‘bench to bedside’ approach in which scientific discoveries can be quickly translated into improved patient care and treatment. The Clinical Pharmacology Unit is affiliated with the Discipline of Pharmacology of the University of Adelaide. It provides a clinical therapeutic drug monitoring service coupled with an active research program in the areas of heart disease, kidney transplantation and cancer.

Through research in these fields we strive to provide a better understanding of drug action, metabolism and disposition in patients with varied genetic makeup in order to better use and tailor medications to each individual, and to develop new therapies.

Lead researcher: Associate Professor Benedetta Sallustio
Email: benedetta.sallustio@sa.gov.au

Honours project opportunities

Honours projects may be available with this group, please contact the lead researcher(s) for more information.

Higher Degree by Research project opportunities

- Metabolic treatments for heart disease and cancer
  Altered cellular energy metabolism is an underlying feature of both heart disease and cancer. In heart disease, maladaptive changes in energy utilisation and storage contribute to a decline in myocardial function and structural remodelling. In cancer cells, changes in energy utilisation allow increased cell survival, replication and metastasis. In addition, a number of cancer chemotherapy agents cause myocardial damage. Therefore, it is possible that myocardial metabolic agents designed for treatment of heart disease, may also be useful adjunct therapy in cancer.
  PhD and honours projects are available in two broad research areas:
  1. Investigating the efficacy of new myocardial metabolic agents in the treatment of heart failure and ischaemic heart disease.
  2. Developing new therapies for chemotherapy-induced myocardial toxicity in cancer patients.

- Individualising Transplantation Therapy
  The success of kidney transplantation depends largely on preventing rejection of the new organ, using a combination of immunosuppressant drugs. These drugs have narrow therapeutic indices and can cause renal, gastrointestinal or haematological toxicity. Due to significant variability in their elimination from the body, doses are currently individualised by targeting therapeutic concentrations in blood. Despite this, rejection and toxicity still occur.

Research areas
Cardiac, respiratory and vascular health
Cancer biology and clinical oncology
Translational health outcomes
Pregnancy and birth

More information
basilhetzelinstitute.com.au

Our research focuses on understanding immunosuppressant distribution into lymphocytes (the mediators of rejection) and renal tissue (a major site of toxicity), as a means of better predicting individual risk of rejection and damage to the transplanted organ.

PhD and honours projects are available in two broad areas of research:

1. To investigate genetic variability in the pathways of immunosuppressant elimination in both kidney donors and recipients, to determine its impact on intra-renal and intra-lymphocyte exposure to immunosuppressants, and its association with rejection and long-term function of the transplanted kidney.
2. To investigate how pregnancy alters the pharmacokinetics of immunosuppressants in renal transplant recipients, and to develop biomarkers that may be used in conjunction with standard monitoring to minimise the risk of nephrotoxicity and graft loss during pregnancy.
Postprandial Hypotension Group
Royal Adelaide Hospital, Adelaide Health and Medical Sciences (AHMS) building

Postprandial hypotension occurs in around 20% of the healthy elderly, and more than 40% of nursing home residents and patients with longstanding type 1 or 2 diabetes.

This phenomenon is more common than orthostatic hypotension, and current management is suboptimal. Research by the CRE has shown that the magnitude of the fall in blood pressure is related to the rate of nutrient delivery from the stomach into the small intestine.

Lead researcher: Professor Karen Jones
Email: karen.jones@adelaide.edu.au

Honours project opportunities
> Effect of endogenous glucagon-like peptide-1 (glp-1) in postprandial blood pressure regulation in older subjects
Postprandial hypotension (PPH), defined as a fall in systolic blood pressure (BP) of 20 mmHg within two hours of a meal, is an important disorder that has received inappropriate little attention. PPH is under-recognised despite being strongly associated with increased morbidity, particularly falls, and mortality. Those at greatest risk include ‘healthy’ older people, nursing home residents and patients with type 2 diabetes (T2DM).

Management of PPH is suboptimal at least in part, because the pathophysiology of PPH is incompletely understood. Our group, which is part of the NHMRC CRE in Translating Nutritional Science to Good Health, is one of the few conducting research in PPH, and is recognised internationally.

Our previous studies have established that the incretin hormone, GLP-1, attenuates the fall in postprandial BP in healthy subjects and T2DM. We plan to evaluate the role of postprandial endogenous GLP-1 secretion in PPH in healthy older subjects using the GLP-1 antagonist, exendin (9-39). The outcome of the proposed study will increase knowledge relating to mechanisms associated with the use of acarbose as a treatment in PPH.

Studies will be conducted in the Clinical Research Facility of the AHMS building.

Higher Degree by Research project opportunities
> Role of the gut in postprandial blood pressure regulation
Postprandial hypotension (PPH), defined as a fall in systolic blood pressure (BP) of 20 mmHg within two hours of a meal, is an important clinical condition. PPH is strongly associated with increased morbidity, particularly falls, and mortality. Those at greatest risk include ‘healthy’ older people, nursing home residents and patients with type 2 diabetes.

Professor Jones’ group, which is part of the NHMRC CRE in Translating Nutritional Science to Good Health, is one of the few conducting research in PPH, and is recognised internationally.

Management of PPH is suboptimal. Previous studies have established that PPH should in the broadest sense, be regarded as a gastrointestinal disorder, which has major implications for effective management, in particular the interrelated gastrointestinal factors of meal volume and composition, gastric distension, the rate of delivery of nutrients into the small intestine and changes in gastrointestinal hormones and splanchnic blood flow to the regulation of postprandial BP.

The outcomes of the proposed studies in the PhD programme, conducted in the CRF of the AHMS building, will increase knowledge relating to mechanisms associated with PPH and have implications for the development of effective dietary and pharmacological management strategies.

Research areas
Cardiac, respiratory and vascular health
Ageing, frailty and mobility
Nutrition and metabolic health

More information
researchers.adelaide.edu.au/profile/karen.jones

Professor Karen Jones (left) with some of the members of the NHMRC Centre of Research Excellence in Translating Nutritional Science to Good Health in the Gamma Camera Suite at the Clinical Research Facility within the AHMS Building.
Biological Anthropology and Comparative Anatomy Unit
The University of Adelaide, North Terrace Campus

The Biological Anthropology and Comparative Anatomy Research Unit is organised around, and supported by, the Wood Jones Chair of Anthropological and Comparative Anatomy. The unit's diverse research interests include: forensic anthropology; anthropometry; dermatoglyphics; biological structure and dynamics of earlier and present human populations; population genetics; human ecology and adaptation; paleodemography; and much more.

Lead researchers: Professor M Henneberg and Dr J Kumaratilake
Email: maciej.henneberg@adelaide.edu.au

Honours project opportunities

* Exploration of brown fat deposits in adult humans in the supraclavicular region
  It has been long believed that brown fat tissue in humans is present only in infants. Recently, based on physiological studies and imaging methods, it has been postulated that adults also have brown fat deposits. Brow fat tissue is a thermogenic organ that uses a special process facilitated by uncoupling protein 1 (UCP-1) to transport hydrogen ions across mitochondrial membrane to convert energy of chemical bonds to heat without going through the ATP synthesis. Activation of brown fat tissue is postulated as a way to increase energy expenditure in cases of obesity to reduce body weight. Anatomical proof of the presence of brown fat in adults is needed. The project will involve dissection and immunocytochemistry.

* Arterial variation in the upper limb: prevalence of high division of the brachial artery, retention of median artery and structure of superficial palmar arch
  Microevolutionary processes change prevalence of embryonic variants in the human body. The best documented of these is the increase in the prevalence of the median artery of the forearm during the 20th century. Preliminary results also indicate increasing incidence of high division of the brachial artery and not-normal patterns of anastomoses in the superficial palmar arch. Investigation of the prevalence of these arterial variants in a sample of Australian cadavers is needed. Dissection techniques will be used.

* Formation of collateral arteries in the coronary circulation
  It has been recently found that processes of arteriogenesis may occur in the hearts of people who suffered an insufficient blood flow through one of the normal branches of coronary arteries. This process forms collateral circulation in the heart. Study of arterial systems in hearts of people who donated their bodies is planned to explore the extent to which collateral circulation may develop. This will be investigated by dissection and latex injections.

* Trunk frame and obesity risk in Australian children
  It has been shown that the trunk frame (used to reflect the size of abdominal contents, i.e. of the gastrointestinal tract) is related to adiposity in Australian adults and South African children. It is useful to know whether this relationship occurs in Australian children, because measurements of body frame in children can be used to assess their risk of developing obesity, and thus allow to apply preventive measures before obesity develops. Prevention is better than cure.

Higher Degree by Research project opportunities

* Elastic changes in frontal arteries due to the UV exposure. A histological study
  Elastic tissues (solar elastosis) degeneration results from exposure to ultraviolet radiation, particularly UV B. Influence of UV B on skin is well known, but it is not clear whether UV B exposure may also influence tissues located deeper in the body, nor what the mechanism of such influence can be. This study uses temporal arteries and their branches because they lie close to the skin surface. To test whether the UV B influence of the elastic tissue in arteries is a direct effect of their exposure, or an effect of physiological processes initiated in the skin and then spreading through other tissues, the degree of damage to arterial walls on the side adjacent to the skin needs to be compared to that lying deeper in the body. Cytochemistry and immunocytochemistry will be used in addition to electron microscopy techniques.

* Comparative anatomy, histology and morphometry of primate and marsupial brains
  Evolution and functions of human brains still require clarification of many points concerning individual variation of anatomical and histological structures in relation to their functions. Anatomy of marsupial brains is less well known. We have a repository of preserved brains of primates and marsupials that can be studied by comparative anatomy, histology and histomorphometry techniques.

* Exploration of brown fat deposits in bodies of adult humans
  It has been long believed that brown fat tissue in humans is present only in infants. Recently, based on physiological studies and imaging methods, it has been postulated that adults also have brown fat deposits. Brow fat tissue is a thermogenic organ that uses a special process facilitated by uncoupling protein 1 (UCP-1) to transport hydrogen ions across mitochondrial membrane to convert energy of chemical bonds to heat without going through the ATP synthesis. Activation of brown fat tissue is postulated as a way to increase energy expenditure in cases of obesity to reduce body weight. Anatomical proof of the presence and distribution of brown fat in adults is needed. For practical applications to control obesity it is necessary to know the quantiy of brown fat deposits variation in adult bodies. The project will involve dissection and immunocytochemistry.

Research areas
Cardiac, respiratory and vascular health
Nutrition and metabolic health
Neuroscience, behaviour and brain health
Ageing, frailty and mobility

More information
health.adelaide.edu.au/medicine/disciplines/anatomy-and-pathology
Health Performance and Policy Research Unit
Royal Adelaide Hospital/Basil Hetzel Institute for Translational Health Research, The Queen Elizabeth Hospital, Woodville

The Health Performance and Policy Research Unit assesses important and results of healthcare such as effectiveness, safety, quality, and costs. Combining clinical medicine and data science, our goal is to generate research that informs clinical and policy strategies to improve the quality of care received by Australian communities. We are particularly focused on leveraging data routinely collected by health care facilities, and advanced analytical methods, to inform health outcomes and decision-making. We also seek to develop low-cost and implementable methods to measure to measure healthcare performance and reduce unwarranted variation in care.

Our vision is a patient-centered, value-driven and transparent health system that delivers the best possible health outcomes for healthcare dollars spent. We achieve this vision through critical and innovative health services research and training, and by generating research output that both stimulates and empowers clinicians and health services to improve patient care.

Lead researcher: Dr Isuru Ranasinghe
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Honours project opportunities

> Young women and their outcomes after a heart attack
Increasing international evidences suggest that women (particularly young women) have an elevated risk of death and readmission after a heart attack compared to similarly aged men. This project will examine whether similar gender differences in outcomes exists following a heart attack in Australia using nationwide data explore factors that may contribute to an elevated risk.

> Why do some patients get readmitted to hospital unexpectedly?
Hospital readmissions are common, distressing for patients and costly to the health system. A multitude of reasons can lead to unexpected readmission to hospital although the precipitating factors are poorly understood. This clinical project will conduct a root cause analysis to determine why patients return to hospital unexpectedly. The outcomes of this project will help to develop more effective, patient oriented, interventions to reduce unexpected readmissions.

> Living with Chronic Heart Failure
Chronic heart failure (CHF) is a clinical syndrome that manifests when the heart’s function as a pump is inadequate to meet the body’s needs. Patients with chronic heart failure experience a number of symptoms such as shortness of breath, weakness, and swelling which may have a significant impact on their ability to live a normal life. This clinical project will examine patients experience with living with chronic heart failure, their quality of life, and how they navigate the health system. The end goal of this project is to better understand what patients experience so to better design health services to meet patients ongoing needs.

Higher Degree by Research project opportunities

> Cardiovascular epidemiology
HPPR holds over a decade of cardiovascular data collected from all public and most private hospitals in Australia and New Zealand. There are unique opportunities for honours or PhD candidates interested in publishing nation-wide studies of cardiovascular epidemiology for a range of common cardiovascular conditions and procedures such as heart attacks, heart failure, peripheral vascular disease and stroke. Students are supported by senior statisticians and clinicians. This project is ideally suited to students with and background in epidemiology or statistics wishing to apply their knowledge to publish research output. Formal training can be provided for highly motivated students without prior statistical experience.

> Cardiac procedural safety and outcomes
Cardiac procedures such as heart valve replacements, ablations, are device implants are among the most common, risky and costly procedures performed in Australian hospitals. The research aims to investigate the safety and outcomes of these procedures with a focus on developing better ways to rapidly identify adverse events. This research provides the foundation for development in a range of methods and skills to assess and report procedural safety, quality, and patient outcomes; work with both clinical and routinely collected hospital data from multiple Australian hospitals; and the opportunity to collaborate with leading clinical and health services researchers nationally and internationally.

> Strategies to reduce unanticipated hospital readmissions
Hospital readmissions are common, distressing for patients and costly to the health system. Many readmissions are also preventable. This project aims to evaluate the burden of these hospitalisations among Australian hospitals using linked hospitalisation data. It focuses on the (1) Frequency, variation and cause of these visits; (2) The associated cost and resource utilisation; (3) The evaluation of potential clinical and policy interventions to reduce these hospitalisations. The central goal is to generate research that may inform future policy making to reduce unanticipated hospitalisations.

> Avoidable health care expenditure associated with hospitalisations
In Australia, an estimated $59 billion (or about $2,542 per person) was spent on hospital care in 2013-14 with this cost rising by 4.2% each year—a rate that is considerably faster than inflation. Minimising avoidable healthcare expenditure is thus highly desirable. This project, in collaboration with health economists, will examine avoidable health care expenditure associated with hospitalisations and emergency care presentations. This project is ideally suited to students with an interest or background in health sciences, health economics, commerce or social sciences.

Research areas
Cardiac, respiratory and vascular health
Translational health outcomes

More information
Vascular Research Centre
South Australian Health and Medical Research Institute (SAHMRI)

Our mission is to understand the factors that influence the natural history of atherosclerosis, the leading cause of death in our community. Using a range of experimental approaches, we undertake translational studies that aim to elucidate the molecular pathways that influence vascular risk, develop novel biomarkers for the assessment of cardiovascular risk and evaluate the impact of potentially protective therapies. Our studies span the spectrum from fundamental laboratory discovery through to clinical trials and ultimately studies to determine how novel treatments are applied in clinical practice. For further details see: sahmri.org/

Lead researcher: Professor Stephen Nicholls
Email: Peter.Psaltis@sahmri.com

Honours project opportunities

> Do local stem cells in blood vessels contribute to the hardening of arteries in atherosclerosis?

Atherosclerosis is the main cause of heart attack and stroke, resulting in an enormous burden to patient morbidity, mortality and health care expenditure. Macrophages play an integral role in the formation of atherosclerotic plaque, that leads to arterial narrowing, plaque rupture and clot formation that result in arterial occlusion. For a long time, it has been thought that all macrophages in atherosclerotic arteries come from monocytes, that originate in bone marrow, circulate in blood and enter the artery wall to become macrophages. Our group has discovered, for the first time, the existence of a new population of stem cells, called Adventitial Macrophage Progenitor Cells (AMPCs), that are present in the outer layer of arteries (adventitia), and can generate macrophages independently of circulating blood monocytes. We have found that these AMPCs are more abundant in atherosclerotic blood vessels. Current and future projects are focused on acquiring a better understanding of these AMPCs, including: where they come from in embryonic development, how they arrive in blood vessels, how they are regulated, and most importantly, what roles they play in normal and atherosclerotic blood vessels. This research is crucial to national and global health to improve preventive and treatment strategies of atherosclerosis.

> Do macrophages from leukaemia patients have pro-atherogenic tendency?

It is increasingly recognised that there are strong associations between the development of cardiovascular disease and different types of cancer, but the mechanistic basis for these links remains unclear. Macrophages are a type of inflammatory cell belonging to the innate immune system, that are known to play crucial roles in the pathogenesis of both atherosclerotic cardiovascular disease (causing heart attack and stroke) and solid and haematological malignancies. In this research project, we will study macrophages and their monocyte precursors from patients suffering from chronic myeloid leukaemia (CML). Using a series of phenotypic and functional assays, we will interrogate monocyte and macrophage sub-populations obtained from the bone marrow and blood of CML patients at the time of diagnosis and at different stages of their treatment. We will investigate the prevalence of pro- and anti-inflammatory monocyte and macrophage subsets in these patients to determine how this affected by stage of disease, type of treatment, and responsiveness to treatment. We will also study the response of macrophages from these patients to various atherogenic stimuli (cholesterol crystals, cholesterol lipoproteins) to establish whether they are primed to be more or less atherogenic, as a possible explanation for the prevalence of cardiovascular disease in this cohort of patients.

> Sensing atherosclerosis related changes in Nitric Oxide within macrophages, using a novel nanoscale sensor

Heart Health, SAHMRI holds the collaborative arm of Inside Blood Vessels within the ARC Centre of Excellence for Nanoscale Biophotonics (CNBP). Our recent work entailed of using a novel Ruthenium based, irreversible, fluorescent, extracellular sensor for nitric oxide (NO) to detect endogenous and exogenous NO in human endothelial cells. NO is a highly diffusible, gaseous, lipophilic, free radical, cellular signalling molecule that plays a critical role in maintaining optimum regulatory functions within the cardiovascular system. Tissue specific alterations in NO availability and deregulation of NO production are associated with a range of vascular disorders including atherosclerosis. The Ruthenium based sensor is internalised to macrophages which could to detect and measure iNOS (inducible nitric oxide synthase) mediated NO in macrophages, broadening our interest in studying the role of macrophages and NO in atherosclerosis. This project broadly involves sensing/measuring macrophage iNOS mediated changes in NO in the presence of pro-atherogenic and athero-protective agents such as oxidised LDL, TNF, IFN, HDL and statins. Confocal microscopy, Fluorescence-activated cell sorting and spectrophotometric methods could potentially be applied for sensing NO in macrophages using this sensor, with further validation with commercially available NO detection methods. This project will also incorporate relevant mRNA and protein quantification studies.

> Micromanaging diabetes-impaired angiogenesis

Type 2 diabetic patients have an increased risk of developing a heart attack due to increased vascular complications associated with impaired angiogenesis. Furthermore, diabetic patients have increased rates in peripheral arterial disease and a reduced capacity for wound healing. High-density lipoproteins (HDL) have vasculoprotective and anti-diabetic effects. We found that HDL rescues diabetes-impaired angiogenesis, however the complete mechanism is unknown. MicroRNAs (miRNAs), small non-coding RNAs that regulate gene expression, are emerging as new therapeutic targets due to their ability to concurrently target multiple genes. HDL is known to facilitate miRNA transport and delivery to sites of injuries. We have preliminary evidence that miRNAs are involved in the action of HDL and seek to interrogate this further. This project will elucidate the role of specific miRNAs and explore the potential of HDL as a delivery agent in diabetes-impaired angiogenesis. The importance of miRNAs will be determined in vitro using functional angiogenesis assays and key angiogenic targets. This project will provide the opportunity to learn a broad range of techniques including tissue culture, RT-PCR, Western blotting, flow cytometry and miRNA knock-down/overexpression in vitro.

> The role of the ‘good cholesterol’ in cellular metabolic reprogramming in diabetes

Wound healing is significantly impaired in diabetic patients. This is due a poor ability to grow new blood vessels, essential for tissue repair. There is evidence that poor blood vessel growth is
due to an inability of endothelial cells to respond appropriately to the hypoxia (low oxygen) that is created following the wounding process in diabetes. Our laboratory has shown that high-density lipoprotein (HDL) or the “good cholesterol” is able to improve wound healing in diabetic mice and increase wound blood vessel growth. One mechanism for this maybe via the improvement of cellular metabolic responses to hypoxia by HDL. This project will explore this hypothesis and aim to determine if HDL can regulate the key markers involved cellular metabolic reprogramming following exposure to hypoxia. This project can be pursued either in vi or in vivo experiments and will provide the opportunity to explore an entirely new area of research and learn a broad range of techniques including RT-PCR, Western blotting, Elisa and either tissue culture or animal experimentation experience. NMR-spectroscopy will also be utilised and changes cellular respiration will be determined. All in vitro and in vivo wound healing models are already established in our laboratory.

> Investigation into the role of the novel lipogenesis protein TTC39B in endothelial cells and its regulation by high-density lipoproteins

Endothelial cells are essential for providing a barrier that protects the artery against the infiltration of inflammatory cells from the circulation and the development of atherosclerosis. The tetratricopeptide repeat domain protein (T39) has recently been shown to be a novel regulator of lipogenesis and cholesterol efflux, both key functions in the pathogenesis of atherosclerosis. Mice with deletions in T39 were found to have increased plasma high-density lipoprotein (HDL) cholesterol (also known as “the good cholesterol”) and increased liver X receptor (LXR) protein (regulator of cholesterol efflux). Whether or not T39 can be regulated by HDL is however, unknown, and its role in endothelial cells is currently unexplored. This study will first determine if HDL can regulate TTC39B expression in human coronary artery endothelial cells. Then, using siRNA knockdown of TTC39B, we will determine the role of TTC39B in mechanisms of endothelial inflammation including monocyte adhesion, adhesion molecule expression and chemokine expression. Our previous work has also found that HDL regulates angiogenic functions in endothelial cells. We will therefore investigate the role of TTC39B in the regulation of key promoters of angiogenesis such as VEGF and HIF-1α as well as in angiogenic functional assays. This project will provide the opportunity to learn a wide-range of in vitro techniques including quantitative PCR, western blotting, siRNA knockdown as well as functional adhesion assays and angiogenesis assays (tubulogenesis, proliferation, migration).

> The impact of hyperglycemia and diabetes on mechanisms of vascular calcification

Vascular calcification is increased in patients with diabetes and is associated with increased morbidity and mortality rates compared with patients with diabetes in the absence of calcification. Despite its considerable clinical significance, little is known about the molecular pathways through which vascular calcification is triggered by diabetes pathology, although several diabetes associated factors, including high glucose, could play important roles in the pathogenesis. Therefore, a greater understanding of the mechanisms through which diabetes may induce calcification is required to develop effective treatment strategies. This project will involve the evaluation of hyperglycemia on vascular smooth muscle cell calcification and the regulation of key markers involved in vascular calcification. This project can be performed both in vitro and in vivo including techniques such as RT-PCR, Western blotting, ELISA and either tissue culture or animal studies.

Higher Degree by Research project opportunities

> Do local stem cells in blood vessels contribute to the hardening of arteries in atherosclerosis?

Please see Honours project description for more information.

> Micromanaging diabetes-impaired angiogenesis

Please see Honours project description for more information.

> The effect of High-Density Lipoproteins on advanced atherosclerotic plaques versus early-stage atherosclerosis: The mechanisms of action

There is overwhelming epidemiological and pre-clinical evidence demonstrating that High-Density Lipoproteins (HDL) have anti-atherosclerotic properties. HDL exert their beneficial effects by effluxing cholesterol from macrophage cells in atherosclerotic plaques and then transport the cholesterol back to the liver for processing. HDL also have potent anti-inflammatory properties. The majority of people who present to clinic with cardiovascular problems are most likely to have atherosclerotic plaques that are at an advanced stage, however most preclinical models investigating the effects of HDL on atherosclerosis look at early-stage lesions. As there are distinct phenotypic differences as well as differences in immunological and inflammatory processes between advanced and early-stage plaques it raises the possibility that HDL also has different effects on plaques at different stages of atherosclerosis. This project will therefore investigate the effect of HDL on advanced versus early-stage atherosclerotic plaques and assess differences in the mechanisms of action using a unique animal model of plaque macrophage cholesterol efflux. This project will provide the opportunity to learn about animal models of atherosclerosis, including animal surgery. Other skills will include immunohistochemistry, ELISAs, RT-PCR and Western blotting.

> Regulation of stent restenosis by chemokines

This project seeks to determine the importance of chemokines in the regulation of smooth muscle cell inflammation and proliferation that contributes the restenosis following stent implantation. Smooth muscle cells (SMCs) play key roles in controlling the constriction and dilation of arteries. However, in inflammation such as following stenting, SMCs undergo unregulated excessive proliferation causing accelerated stent failure due to stent closure or restenosis. Increasing evidence implicates chemokines and in particular the CC-chemokine class in promoting SMC proliferation. Our laboratory has a protein 35K that is able to provide broad-spectrum inhibit of the CC-chemokine class. These studies will use 35K in in vitro and in vivo experiments to identify the role of the CC-chemokine class in SMC proliferation, inflammation and restenosis. In vitro functional proliferation assays will be used to test this and real-time (RT) - PCR and Western blotting will also be used to determine the intracellular mechanisms involved. Our lab has developed an in vivo model of stenting in which we will test the effect of CC-chemokine inhibition using 35K on stent restenosis. All the resources, techniques and expertise required for these experiments are present at the HRI. This project will provide the opportunity to learn a broad range of skills including: molecular biology techniques, tissue culture, in
Do macrophages from leukaemia patients have pro-atherogenic tendency?

It is increasingly recognised that there are strong associations between the development of cardiovascular disease and different types of cancer, but the mechanistic basis for these links remains unclear. Macrophages are a type of inflammatory cell belonging to the innate immune system, that are known to play crucial roles in the pathogenesis of both atherosclerotic cardiovascular disease (causing heart attack and stroke) and solid and haematological malignancies. In this research project, we will study macrophages and their monocyte precursors from patients suffering from chronic myeloid leukaemia (CML). Using a series of phenotypic and functional assays, we will interrogate monocyte and macrophage sub-populations obtained from the bone marrow and blood of CML patients at the time of diagnosis and at different stages of their treatment. We will investigate the prevalence of pro- and anti-inflammatory monocyte and macrophage subsets in these patients to determine how this affected by stage of disease, type of treatment, and responsiveness to treatment. We will also study the response of macrophages from these patients to various atherogenic stimuli (cholesterol crystals, cholesterol lipoproteins) to establish whether they are primed to be more or less atherogenic, as a possible explanation for the prevalence of cardiovascular disease in this cohort of patients.

Research areas
Cardiac, respiratory and vascular health
Translational health outcomes
Fertility and Conception
Conception is the foundation event for each new life, with every child’s development, growth trajectory and health over the life course set in motion from the moment sperm and oocyte unite to form an embryo.

Our research in this area is led by the Robinson Research Institute, which is internationally recognised for its work in fertility and conception. A more in-depth explanation of this research area is available on the Robinson Research Institute's website.
Fertility and Conception research opportunities

RRI Bioinformatics
University of Adelaide North Terrace Campus; Adelaide Health and Medical Sciences building (AHMS)

Bioinformatics enhances the Institute’s capability in next-generation sequencing and systems biology approaches to basic science and clinical research investigating human and animal reproduction and development. Bioinformatics strategies to design and analyse transcriptome, deep-sequencing, genome and proteome data sets are a powerful approach to generating fundamental knowledge on systems and processes in biology and disease.

Lead researcher: Dr Jimmy Breen
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Honours project opportunities

> Project 1
Currently, medical and biomedical researchers run sophisticated pathway enrichment analyses for their labs in proprietary software which is often extremely expensive and poorly updated. The reliance on paid software sources often prevent development of new tools that can be created from new datasets. In this project, we will develop a pathway enrichment analysis program for biomedical researchers using the Shiny app package (shiny.rstudio.com/) as part of the R programming language. Shiny is an interactive web application that allows a user to run R code developed by a Bioinformatician. This project will be conducted with the help of both the Robinson Research Institute’s Bioinformatics core-facility and the University of Adelaide’s Bioinformatics Hub.

> Project 2
Pregnancy complications such as preeclampsia, small for gestational age and pre-term birth, have a major effect on the life of an infant post-pregnancy. Additional factors and clinical variables often explain a significant amount of variation in each disease (e.g. differences between sexes). One such variable, genetic background explains a significant amount of variation in disease susceptibility where we see much higher rates of these complications in different genetic backgrounds (e.g. Africans, Aboriginal Australians, East Asians) compared with Europeans. Unfortunately, data from whole-genome sequencing experiments can be extremely expensive, with low-coverage sequencing being more cost effective.

In this project, we will investigate the use of low-coverage genomic data (from in-house and public datasets) to identify population-specific characteristics of individual samples. We will also investigate previously identified single-nucleotide variants that have been associated with pregnancy complications, and create population-level allele-frequencies. This project will be conducted with the help of both the Robinson Research Institute’s Bioinformatics core-facility and the University of Adelaide’s Bioinformatics Hub.

Higher Degree by Research project opportunities

> Project 1: Chromosome conformation analysis using high-throughput sequencing is an approach to characterise the 3D structure of genomic DNA.

Physical proximity of interacting regions of the genome have a large effect on gene expression and ultimately, phenotypic variation, and these areas in which interact at a higher rate than usual are called topologically associated domains or TADs. One such system where phenotypic variation exists because of physical chromosome proximity changes is in regulatory T cells and their changes in autoimmune diseases (multiple sclerosis, crohns disease etc).

In this project, we will characterise enhancer-promoter interactions from a regulatory T cells and overlap with characterised functional elements and epigenetic data contained in large public datasets available online (Blueprint, NIH Epigenomics Roadmap and ENCODE databases). Additionally we will explore the transcriptional profile of TADs with our null hypothesis being that co-expression and transcription of member genes occurs at a high rate in higher interacting domains. Using Bioinformatics and statistical approaches, we will aim to identify differences between regulatory T cells and other T cell sub-types and investigate their roles in autoimmunity. To do this analysis, you will learn the R statistical programming language and interact with both computational and biological researchers in the school. This project will be conducted with the help of both the Robinson Research Institute’s Bioinformatics core-facility and the University of Adelaide’s Bioinformatics Hub.

> Project 2
RNAseq, a high-throughput sequencing approach that quantifies the entire RNA component from a sample, has dramatically changed our understanding of how and when genes are expressed. Total RNA library preparation kits differ slightly from other approaches that quantify gene expression as they allow the identification and quantification of all RNA species in the sample, rather than just poly-A enriched (transcripts with a polyA tail i.e. protein-coding) or CAGE sequencing (sequencing from 5’ or cap start site of the gene).

In this project, we will use a 5’ – >3’ cleaning method that will enable us to distinguish between true retained and pre-spliced introns. We aim to build a Bioconductor/R package that will enable the analysis of a Cumulus-Oocyte-Complex (COC) cells previously analysed for differential gene expression. Identifying intron retention events can significantly extend our knowledge of transcriptomic variation over ovulation. This project will be conducted with the help of both the Robinson Research Institute’s Bioinformatics core-facility and the University of Adelaide’s Bioinformatics Hub.

Research areas
Fertility and conception
Pregnancy and birth
Indigenous and disadvantaged health
Immunology and infection
Reproductive Immunology Group
Adelaide Health and Medical Sciences building (AHMS)

The female immune system supports survival and growth of the fetus, with immune system dysregulation leading to pregnancy disorders such as recurrent miscarriage and preterm birth. Seminal fluid, delivered to the female reproductive tract at coitus, provides signalling molecules which allow the female immune system to set up in preparation for pregnancy. We investigate how these signalling molecules influence cytokine expression and immune cell phenotypes in the uterus to understand how incorrect immune activation causes poor embryo growth, placent al development and reproductive outcomes.

Lead researcher: Professor Sarah Robertson
Email: sarah.robertson@adelaide.edu.au

Honours project opportunities

> The male partner’s seminal fluid as a determinant of fertility and pregnancy health in women

Supervised by Professor Sarah Robertson and Dr David Sharkey.

Seminal fluid is generally thought to have just one biological function—providing sperm to fertilize the oocyte at conception. Another less appreciated role of seminal fluid is to interact with the female reproductive tract, to influence fertility and fecundity. An expanding body of evidence shows this occurs in any species where intromission of male fluids occurs, including human. These changes have potentially critical consequences for fertility and pregnancy health in women. However, the molecular basis of seminal fluid priming in women is incompletely defined and its physiological significance for establishing immune tolerance and receptivity to pregnancy is unknown.

This project will utilise: (a) a human seminal fluid biobank to investigate the association of various bioactive components of seminal fluid with fertility, and (b) in-vitro and in-vivo models of male-female signalling to assess the contribution of both human seminal plasma and sperm to the female reproductive tract immune environment. Techniques used include quantitative RT-PCR and cytokine immunoassay. These studies are essential to advance diagnosis and treatment of subfertility, and to tackle obstetric disorders that originate early in pregnancy.

> Male to female sperm signalling: a new role for sperm in reproduction?

Supervised by Professor Sarah Robertson, Dr John Schjenken, Dr Lachlan Moldenhauer and Dr David Sharkey.

When seminal fluid is delivered into the female reproductive tract at coitus, it interacts with epithelial cells lining the cervix and uterus to induce proinflammatory cytokines and chemokines. This inflammation-like response leads to the establishment of immune tolerance and receptivity to pregnancy. In addition to seminal plasma, our studies have recently shown that sperm play an important role in this process. However, we are yet to identify the specific mechanism that sperm utilises to induce these changes. Using bioinformatics analysis, we have been able to predict sperm signalling molecules including ligands for toll-like receptor 4 (TLR4). This project will employ TLR4 null mutant mice, to identify the contribution of TLR4 to sperm signalling. Techniques used will include quantitative PCR, cytokine immunoassay and flow cytometry. The findings from this study will help us understand the induction phase of the maternal immune response that allows successful pregnancy and may help us understand why some men have reduced fertility despite apparently normal sperm parameters.

> T-regulatory (Treg) cell stability and plasticity in immune tolerance during early pregnancy

Supervised by Professor Sarah Robertson and Dr Lachlan Moldenhauer.

To allow embryo implantation and successful pregnancy, the maternal immune system must become “tolerant” to paternal transplantation antigens. Treg cells are now implicated as key cells mediating maternal immune tolerance. Discoveries in our laboratory show that semen plays an important role in establishing functional tolerance to male transplantation antigens during early pregnancy. We now seek to investigate the role of seminal factors in activating and expanding Treg cells in preparation for embryo implantation.

The aim of this project is to investigate the molecular events involved in activating Treg cells after mating. In particular the importance of seminal plasma TGFbeta and the role of male MHC antigens in semen will be investigated. The project will employ cytokine null mutant mouse models and human samples, linked with state-of-the-art digital flow cytometry (FACS), and quantitative RT-PCR for the Treg fate-determining transcription factor Foxp3. The findings will help us understand the induction phase of the maternal immune response permitting successful pregnancy, and have broader relevance to the transmission of STDs and immune-mediated pathologies linked with infertility.

> MHC disparity and placental vascular supply

Supervised by Professor Sarah Robertson, Dr Alison Care and Professor Claire Roberts.

MHC disparity between paternal and maternal genomes in pregnancy is beneficial to fetal growth and pregnancy success. This is linked with activation and expansion of maternal T cell populations which in a healthy pregnancy, are skewed towards T regulatory cells and immune tolerance. As well as inhibiting cytotoxic immunity towards the conceptus tissue, these T cells may help to promote placental development and robust access to the maternal blood supply. To investigate the role of T cells in placental development and transformation of maternal decidual vessels, this project will utilise mouse models of lymphocyte-deficiency (SCID mice) and regulatory T cell deficiency (DEREG mice).
The project will employ a range of experimental strategies including immunohistochemistry and tissue morphometry to analyse placental vascular structure and physical interactions between endothelial cells and T cells, and quantitative RT-PCR for analysis of genes involved in vascular regulation. The results will provide new insight on the importance of T cells in the vascular adaptation required for optimal placental development and fetal growth. Problems with immune-regulated placental development underpin many common disorders of pregnancy including miscarriage, preeclampsia and poor fetal growth.

Higher Degree by Research project opportunities
HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas
Fertility and conception
Pregnancy and birth
Early origins of health

More information
researchers.adelaide.edu.au/profile/sarah.robertson

Reproductive Biotechnology Group
Adelaide Health and Medical Sciences building (AHMS)
The Reproductive Biotechnology Group has an international reputation in the general areas of reproductive biology and the development of associated technologies for biomedical and agricultural applications. In collaboration with a number of university, institute and hospital research groups in Australia as well as overseas, current research is focused on developing organ, tissue and cell replacement therapies. This work is funded by various agencies including the Juvenile Diabetes Research Foundation, the National Health and Medical Research Council and Industry. Honours, Master and PhD projects are available in a number of different areas offering students the possibility of working in some of medical science most exciting areas.

Lead researcher: Associate Professor Mark Nottle
Email: mark.nottle@adelaide.edu.au

Honours project opportunities

Development of a new embryonic stem cell type for human cell therapies
We have isolated a new embryonic stem cell type from an earlier stage in embryo development than that currently used. These cells have been extensively characterised and may have advantages in terms of the development of cell based therapies. Several projects are offered in this general area. These range from isolating our cell type in other species to the development of differentiation protocols for producing cell types for various treatments. Students will receive experience in a variety of areas from cell and molecular biology to embryology.

Improving human IVF outcomes
We have pioneered the ability to mature pig oocyte or eggs in vitro to generate embryos for research applications. In collaboration with Hannah Brown and others from the Robinson Institute, current research is focused on extending this to other livestock species as well as to humans to overcome the need for patients to monitor their cycle and undergo hormonal stimulation during IVF. Projects will examine the effects of various hormones, growth factors and cytokines present in the prevoluntary follicle can have on in vitro oocyte maturation and embryo development following their addition to maturation media. Students will receive experience in a variety of areas from cell and molecular biology to embryology.

Higher Degree by Research project opportunities

Development of a new embryonic stem cell type for human cell therapies

Improving human IVF outcomes
Please see Honours project descriptions for more information.

Research areas
Fertility and conception

More information
researchers.adelaide.edu.au/profile/mark.nottle
Early Development Group
University of Adelaide North Terrace Campus

Accompanying oocyte maturation and fertilisation are dynamic molecular and biochemical processes that have a major impact on subsequent embryonic and fetal development, as well as adult health. The maturing oocyte and newly fertilised egg is extremely sensitive to the microenvironment within the maternal reproductive tract, and this is reflected in a process of ‘resetting’ of its epigenetic code.

If the metabolic microenvironment surrounding the oocyte and embryo is altered as a result of IVF, diet and lifestyle factors, this will influence the epigenetic mechanisms that ultimately control the growth rate and development potential of the resulting fetus.

Our team explores the metabolic and epigenetic consequences of environmental stress (e.g. culture, oxygen, hyperlipidaemia, hyperglycaemia etc) on the earliest stages of embryo development. With work spanning from the diet of dairy cows to the tightly regulated events of the transitioning chromatin of the maturing oocyte and early embryo, our well-rounded collaborative team are using multi-disciplinary approaches to answer questions on the micro- and nano-scale.

Our major focus is to explain the direct mechanisms by which ‘environmental stress’ impacts early development, to develop new tools to measure the changes, and to successfully develop interventions to reduce the impact.

Lead researchers: Associate Professor Jeremy Thompson, Dr Kylie Dunning and Dr Stephen Warren-Smith
Email: kylie.dunning@adelaide.edu.au

Honours project opportunities
> Novel tools to assess embryo quality

Many women and their partners seek IVF to conceive a baby, yet most are unaware of the low success rates, particularly in women over 35. Success rates would likely be improved if the most developmentally competent embryo could be chosen in the laboratory prior to its transfer into the uterus. A potential tool to achieve this is the use of optical microfibers, whereby conventional optical fibers, which are 125 µm in diameter, are tapered down to dimensions of a several microns or less and thus can be inserted into the preimplanation embryo. These microfibers can be altered at the micro/nano-scale to measure biological parameters such as temperature, refractive index or different metabolic reactions.

In this project, the student will have an opportunity to work in a transdisciplinary team where in vitro embryo culture will be combined with these optical fiber sensors to develop techniques to perform intra-cellular measurements in embryos never before achieved.

The student will work within the Centre for Nanoscale Biophotonics (CNBP), which is a transdisciplinary centre funded by the Australian Research Council. CNBP provides great access to both equipment and experts across disciplines such as reproductive biology, chemistry, and physics.

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas
Fertility and conception

Ovarian and Reproductive Cancer Cell Biology—Robinson Research Institute
Adelaide Health and Medical Sciences building (AHMS)

Lead researcher: Associate Professor Darryl Russell
Email: darryl.russell@adelaide.edu.au

Honours project opportunities
> Discovery of new, safer contraceptives

The contraceptive pill is one example of medical technology having a genuine transformative effect on society. However, the existing technology is based on frequent high dose hormone treatments that have several off-target risks, meaning that the existing contraceptive pill is not safe for women with certain cardiovascular disease risk factors and may also elevate risk of certain cancers.

Furthermore, access to birth control remains a vital unmet global health issue. The World Health Organisation has stated that due to a lack of safe, effective methods for fertility control there is a global unmet need for contraceptive access for ~120 million couples, as a result ~205 million pregnancies each year are unintended and ~44 million end in abortion, often in unsafe conditions.

The mechanism of ovulation; the release of the oocyte (human egg) from the ovary is a key event that can be targeted through non-hormonal and hence safer contraceptive drugs. Our research group is developing screening platforms to identify compounds with potential contraceptive activity through preventing ovulation, building on our expertise and novel insights in the physiology of ovulation from our research over the past decade.

Our research projects will apply molecular methods to investigate hormone action in the ovary and the mechanisms of ovulation as well as developing drug screens for potential contraceptive activity against key targets.

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas
Fertility and conception
Cancer biology and clinical oncology
Pregnancy and Birth
Most prospective mothers anticipate healthy and problem-free pregnancies. However, in reality complications are common, with a quarter of Australian pregnancies affected by one or more conditions that can have serious, lifelong health implications for the mother and her baby.

The most common conditions affecting Australian pregnancies are preeclampsia, preterm birth, foetal growth restriction and gestational diabetes. Their cost for individuals, families and communities is enormous, and can last a lifetime.

The Robinson Research Institute leads our research in pregnancy and birth and has an outstanding record of success in the area. This success relates to the cross-disciplinary capability and bench-to-bedside approach, which has led to major improvements in the health outcomes of mothers and babies. A more in-depth explanation of this research area is available on the Robinson Research Institute’s website.
Pregnancy and Birth research opportunities

Central and Northern Adelaide Renal and Transplantation Service (CNARTS)

Royal Adelaide Hospital; Basil Hetzel Institute for Translational Health Research; The Queen Elizabeth Hospital, Woodville

The Central and Northern Adelaide Renal and Transplantation Service (CNARTS) Clinical Research Group has an active research program encompassing basic laboratory research (Centre for Clinical and Experimental Transplantation), epidemiology of renal disease via the ANZDATA registry and participation in National and International multi-centre clinical trials via the Clinical Trials Unit.

Led by Dr Shilpa Jesudason, the current themes of the research group include:

- Gut health in patients with CKD, Dialysis and Transplantation
- Quality of life for patients with CKD, Dialysis and Transplantation
- Vasculitis and glomerulonephritis
- Clinical transplantation
- Obstetric nephrology
- Epidemiological outcomes for patients with CKD, Dialysis and Transplantation

Lead researcher: Dr Shilpa Jesudason
Email: shilpa.jesudason@sa.gov.au

Honours project opportunities

The Central and Northern Adelaide Renal and Transplantation Service (CNARTS) is the largest renal unit in SA, the unit has over 1000 transplant recipients and currently provides dialysis services to ~700 patients.

Individualising transplantation therapy

The success of kidney transplantation depends largely on preventing rejection of the new organ, using a combination of immunosuppressant drugs. These drugs have narrow therapeutic indices and can cause renal, gastrointestinal or haematological toxicity. Due to significant variability in their elimination from the body, doses are currently individualised by targeting therapeutic concentrations in blood. Despite this, rejection and toxicity still occur. Our research focuses on understanding immunosuppressant distribution into lymphocytes (the mediators of rejection) and renal tissue (a major site of toxicity), as a means of better predicting individual risk of rejection and damage to the transplanted organ.

Honours projects are available to investigate how pregnancy alters the pharmacokinetics of immunosuppressants in renal transplant recipients, and to develop biomarkers that may be used in conjunction with standard monitoring to minimise the risk of nephrotoxicity and graft loss during pregnancy.

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas

Pregnancy and birth
Translational health outcomes

More information


Dr Shilpa Jesudason
Placental Development Laboratory
Adelaide Health and Medical Sciences (AHMS) building; Lyell McEwin Hospital

The four main complications of pregnancy—preeclampsia, preterm birth, intrauterine growth restriction and gestational diabetes—affect 1 in 4 first pregnancies and are life threatening to the mother and/or baby in up to 6% of pregnancies.

Globally, more than 300,000 women die each year from complications of pregnancy and childbirth. Additionally, there are 15 million preterm births annually and this is considered the greatest factor contributing to the 6 million children who die before their fifth birthday. There are currently no screening tools in clinical practice to identify pregnant women at risk, largely because of a poor understanding of the pathogenesis of pregnancy complications and the complex inter-relationships in causal factors.

The Placental Development group have established pregnancy cohort databases and biobanks, and ex vivo, in vitro and animal models to investigate: the molecular profile of the placenta across gestation at the genome and epigenome levels; molecular mechanisms by which fetal sex impacts pregnancy outcome; and how micronutrients impact placental development and function in vivo and in vitro and pregnancy success.

In 2016, we filed a PCT patent application for our algorithms that predict a first-time mother’s risk of pregnancy complications early in her pregnancy. We identified molecular pathways in the placenta that are perturbed in pregnancy complications and demonstrated important effects of gene environment interactions on placental differentiation and function, and fetal growth. Our research program in human pregnancy and mouse models is revealing novel molecular mechanisms by which maternal micronutrient status impacts placental and fetal development and function.

Lead researcher: Professor Claire Roberts
Email: claire.roberts@adelaide.edu.au

Honours project opportunities

> Molecular regulation of placental function in health and disease

Using RNA sequencing, we have identified a number of genes that are switched on in the human placenta during distinct stages of pregnancy. We believe disruptions to the expression of these genes can lead to common pregnancy complications such as preeclampsia, which can arise from abnormal placental development. We have constructed a biobank of human placenta tissues from first trimester, second trimester and term pregnancies and from pregnancies complicated with common pregnancy complications.

The Honours student will utilise our placenta biobank to investigate the roles of a small number of genes and identify what placental cell types they are expressed within. Students will gain experience in quantitative PCR, immunohistochemistry, and primary cell culture. This project would suit a student interested in learning molecular techniques, and the outcomes of this research will help understand how the placenta changes at the molecular level throughout normal and complicated pregnancies.

> The role of micronutrients in pregnancy

Maternal micronutrient deficiencies including folate and vitamin D prior to and during pregnancy have been implicated in adverse pregnancy outcomes. This project investigates the role of the placenta in this association. First trimester and term placental explants will be cultured to determine the effect of folate on changes in placental explant growth, apoptosis, development, gene expression and DNA methylation status. Investigating the effect of micronutrients on placental function is a relatively new area of research with the potential to determine factors that go awry in the placenta during early pregnancy leading to placental insufficiency. This project will ideally suit an enthusiastic student who is interested in learning more about pregnancy, maternal nutrition and placenta and will involve skills such as placenta explants, placenta cell cultures, nucleic acid extractions, quantitative real time PCR and immunohistochemistry.

> Postnatal health

The effects of adverse pregnancy outcomes and intrauterine environment on health of women and offspring are now well established. Women who develop preeclampsia, gestational diabetes, deliver small for gestational age (SGA) infants or deliver preterm are at increased risk of later life vascular diseases compared to women who have uncomplicated pregnancies. Emerging evidence suggests that children born of a complicated pregnancy may also be at increased risk. However, most evidence comes from retrospective studies. Identifying the prevalence of risk factors for vascular disease after pregnancy complications as well as after exposure to adverse intrauterine conditions will allow early targeted interventions to reduce the subsequent burden of vascular diseases. This project aims at following up women and children of a large pregnancy cohort to identify cardiovascular risk factors within a few years after delivery of the first child.

> Maternal diet quality and offspring telomere length

Telomeres are located at the ends of chromosomes and shorten with each cell division. In situations of high oxidative stress or inflammation, telomeres shorten even further. Increasing telomere shortening is associated with chronic diseases. However, there is little information about telomere length, thus poor quality and low micronutrient diets could potentially result in erosion of telomeres and contribute to chronic disease. There is increasing evidence that nutritional factors are associated with telomere length, thus poor quality and low micronutrient diets could potentially result in erosion of telomeres and contribute to chronic disease. However, there is little information about telomere length in pregnancy and infancy. Offspring exposed to adverse intrauterine exposures such as poor diet may have shorter telomeres at birth and during childhood, thus already placing them at greater risk for chronic disease in later life. The aim of this project is to determine whether maternal dietary quality is associated with telomere length in mum, baby and child. The student will gain experience in dietary questionnaires and quantitative real time PCR.

Higher Degree by Research project opportunities

Any of our group’s projects can be tailored for PhD students.

Research areas

Pregnancy and birth
Early origins of health
Nutrition and metabolic health

More information

researchers.adelaide.edu.au/profile/claire.roberts
Reproductive Immunology

Adelaide Health and Medical Sciences (AHMS) building

We are interested in what activates the female immune system at the time of conception, allowing for the conferral of immunological tolerance before the embryo implants into the placenta.

In pregnancy, the female immune system recognises the fetus as foreign and as such, special adaptation is required to prevent rejection. An active state of immunological tolerance must be present to allow embryo implantation and development. Many common reproductive and pregnancy disorders—including unexplained infertility, recurrent miscarriage, preeclampsia and preterm birth—have their origins in immune and inflammatory disturbances that impact on placental development and leave the fetus vulnerable to immune and inflammatory attack.

The Reproductive Immunology Group focuses on events at conception that illicit a sequence that acts to stimulate the generation of regulatory T cells (Treg cells). Treg cells are anti-inflammatory and protect the implanting embryo and developing placenta. Recently, we made significant progress in understanding molecular pathways by which the immune response contributes to pregnancy and offspring health. Our work has demonstrated that the male partner makes an important contribution to the peri-conception environment.

We are expanding our studies to explore how both sperm and seminal plasma factors interact with cells in the female reproductive tract, regulating gene expression to impact pathways that control uterine receptivity to embryo implantation.

Additionally, we are investigating new drug compounds for tackling preterm birth. By suppressing the pro-inflammatory pathway activated by infection or by sterile insults, small molecules that block Toll-like receptor 4 and/or peptide antagonists of Interleukin-1 signalling (that is, molecules involved in immune responses to foreign agents) are showing great promise in inhibiting the steps that would otherwise lead to premature birth.

Lead researchers: Dr Alison Care (supervisor) and Professor Sarah Robertson (co-supervisor)

Email: alison.care@adelaide.edu.au

Honours project opportunities

Immune and vascular adaptations are essential for early placental development

Preeclampsia is a complication that affects 5-8% of pregnancies worldwide. Characterised by the de novo appearance of hypertension and proteinuria after mid-pregnancy, preeclampsia poses a significant risk to maternal health, and accounts for up to 12% of infants born small for gestational age and 20% of preterm births. As such, preeclampsia contributes to long-term health complications in offspring. The syndrome is characterised by a failure to adequately remodel maternal uterine spiral arteries and increase the capacity of maternal blood flow. This causes placental insufficiency and the consequent release of placental factors that precipitate the maternal syndrome. Although the precise mechanisms underlying preeclampsia onset and development are unknown, accumulating evidence implicates dysregulation of maternal immune responses in abnormal placental development and progression of preeclampsia.

In this project, we will use tissue from a mouse model of complicated pregnancy, and assess the extent of spiral artery remodeling in the placenta and the relative contributions of immune cells. Our preliminary data suggests for the first time that the regulatory T cells, cells essential for maternal immune tolerance to the developing fetus and placenta, are essential for driving the vascular adaptations to enable a healthy pregnancy. We will further interrogate their role in placental spiral artery remodeling.

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas

Pregnancy and birth
Immunology and infection
Cardiac, respiratory and vascular health
Fertility and conception

More information

researchers.adelaide.edu.au/profile/alison.care

Dr Alison Care
Early Origins of Health
The health trajectory of every child—including their metabolic, cardiovascular, immune and reproductive health, and neurological function—is profoundly influenced by their parents’ health and wellbeing prior to conception, throughout pregnancy, and during early postnatal life.

The Robinson Research Institute leads our research in the early origins of health and is well placed to tackle this challenge, having conducted some of the largest trials in the world investigating interventions in pregnant women and newborn infants to improve outcomes for the mother and child. A more in-depth explanation of this research area is available on the Robinson Research Institute’s website.
**Early Origins of Health research opportunities**

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**Circadian Physiology**
*Adelaide Health and Medical Sciences building (AHMS)*

Shift work increases the risk of developing a range of chronic disorders including heart disease, diabetes and obesity. These effects occur independently to confounding factors such as socioeconomic group and smoking, and the risk increases with the number of years of exposure.

Approximately 370,000 Australian women of reproductive age (20-44 years) work at night either permanently or on rotating shift rosters of varying types. The resulting altered sleep and meal times, together with altered light exposure, disrupts many physiological systems and rhythms. There is emerging evidence that not only do women who work shifts experience poorer fertility, but pregnant women working shifts are at increased risk of spontaneous abortion, preterm birth and low birth weight. Additionally, our animal studies have shown that disrupting circadian rhythms during the prenatal period may program metabolic disease in the subsequent offspring as they grow into adulthood.

The group’s multiple studies have demonstrated that mismatching the timing of sleep opportunity and food availability adversely affects glucose metabolism and insulin sensitivity in both animal and human models. In the case of the human trial, our preliminary evidence indicates that as few as four consecutive 12 hour night shifts induces insulin resistance even when there is no sleep deprivation.

**Lead researcher:** David Kennaway
**Email:** david.kennaway@adelaide.edu.au

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**Honours project opportunities**

- **Does shift work exposure during gestation affect pregnancy outcomes and the long term metabolic health of the progeny?**
  
  This project, based within an NHMRC Project (APP1106674; Kennaway, Gatford & Varcoe 2016-2018), will use a large animal model to investigate the impact of simulated shift work exposure during gestation the metabolic health of the progeny through until adulthood. Simulated shift work will involve controlling light exposure and food access of pregnant ewes at different stages of gestation. Lambs will be assessed at 12 months for body composition, glucose tolerance and insulin sensitivity. The student will experience a range of sampling and analytical techniques including: large animal surgery, radioimmunoassay, quantitative PCR and immunohistochemistry. The project will be jointly supervised by Dr Tamara Varcoe and Dr Kathy Gatford.

- **Does maternal melatonin during the preconceptual and prenatal period program metabolic homeostasis of adult offspring?**
  
  Of particular interest, a complete suppression of maternal melatonin before and during pregnancy in animal models perturbs metabolic homeostasis of offspring. Rodents whose mothers lack melatonin have poorer glucose tolerance, reduced glucose-stimulated insulin secretion and hepatic insulin resistance as adults. The impact of supra-physiological levels during pregnancy on progeny metabolic health has not been investigated.
  
  This project will determine whether restoring physiological levels of maternal melatonin during pregnancy can normalise metabolic health of progeny. We will manipulate the dose of exogenous melatonin administered to melatonin deficient mice during pregnancy, then assess the long term metabolic health as measured by adiposity, glucose tolerance and insulin sensitivity.
  
  This project will be jointly supervised by Dr Tamara Varcoe and Professor David Kennaway.

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**Higher Degree by Research project opportunities**

- **Does shift work exposure during gestation affect pregnancy outcomes and the long term metabolic health of the progeny?**
  
  Please see Honours project description for more information.

**Research areas**

- Early origins of health
- Nutrition and metabolic health
- Pregnancy and birth
- Translational health outcomes

**More information**
[adelaide.edu.au/directory/david.kennaway](adelaide.edu.au/directory/david.kennaway)
Early Life Programming of Health and Disease

Adelaide Health and Medical Sciences building (AHMS)

Dr Kathy Gatford investigates mechanisms for long-term health impacts of pregnancy complications and developing interventions to improve health of progeny.

The early environment—before, and shortly after, birth— influences an individual’s risk of developing major non-communicable diseases including diabetes, cardiovascular disease, impaired neurological function and allergy. Importantly, the effects of adverse prenatal exposures are not always permanent or reversible, opening the way for interventions during in early life to improve outcomes.

The Early Origins of Health and Disease Group seeks to optimise the life-long health of the next generation by understanding how early life exposures cause long-term changes in health. The goal is to develop interventions during pregnancy or in early postnatal life to improve health and reduce risks of non-communicable disease in the next generation. We are also interested in defining the developmental stages at which such intervention strategies are most effective.

Recently, we evaluated the metabolic and other benefits of exercise training in later life, after intrauterine growth restriction (IUGR). We aim to understand whether individuals with growth restriction before birth experience the same improvements in glucose control and insulin sensitivity as normal individuals when they undertake regular moderate exercise. So far we have demonstrated adverse effects of IUGR on learning and memory, which are ameliorated by the extent of postnatal catch-up growth, suggesting interventions to promote catch up could improve outcomes.

We are continuing to evaluate adult outcomes of exercise training in progeny from normal or growth-restricted pregnancies, including effects on insulin signalling to control glucose levels. We are also collaborating to identify mechanisms and interventions to improve metabolic and neurodevelopmental outcomes after other common perinatal exposures, including shift work during pregnancy, maternal overweight and obesity, preterm birth and maternal asthma.

Lead researcher: Dr Kathy Gatford
Email: kathy.gatford@adelaide.edu.au

Honours project opportunities

Developmental programming of allergy
We have demonstrated in preclinical models that intrauterine growth restriction (IUGR) is protective against allergy in progeny, whilst maternal allergic asthma during pregnancy changes the fetal immune system in ways likely to increase allergy risk. Honours and HDR projects are available to:
• assess the evidence for protection against allergy by IUGR from human studies
• investigate the impact of maternal asthma on postnatal immune system and allergy in a preclinical model. (This project will require off-site and after hours field work)
• investigate the epigenetic basis for long-term effects of prenatal exposures on postnatal immune function and allergy in our preclinical models

Preventing IUGR
In preclinical models, daily injections of the mother with growth hormone can improve placental function and fetal growth. We are currently investigating a dietary approach to increase maternal growth hormone, as a strategy to prevent IUGR that does not require injections. Honours and HDR projects are available (some subject to pending funding) to:
• characterise a preclinical (mouse) model of IUGR in which we will test our dietary intervention
• investigate how pregnancy changes gut regulation of metabolism using the mouse
• investigate effects of the hormone pathway downstream of our diet on growth and function of the human placenta

Improving newborn survival in lambs
Newborn lambs often struggle to survive in a harsh environment, and poor survival is a problem particular in twin lambs, who are smaller and less resilient. In collaboration with colleagues in the School of Animal and Vet Sciences at Roseworthy and at SARDI, we are pursuing several dietary strategies to increase lamb energy stores and improve lamb temperature regulation at birth. Honours and HDR projects are available from 2018 to evaluate one of four intervention strategies, and the mechanisms that underlie their effects. (This project will require off-site and after hours field work)

Higher Degree by Research project opportunities

Developmental programming of allergy
Preventing IUGR
Improving newborn survival in lambs
Please see Honours projects for descriptions.

Research areas
Early origins of health
Pregnancy and birth

More information
researchers.adelaide.edu.au/profile/kathy.gatford
Ovarian Cell Biology

Ovarian Cell Biology

Adelaide Health and Medical Sciences building (AHMS)

The Ovarian Cell Biology group is investigating the biological mechanisms by which somatic cells in the ovary nurture the oocyte and endow it with the capacity and essential components to form an embryo, and then trigger its timely release for fertilisation. Discovering this information is essential for understanding the foundations of reproduction and the earliest stages of embryogenesis.

Using both genetic and dietary mouse models of obesity, we have shown that the detrimental effects of obesity on female reproduction and embryo development commence with dramatic alterations in oocyte quality. We found that cumulus-oocyte-complexes of obese mice contain high levels of lipid and mitochondrial dysfunction, and in collaboration with Fertility SA, verified similar changes in obese women. Our most recent studies in mice now show that obesity-induced mitochondrial disturbance in oocytes persist into offspring tissues, a finding with major implications for understanding the transgenerational transmission of obesity. Most importantly, we discovered a class of compounds that when administered to obese female mice before conception, prevent the mitochondrial changes in oocytes.

The vision of the Ovarian Cell Biology team is to discover the biological mechanisms by which ovarian cells act as the conduit between maternal physiological signals, the release of the egg and the healthy development of offspring. We aim to use this knowledge to improve female reproductive health, generate new approaches to treat infertility and to optimise embryo growth in all pregnancies.

Lead researchers: Associate Professor Rebecca Robker and Associate Professor Darryl Russell

Email: rebecca.robker@adelaide.edu.au

Honours project opportunities

Ovarian Cell Biology Group

The research teams of Associate Professor Rebecca Robker and Associate Professor Darryl Russell are dedicated to understanding the cellular and molecular biology that regulates ovarian function. All aspects of women’s health are dependent upon proper functioning of the ovary, which synthesises steroid hormones, undergoes dramatic tissue remodelling to release oocytes (eggs) and endows eggs with all of the building blocks that confer its pluripotency and capacity to form an embryo.

Available projects fall into a number of areas:

- Understanding how age and obesity alter cell functions in the ovary to cause poor egg quality and impaired embryo development.
- Discovering proteolytic mechanisms by which the cells surrounding the egg are able to propel it into the oviduct for fertilisation.
- Assessing how common contaminants in the environment disrupt cell signalling to result in infertility and/or defective embryo development.
- Characterising how steroid hormone receptors restructure DNA to regulate unique gene-sets depending on cellular context.
- Determining how the environment of the egg and embryo changes mitochondrial inheritance in offspring.

This research is important for 1) elucidating the fundamental biology that controls the generation of new life; 2) developing new therapies for infertility as well as new non-steroidal contraceptives; 3) understanding how preconception events shape lifelong health trajectories.

Our teams are based in the state-of-the-art facilities at AHMS and use cutting edge techniques supported by a suite of advanced core facilities. Our experimental systems use unique mouse models and cell culture with analysis by high resolution confocal microscopy and high-content image analysis to interrogate these biological questions on a molecular level. We use time-lapse video microscopy to monitor the earliest stages of embryo development and are able to then correlate these measures with later postnatal growth and health and molecular readouts using genome-wide sequencing, chromatin immunoprecipitation, lentiviral gene transfer, CRISPR/Cas9 gene editing, bioinformatics and cellular phenotyping methods in order to elucidate mechanisms of hormone action and cell signalling.

Each specific project is designed in consultation with prospective students according to their interests, expertise and skill levels. We encourage students to meet with us and discuss the possibilities.

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas

Early origins of health
Fertility and conception

More information

researchers.adelaide.edu.au/profile/rebecca.robker

From left to right: Ovarian Cell Biology Group. Mouse embryo with differentially labelled inner cell mass and trophectoderm. Fluorescent protein expression in cumulus cells surrounding oocytes by lentiviral transfer.
Child and Adolescent Health
Research is ongoing to detect, prevent and treat the many chronic physical and mental disorders that originate in childhood, to improve the health of all children and adolescents.

Internationally, the Robinson Research Institute is known for achieving advances in childhood and adolescent mental health and diabetes. It is also recognised nationally as being at the forefront of immunisation research.

The Robinson Research Institute leads our child and adolescent health research, and an in-depth explanation of this research area is available on the Robinson Research Institute’s website.
Child and Adolescent Health research opportunities

Diabetes Research Group

*Women’s and Children’s Hospital*

The incidence of type 1 diabetes in childhood has increased worldwide, doubling in Australia over the last 20 years; suggesting the modern changing environment plays a role in type 1 diabetes. The specific environmental factors that contribute to and protect against type 1 diabetes are unknown, although it is likely that exposures in pregnancy and very early life are critical. Children with type 1 diabetes have an increased lifetime risk of heart, kidney, and eye disease due to damage to their blood vessels.

The Diabetes Research Group conducts clinical and laboratory research focusing on:

- environmental exposures that drive diabetes
- immune regulatory function
- the protection of blood vessel health in children and adolescents

Recently the ENDIA pregnancy to birth cohort received $8 million from JDRF Australia and the Helmsley Charitable Trust to expand recruitment and data acquisition across Australia, and to develop international collaborations. This builds upon the NHMRC/JDRF Centre of Research Excellence for the Protection of Pancreatic Beta Cells. We were invited by the TEDDY consortium in US to attend their closed meeting to best align our work to global efforts aimed at preventing type 1 diabetes. Additionally, we discovered the importance of salt intake and exercise in blood vessel health in children with diabetes; completed studies uncovering how the stomach functions in type 1 diabetes and the affect on blood glucose control; and presented the results of the first randomised controlled trial of the blood vessel benefits of the medication metformin in adolescents with type 1 diabetes.

**Lead researcher:** Professor Jenny Couper

**Email:** jennifer.couper@adelaide.edu.au

Honours project opportunities

- **Feasibility assessment and validation of the ENDIA Infant Feeding Diary using weighed food records**

  The incidence of type 1 diabetes (T1D) has increased worldwide, particularly in younger children and those with lower genetic susceptibility. These observations indicate that the modern environment may play a role in initiating and accelerating of the autoimmune process that leads to the destruction of insulin-producing beta cells. The Environmental Determinants of Islet Autoimmunity (ENDIA) Study is investigating candidate environmental exposures and gene-environment interactions that may contribute to the development of islet autoimmunity and T1D. Early infant feeding practices and the composition of the infant diet may have relevance to T1D risk. The ENDIA Infant Feeding Diary has been custom designed to capture dietary information from birth until 12 months of age. It is intended to be completed by the infant’s primary caregiver weekly.

**Higher Degree by Research project opportunities**

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

**Research areas**

- Child and adolescent health
- Nutrition and metabolic health

**More information**

[enda.org.au](http://enda.org.au)

**National ENDIA Study team**
Cystic Fibrosis Airway Research Group  
Women's and Children's Hospital

Our goal is to develop an effective genetic therapy for prevention or treatment of Cystic Fibrosis (CF) airway disease. Research themes are currently focussed on several complementary areas; achieving effective lentiviral CFTR vector gene delivery, transduction of airway stem cells in situ to enable extended gene expression, development of rapid and accurate outcome measures for assessment of airway disease using X-rays, and the investigation of human amnion epithelial cells for use as a cell therapy to correct CF airway function.

In 2016, we created rats with CF using gene-editing methods developed by collaborators at Monash University. These CF rats are expected to provide a CF lung disease model with much similarity to that present in humans with CF, and form an ideal test bed for our genetic therapies. We also envisage the colony will be able to provide CF rats for other CF researchers across the Asia-Pacific region.

The need for fast, reliable, and non-invasive methods to pre-clinically test for correction of CF airway physiological function has led to rapid progress using novel synchrotron X-ray imaging approaches in live mice in collaboration with physicists from Monash University and the Australian Synchrotron.

Research into translation of methods for potential human application in a non-synchrotron diagnostic setting has recently begun and has been assisted by the 2013 opening of the Imaging and Medical Beamline at the Australian Synchrotron and the Monash Dynamic X-ray Imaging Facility in the Laboratory for Dynamic Imaging.

Lead researchers: Dr Martin Donnelley and Associate Professor David Parsons  
Email: martin.donnelley@adelaide.edu.au

Honours project opportunities
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Cystic Fibrosis rat characterisation

In 2016, we used CRISPR/Cas9 gene editing to generate a breeding line of rats with the Phe508del CFTR mutation, which is the most common CF mutation in humans. During the gene editing process two other off-target mutations were identified. Rats with these three phenotypes have been bred, with the first CF litters born around June 2017. So far these rats are uncharacterised, apart from examining activity levels and survival to weaning, although the off target mutations seem to be more severe.

This project is designed to analyse the CF rat genotype and phenotype to understand how the disease manifests in this new model. It will also test the effects of airway gene therapy on the lung phenotype, and determine whether this novel treatment has the ability to alter the course of disease. This will be achieved with the use of tools such as PCR, histology, immunohistochemistry, and nasal potential difference assessment, as well as gene vector production.

> Cystic Fibrosis lung bacterial infections

In patients with CF the CFTR defect results in dehydration of the airway surface liquid and production of thick sticky mucus that blocks airways. This also means that clearance of inhaled particulates and pathogens is inhibited, enabling a cycle of persistent infection and inflammation to develop. The mucus creates a perfect breeding ground for bacteria to breed, and colonisation of the lungs has a major impact on the course of the disease. This process results in destruction of the lung tissue and eventually lung failure. Our gene therapy method utilises a tight junction opening compound called LPC to increase airway stem cell transduction levels, but the safety of this pre-treatment in bacterially infected lungs is currently unknown, including whether it might elicit a systemic bacterial infection.

This project is designed to examine the effects of bacterial colonisation in the lungs of normal and CF rats. Lung infections with varying severity can be generated by depositing agar beads containing pathogens such as Pseudomonas Aeruginosa into the lungs. The effects of performing gene vector delivery (including the use of LPC) in the presence of bacteria will then be assessed. Tools such as PCR, histology, immunohistochemistry, gene vector production, reporter gene delivery, etc will be used.

> Measurement of Cystic Fibrosis lung function and airway surface health

The ability to rapidly and accurately measure the effects of genetic or pharmaceutical therapies on airway surface health and lung function are very important. Changes in mucus clearance might occur relatively quickly, but are hard to measure in situ. Changes in lung function take much longer to be measurable, and their location within the lung cannot be identified. We have therefore developed a range of X-ray imaging technologies to quantify treatment efficacy. At the SPRing-8 synchrotron in Japan we can measure changes in the mucociliary transit behaviour of deposited tracking particles. At the imaging and medical beamline (IMBL) at the Australian Synchrotron we can use a technology called computed tomographic X-ray velocimetry to measure flow in each airway as it changes with mucus blockage or clearance.

This project is designed to examine the effects of genetic or pharmaceutical treatments on lung health. Depending on the expertise and skills of the applicant it could involve computer science techniques such as image processing algorithm development and image data analysis, or alternatively it could be based on gene vector production, animal handling and molecular assessments. Some travel may be involved.

Higher Degree by Research project opportunities

Please see Honours projects. These can all be adapted to HDR projects.

Research areas
Child and adolescent health  
Cardiac, respiratory and vascular health  
Innovative therapeutics  
Immunology and infection

More information
adelaide.edu.au/robinson-research-institute/research/groups/cf/

CF airway research group, 2016
Vaccinology and Immunology Research Trials Unit

Women's and Children's Hospital

Professor Marshall's research program is directed to address urgent priorities in infectious disease prevention and includes clinical trials in investigational vaccines, infectious and social epidemiology and public health. She provides research leadership through her position as Deputy Director, Clinical and Translational Research and as a Research Leader of the Child and Adolescent Theme in the Robinson Research Institute.

Professor Marshall’s main interests include meningococcal, Human Papillomavirus and pertussis infections and their prevention by immunisation. Professor Marshall has been an investigator on over 50 paediatric, adolescent and adult clinical trials. She is the Principal Investigator on the B Part of It Study, a landmark study to assess the impact of MenB vaccine on carriage in up to 40,000 school students in South Australia.

Additionally, her research group VIRTU is one of only two research centres in Australia using social science research methodologies to investigate community acceptance of immunisation programs and the only centre assessing community attitudes to introduction of new vaccines.

Since 2004, Professor Marshall has published over 120 peer-reviewed papers in high quality general medicine and specialist journals across diverse disciplines. She has been awarded 10 NHMRC grants and ARC, Government, Foundation and Industry grants totalling >$25 million. Her leadership is recognised by 24 international and 22 national invited speaker invitations. Professor Marshall has been awarded the South Australian Science Award for Excellence in Research for the Public Good and received a Fellowship of the Public health Association of Australia as recognition of her research leadership.

Lead researcher: Professor Helen Marshall
Email: helen.marshall@adelaide.edu.au

Honours project opportunities

> FLUTE — Flu vaccine in adolescents

Vaccination has been one of the most valuable and significant public health interventions in history, however vaccines are often not 100% effective, and various internal or external factors can influence the immune response achieved following vaccination.

This project aims to explore whether Body Mass Index and/or various cytokines are associated with altered influenza vaccine responses in adolescents. The study will offer opportunities to learn about vaccination programs, influenza, epidemiology and biostatistics and clinical research and immunology.

> PAEDS — active surveillance for vaccine preventable diseases

Projects are available involving surveillance of vaccine preventable diseases in children. These projects aim to understand the burden of vaccine preventable disease such as pertussis, influenza and varicella and improve our understanding of the role of vaccination in prevention of these illnesses. Involvement in this project will offer opportunities to learn about vaccination programs, disease surveillance and paediatric infectious diseases.

The South Australian Meningococcal B Vaccine Herd Immunity Study (B Part of It)

The South Australian Meningococcal B Vaccine Herd Immunity Study (B Part of It), is a cluster RCT study being undertaken in South Australia in 2016 – 2019, through a partnership between the University of Adelaide and SA Health.

The three-year study has offered participating students across 237 schools the opportunity to have meningococcal B vaccine and 2 throat swabs. It is the largest study of its kind in the world and will have both national and international significance for policy development of meningococcal B vaccines in immunisation programs. The primary aim of the study is to assess the impact of the meningococcal B vaccine (MenB vaccine) on pharyngeal carriage of all serogroups of Neisseria meningitidis in adolescents attending South Australian metropolitan and country schools in years 10, 11 and 12 in 2017.

The study is highly collaborative and involves a wide range of stakeholders and partnerships. SA immunisation providers carry out the study consent process, administer the vaccinations and swabs within SA schools.

Honours student projects may be considered in the following areas: analysis of the study media and communications; factors affecting decisions making around study participation amongst high school students; analysis of the relationship between the schools and immunisation providers.

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas

Child and adolescent health
Immunology and infection

Vaccinology and Immunology Research Trials Unit
Neuroscience, Behaviour and Brain Health
Neuroscience, Behaviour and Brain Health research groups

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The brain and spinal cord comprise the central nervous system of the body. Damage and disease of the brain or spinal cord can lead to developmental delay, intellectual or physical disability, loss of cognitive function and behavioural and psychological disorders.

Neuroscience is an interdisciplinary science that focuses on the study of neurochemistry and experimental psychology. It deals with the structure and normal function of the nervous system and brain that impact on behaviour, cognitive function and neurological dysfunction.

Our researchers investigate these areas with the aim of developing therapies and informing improved health service provision for individuals.

Researchers across the faculty are focused on:

- understanding the function of genes that cause neurodevelopmental disorders, such as intellectual disability and epilepsy
- investigating the causes of diseases of the brain, spine or nervous system (including Parkinson's disease and Alzheimer's disease) to inform diagnosis, prevention and treatment
- understanding the cellular and molecular basis of cognition, perception and neuropsychology
- developing therapies, and translating results into the treatment and prevention of neurological diseases
- understanding the health psychology, healthy development across the lifespan, and disability to inform and assess rehabilitation and health service delivery
- developing innovative biological computation technologies to enable large-scale epidemiological studies that can inform health care policy and service provision.
Neuroscience, Behaviour and Brain Health research opportunities

Applied Cognition and Experimental Psychology

University of Adelaide North Terrace Campus

The ACEP research group focuses on the application of theories and models of cognition, judgement and decision making to legal and medical contexts. We are interested in understanding human interaction with intelligent agents. We use experimental methods and modelling of cognitive processes to understand and improve human decision making in important contexts—such as health, policing and national security. Our research is focused on understanding how individuals who are proficient in unfamiliar face matching achieve high levels of performance and on how technology might be used to enhance proficiency. Our research has been used to improve the decisions of police, eyewitnesses, jurors and health consumers.

The research has been funded by ARC Discovery and Linkage grants, the National Science Foundation (USA) and by the Department of Prime Minister and Cabinet.

Lead researcher: Dr Carolyn Semmler
Email: carolyn.semmler@adelaide.edu.au

Honours project opportunities

- **Project 1**
  Police use many differing techniques to test the memory of eyewitnesses and determine the identity of a perpetrator. This project will investigate the effectiveness of a procedure called a ‘show-up’. You will be involved in the planning, design and implementation of the research. It will involve collection of data from people in outdoor settings. It will involve the application of models using signal detection frameworks to understand the data. The work is funded by an Australian Research Council Discovery grant.

- **Project 2**
  Unfamiliar face matching is a task that is used in many security and surveillance settings. This project will investigate the individual differences predictive of proficiency in this task. It will also map the time course of the decision process using drift diffusion modelling. Proficiency in using R is desirable for this project.

- **Project 3**
  Sustainable consumption of meat is a major challenge facing the world, with agriculture for meat production producing large amounts of carbon emissions and having important consequences for the health of individuals. This project will explore the psychological aspects of meat consumption and apply cognitive dissonance models to understand how emotional responses can determine the maintenance and change of consumption behavior. This project will be carried out in collaboration with Professor Anna Chur-Hansen.

- **Project 4**
  Medical tribunals make important decisions regarding the professional practice of doctors. They have to interpret detailed submissions and determine the chances that a doctors behaviour will lead to harm, and how to mitigate that harm through orders to suspend or modify their practice. This project will investigate the features of cases where ongoing harm has occurred. It will be carried out in collaboration with Dr Frida Creak.

Higher Degree by Research project opportunities

- **Project 1**
  Memory for context is a critical aspect of effective recall and reporting of information. This project would develop an approach for understanding how people direct and differentiate search processes in memory where contexts are highly similar and where they are highly dissimilar. A background in computational modelling (using R) is desirable for this project.

- **Project 2**
  Computer systems that require natural language input from a human to work are common place. However, little is known about how the human and system work together to solve problems such as determining the identity of an individual. This project will look at the impact of biases on search efficiency in a human-machine system. A background in computer science and modelling of human-machine systems is desirable for this project.

- **Project 3**
  This project aims to understand how humans encode, use and communicate identity relevant information when observing unfamiliar targets in unconstrained imagery. It will use a combination of experimental design and computational modelling of cognition grounded in physiological measures to develop a new approach to the research challenge of combining human and machine in surveillance contexts. EEG recordings (focusing on the P3 wave form) along with behavioural measures (identification decision, confidence and response time) and a language corpus of identity relevant information will be used to determine the relationship between perception and language for identification. Modulations of negativities around 400 msec are related to the retrieval of content from face representations and of its associated verbal-semantic information. A background in using ERPs to study psychological processes is desirable for this project.

Research areas

Neuroscience, behaviour and brain health

More information

researchers.adelaide.edu.au/profile/carolyn.semmler
Healthy Mothers, Babies and Children

South Australian Health and Medical Research Institute (SAHMRI); Women’s and Children’s Hospital

Professor Maria Makrides is the Theme Leader for Healthy Mothers, Babies and Children. She is also Director of the Child Nutrition Research Centre with its headquarters at the Women’s and Children’s Hospital. Professor Makrides is a National Health and Medical Research Council (NHMRC) Principal Research Fellow and also Professor of Human Nutrition, University of Adelaide.

Professor Makrides leads a multi-disciplinary research group of over 30 staff who are highly skilled in conducting and translating nutrition intervention trials involving mothers and babies.

Lead researcher: Professor Maria Makrides
Email: jacqueline.gould@adelaide.edu.au

Honours project opportunities

- Behaviour and mental health outcomes in adolescents who were born very preterm
  Children born preterm often suffer a range of medical and developmental complications, such as higher rates of long-term health, behavioural, and educational impairments, with consequences that last into young adulthood such as higher rates of emotional and mental health problems. This project will assess a variety of mental health, behavioural, and socio-emotional outcomes at 15 years of age, in a cohort of Australian adolescents born preterm who had suboptimal behavioural functioning at seven years of age, and thus are at high risk of poor adolescent outcomes.

- Using data linkage to determine safety outcomes in high-risk preterm infants following early high-dose omega-3 docosahexaenoic acid supplementation
  Randomised controlled trials frequently require longer recruitment periods than initially estimated with some failing to recruit the required number of participants. This has implications for trial results, as with lengthy recruitment periods it is possible for clinical practice to change during that time and with difficult recruitment selective enrolment may occur, both affecting the generalisability of the study.

  Trials that don’t reach sample size will suffer from lack of power.

  The aim of this project is to determine individual, clinician and organisational factors that influence participation in trials as well as to consider ways to optimise the expertise for the trial participants.

- Breast milk micronutrient composition in South Australia
  Breast milk composition varies depending on the age of the infant, from the beginning to the end of a feed. We have previously demonstrated that common allergens are transferred from the mother’s diet into breast milk. We are now interested in factors that influence the micronutrient content of breastmilk, and their potential impact on the infant.

Higher Degree by Research project opportunities

- Improving participation and engagement in randomised controlled trials
  The aim of this project is to determine the safety of an enteral emulsion containing docosahexaenoic acid (DHA) given in the neonatal period by assessing a combination of hospital admission, emergency department attendance, medical and pharmaceutical service data measured in early childhood. This is a follow-up of the N3RO randomised controlled trial. In N3RO 1244 infants born >29 weeks gestation were given supplementary enteral DHA (60 mg/kg/day) compared to control (no additional DHA) from within the first days of life to 36 weeks post menstrual age.

  The primary outcome for the trial is the incidence of bronchopulmonary dysplasia (BPD) and results will be known early 2016. It is important to determine the longer term safety of the DHA intervention up to two years of age. This will be done by using person-level linked health related data (with parent consent) from Australian, New Zealand and Singapore data linkage programs, and from Medicare and the Pharmaceutical Benefits Schedule.

- Improving the metabolic outcomes of adolescents born very preterm
  Infants born >33 weeks’ gestation have an increased risk of a range of long-term adverse health outcomes, including a higher risk of developing cardio-metabolic diseases in adolescence and adulthood. This project involves assessing the cardio-metabolic health of adolescents who were born very preterm.

Research areas

Neuroscience, behaviour and brain health
Early origins of health
Pregnancy and birth

More information
sahmriresearch.org/our-research/themes/healthy-mothers-babies-children/theme-overview
Visceral Pain Research Group

South Australian Health and Medical Research Institute (SAHMRI)

Our research focuses on chronic pain, with particular emphasis on Irritable Bowel Syndrome (IBS), Inflammatory Bowel Disease (IBD), and overactive bladder. We determine the mechanisms responsible for detecting painful events and how they change during acute and chronic pain. It is clear that certain mechanisms are reprogrammed during chronic pain, which fail to ‘reset’ back to normal. Overall, understanding how these mechanisms are changed is the first step in finding new therapeutic treatments for chronic pain.


Lead researcher: Associate Professor Stuart Brierley
Email: stuart.brierley@sahmri.com

Honours project opportunities

- Molecular mapping of brain regions activated by visceral pain and how these change in states of chronic visceral pain
  Harmful events occurring in internal organs (viscera) are detected by sensory nerves that signal into the spinal cord. From there this information is relayed into the brain to be perceived. This project aims to localise and map out the neurons in the brain activated by painful visceral stimuli. Molecular and neuroanatomical tracing approaches will be used in combination with models of visceral pain.

- Molecular characterisation of spinal cord neurons processing visceral pain and how these change in states of chronic visceral pain
  This project will use laser microdissection to isolate neurons in the spinal cord involved in relaying visceral pain into the brain. Once isolated these neurons will have their molecular expression profiles characterised. Spinal cord slice electrophysiology and calcium imaging will be used as functional correlates to expression studies.

- Ion channels: Critical targets for the treatment of chronic abdominal pain
  This project will follow up on our recent Nature paper to investigate novel ion channels in sensory neurons, and how their function changes across acute and chronic pain models. We will also determine how ion channel expression is altered in tissue from human patients with chronic visceral pain.

- G-protein coupled receptors: The cause of and solution to chronic abdominal pain?
  This project will follow up on our recent Cell and Nature Communications papers to investigate how novel G-protein coupled receptors are activated in chronic pain. We will also determine how receptor expression is altered in tissue from human patients with chronic visceral, thereby linking altered expression with symptoms.

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas
Neuroscience, behaviour and brain health
Nutrition and metabolic health
Immunology and infection

More information
adelaide.edu.au/directory/andrea.harrington
Integrative Human Neurophysiology Lab
University of Adelaide North Terrace Campus

The research conducted in this laboratory investigates how the central nervous system coordinates the movement of our bodies and how it is reorganised as a consequence of exercise. The lab focuses on the area of fatigability and exercise intolerance in health, aging and disease. The research involves the application of various novel and non-invasive electro-physiological techniques such as Transcranial Magnetic Stimulation (TMS), peripheral nerve stimulation, and electromyography (EMG) in experiments involving human subject.

Lead researcher: Dr Simran Sidhu
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Honours project opportunities

- **Brain areas that contribute to fatigue during locomotor exercise**
  
  There is now some evidence, although indirect, demonstrating that central fatigue is attributed to attenuation in neural drive from at or above the motor cortex (M1) region of the brain. This suggests that there are other important brain areas within and in association with M1 that feed activity-dependant inhibitory and excitatory neural signals into M1 output cells during fatiguing exercise. Differentially active brain areas are assumed to be significant constituents of the functional system governing human performance. The evidence, albeit from studies involving single joint exercise, suggests that in addition to the primary sensorimotor areas M1 and S1 (the somatosensory cortex) secondary and association cortices, including supplementary motor area (SMA), prefrontal cortex (PFC), insular cortex (IC) and cerebellum, play important roles in the development of fatigue during exercise. Information on the causative role can be obtained via direct manipulation of the activity in the cortical areas concerned, for example with the use of transcranial magnetic stimulation (TMS). The exact contribution from specific sensory and motor brain regions in the development of brain fatigue during locomotor exercise remains will be determined in these series of studies.

- **Effects of neuromodulation on targeted brain areas during locomotor exercise performance**

  Transcranial direct current stimulation (tDCS) has been shown to produce sustained changes in human cortical excitability. This form of neuromodulation has the potential to attenuate the development of brain fatigue by moderating the manner in which a given brain area processes a stimulus. Application of tDCS on M1 for ten minutes prior to exercise increases time to task failure of a sustained isometric elbow flexion and improve locomotor exercise performance. Interestingly, when tDCS is applied on insular cortex before cycling exercise test, perceived exertion is reduced and performance is enhanced. However, the neural mechanisms underlying this effect remain unknown. Specifically, we need evidence on whether the increase in locomotor performance outcome is a consequence of tDCS mediated reduction in cortical inhibition.

- **Impact of centrally driven locomotor fatigue on attentional cognitive performance**

  To perform accurate, goal-directed motor actions in everyday scenarios, our eyes and hands must interact, coordinate and implement with a low error rate. The performance of goal-directed movements requires the rapid deployment of attention. In particular, visual attention plays a key role in planning and executing goal-directed movements, since these movements are typically directed to visual targets.

  Recent work has shown that when we interact with objects in the environment, the profile of visual attention rises and falls at different times and locations relative to movement goals. It appears that in our body's adaptation to aerobic exercise diminishes cognitive performance. If central fatigue does indeed have a detrimental effect on cognitive performance, then we can expect that application of a form of neuromodulation called transcranial direct current stimulation (tDCS) to increase excitability of neural circuitry in the areas contributing to central fatigue will also improve attentional performance. This phenomenon will be explored in these series of studies.

Higher Degree by Research project opportunities

- **Effects of human locomotor fatigue on the brain and performance**

  Fatigue limits our ability to perform everyday tasks. We understand little about the brain areas involved in the development of fatigue during human locomotor movements, and the impact of centrally driven fatigue on movements that are vital for interaction with our environment. Having a comprehensive understanding of the neural mechanisms and interactions that occur between the components in the brain during locomotor exercise is critical to establish the anatomical sites of intervention that will result in the most effective functional outcomes.

  To improve human work productivity, both the neurophysiological and psychophysical aspects of fatigue must be addressed. In these series of studies, it will be determined how locomotor fatigue influences neural circuitry in specific brain areas and how this interacts with physical and cognitive performance.

- **Age-related impact of fatigue on the brain**

  Age-related alterations in the neuromuscular system can predispose old adults to a different magnitude and mechanisms of neuromuscular fatigue. Recent evidence suggests that older adults are characterised by an increase in supraspinal (intrinsic of the brain) fatigue. Furthermore, due to changes in attentional demands and information processing capacities with aging, it can be assumed that the consequences of brain fatigue on cognitive and motor function is higher in elderly people compared to young adults. Indeed, both exercise intolerance and impaired cognitive function not only impairs the elderly's quality of life but also depicts a major source of morbidity.

  The aim of the current project is to elucidate these mechanisms via techniques and concepts that are at cutting edge of international research in integrative neuroscience. Specifically, the project will employ non-invasive brain stimulation techniques such as transcranial magnetic stimulation and novel motor skill learning and cognitive tasks during a fatiguing cycling exercise in older adults (>65 years) and young controls.

Research areas

- Neuroscience, behaviour and brain health
- Ageing, frailty and mobility

More information

researchers.adelaide.edu.au/profile/simran.sidhu
Ophthalmic Research Laboratory
Royal Adelaide Hospital; Adelaide Health and Medical Sciences building (AHMS)

The Ophthalmic research laboratory, located in the Hanson Institute, is a well-funded laboratory comprising senior scientists, research assistants and students. We received two 4-year NHMRC Project Grants in 2016 for approximately AUD$1.5 million. We foster interdisciplinary and industry collaboration, and have developed a highly productive research program with an Adelaide-based ophthalmic laser company, Ellex Medical Lasers. We conduct world-leading basic science and translational research. All our students gain valuable experience in translational science and authoring publications.

Lead researcher: Professor Robert Casson
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Honours project opportunities

> Hyperspectral imaging of the retina: a novel technique for detecting and monitoring eye diseases

Hyperspectral sensors capture the wavelengths of light, the natural colours, that biological products emit. These spectral signatures enable identification of the molecular composition of a scanned object. The technique has been widely applied in geology and agriculture and is emerging as a tool in medicine.

Hyperspectral imaging can determine changes to cellular metabolism prior to cell death and can potentially detect disease at very early stages. The hypothesis is that mammalian retinal ganglion cells (RGCs) and photoreceptors have a measurable hyperspectral signature that is altered in disease states.

This is a highly innovative project that brings together an ideal interdisciplinary team. The funded current proposal would enable ongoing research in this exciting field. The potential significance and community impact is enormous. This is world-leading research that has a high chance of success. It represents a first step in taking this transformative technology to the clinic to improve outcomes for individuals with potentially blinding diseases.

> Blinding eye disease and retinal energy metabolism

This research focuses on understanding retinal energy metabolism and manipulating it to clinical advantage. We have a highly innovative research program that has already delivered proof-of-principle clinical translation. In a first-to-man, double blind randomised trial, we recently demonstrated that ocular glucose delivery temporarily recovered contrast sensitivity and visual acuity in patients with severe primary open-angle glaucoma (Casson et al., 2014).

This trial stemmed from our laboratory-based bioenergetics research program and has laid the foundation for further clinical trials. For retinal and optic nerve diseases where energy failure is part of the problem, we have already established a pathway for rapid clinical translation of bioenergetic research, using clinical methodology that can measure neurorecovery (Casson et al., in press). Although the retina is an out-pouching of the brain, its energy metabolism is more akin to that of a cancer. Our own translational research supports historical concepts of the mammalian retina’s unusual metabolism.

The current project, in collaboration with the Peet Laboratory in Molecular Life Sciences aims to determine fundamental aspects of retinal metabolism including the mechanism of the Warburg effect and the biosynthesis requirements of the photoreceptors.

> Predicting risk of glaucoma from relevant snps with strong association (progressa) study

Glaucoma describes a group of ocular disorders united by a clinically characteristic intraocular pressure-associated optic neuropathy. It is potentially progressive with the natural history of chronic glaucoma typified by a gradual degeneration of retinal ganglion cells (RGCs) with associated visual loss.

Given that chronic glaucoma has a pathological continuum, with the absence of definitive biomarker, there exists a diagnostic ‘grey zone’ between those without glaucoma and those with early glaucoma. Such individuals (or eyes) are known as glaucoma suspects. This distinction has important clinical and public health implications. Some glaucoma suspects will never progress, whilst others have early glaucoma that will manifest with time. Glaucoma suspects are generally untreated until they develop progressive structural or functional changes. However, in some individuals at higher risk, for example those with a strong family history, treatment may be initiated before glaucoma is definitively diagnosed. The ongoing surveillance of these individuals is associated with a significant burden to both the individual and society. Understanding genetic risk factors and their interactions with other predictors of progression would provide clinicians with valuable information to optimize management, and is likely to provide mechanistic insights that could lead to novel treatment strategies.

By monitoring a longitudinal cohort of glaucoma suspects and individuals with early manifest glaucoma over a five-year period, the principle aim of the study was to assess genetic markers of progression and gene-environment interactions predictive of glaucomatous progression: the Predicting Risk Of Glaucoma from RElevant SNP with Strong Association (PROGRESSA) Study.

Data collection on this project is almost complete and the current exciting Honours or higher degree project would involve the analysis of the clinical and genetic data.

Higher Degree by Research project opportunities
The Honours projects described above could also be Masters or PhD projects.

Research areas
Neuroscience, behaviour and brain health
Innovative therapeutics

More information
researchers.adelaide.edu.au/profile/robert.casson
Brain plasticity and motor function in older adults

Cortical mechanisms associated with age-related deficits in motor function

The research conducted in this laboratory examines the cortical, spinal and neuromuscular mechanisms responsible for changes in motor performance with alterations in physical activity. The laboratory uses sophisticated stimulation and electrophysiological recording and analysis techniques to address these issues, which include transcranial magnetic stimulation (TMS), combined TMS and electroencephalography (EEG), peripheral nerve stimulation, surface electromyography (EMG) and single motor unit recording. The overall goal is to understand how the healthy nervous system functions to control movements following a variety of interventions, and how it may be rehabilitated following neuromuscular injury or disease.

Lead researcher: Associate Professor John Semmler
Email: john.semmler@adelaide.edu.au

Honours project opportunities

> Cortical mechanisms associated with age-related deficits in motor function

Led by Dr George Opie.

A degradation of motor function represents one of the most common deficits associated with the ageing process. These changes can impede the ability of older adults to care for themselves, and may significantly reduce their quality of life. Given the rapidly ageing population, it is crucial to develop a better understanding of these deficits and how they might be treated. Subsequently, this project will use advanced non-invasive brain stimulation techniques to characterise changes within the brain that may contribute to age-related reductions in motor function.

> Investigating the neurophysiological effects of mild traumatic brain injury

Led by Dr George Opie.

Mild traumatic brain injury (mTBI) is extremely common, affecting millions of people annually. In contrast to the common belief that these injuries are short-lived in nature, emerging evidence suggests that alterations within the brain may be present long after mTBI. The nature of these alterations, and how they contribute to long-term functional deficits associated with injury, is not well understood. Using advanced neurophysiological techniques, this study will attempt to identify specific mechanisms of brain injury in mTBI patients.

> Brain plasticity and motor function in older adults

Ageing is commonly associated with a reduced capacity to reorganise brain connections (i.e. plasticity), which may contribute to an age-related decline in cognitive, motor and other brain functions. Recent studies from our group show that it is possible to improve brain plasticity in older adults by priming the brain using transcranial magnetic stimulation (TMS). Furthermore, several studies in young subjects have shown that longer lasting changes in brain plasticity can be achieved with daily sessions of priming TMS.

This project will examine if longer lasting changes in brain plasticity can be achieved in older adults by repeated TMS sessions over multiple days. A better understanding of changes in brain function and plasticity with advancing age will help to optimise the design of preventative programs aimed at rejuvenating motor and cognitive function in the elderly.

> Brain function and connectivity after eccentric muscle damage

Eccentric contractions are performed regularly in everyday lives, and are important considerations in sports medicine and science as they offer significant advantages for rehabilitation and training because of their potential to produce large forces with a low metabolic cost. However, the consequence of performing eccentric exercise is that it causes significant damage to muscle fibres, resulting in a loss of strength and soreness that can last many days.

Along with the changes in the muscle, we have recently shown changes in motor cortex function after eccentric muscle damage, but whether there are more widespread cortical changes are unclear. Combining TMS with electroencephalography (TMS-EEG) provides a more direct measure of cortical excitatory and inhibitory function (i.e. measured from the brain rather than the muscle), and permits an assessment of interactions between multiple brain areas (i.e. functional connectivity). Therefore, the aim of this study is to use TMS-EEG to examine the changes in cortical excitability and functional connectivity after eccentric muscle damage. A greater understanding of the neural adaptations to eccentric exercise is necessary for refining interventions for injury prevention, injury treatment, and strength training.

Higher Degree by Research project opportunities

> Cortical adaptations to strength and endurance training

It is now commonly accepted that the central nervous system possesses a remarkable ability to alter its structure and function in response to different types of motor training. In particular, strength and endurance training represent the extremes of physical activity, and are likely to elicit different neural adaptations due to the goal of maximising muscle strength or endurance. However, it is not known whether strength or endurance training influences the ability to reorganise cortical connections (i.e. plasticity) or if there are training specific changes in the interactions between multiple brain areas (functional connectivity) that relate to the ability to generate muscle strength or endurance.

The overall goal of these studies is to determine if strength and endurance training induce changes in cortical excitability, plasticity and connectivity that are specific to the motor experience. It is hypothesised that strength and endurance training will produce divergent effects on cortical excitability, plasticity and connectivity, which will be related to differences in muscle strength and endurance.

> Improving motor skill learning with exercise and brain stimulation

It is now well known that physical exercise is capable of providing benefits to the central nervous system (CNS) that can maintain or enhance brain and motor function. More recently, evidence has emerged indicating that an acute bout of exercise can improve motor skill learning. In addition, numerous studies have reported that transcranial direct current stimulation (tDCS) can also improve motor skill learning. For example, tDCS over the cerebellum is known to improve motor skill acquisition, whereas tDCS over the motor cortex improves motor skill retention. However, it is not
known if prior exercise can strengthen motor skill learning and retention when combined with tDCS.

The overall goal of these studies is to determine if tDCS in combination with exercise can improve motor skill learning. This work has the potential to provide new information on the relative significance of exercise and tDCS in human neuroplasticity and motor function. Furthermore, a combined contribution of exercise and tDCS to motor skill learning may be very important therapeutically where, for example, an acute exercise bout could be used to facilitate targeted rehabilitation following injury to the motor system.

Research areas
Neuroscience, behaviour and brain health
Ageing, frailty and mobility

More information
researchers.adelaide.edu.au/profile/john.semmler

Neuropharmacology of Drug Abuse

University of Adelaide North Terrace Campus

Understanding how drugs of abuse interact with the cells in our body to cause their effects is fundamental to the development of strategies to deal with many of the social and health problems associated with these drugs. This requires understanding of the chemistry of the drugs, associated neuroscience and their neuropharmacology. We use a number of methods and techniques to pursue this understanding including in vivo radiotelemetry and microdialysis. The drugs currently under investigation include ecstasy and associated amphetamines.

Lead researcher: Dr Abdallah Salem
Email: abdallah.salem@adelaide.edu.au

Honours project opportunities

> Microglial activation and MDMA-induced hyperthermia

The main MDMA-induced adverse effect is disruption of normal thermoregulation leading to life threatening hyperthermia which is exacerbated by high ambient temperature and linked to chronic neurotoxicity. Results obtained from our recent studies suggest an association between microglial activation and MDMA-induced hyperthermia. We have demonstrated that pre-treatment with minocycline, an antibiotic with glial attenuating properties, can significantly reduce the severity of MDMA-induced hyperthermia. The overall aim of this project is to extend our understanding of the underlying mechanisms leading to the disruption of normal thermoregulation and how minocycline reduces the hyperthermic response to MDMA.

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas
Neuroscience, behaviour and brain health
Stroke Research Program
South Australian Health and Medical Research Institute (SAHMRI)

Stroke is by far the most common neurological disease and afflicts 60,000 Australians per annum. It is the second leading cause of death, and a significant number of people who survive a stroke are left with neurological disability. It remains the leading cause of adult disability in Australia.

The Stroke Research Program (SRP) is a unique collaboration between the SA Health and Medical Research Institute (SAHMRI), University of Adelaide and the Central Adelaide Local Health Network. There are 22 members of the SRP, including 13 scientists and nine clinical; with four Stroke Unit heads from all major Adelaide public hospitals.

Over the last 16 years the SRP has trained 26 PhD students, three Masters students and 30 Honours students in various disciplines (26 with first-class honours), and four neurologists with a clinical and/or scientific interest in stroke medicine.

**Lead researchers:** Professor Simon Koblar, Associate Professor Anne Hamilton-Bruce

**Email:** srp@adelaide.edu.au

Honours project opportunities

**Dental pulp stem cell (dpsc) therapy for stroke**

Our research investigates brain repair following ischaemic stroke using adult human stem cells from teeth (DPSC). We have published that DPSC have therapeutic potential, however, it remains unknown how these stem cells mediate improvement following stroke, and the best treatment paradigm for DPSC administration. We are also investigating how we make these stem cells available at a human-grade for a clinical trial and if there are differences between young and older DPSC for autologous transplantation in humans.

**Npas4 and stroke**

In 2004, we discovered a new brain specific gene encoding a transcription factor (Npas4) that is expressed specifically in the brain and following injury such as stroke. Exciting findings from our recent research demonstrated that Npas4 has a neuroprotective role in ischaemic stroke and, for the first time, that Npas4 is involved in modulating inflammation, an important contributor to the pathogenesis of stroke. In addition, we have shown that Npas4 also has an important role in neurogenesis (generation of new nerves), which is induced by stroke as a compensatory response to repair brain damage.

Our laboratory aims to clarify how Npas4 expression modifies the brain’s response to stroke and improves neurological outcomes following stroke.

**Clinical translation of stroke treatment**

We partner with the South Australian Academic Health Science and Translational Centre (AHSTC) to continuously enhance translation of research into health care. Stroke is an AHSTC priority and we participate in research to improve stroke unit services and expect the opportunity afforded by the opening of the new RAH will assist us to implement clinical translation of stroke research.

Higher Degree by Research project opportunities

**Proteomics of stroke and Transient Ischaemic Attack (TIA)**

TIA is a common precursor and warning sign for an imminent ischaemic stroke. Correctly distinguishing TIA from benign mimic conditions such as complicated migraine or focal seizures is clinically problematic. There are currently no biochemical markers for TIA or stroke, making diagnosis of these conditions dependent on expensive and time-consuming imaging.

This study explores the human plasma proteome for differentially expressed TIA- or stroke-sensitive plasma proteins that could be used as diagnostic biomarkers.

Research areas

Neuroscience, behaviour and brain health
Investigating the role of TBL1XR1 mutations in neurodevelopmental disorders

The Neurogenetics research group aims to uncover the molecular mechanisms of early childhood neurodevelopmental disorders (NDDs) including epilepsy, intellectual disability and autism. Our recent research has uncovered that the PCDH19-NDNO-estrogen receptor alpha (ERα) pathway contributes to the pathogenesis of girls clustering epilepsy and NDDs. Additionally, we also have preliminary data implicating TBL1XR1 (another co-regulator of ERα) in NDDs. TBL1XR1 is an F-box-like protein that plays an essential role in transcriptional regulation mediated by nuclear receptors. While the role of TBL1XR1 has been extensively studied in cancers, its role in neurodevelopment is not well understood. The aim of this Honours project is to investigate the molecular mechanisms of TBL1XR1 mutations in NDDs by using a range of molecular, cellular and biochemical techniques including; RNA and protein expression analysis, in vitro functional assays and bioinformatics tools. These techniques will be utilised to examine naturally occurring human TBL1XR1 mutations and their involvement in NDDs. This project will suit a passionate student interested in learning more about childhood disability. The student will be working in a large, highly productive, multidisciplinary research team providing opportunities to learn multiple skills with the potential for further research opportunities.

Functional analysis of mutations causing BRAT1-associated neurodegenerative disorder

Mutations in the gene BRAT1 cause a progressive childhood neurodegenerative disorder characterised by microcephaly, intellectual disability and ataxia. Most patients also have seizures and dysmorphic features. The BRAT1 protein is required for the regulation of DNA damage pathways and is involved in control of the cell cycle. The loss of the protein in BRAT1-related disease is thought to cause increased neuronal death, leading to neurodegenerative disease. In severe cases, BRAT1-associated disease leads to death in infancy while less severely affected individuals survive into childhood. This highly variable disease severity is hypothesised to be due to differences in the functional effects of the causative BRAT1 mutations.

In this project the functional effects of known disease-causing mutations in BRAT1 will be investigated using an in vitro cell-based model. The project will involve the use of molecular biology techniques, protein analysis, cell culture and assays of cellular functions affected by BRAT1 mutations. This project will suit an enthusiastic student who is interested in pursuing a research career in neurogenetics. This is an opportunity to join a large multidisciplinary research team working on the causes of childhood neurological disorders.

Investigations on the TREX-mediated nuclear mRNA export using mouse embryonic stem cell neuronal differentiation model

Animal and plant cells have developed sophisticated mechanisms to ensure competitive growth and survival. One such process is efficient mRNA export from the cell nucleus to the cytoplasm that is achieved via a highly-conserved TREX (Transcription-Export) complex. TREX contains the heterohexameric THO subcomplex (THOC1-3, THOC5-7) and UAP56, Aly, CIP29, PDIP3, SRRT, ZC11A, UIF and ChTop subunits. Recent studies show that the TREX complex plays diverse and critical roles in gene expression, 3mRNA processing, nuclear mRNA export, stress responses, mitotic progression and genome stability as well as developmental processes such as pluripotency maintenance and haematopoiesis. We and others have demonstrated that even slight perturbations in mRNA export by e.g. mutation or preferential cytoplasmic aggregation lead to neurodevelopmental disorders, neurodegeneration or cancer. Systematic investigations to define the role of TREX and functional contribution of its subunits to normal development and differentiation processes in different tissues have not been attempted. This project will use highly-regulated Tho/TREX subunit knockdown in in vitro mESC differentiation model and tissue-specific TREX composition to gain deeper insight into molecular pathways and cellular functions of the mRNA export process.

Higher Degree by Research project opportunities

Functional investigations into the role of TREX nuclear mRNA export in neurodevelopmental disorders

Neurodevelopmental disorders (NDDs) are frequent (~1 in 30 children), and clinically and genetically heterogeneous, with 1000 genes already involved. They encompass intellectual disabilities (ID), epilepsies, autisms, and movement and behavioural disorders. Accumulating genetic evidence implicates multiple subunits (e.g., THOC2, THOC1, THOC5, THOC6) of the highly-conserved TREX (TRanscription-Exprot) mRNA export complex in human disease and NDDs in particular.
TREX exports capped, processed and mature mRNAs from the cell nucleus to the cytoplasm. Proper nuclear mRNA export is essential for efficient protein synthesis in all eukaryotic cells and therefore critical for normal development and function of multicellular organisms. We postulate that subtle perturbations in protein synthesis caused by defective TREX complex impact neural progenitor cell function and behaviour, particularly during early stages of development when brain is highly-susceptible to subtle changes in protein levels.

Research areas
Neuroscience, behaviour and brain health
Child and adolescent health

More information
adelaide.edu.au/directory/jozef.gecz
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\textbf{Neuromotor Plasticity and Development Research Group}$

The Neuromotor Plasticity and Developmental Group research interests encompass neuromotor development and neuroplasticity across the human lifespan, from prenatal and early postnatal factors influencing motor development, through to therapeutic uses of induced neuroplasticity in ageing and neuropathological disorders such as stroke and dystonia. The aim of the group’s research is to inform and develop therapeutic interventions to develop, maintain and rehabilitate human motor function.

**Lead researcher:** Professor Michael Ridding  
**Email:** michael.ridding@adelaide.edu.au

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\textbf{Honours project opportunities}$

> **Cortical effective connectivity during cognitive control**  
   
   The adaptive, goal-directed control of thoughts and behaviour is fundamental for everyday life. However, the neural mechanisms supporting these cognitive control processes are not fully understood. The recent combination of transcranial magnetic stimulation (TMS) and electroencephalography (EEG) has made it possible to measure how activation of a targeted cortical area propagates to the rest of the brain (i.e. effective connectivity), both at rest and during task performance.

   This project will use TMS-EEG to explore the effective connectivity of different brain regions thought to play key roles in cognitive control. This novel study will provide important mechanistic insights into the brain processes that adaptively control human behaviour.

> **Age differences in human prefrontal cortex stimulus-response characteristics**  
   
   The prefrontal cortex is a multimodal association brain region that supports higher cognitive function. It is among the most affected brain regions in age-related neurodegeneration, with deterioration of both grey and white matter. Transcranial magnetic stimulation (TMS) is a non-invasive and painless tool for studying the neurophysiological properties of the awake human brain, and when applied in combination with electroencephalography (EEG), can be used to provide novel insights into the excitability and connectivity of numerous brain regions, including the prefrontal cortex.

   This project will use TMS-EEG to investigate the stimulus-response characteristics of the ageing prefrontal cortex. The findings of this study will advance our understanding of how the brain changes with age.

> **Does pain boost your brain?**  
   
   In this study, we are interested to observe the dynamics of plasticity after a painful stimulus in healthy people. Plasticity is the intrinsic property of the central nervous system that enables us to adapt to new demands. Response to painful stimulation is accompanied by plasticity that influences the state of neuronal excitability from the periphery to the cortex. Indeed, acute painful stimulation can lead to reflex withdrawal and long-term learning about safety and avoidance, but very little is known about the relationship between the dynamic components of the plasticity response, pain, and subsequent outcomes in humans.

   By using a direct, non-invasive, and subtle measure of cortical plasticity (transcranial magnetic stimulation [TMS] and electroencephalography [EEG]), this study will probe the plasticity characteristics of cortical areas associated with the cognitive components of a pain experience (i.e. prefrontal cortex). The aim of the study is to determine whether painful stimulation alters cortical network plasticity in the prefrontal cortex. It is plausible that persistent dysregulated or excessive plasticity in cognitive cortical areas might contribute to an overzealous response to noxious stimuli and lead to the formation of fear memories and even to the transition of acute to chronic pain.

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\textbf{Higher Degree by Research project opportunities}$

> **The neurophysiology of human cognitive ageing**  
   
   Ageing is associated with a decline in cognitive performance, the profile of which can vary considerably between individuals. Cortical network connectivity and neuroplasticity are key factors supporting cognition, and there is growing evidence that these processes are also affected in the ageing brain. Transcranial magnetic stimulation (TMS) has long been a useful tool for non-invasively probing human neurophysiology, although conventional measures have been limited to the motor cortex, thus limiting their relevance to cognitive ageing.

   The recent combination of TMS with electroencephalography (EEG) has provided exciting new possibilities for assessing neural function in non-motor areas, including those higher-order association brain regions that are important for cognition and are particularly vulnerable to the effects of ageing. This project will use cutting-edge TMS-EEG to investigate the role of cortical network connectivity and neuroplasticity in later life cognitive health. This work will provide novel insights into the mechanisms of successful cognitive ageing, and may have important implications for the early diagnosis and intervention of dementia.

   The successful applicant will gain hands-on experience with state-of-the-art brain stimulation and recording techniques, and will have the opportunity to work with a world-class team of experts in human neurophysiological research.

> **A TMS/EEG investigation of plasticity in people with chronic pain**  
   
   Converging evidence from human experiments shows that chronic pain induces a complex reorganisation of structures and networks in the brain. Cortical plasticity is the intrinsic property of the central nervous system that enables reorganisation in response to changing demands. Changes at a local level (cortical network plasticity) may the first in a series of neural circuit alterations that underpin maladaptive change and or susceptibility to a disorder. If so, indices of cortical plasticity in people with chronic pain may represent an objective correlate of an individual’s susceptibility to induced changes.

   A direct and subtle measure of cortical network plasticity is possible using a technique that combines transcranial magnetic stimulation (TMS) and electroencephalography (EEG). This non-invasive technique is easily tolerated by people with pain. Comparing combined TMS-EEG measures between people with chronic pain and healthy controls promises to answer two very important questions: Do people with chronic pain differ in characteristics of cortical plasticity from healthy controls, and do patterns of altered cortical plasticity predict a response to treatment? You will have the chance to work with an internationally recognised team of experts using cutting edge technology during this exciting project.
Research areas
Neuroscience, behaviour and brain health
Ageing, frailty and mobility
Early origins of health
Men’s health

More information
adelaide.edu.au/directory/mitchell.goldsworthy
adelaide.edu.au/directory/carolyn.berryman

Behavioural Neuroscience Group
University of Adelaide North Terrace Campus

Dr Femke Buisman-Pijlman has a strong interest in the neurobiological basis of individual differences in behaviour and mental health. She works on the intersection between psychology, physiology and behaviour using a translational approach. She has proposed a new theory about the effects of early life experiences on the developing oxytocin system and the impact this has on later drug use. Her research group is using a range of techniques to test the impact on infants of observed early life environment.

Lead researcher: Dr Femke Buisman-Pijlman
Email: femke.buisman-pijlman@adelaide.edu.au

Honours project opportunities
> The biological impact of play
A responsive early social environment is vital for healthy development. But does play and social interaction impact on our body through our hormones (like oxytocin) as well? We will use different techniques to start answering these questions.
We have found that collecting new human data is not feasible in an Honours project. However, secondary data analysis of birth cohort data can be very useful to answer sub-questions.

> The biological basis of susceptibility to addiction
Large individual difference exist in our susceptibility to develop addiction. There are a number of biological factors that can increase or decrease the risk that someone will develop problem use of alcohol or drugs. We can use a range of methods to investigate these factors.

Higher Degree by Research project opportunities
> Improving child outcomes through play
Play and social interaction are vital for babies and children. They learn how to behaviour and how the world works. But does play and social interaction impact on our body through our hormones as well? Kids with early adversity can be at increased risk of developing mental health and addiction problems. Does the experience, or lack of positive experience, affect the developing brain and hormone systems? What makes some people so resilient? We will start answering these questions using behavioural observations and hormone measurements.

> The biological basis of susceptibility to addiction
Large individual difference exist in our susceptibility to develop addiction. There are a number of biological factors that can increase or decrease the risk that someone will develop problem use of alcohol or drugs. We can use a range of methods to investigate these factors.

Research areas
Neuroscience, behaviour and brain health
Early origins of health
Child and adolescent health

More information
researchers.adelaide.edu.au/profile/femke.buisman-pijlman
Cognition and Functioning in Psychiatry
Adelaide Health and Medical Sciences building (AHMS)

Lead researcher: Professor Bernhard Baune
Email: bernhard.baune@adelaide.edu.au

Honours project opportunities
> Cognitive function and mood study (CoFaMS)
   Investigate effects of depression and anxiety on a person's mental status and cognitive capacity by analysing psychological, and functional genetic differences in a healthy cohort and those suffering from mood and anxiety disorders.

> Cognitive and functional assessment of psychosis staging study (CoFAPSS)
   In current clinical practice it is impossible to predict individual course of psychotic illness or treatment response. This longitudinal study assesses patients at different stages of psychotic illness to develop accurate biomarkers of risk profile, transition between disease stages and potential for functional recovery.

> Cognition and functioning in depression with peripartum onset (PPD) study
   This longitudinal study investigates the relationship between cognition, functioning, and parenting ability in mothers with PPD.

Higher Degree by Research project opportunities
HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas
Neuroscience, behaviour and brain health

Psychiatric and Medical Comorbidities
Adelaide Health and Medical Sciences building (AHMS)

Lead researcher: Professor Bernhard Baune
Email: bernhard.baune@adelaide.edu.au

Honours project opportunities
> Investigation into the mechanisms of inflammasome mediated inflammation in psychosis
> Genetic comorbidity in cardiometabolic syndrome and mood disorders

Higher Degree by Research project opportunities
HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas
Neuroscience, behaviour and brain health

More information
health.adelaide.edu.au/medicine/disciplines/psychiatry
Biomarkers and Pharmacogenetics

Adelaide Health and Medical Sciences building (AHMS)

Lead researchers: Professor Bernhard Baune and Dr Scott Clark
Email: bernhard.baune@adelaide.edu.au

Honours project opportunities

> Identification of biomarkers including polygenic risk scores associated with cognitive and general function in depression (CoFaMS)
> Investigating the regulation of local lincRNAs and protein-coding genes by 4 lithium response SNPS in human cell lines

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas
Neuroscience, behaviour and brain health

More information
health.adelaide.edu.au/medicine/disciplines/psychiatry

Trajectory Modelling

Adelaide Health and Medical Sciences building (AHMS)

Lead researchers: Professor Bernhard Baune and Dr Scott Clark
Email: bernhard.baune@adelaide.edu.au

Honours project opportunities

> Psychosis trajectory research project
Analysis of existing clinical data of patients with first episode psychosis and their long-term clinical trajectory over time.
> Mood disorder trajectory research project
Analysis of existing clinical follow-up data on the relationship between clinical treatment outcomes and long-term functioning in daily life.

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas
Neuroscience, behaviour and brain health

More information
health.adelaide.edu.au/medicine/disciplines/psychiatry

Epidemiology and Health Services

Adelaide Health and Medical Sciences building (AHMS)

Lead researchers: Professor Bernhard Baune and Dr Scott Clark
Email: bernhard.baune@adelaide.edu.au

Honours project opportunities

> Trajectories of metabolic syndrome in chronic psychosis
> Mortality in chronic psychosis
> Clozapine myocarditis

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas
Neuroscience, behaviour and brain health

More information
health.adelaide.edu.au/medicine/disciplines/psychiatry
Health professionals are misled by misinformation about mental health and mental disorders, as are the media, the public, and governments, which spend billions of taxpayers’ money on mental health every year.

Unhappiness, distress, and stress are inappropriately medicalised, resulting in overdiagnosis and unnecessary prescribing of psychiatric treatments. At the same time, partly as a consequence, there is inadequate treatment and support for people with serious chronic mental illnesses.

Psychiatric research has been biased by pharmaceutical industry funding, and has been further biased and misrepresented to support a range of vested interests; social determinants of mental health have been neglected in favour of biological factors and individual characteristics; and the voices of people with lived experience of mental illness have been marginalised.

Mental health policy has become highly politicised and has been influenced by intensive lobbying that relies heavily on misleading sound-bites and misrepresentation of evidence.

Objectives of the research are:

1. To undertake and promote objective critical analysis of mental health, mental disorders, psychiatric epidemiology, and psychiatric/mental health interventions
2. To undertake meta-research about mental health research, particularly in relation to bias and misrepresentation
3. To challenge academic and public misconceptions about mental health
4. To critique inappropriate psychiatric practice, including imposition of culturally inappropriate diagnoses and interventions in developing countries, and with vulnerable populations (e.g. immigration detention)
5. To develop tools to assist others to undertake such critical activities
6. To develop and promote rigorous, ethical and culturally sensitive approaches to mental health, mental disorders, and psychiatric/mental health interventions
7. To support individuals and groups with lived experience of mental health problems in voicing a constructive critique of mental health practice
8. To contribute to public and academic discourse and clinical practice through:
   - academic publications, including rapid responses
   - essays and commentary in the lay media
   - website and blogs
   - web-based and face-to-face teaching and training promoting critical thinking
   - supervising undergraduate and postgraduate research in critical mental health

Lead researcher: Professor Jon Jureidini
Email: jon.jureidini@adelaide.edu.au

Honours project opportunities

> Language of mental health
CEMH has been collaborating with Adelaide University Linguistics (Dr John Walsh) in developing a methodology to highlight shortcomings in the public/media discourse about mental health.

Journalists have found a language to talk about racism, and, in collaboration with the AFL, have made a significant contribution to changing public attitudes.

We have looked at the reporting of the breakdown and recovery of an AFL player in 2015-2016. We concluded there was an impoverished language to describe his predicament. Over two-thirds of labels applied were empty terms such as ‘issue’ or generic medical terms such as ‘mental illness’. There is a stark contrast with the reporting of physical illness in athletes.

There might be a number of reasons for this pattern of reporting, including limited information, a wish to respect privacy and perhaps a wariness of breaking formal and informal codes for reporting mental illness. More importantly however, we argue that this case study illustrates the lack of a useful public language of psychiatry (beyond reductive psychiatric labels).

An honours project will be developed around applying our methodology to other public discourse about mental health.

> Psychototropic drug use by older people
There are high levels of polypharmacy (use of multiple prescribed drugs) among older people. This includes psychotropic drugs, particularly antidepressants, benzodiazepines, and antipsychotics, as well as other drugs that can have psychoactive effects, e.g. dizziness. Much of this drug use is off-label—for non-approved indications. The number of prescribed drugs is the single most important predictor of adverse drug events in older people.

Potential projects include:
- Pharmacoepidemiological investigation of adverse events associated with psychotropic use
- Patterns/drivers of psychotropic prescribing to elderly people in residential aged care
- Patterns/drivers of psychotropic prescribing to elderly people living independently in the community

Higher Degree by Research project opportunities
HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas
Neuroscience, behaviour and brain health
Molecular Neurpharmacology
University of Adelaide North Terrace Campus

Dr Ian Musgrave's work focuses mainly on neurotoxicology with an emphasis on natural products. From the point of view of:
1) Natural products causing neurotoxicity (and other forms of toxicity such as hepatotoxicity)
   a) Herbal medicine components and contaminants
   a) Cyanobacterial toxins
   a) Amyloids and other neurotoxic proteins in neurodegeneration
2) Natural products that can act as novel therapeutic agents in preventing neurotoxicity, specifically neurodegenerative diseases (eg Alzheimer's and other amyloid disorders)

Lead researcher: Ian Musgrave
Email: ian.musgrave@adelaide.edu.au

Honours project opportunities

> New approaches of anti-amyloid therapies
Alzheimer's disease (and other amyloidoses) therapy has concentrated on trying to prevent neuronal death. However, toxicity to axons and axonal connections is also important. This project will explore the ability of drugs to prevent amyloid toxicity to developing neurites in a tissue culture model as a novel therapeutic approach.

> Herbal Medicine toxicity through unappreciated drug herb interactions
Herbal medicines are widely thought of as being safe, yet they can have significant and often severe adverse effects through interacting with conventional drugs. Herbal medicine interaction with statins is one under-researched area. Herbal medicine interaction with statins will be explored in a tissue culture model.

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas
Neuroscience, behaviour and brain health
Innovative therapeutics

More information
adelaide.edu.au/directory/ian.musgrave

Neurobiology, Lysosomal Diseases Research Unit
South Australian Health and Medical Research Institute (SAHMRI)

Lead researcher: Dr Tim Sargeant
Email: tim.sargeant@sahmri.com

Honours project opportunities

> Can adjusting nutrients available to human neurons change the course of Alzheimer's disease?
This project will examine how human neurons adapt to changing nutritional conditions, with an emphasis on Alzheimer's disease. This disorder is caused by accumulation of molecules that stick together to form plaques and tangles in the brain. It is thought that plaques cause the tangles, which in turn drive most of the subsequent brain damage. The molecule that forms plaques is amyloid-beta, which comes from a larger molecule called amyloid precursor protein (APP). However, generation of amyloid-beta from APP does not need to occur. Instead, the neuron can destroy APP before this happens. The neuron can clear APP by sending it to the neuron's recycling centres—lysosomes.

Our research group has recently found that this process is enhanced when human cells are limited for nutrients. We therefore want to know how nutrient restriction affects entry of APP into lysosomes. To do this, we will study this process in human neurons. This study is important because it will characterise nutrient-responsive mechanisms that neurons use to limit the accumulation of toxic molecules that cause Alzheimer's disease, and the mechanisms by which nutrition may influence disease onset.

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas
Neuroscience, behaviour and brain health
Nutrition and metabolic health

Dr Ian Musgrave
Visual Physiology; Neurobotics Laboratory
University of Adelaide North Terrace Campus

The Visual Physiology and Neurobotics Laboratory (VPNL), study how the brain processes visual information. We investigate visual processing from behavioural, computational and physiological levels, with a multidisciplinary team covering fields of neuroethology, neurobiology, psychology, computer vision and engineering.

Consider a human catching a ball, a dog leaping at a Frisbee or a dragonfly hunting prey amidst a swarm. Brains large and small have evolved the ability to predictively focus attention on a moving target, whilst ignoring distracters and background clutter.

We use electrophysiological techniques to investigate how flying insects perform such visual tasks. Our most recent work suggests that insects use sophisticated mechanisms of attention similar to those in primates, to aid in the selection of one feature even in the presence of distracters (e.g. feeding in a swarm).

The physiological data obtained in our laboratory feeds into our robotics projects, as we implement neuronal processing onto an autonomous platform. This research involves computational modelling or hardware development, and is therefore suited to those with mathematical or engineering backgrounds. We work with collaborators in both Mechanical Engineering and Computer Vision on jointly supervised projects.

Lead researcher: Dr Steven Wiederman
Email: steven.wiederman@adelaide.edu.au

Honours project opportunities

> Modulation of early vision by higher-order processes

The commonly accepted view is that photoreceptor and first order interneuron responses depend only on the intensity of the light source presented within their receptive field. That is, these early visual neurons represent changes in light in a feed-forward manner, passing this information to higher-stages of visual processing. However, in the fly’s visual system there are neurons that synapse back onto the retina and lamina layers and the functionality of this neuronal architecture is yet to be completely understood. This project will explore what is currently a hot topic in neuroscience—how early sensory neurons may be modulated by higher-order processes, such as expectation and attention.

Higher Degree by Research project opportunities

> Target-tracking neurons in the insect visual system

Visual target detection against a cluttered, moving background is a challenging problem for any visual system, natural or artificial. We study a set of neurons from the brain of insects, which achieve this in spectacular fashion. Our most recent work suggests that the insects use sophisticated mechanisms of attention similar to those in primates, to aid in the selection of one feature even in the presence of distracters (e.g. feeding in a swarm). This project aims to explore physiological responses to single or multiple targets moving along natural trajectories, typical of pursuits in real-world environments. We will also explore how the electrophysiological properties of these neurons (e.g. their complex receptive fields) are matched to the underlying morphology of the neurons. This project is composed of several sub-projects, suited to students with different educational and work experiences (e.g. electrophysiological recording).

> Neurobotics: active vision systems

The physiological data obtained in our laboratory feeds into our robotics projects, as we implement neuronal processing onto an autonomous platform. This project involves computational modelling or hardware development, and is therefore suited to those with mathematical or engineering backgrounds. If desired, we have collaborators in both Mechanical Engineering and Computer Vision to establish jointly supervised projects.

> Nanoscale biophotonics

We are investigating the in vivo application of fluorescent nanoparticles for the purpose of recording neuronal function in behaving organisms. This project combines life and physical sciences as we explore properties of the nanoparticles, the tapering of optical fibers and their interaction with nervous tissue. This project is part of the ARC Centre for Nanoscale BioPhotonics and is in collaboration with the Institute for Photonics and Advanced Sensing (IPAS).

Research areas

Neuroscience, behaviour and brain health
Experiences throughout life constantly shape and rewire the brain. This occurs through changing the strength of existing neural connections and developing new connections, and is known as neuroplasticity. Neuroplasticity underlies our ability to learn and remember new skills, to forget information, and to recover from injuries to the brain. While this ability is life-long, the brain is at its most plastic in fetal life and early childhood. This facilitates the rapid learning of our early development, but it also makes the brain more vulnerable to adverse experiences and injury in early life. During this time the brain is less able to adapt appropriately to experiences and reduces the ability to recover from injury in later life.

The NeuroPAD group aims to understand how experiences and injuries alter human brain motor and cognitive function throughout the lifespan, and to develop effective therapies and interventions to ameliorate the negative consequences.

Neuropad are working on two major projects; examining changes in brain plasticity following ischemic stroke, and uncovering whether preterm birth is associated with impairments in brain plasticity and function. Additionally, Dr Mitchell Goldsworthy conducted a study to explore the possible usefulness of several neurophysiological markers for detecting early cognitive impairment.

Lead researcher: Dr Bahar Moezzi
Email: bahar.moezzi@adelaide.edu.au

Honours project opportunities
- A computational approach to predicting the development of dementia in older adults
  Dementia is a neurological disorder characterised by deterioration in cognition and, ultimately, the ability to perform daily life activities. There are more than 400,000 people living with dementia in Australia, with incidence expected to triple by 2056.
  There is a long delay between the physiological events that precede dementia and the appearance of cognitive symptoms. Older adults with identical neuropathological profiles can express different cognitive outcomes, with some developing dementia whereas others maintaining healthy cognitive function. Accurate tests predicting who will develop dementia are currently lacking.
  In this study, we will perform computational analysis on the neurophysiological data that our group has collected to uncover the neural factors that predict the development of dementia in older adults.

Higher Degree by Research project opportunities
HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas
- Neuroscience, behaviour and brain health
  Ageing, frailty and mobility

The Critical and Ethical Mental Health (CEMH) research group conducts research, teaching and advocacy in order to promote safer, more effective and more ethical research and practice in mental health.

Evidence indicates that unhappiness, distress, and stress are inappropriately medicalised, resulting in over-diagnosis and the unnecessary prescription of psychiatric drugs. At the same time, there is inadequate treatment and support for people with serious chronic mental illnesses.

One contributing factor is significant misinformation about mental health and mental disorders, which misleads health professionals, the media, the public, and governments, jeopardising the rational allocation of the billions of dollars of taxpayers’ money spent on mental health services every year.

Lead researcher: Dr Melissa Raven
Email: melissa.raven@adelaide.edu.au

Honours project opportunities
- National Survey Of Mental Health And Wellbeing: Still lots to discover
  The 1997 and 2007 ABS National Survey of Mental Health and Wellbeing provide a wealth of information about the mental health of Australians, including the current and lifetime prevalences of common mental disorders, comorbidity between mental and physical disorders, the uptake of treatment, reasons for not accessing treatment, suicidal ideation and behaviours, and associations between mental disorders and sociodemographic factors. In addition, the data allow for trend analysis and investigation of cohort effects.
  Despite numerous published studies, much of the potential value of the data remains untapped.
  Possible projects include analyses of:
  1. Analyses of social determinants of mental health
  2. Investigation of treated versus untreated mental disorders
  3. Investigation of employment and mental health
  For these projects, experience in using Stata and/or SAS is required.

Higher Degree by Research project opportunities
- National Survey of Mental Health and Wellbeing: Still lots to discover
  Please see Honours project description for more information.
Translational Neuropathology Laboratory

Adelaide Medical School, The University of Adelaide

We use pre-clinical models to investigate the complex mechanisms of injury and disease to develop new treatments for central nervous system disorders including stroke (Dr Renee Turner), traumatic brain injury (Dr Frances Corrigan; Associate Professor van den Heuvel), spinal cord injury (Dr Anna Leonard) and neurodegenerative diseases such as Parkinson’s Disease (Dr Lyndsay-Collins Praino). We have a particular focus on translating research findings into the clinical setting.

Lead researcher: Associate Professor Renee Turner
Email: renee.turner@adelaide.edu.au

Honours project opportunities

- How does the NK1-receptor antagonist affect long term functional outcome following stroke?
  Every 2 seconds, someone in the world will suffer a stroke. Stroke is a devastating condition, affecting more that 15 million people worldwide each year, 2/3 of whom will die or be left permanently disabled. Much of this death and disability is attributable to the abnormal accumulation of fluid in the brain, or cerebral oedema. Cerebral oedema is the leading cause of death within one week of stroke and carries a mortality rate of up to 80%. This is due to the devastating effects of space-occupying swelling which precedes elevations in intracranial pressure (ICP) and secondary neurological deterioration, resulting in irreversible brain tissue damage and death.

  Despite this, the underlying mechanisms of cerebral oedema development remain unclear and current treatments are limited and fail to address the underlying mechanisms of swelling, highlighting the urgent need for development of targeted treatments. However, we have recently described that neurogenic inflammation and the release of substance P (SP) following stroke has been linked to profound blood brain barrier disruption, cerebral oedema and poor functional outcome. SP elicits its effects by binding the NK1 tachykinin receptor (NK1R), with administration of an NK1R antagonist completely ameliorating BBB dysfunction and cerebral oedema and improving functional outcomes following stroke in rodent models. However, when screening novel therapeutic agents, such as the NK1R antagonist, it is also essential to use clinically relevant large animal models to improve the likelihood of successful clinical translation.

  Project aims
  1. To examine the impact of the NK1R antagonist on long term functional outcome following stroke
  2. To examine differences in protein expression profiles up to 28 days following stroke

- Investigation of amyloid precursor protein derivatives as novel therapeutic agents against traumatic brain injury

  Recently, our research team have shown that the amyloid precursor protein (APP) derivatives APP96-110 and mutant APP96-110 have shown encouraging neuroprotective activity following experimental TBI in rats. The aim of this project is to assess the effects of these APP derivatives on a range of neurodegenerative and synaptic markers using rat brain tissue already obtained with survival times of 24 hours, seven days, and one month post TBI. This study will involve both immunohistochemical and Western blot analysis of these markers.

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas

Neuroscience, behaviour and brain health

Differences in brain (A) and spinal cord (B) structure/size between species (Dr Renee Turner and Dr Anna Leonard).
Surgical and Health Systems Innovation
Surgical innovation, and indeed all innovation in the health system, significantly enhances the quality and length of life for many in our community, and enables health services to reach more of our community.

Our researchers are working to enhance the quality, effectiveness and sustainability of surgical and health systems innovation at all levels. Our research addresses the many challenges of bringing health innovations into practice, including validating the innovation, justifying the economics, influencing the policies and spreading the knowledge to implement these new approaches.

Using evidence-based assessment, researchers test the efficacy and safety of the innovation, model the costs of implementation, and finally garner the support of the health industry, health service providers, policymakers and the community to implement the innovation. This exciting and challenging field can yield highly rewarding results that benefit society for years to come.

Researchers across the faculty are focused on:

- developing and evaluating the efficacy of new therapeutics
- evaluating new, less invasive diagnostic technologies to lower patient risk, improve the patient experience and reduce health service costs
- performing large-scale, multi-centre clinical trials to rigorously assess treatments and predictive diagnostic tests
- performing longitudinal studies to monitor patient health status and quality of care to identify problems in the health system’s delivery of services
- performing long-term analysis of total-joint-replacement patients to analyse prosthetic failure, assessing the device, the biomaterials and methodology
- assessing the impacts of health policies and implementation of preventative health interventions.
Surgical and Health Systems Innovation research opportunities

Surgery, Ear-Nose-Throat Diseases, Head and Neck Surgery

_Basil Hetzel Institute for Translational Health Research; The Queen Elizabeth Hospital, Woodville_

The Department of Otolaryngology, Head and Neck Surgery, is committed to excellence in translational research and education. Research in our department focuses primarily on understanding the pathogenesis of chronic rhinosinusitis (CRS), using a multidisciplinary approach, aimed at identifying new diagnostic/prognostic markers and treatment strategies to the benefit of our patients.

Research projects cover all aspects of rhinological research from pathophysiological aspects of CRS to the identification and validation of new treatment strategies in vitro and in vivo, bringing research from bench to bedside. The team is also interested in formulating new strategies to improve wound healing post-surgery.

**Lead researcher:** Professor PJ Wormald
**Email:** peterj.wormald@adelaide.edu.au

Honours project opportunities

> **Development of a mucus transplant for chronic rhinosinusitis**

Chronic rhinosinusitis (CRS) is characterised by persistent sinonasal mucosal inflammation and chronic relapsing microbial infection. Pilot data shows a severely compromised microbial ecosystem is patients with CRS unresponsive to medical or surgical treatments. In this clinical study, we aim to develop a mucus transplant that will be used as an adjuvant to treat chronic sinus inflammation in CRS patients.

> **The role of bacterial toxins to develop chronic sinus inflammation in vivo**

We have found specific bacterial toxins produced by Pseudomonas aeruginosa to have detrimental effects on the mucosal barrier structure and function of mammalian cells in vitro. In this project, we will test whether these toxins induce sinus inflammation in a mouse model of sinusitis. We will also test whether application of inhibitory compounds can prevent sinus inflammation induced by those toxins.

Higher Degree by Research projects opportunities

> **The role of Tertiary Lymphoid Organs in chronic rhinosinusitis**

Chronic rhinosinusitis (CRS) is characterised by persistent sinonasal mucosal inflammation with decreased mucosal antimicrobial immune function and frequent microbial colonisation. This interdisciplinary project builds on our recent discovery that recalcitrant CRS patients demonstrate distinctive histopathological features with organisation of immune effector cells into organised lymphoid infiltrates termed Tertiary Lymphoid Organs (TLOs). The project will combine flow cytometry, in vitro microfluidics systems and in vivo murine experiments to define the identity and role of immune effector cells in the development of TLOs in the context of severe sinus inflammation.

Research areas

Surgical and health systems innovation
Immunology and infection
Translational health outcomes
Innovative therapeutics
Royal Adelaide Hospital Colorectal Unit
Royal Adelaide Hospital

Lead researcher: Associate Professor Tarik Sammour
Email: tarik.sammour@gmail.com

Honours project opportunities

- Lateral nodes in rectal cancer—a systematic review of surgical dissection versus non-operative management with or without neoadjuvant chemoradiation
  This project will involve a formal literature review and meta-analysis of data if possible.

- Management of the rectal stump after emergency total colectomy for inflammatory bowel disease
  Audit of current practice at Royal Adelaide Hospital with systematic review of published data. Research will formulate recommendations based on the above

Higher Degree by Research projects opportunities

- STIMULAX trial
  An open label randomised controlled trial of a combination of simple intestinal STIMulants and LAXatives to prevent post-operative ileus in patients undergoing colorectal surgery.
  This project is intended to be part of a PhD thesis.

Research areas
Surgical and health systems innovation
Translational health outcomes
Cancer biology and clinical oncology
Enteric Neuroscience and Gastrointestinal Research Group

University of Adelaide North Terrace Campus; Adelaide Health and Medical Sciences building (AHMS); South Australian Health and Medical Research Institute (SAHMRI)

Lead researcher: Marc A Gladman
Email: marc.gladman@adelaide.edu.au

Honours project opportunities

> Quantification and neurochemical coding of the gastrointestinal myenteric plexus in humans

The human gastrointestinal (GI) tract contains a complex enteric nervous system (ENS) that is referred to as the ‘little brain of the gut’. It contains many of the same neurotransmitters as the CNS and a similar number of neurons to the spinal cord. This ENS is responsible for normal GI function, including digestion, absorption and contraction. It also connects with the brain, accounting for feelings such as ‘butterflies in the stomach’ and ‘feeling full after a meal’ that we all can recognise. It is well established that certain disorders of the GI tract, such as severe constipation and abdominal pain may occur due to abnormalities of the ENS.

In humans, different regions of the GI tract have varying functions but it is unclear whether the ENS varies along the gut in terms of its quantification and neurochemical coding. This project has direct relevance to the care of patients with GI disorders and will focus on more accurately characterising the ENS in humans, so that we will be better able to understand changes in various pathological conditions.

> Variation in the surgical anatomy and clinical relevance of the pelvic plexus in humans

Urinary leakage affects up to 1 in 3; and bowel leakage up to 1 in 8 of the population in Australia. The pelvic plexus of nerves controls bladder, sexual and bowel function in humans but much of our knowledge relating to this important plexus is based on historical research studies. Recent attempts to improve bladder / bowel control and function have focused on delivering stimulation to these nerves, but to do this effectively requires accurate appreciation of its anatomy and its variation. Additionally, the pelvic plexus is susceptible to injury during common surgical abdominal and pelvic operations such as bowel resection, hysterectomy and operations on the prostate and bladder. Damage may result in problems with bowel / bladder control and sexual function and can have a devastating impact on patients’ lives. Accordingly, improved understanding of the normal anatomy of this important nerve plexus has implications for pelvic surgeons.

Using a combination of radiological, surgical and immunohistochemical techniques, this project aims to accurately determine the organisation, variation and location of this important plexus with a view to better protecting it during surgery and to accurately deliver therapeutic interventions to enhance its function.

Higher Degree by Research projects opportunities

> Variation in Outcomes following Surgery

Each year more than 230 million major operations are performed worldwide, one for every 25 people in the world. Incredibly, patients don’t survive in 3 million of these operations, meaning there is one death worldwide following surgery every 10 seconds.

In Australia alone, there are over 2.5 million major operations performed each year. Approximately 10% of these patients are at high-risk of complications and end up accounting for 80% of postoperative deaths. Patients who survive often have reduced functional independence and poor long-term survival.

Further, diseases of the bowel are among the most common in the population, with bowel cancer being the second most common type of newly diagnosed cancer in Australia and the second biggest cancer killer. However, it is unclear how many operations are performed for bowel problems in Australia each year and what results are achieved following surgery.

This project will explore outcomes following surgery and look to identify strategies to reduce unwarranted variation to improve survival rates and reduce complication rates in patients undergoing major surgery.

> Phenotypical characterisation of patients with faecal incontinence

A staggering 1 in 8 of the population suffer from bowel leakage or faecal incontinence (FI). It has potential to severely impact every aspect of life, affecting general health, social, emotional/mental and physical functioning meaning that this debilitating condition socially isolates sufferers, increases dependence on health care resources and is a leading contributor to patients being institutionalized in nursing homes.

Traditionally, it was considered that FI occurs solely due to problems of the anal sphincter muscles. However, extra-sphincteric mechanisms may also be important in the development of FI. Indeed, our group has pioneered the contemporary understanding that abnormal rectal function and / or abnormal communications between the rectum and the brain may also lead to FI. As the maintenance of continence is dependent on a complex interaction between somatic, enteric and autonomic nervous systems as well as smooth and striated muscles under higher cerebral control, it is likely that numerous factors paly a role in the loss of bowel control in individual patients.

This project will use cutting edge technological to accurately characterise the underlying causes of patients with FI with the view to identifying subgroups of patients who will benefit from the latest treatments.

Research areas

Surgical and health systems innovation
Translational health outcomes
Nutrition and metabolic health

More information

health.adelaide.edu.au/medicine/anatomy-and-pathology
Surgical Evaluation Group
Basil Hetzel Institute for Translational Health Research; The Queen Elizabeth Hospital, Woodville

- Evidence based surgical appraisal
- Evaluation of hepatic surgical outcomes
- Minimally invasive surgery
- Development of techniques for liver tumour destruction (particularly minimally invasive techniques capable of destroying both primary and secondary liver tumours by the insertion of electrodes)

Lead researcher: Professor Guy Maddern
Email: guy.maddern@adelaide.edu.au

Honours project opportunities
Honours projects may be available with this group, please contact the lead researcher(s) for more information.

Higher Degree by Research projects opportunities

> The Laparoscopic Simulation Skills Program (LSSP)

Current access to surgical simulation training in Australia is limited and the best formal for delivery is yet to be established. Self-directed learning has the potential to limit the costs associated with simulation training, as well as improve access through increased flexibility of training times. The aim of the LSSP is to develop and assess the efficacy and feasibility of a self-directed simulation-based training program, and to determine if a period of more formal (supervised) training is required.

> Coaching to enhance surgeons’ non-technical skills

The concept of coaching for performance improvement is an accepted and well-established approach in fields such as sports, education, business and music. It has only been much more recently recognised that application of this model of learning, which is grounded in established learning and psychological concepts, may be of particular value when applied in health care settings. This project investigates whether surgical coaching is a potentially valuable tool to enhance surgeons’ non-technical skills and whether it would be beneficial to develop a surgical coaching program for General Surgeons for the purpose of improving their ongoing professional development.

> The use of a novel gel to prevent adhesion formation post-abdominal surgery

Postoperative intra-abdominal adhesions are a major cause of morbidity and mortality and a heavy burden to health care resources. In 2016 and 2017, we investigated the effectiveness of novel recombinant human lubricin gel in preventing intra-abdominal adhesion in a rat model. In 2018, further studies will be complete to investigate toxicity and anti-adhesion properties in more significant operations.

> Developing novel diagnostic tools and preventative therapies for metastatic colorectal cancer

The majority of colorectal cancer (CRC) related deaths are attributable to liver metastasis—the most critical prognostic factor observed in CRC patients. However, there is no clinical test to predict metastatic risk and allow informed selection of preventive treatment regimen. The translational challenge, therefore, is to validate immune checkpoint biomarkers controlling metastasis. In collaboration with other groups at the BHI, we investigated the prognostic value of candidate protein biomarkers. HLA-G expression by tumour cells is an established mechanism to escape immune-mediated destruction. Our analysis demonstrated that soluble HLA-G is a differential prognostic marker of liver metastasis in CRC patients. We therefore propose that HLA-G secretion by different cell types is predictive of particular prognosis in sequential CRC disease stages.

Our proteomic and lipidomic analysis of CRC patients’ tissue and blood samples identified additional proteins and lipids, which are candidate biomarkers of progression to liver metastasis. These candidates are currently being validated in a larger patient cohort.

Research areas
Surgical and health systems innovation
Cancer biology and clinical oncology
Bioengineering Imaging Group

Our group brings together engineers, clinicians, physicists and computer scientists to design and build novel imaging devices to explore the body, and then translate these devices into clinical usage.

We have a particular focus on developing new optical imaging technologies, and have strong research programs in optical coherence tomography and fluorescence imaging. Much of our work involves our ‘imaging needle’ technology, highly miniaturised optical imaging probes small enough to be encased within a needle, and we have active programs extending this work to brain cancer and lung disease.

Lead researcher: Professor Robert McLaughlin
Email: robert.mclaughlin@adelaide.edu.au

Honours project opportunities

> 3D printing of optical calibration objects for high resolution medical imaging

Our group develops highly novel imaging scanners that scan the body using optical coherence tomography. When developing new imaging probes, or using these scanners in medical trials, it is important to regularly acquire scans of standardised, calibration objects. Examining the scans of these calibration objects allows us to rapidly identify when there are problems with the scanner.

In this project, the student will first gain a deep understanding of the physics underlying optical coherence tomography to understand which aspects of the scanner are important to characterise. The student will then design a set of calibration objects that will allow us to easily assess the quality of the scanner.

To fabricate the calibration objects, the student will use our recently-purchased stereolithography 3D printer from FormLabs, USA. The student will also gain experience with a number of highly novel optical imaging probes as they undertake their characterisation.

Prerequisites: The student must have a strong background in Physics, with an emphasis on optics.

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas

Surgical and health systems innovation
Mucosal Immunology Research Group
Adelaide Health and Medical Sciences (AHMS); Centre for Cancer Biology (CCB)

Our multidisciplinary and inter-institutional research team from Otolaryngology Head and Neck Surgery (Associate Professor H Pant), Lung Research Laboratory (Professor S Hodge, Dr Haibac Tran and Professor Jersmann) and Centre for Cancer Biology (Professor A Lopez and Dr Dave Yip) bring a unique set of skills aimed at improving the diagnosis and treatment of patients with recalcitrant mucosal inflammation and mucosal oropharyngeal squamous cell carcinoma.

We are investigating immunological aspects of the following mucosal diseases: asthma, allergic rhinitis, chronic rhinosinusitis and nasal polyps, rhinitis and oropharyngeal SCC to better understand the pathogenesis, key cells and mediators that drive chronic inflammation and tumour progression. By using clinically relevant disease models to develop and validate novel therapies, we are facilitating rapid and effective translation of cutting-edge research into clinical practice.

Our group is at the forefront of mucosal immunology research as demonstrated by our recent publications and invited review article. Our group values the pursuit of research excellence in a supportive environment for students and researchers and offers national and international opportunities for further career enhancement.

Our research includes:
- Development of novel and effective treatments for allergic and non-allergic inflammation
- Human nasal polyp – animal model to study chronic mucosal inflammation in vivo
- Understanding the upper and lower airway mucosal lymphoid structure and function in disease and in health; and interactions with the microbiome
- Development of novel therapeutics to improve post-surgical mucosal wound healing
- Novel treatments for HPV-associated oropharyngeal SCC

Lead researcher: Associate Professor Harshita Pant
Email: harshita.pant@adelaide.edu.au

Honours project opportunities

- Development of 3-D model of respiratory mucosa
  Host and pathogen interactions underpin chronic inflammatory upper and lower respiratory diseases. To unravel the mechanisms of microbial infection and therapeutic efficacy, the development of models based on two or more cellular lineages (epithelial, stromal and immune cells) are needed to provide a research platform which represents a more accurate and physiological system. The focus of this project is to utilize our experience with stem cell research to develop a 3-D in-vitro model of upper respiratory mucosa from human nasal polyp tissue.

- Characterisation of single cell transcriptional activity in nasal polyps and asthma
  There are striking similarities in the upper (nasal polyp) and lower (asthma) airway pathology, with inflammatory cells, epithelial cells, resident mast cells, and remodelling with mucous gland hyperplasia, basement membrane thickening and fibrosis. They exhibit a similar inflammatory milieu, with coexisting allergy: an influx of fibroblasts and T cells, Th2 cytokines. Similar to asthma, nasal polyp patients display a spectrum of disease severity and response to prednisolone. This study focuses on examining specific inflammatory cell signalling pathways that are being affected, qualitatively and correlation with clinical consequences in clearly defined patient groups to identify a biological marker of disease severity and response to specific therapies.

- Characterisation of mitochondrial oxidative stress and inflammasome activation in asthma
  Although health advances have been made in mild and moderate asthma, mechanisms involved in severe asthma are largely unknown. Key proteins involved in mitochondrial oxidative stress and inflammasome activation are associated with increased levels of specific pro-inflammatory cytokines linked with asthma severity and subtype. This study focuses on identifying a clinically relevant biomarker utilising the upper airway epithelial cells in patients with and without asthma.

Higher Degree by Research project opportunities

- Characterisation of molecular and immunologic profiles of T cell populations in HPV and non-HPV associated OSCC.
  Tonsil and tongue-base comprise >90% of oropharyngeal SCC (OSCC). Despite standardised treatments, survival is poor and traditional prognostic indicators have been unreliable predictors of outcomes. HPV-associated OSCC is prevalent in young adults but has a better prognosis that may be linked to its unique mucosal immunopathology. Our focus is to investigate the role of T cells in tumour progression with the potential of manipulating host immune cells to enhance disease-free survival in both forms of OSCC.

- Novel approaches to control mast cell function in IgE-associated inflammation.
  A hallmark feature of asthma and chronic rhinosinusitis inflammation is the presence of activated mast cells, eosinophils, IgE and allergen specific Th2 immune response where the β common (βc) family of cytokines IL-3, IL-5 and GM-CSF feature as drivers of inflammation. These cytokines act via specific β chain and a common receptor (βc) on target cells, including mast cells. Mast cells are long-lived tissue resident cells which are at the centre of IgE-mediated inflammation. Our focus is to investigate the effect of novel therapies targeting βc family of cytokines in a model in which human nasal polyps are grown in genetically modified mice. Nasal polyps are characterized by IgE-dependent activation of mast cells, Th2 cells and cytokines, eosinophils and neutrophils and are ideal to study human allergic inflammation.

Research areas
Surgical and health systems innovation
Immunology and infection
Innovative therapeutics
Translational health outcomes
Indigenous and Disadvantaged Health
Closing the gap in health equality between Aboriginal, Torres Strait Islander people and other disadvantaged Australians is a national priority. Focused effort is required to understand and resolve the underlying basis for the inequalities of health care and health care outcomes across our most vulnerable Australian community members.

There are many factors impeding the availability and delivery of health care to ensure good health outcomes for Indigenous and disadvantaged groups in Australia. These include: physical access to services for rural and remote communities; cultural appropriateness of treatment; education on the maintenance of health; and financial restrictions.

Our researchers are investigating ways to overcome these barriers and provide an improved understanding of the health and health care amongst Indigenous and disadvantaged communities. This understanding is essential for the development and implementation of informed, effective public health policy.

Researchers across the faculty are focused on:

- reducing the burden of disease and health inequalities, arising from chronic dental diseases among Indigenous children
- monitoring and surveying Indigenous oral health and use of dental services
- working with Indigenous women to develop culturally-appropriate care in order to improve the outcomes for mothers and their babies
- working with the Indigenous community to use existing knowledge on best-practice chronic disease prevention and treatment to improve the coverage and appropriateness of health services and care
- conducting interventional clinical trials to provide evidence for optimal management of HIV/AIDS across high-, middle- and low-income communities.

Indigenous and Disadvantaged Health research groups

- Improving Aboriginal Renal Care and Patient Journeys Project
- Australian Research Centre for Population Oral Health
Indigenous and Disadvantaged Health research opportunities

Improving Aboriginal Renal Care and Patient Journeys Project

Royal Adelaide Hospital; Adelaide Health and Medical Sciences building (AHMS); South Australian Health and Medical Research Institute (SAHMRI); Hampstead Campus

Dr Janet Kelly is a nurse researcher and course coordinator focusing on improving health care and outcomes for Aboriginal people. She began her nursing career at the Royal Adelaide Hospital, and continued in midwifery, child and youth health, adolescent health, Aboriginal health and women’s and sexual health in a range of urban and regional settings. Her Master of Nursing explored the role of sexual health nurses working with young Aboriginal women in urban areas and her PhD focused on Aboriginal women’s health and collaboration. More recent collaborative research has involved co-developing a set of Aboriginal patient journey mapping tools with flexible adaptations. These have been used for quality improvement, reflective practice, education and training.

Lead researcher: Dr Janet Kelly
Email: janet.kelly@adelaide.edu.au

Honours project opportunities

> Improving Aboriginal renal care

We invite an Honours student to be involved in our collaborative mixed methods Aboriginal health care study involving the Adelaide Nursing School, Central Northern Adelaide Renal Transplant Service (CNARTS) and SAHMRI. We are a multidisciplinary, cross cultural research and clinical team working together to improve renal care for Aboriginal people.

As an Honours student, you will coordinate and analyse a (newly developed) survey of all CNARTS staff (doctors, nurses, allied health and support staff) to accurately identify current levels of cultural care, knowledge, skills, expertise and resources.

You will also conduct a scoping review to identify approaches to care that are both clinically and culturally responsive to individual Aboriginal patient needs.

The findings from these two activities will then be used to develop education packages for clinical staff in Adelaide and beyond, and to inform ongoing quality improvement activities that meet new cultural safety quality and safety requirements.

This project is part of much larger vision to improve renal care for Indigenous peoples nationally and internationally. As an Honours student, you will have an opportunity to work alongside leading clinicians and researchers, while being supported to develop your own research skills and interests.

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas

Indigenous and disadvantaged health
Cardiac, respiratory and vascular health
Surgical and health systems innovation
Australian Research Centre for Population Oral Health

Adelaide Health and Medical Sciences (AHMS)

The Australian Research Centre for Population Oral Health (ARCPOH) is Australia’s pre-eminent population oral health research body undertaking dental research and provides a broad range of dental and oral health statistics for Australia.

ARCPOH was established at the University of Adelaide in 2001 to undertake research and research training in population oral health that is internationally recognised to be of the highest quality.

In addition to the University, ARCPOH’s stakeholders include government agencies, dental organisations, and private corporations. Part of the Adelaide Dental School, the Centre is involved with the academic and research areas of social and preventive dentistry, oral epidemiology and geriatric dentistry.

Lead researcher: Professor Lisa Jamieson
Email: lisa.jamieson@adelaide.edu.au

Honours project opportunities

Honours projects may be available with this group, please contact the lead researcher(s) for more information.

Higher Degree by Research project opportunities

> Investigating the role of discrimination experienced by Indigenous Australians on both self-rated and clinical markers of general health and oral health

All data collected; three data sets. Potential for at least three published journal articles and presentation at one international conference.

> Analysing outcomes of a randomised control trial that aimed to reduce progression of chronic kidney disease among Aboriginal Australians residing in Alice Springs, through a periodontal intervention

Potential for at least three published journal articles and presentation at one international conference. Also potential to spend time in Alice Springs with study team.

> Exploring the role of health states and utilities among Aboriginal Australians, using hypothetical models of oropharyngeal cancer and Human Papilloma Virus

Potential for at least three published journal articles and presentation at one international conference. Also potential to spend time with study team travelling throughout South Australia to collect and collate data.

> Analysing the prevalence of, and risk factors for, oropharyngeal cancer among Aboriginal Australians, and the attributable fraction related to Human Papilloma Virus

Potential for at least three published journal articles and presentation at one international conference. Also potential to spend time with study team travelling throughout South Australia to collect and collate data.

Research areas

Indigenous and disadvantaged health
Oral health
Nutrition and metabolic health
Cardiac, respiratory and vascular health

More information

adelaide.edu.au/arcpoh/ihu/

Professor Lisa Jamieson of the Australian Research Centre for Population Oral Health
Nutrition and Metabolic Health
The effects of nutrition quality and availability on metabolic processes not only plays a significant role in the incidence of many serious illnesses, but can drastically influence our general health and wellbeing throughout our lives.

The links between nutrition, metabolism and human health are complex, and our researchers—from basic scientists, human physiologists, clinicians and population health specialists—are working to enhance our understanding of these links.

Our researchers are investigating the associations between diet and sleep, pregnancy, foetal growth and mortality, and serious illnesses such as coronary heart disease, stroke, hypertension, atherosclerosis, obesity, cancer, type 2 diabetes, osteoporosis, dental caries, gall bladder disease, dementia and nutritional anaemias.

Our overarching goal is to develop and validate innovative diets to promote health and wellbeing, and deliver improved health outcomes to the community in a range of areas.

Researchers across the faculty are focused on:

- determining the effects of modifying diet on metabolic health
- developing strategies to prevent and manage obesity and type 2 diabetes
- studying the molecular and cellular basis of appetite regulation
- understanding immune function and pain-sensing in the gut
- exploring how nutrition interacts with sleep patterns and metabolic disorders
- investigating metabolism in liver, muscle, fat tissue and bone tissue
- understanding nutrition in vulnerable populations such as the elderly, and determining the association between nutritional intake and chronic disease
- conducting studies longitudinal, large cohort studies to assess associations between diet and chronic diseases.
Nutrition and Metabolic Health research opportunities

Intestinal Nutrient Sensing Group
Royal Adelaide Hospital; Adelaide Health and Medical Sciences building (AHMS); South Australian Health and Medical Research Institute (SAHMRI)

The Intestinal Nutrient Sensing Group undertakes research focused on the form and function of the intestinal sweet taste system. This system senses intestinal glucose, and in response regulates the release of gut hormones and control of glucose absorption.

Our research has revealed regulation of this system by luminal and blood glucose, and dysregulation in human diabetes, critical illness and obesity. The group has access to genetic and disease models and to a wide range of human tissue to answer a range of research questions:

• Do artificial sweeteners influence intestinal sweet sensing and glucose absorption in humans?
• Does blocking intestinal sweet taste receptors reduce glucose uptake in patients with type 2 diabetes?

Our research group has major collaborators from basic and clinical science backgrounds and industry which strengthens our ability to deliver novel therapies for obesity and type 2 diabetes.

Lead researcher: Associate Professor Richard Young
Email: richard.young@adelaide.edu.au

Honours project opportunities
Honours projects may be available with this group, please contact the lead researcher(s) for more information.

Higher Degree by Research project opportunities

• Can blocking the sweet sensing ability of the gut improve blood glucose control for people with type 2 diabetes?
  Artificial sweeteners are increasingly consumed in the community, and we have shown that regular, high intake leads to faster uptake of sugar into the blood, and impaired blood glucose control in healthy people. This may explain why regular, high intake of artificial sweeteners can increase the risk of developing type 2 diabetes. We have also shown that people with type 2 diabetes may be at even higher risk of worsening blood glucose control due to artificial sweeteners, as they already have a defect in this uptake pathway. This HDR project will investigate whether blocking the ability of the upper gut to detect sweet improves control of blood glucose levels in people with type 2 diabetes. This project will involve clinical research in the new RAH and anatomical and molecular experiments in SAHMRI.

Friend or foe: How does the human gut respond to artificial sweeteners?
In contrast to the view that artificial sweeteners are ‘nutritionally inert’ we now known that they are detected in the gut by the same pathway that recognises sugars as sweet taste, and can trigger adverse changes in the control of blood glucose. Artificial sweeteners may also alter blood glucose by changing the way gut bacteria work, and how they communicate to the gut/host.

This HDR project will examine basic mechanisms that detect and signal the presence of artificial sweeteners in the human gut, and ways that sweeteners may change bacterial communities in the gut. This will involve research on gut function using human tissues and measurement of signals released by artificial sweeteners, as well as experiments examining gut bacteria (metagenomics) in SAHMRI, and with collaborators.

Research areas
Nutrition and metabolic health
Translational health outcomes

More information
researchers.adelaide.edu.au/profile/richard.young

Nutrition and Metabolic Health research opportunities

Intestinal Nutrient Sensing Group, SAHMRI: (Left to right) Nada Cvijanovic (Postdoc), Nicole Isaacs (Senior RA), Richard Young, Nektaria Pezos (Senior RA). Absent: Gudrun Schober (Postdoc), Denise Kreuch (M Phil candidate)
Gastrointestinal Neuro-immune Interactions
South Australian Health and Medical Research Institute (SAHMRI)

Dr Patrick Hughes is interested in communication between the nervous and immune system, and particularly how this is relevant for gastrointestinal diseases. He collaborates with clinical gastroenterologists, immunologists and neuroscientists to investigate the effects immune mediators have on sensations from the gut, but also the effects neurotransmitters have on the immune system.

Lead researcher: Dr Patrick Hughes
Email: patrick.hughes@adelaide.edu.au

Honours project opportunities
Aspects of all PhD projects outlined below are available for honors projects.

Higher Degree by Research project opportunities

> Is naive and relapsing inflammation of the colon the same?
Inflammatory Bowel Disease is characterised by chronic inflammation that comes and goes over time. However, little is understood regarding how the type(s) of immune responses differ between acute and relapsing inflammation. This project uses cutting edge immune and nerve analysis (e.g. molecular biology, flow cytometry, electrophysiology) to understand the effects of repeated inflammation on immune and nerve responses.

> How do microbial products maintain immune and physiological homeostasis in the colon?
The microbiota is known to be altered in many diseases, but little is understood regarding the effects microbiota products have on colonic immune and nervous systems. This project combines studies using human samples with animal models of disease to understand how changes in microbiota composition affect the physiology of the intestinal tract.

> How does activation of the immune system contribute toward symptoms in Irritable Bowel Syndrome?
Irritable Bowel Syndrome is characterised by symptoms of pain and altered motility that occur in the absence of overt pathophysiological changes. However recent evidence indicates that the immune system is altered in IBS consistent with a low grade inflammatory event. This project combines studies of human tissue with animal models to understand how immune changes lead to symptoms of pain and altered motility in IBS.

> Novel techniques for imaging colonic inflammation
In collaboration with MITRU at SAHMRI, we are using radiolabelled antibodies against immune markers to develop novel in-vivo techniques for imaging colonic inflammation.

Research areas
Nutrition and metabolic health
Immunology and infection
Neuroscience, behaviour and brain health
Innovative therapeutics

Gastrointestinal Function and Appetite Regulation
Adelaide Health and Medical Sciences building (AHMS)

Our research is focused on characterising the role of the upper gastrointestinal (GI) tract, particularly the role of dietary nutrients, in activating GI functions, including gut hormone release and stimulation of gut motor functions, in appetite regulation and the generation of dyspeptic symptoms in humans. The work has made major contributions to current understanding of mechanisms underlying conditions such as obesity and functional dyspepsia (which are highly prevalent conditions, i.e. with substantial health, economic and psychosocial implications) and shaped current concepts of how nutrients interact with GI function in the regulation of appetite and overeating on the one hand, and digestive symptoms associated with a lack of appetite on the other.

Thus, our research has established (i) key roles for specific GI motor and hormone functions in energy intake regulation in humans, (ii) that very small amounts of specific nutrients (e.g. certain fatty acids or amino acids), through their potent GI effects, have major appetite-suppressant and glucoregulatory effects, and, therefore, may have the potential to be developed into novel, nutrient-based therapeutic agents, (iii) that adaptive changes in GI function can occur to both high-fat diets and dietary restriction, discoveries that have wide-reaching implications for a better understanding of a range of intake-related conditions, including obesity, functional dyspepsia as well as anorexia nervosa, and (iv) a key role for dietary factors (including meal size and dietary nutrient composition) for symptoms in FD.

Lead researcher: Professor Christine Feinle-Bisset
Email: christine.feinle@adelaide.edu.au

Honours project opportunities

> Effects of dietary fatty acids or amino acids on upper gut motor and hormone functions, energy intake and blood glucose
Our research focuses on the effects of specific dietary nutrients on a number of gastrointestinal functions, including gut hormones and gastrointestinal motility, and how these contribute to the regulation of appetite and energy intake and blood glucose control using a range of state-of-the-art techniques. We offer a number of projects in healthy participants to characterise physiological effects, and in patients with obesity and/or type 2 diabetes, in order to establish the clinical relevance of our findings. The ultimate aim of our research is to identify nutrients that have the ability to modulate gastrointestinal functions in a way that helps to control appetite and energy intake.

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas
Nutrition and metabolic health
Honours project opportunities

> Thiamine deficiency and mitochondrial dysfunction in sepsis: A pilot observational study of prevalence and outcomes in Intensive Care

Recent evidence suggests that thiamine deficiency may be under-recognised in critically ill patients, and associated an increase in mortality of up to 50%. The concept of metabolic resuscitation has recently become an area of interest in critical care research, particularly in relation to the management of sepsis.

This pilot observational study will determine the association between thiamine deficiency and immune cell mitochondrial dysfunction in patients admitted to ICU with sepsis, and the potential role of thiamine supplementation in the treatment of sepsis-associated mitochondrial dysfunction.

In addition, the researcher will conduct a prospective observational snapshot of the prevalence of thiamine deficiency in all patients admitted to ICU across a one month period, with a view to identifying point prevalence of thiamine deficiency in the ICU population.

The findings of this study will be used to generate hypotheses and funding applications related to mitochondrial dysfunction and metabolic resuscitation in critical illness. The student undertaking this study will be expected to be involved in hypothesis generation, the application for future funding, and potentially involved in the conduct of future studies.

> Enteral naloxone for the prevention of opioid-associated constipation in ventilated intensive care patients

Constipation occurs commonly in Intensive Care Units (ICU), affecting up to 80% of patients, and can result in significant morbidity. The cause is likely to be multifactorial but probably relates at least in part to the administration of opioids for analgesia. The enteral administration of naloxone has been studied in ICU for the treatment of constipation, but not for prevention. Observational studies have reported encouraging improvements in bowel function, without an increase in pain. However, these studies have used intravenous (IV) formulations of naloxone, delivered enterally, which requires large volumes of IV preparations which are costly and impractical for ongoing regular enteral administration. An alternative to the enteral administration of IV formulations of naloxone is a combination opioid agonist/anatagonist therapy which has been shown to preserve bowel function in patients with chronic cancer pain.

In this study, a commercially available enteral preparation of oxycodone/naloxone combination will be administered to ventilated patients who are receiving opioid therapy, and who have commenced enteral feeding, with a view to establishing whether oxycodone/naloxone administration results in decreased rates of constipation, and associated complications, in ventilated patients receiving IV opioids.

> Resolution of elements influencing nutritional status after critical illness

Led by Dr Lee-anne Chapple (Post-Doctoral Research Fellow, Dietitian) and Professor Marianne Chapman (Senior Intensivist, Director of ICU Research, RAH).

We are a dynamic and competitive group of ICU consultants, dietitians, nurses, scientists and PhD candidates based in Intensive Care at the Royal Adelaide Hospital. Led by Professor Chapman, ICU Research is a word-leader in nutrition, GI function and glucose metabolism in critical illness with an emphasis on clinically-focused, technically-challenging studies ranging from physiological studies to large NHMRC-funded clinical trials.

Nutrition delivery to critically ill patients is largely suboptimal, and patients experience significant muscle wasting leading to reduced functional capacity that persists well after hospital discharge. The proposed research project is a hands-on clinical study with the aim of determining the extent to which factors that affect nutritional status, including delayed gastric emptying, reduced glucose absorption, and hypercatabolism, return to normal on the post-ICU ward in survivors of critical illness.

Our unit has successfully supervised seven medical students to First Class Honours, one who subsequently received a Rhodes Scholarship. All students have been first author on a high-impact publication and presented at major national or international meetings. Our program is particularly well-suited to students with an interest in acute care medicine, anaesthetics, endocrinology or gastroenterology.

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> Heart rate variability as a predictor of elevated intracranial pressure in patients with traumatic brain injury

Supervised by Dr Benjamin Reddi.

Traumatic brain injury is a common condition that can lead to profound long-term disability and even death. Following severe head injury the brain swells inside the skull leading to high intracranial pressure. This high pressure limits the flow of arterial blood into the skull, reducing oxygen and glucose supply to the neurones and causing irreversible brain damage. It is crucial to identify elevated intracranial pressures so that urgent steps can be taken to reduce it. Currently, the only method of identifying the presence of elevated intracranial pressure is by the potentially dangerous technique of using catheters placed directly into the brain.

This project will involve the assessment of patients with traumatic brain injury in the Intensive Care Unit of the Royal Adelaide Hospital. The project aims to establish whether specific changes in neural modulation of heart rate, measured through the continuous electrocardiogram, can predict the development of elevated intracranial pressures without the need for invasive intracranial monitoring devices.

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Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas

Nutrition and metabolic health
Immunology and infection
Vagal Afferent Research Group

South Australian Health and Medical Research Institute (SAHMRI)

Obesity is resistant to behavioural intervention, but to date, pharmacological approaches have had limited efficacy or unacceptable adverse effects. It is increasingly appreciated that the stomach plays an important role in appetite regulation. It is targeted in bariatric surgery and gastric vagal electrical stimulation to treat obesity. Our study of gastric vagal afferent (GVA) innervation has resulted in major contributions to our understanding of the role of these afferents in health and disease (e.g. obesity). These include:

1) Phenotypic specialisation of vagal sensory endings. Early work involved development of an in vitro preparation that enabled classification of vagal sensory endings. This nomenclature has been adopted worldwide and extended to other regions of the gut.

2) G-Protein Coupled Receptors (GPCRs) as modulators of gastro-oesophageal vagal afferent activity. Using pharmacological approaches we have demonstrated that GABAB receptor agonists inhibit peripheral gastro-oesophageal vagal afferent endings and thus GABAB receptors are potential target for gastro-oesophageal reflux disease. As a direct result of this work, GPCR modulation is now a major clinical target for many diseases.

3) Role of vagal afferents in food intake. Using innovative approaches we have demonstrated that satiety signals originating in the stomach can be modulated by appetite hormones including leptin and ghrelin. Together, these studies have highlighted the importance of the stomach in the regulation of food intake, the complex interplay between appetite hormones and vagal afferent activity and the changes that occur in high fat diet (HFD)-induced obesity.

Lead researcher: Professor Amanda Page
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Honours project opportunities

> Novel new molecular targets for functional dyspepsia.

Functional dyspepsia (FD) is a gastrointestinal disorder associated with recurrent bloating, early satiety (feelings of fullness), nausea and/or pain. There are two clinically distinct FD syndromes: 1) postprandial distress syndrome (PDS), where feelings of fullness occurs early in the meal and there is persistent bloating after eating; and 2) epigastric pain syndrome.

Information about the amount and type of food eaten is sent from the gut to the hindbrain via specialised nerves called vagal afferents. Normally, these signals impact on our desire to eat and during a meal lead to the sensations of fullness and satiation that are intended to stop us eating. In FD, the vagal afferents appear to be oversensitive giving rise to heightened upper abdominal responses to gastric distension and the symptoms observed in PDS. Various ion channels mediate the conversion of mechanical stimuli (e.g. gastric distension) into a nerve action potential. The vagal afferents that carry signals from the stomach to the brain have a specialised ion channel called the transient receptor potential vanilloid 1 (TRPV1) channel. When this ion channel is activated the number of vagal afferent action potentials generated in response to distention of the stomach increase intensifying the satiety signal to the brain. Conversely, when this channel is deactivated the opposite occurs. This project will investigate the role of TRPV1 in the heightened sensitivity of vagal afferents to food related stimuli in an animal model of FD.

> Tripping over appetite regulation in the stomach

The prevalence of obesity in Australia has more than doubled in the last 30 years, with an estimated health care cost of $58 billion in 2008. Obesity is resistant to dietary/behavioural interventions and pharmacological approaches, mainly aimed at appetite control via the central nervous system, have been limited by low efficacy and/or adverse effects. The most successful treatments are surgical. However, such surgery carries morbidity and is not feasible on a widespread basis. Vagal afferent nerves transmit information, on the amount and type of food consumed, from the gastrointestinal tract to the hindbrain. These signals impact on our desire to eat and during a meal lead to the sensations of fullness and satiation, involved in the termination of a meal.

The literature indicate that the endocannabinoid system and ghrelin increase food intake, whereas, agonists of the transient receptor potential vanilloid 1 (TRPV1) channel decrease food intake. We propose that dampened gastric vagal afferent satiety signalling, observed in obesity, is the consequence of increased activation of the endocannabinoid system, which can also promote gastric ghrelin release, and reduced TRPV1 signalling. This project will investigate the anatomical relationship between TRPV1 channels, ghrelin and endocannabinoid receptors in the stomach wall of healthy and high fat diet-induced obese mice.

> The role of reactive oxygen species in leptin modulation of gastric vagal afferent satiety signals

The gut-brain axis plays an important role in appetite regulation relaying information on the amount and nutrient composition of food consumed. We have shown that gastric vagal afferent (GVA) responsiveness is modified by circadian cues, nutrients, gastric hormones and adipokines. Further, we have demonstrated that the nature of the response of GVAs to meal related stimuli may be profoundly altered by nutritional status. Thus GVA function demonstrates plasticity in order to finely control the amount of food consumed. The molecular mechanisms underpinning this plasticity remain to be determined. The cytokine leptin reduces food intake, an effect generally attributed to a central mechanism of action. However, leptin is also expressed in the gastric mucosa where it has a paracrine effect on GVAs.

Selective deletion of leptin receptor (LepR) from VA nerves results in increased food intake and weight gain. We have previously established that under ‘normal’ fed conditions, leptin has an excitatory effect on GVAs, whereas, in high fat diet (HFD)-induced obese mice this excitatory effect of leptin is lost and instead leptin inhibits GVAs with a subsequent increase in food intake. We have shown that following inhibition reactive oxygen species (ROS) production, GVAs from lean fed animals respond to leptin as if they were on a HFD.

This project will further investigate the interaction between leptin and ROS in the modulation of GVA satiety signalling.

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas
Nutrition and metabolic health
Neuroscience, behaviour and brain health
Gastrointestinal Function in Diabetes Mellitus
Royal Adelaide Hospital; Adelaide Health and Medical Sciences building (AHMS)

Professor Chris Rayner’s major research interest concerns nutrient-gut interactions, including the regulation of gastrointestinal motility, with an emphasis on the role of upper gut function in diabetes. His work seeks to develop an understanding of the mechanisms of nutrient sensing and incretin hormone release in the gut, and how these can be manipulated for therapeutic gain. He has developed the concept of protein preloads, taken in advance of meals, to initiate gut feedback mechanisms that will lower subsequent postprandial glycaemia in type 2 diabetes.

Lead researcher: Professor Chris Rayner
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Honours project opportunities
Please see the Higher Degree by Research information below; a variety of projects could be considered within the areas discussed.

Higher Degree by Research project opportunities
Our group includes Professor Michael Horowitz, Professor Karen Jones, Dr Tongzhi Wu, Dr Liza Phillips, and Dr Chinmay Marathe. We form part of a NHMRC Centre of Research Excellence in Translating Nutritional Science to Good Health, and collaborate closely with Associate Professor Richard Young’s Intestinal Nutrient Sensing Group at SAHMRI.

We have established an international reputation in the area of gastrointestinal function in diabetes, and have a history of supervising higher degree students from a broad variety of clinical and scientific backgrounds. We have the capacity to measure gastric emptying with scintigraphy, ultrasound or breath tests, gastroduodenal pressure events with manometry, release of small intestinal hormones (eg. GLP-1, GIP, CCK) by assays on plasma samples, gut sensations by validated visual analogue scores, and appetite and food intake by ad libitum buffet meals.

Research projects include evaluation of dietary or drug interventions to control postprandial hyperglycaemia, or physiological studies seeking to understand the basis of disordered gastric or small intestinal function in diabetes.

Research areas
Nutrition and metabolic health

More information
adelaide.edu.au/cre-nutrition

Professor Chris Rayner

FOODplus Research Centre
South Australian Health and Medical Research Institute (SAHMRI); Women’s and Children’s Hospital

Lead researcher: Associate Professor Beverly Muhlhausler
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Honours project opportunities
Honours projects may be available with this group, please contact the lead researcher(s) for more information.

Higher Degree by Research project opportunities

> Improving the long-term cardio-metabolic health of very preterm infants through nutritional interventions: A role for omega-3 fatty acids?

Infants born very preterm (< 33 weeks) are at increased risk of a range of long-term adverse health outcomes. While most studies to date have focused on neurodevelopment, it is becoming increasingly clear that these infants also have a higher risk of developing cardio-metabolic diseases in adolescence and adulthood.

This project will investigate whether the long-term cardio-metabolic health of these infants can be improved by a simple nutritional intervention in the early postnatal period by undertaking a follow-up study of very preterm infants who were or were not supplemented with the omega-3 fatty acid DHA (1% total fatty acids in the diet compared to 0.3% in the placebo group) from 2-4 days after birth to term equivalent age (Makrides et al, JAMA, 2009).

Research areas
Nutrition and metabolic health
Early origins of health
Nutrition and Metabolic Health research opportunities

**Obesity and Metabolism Group**

*South Australian Health and Medical Research Institute (SAHMRI)*

Associate Professor Leonie Heilbronn is Group Leader of the Obesity and Metabolism Group based within the Nutrition and Metabolism Theme at SAHMRI. Her research focus is to better understand the molecular and physiological basis of obesity and its co-morbidities, and in particular the role that insulin resistance plays in the aetiology of these conditions.

Her research is at the interface between basic and clinical science, and she currently has research projects aimed at understanding mechanisms of insulin resistance in skeletal muscle and in adipose tissue utilising various environmental perturbations (e.g. overfeeding, calorie restriction, exercise, hyperbaric oxygen therapy). She is also keenly interested in the role of nutrition in healthy ageing and is a member of the Robinson Research Institute, where she also studies mechanism of insulin resistance in IVF.

**Lead researcher:** Associate Professor Leonie Heilbronn  
**Email:** leonie.heilbronn@adelaide.edu.au

**Honours project opportunities**

Honours projects may be available with this group, please contact the lead researcher(s) for more information.

**Higher Degree by Research project opportunities**

We have a range of projects that will suit students interested in clinical or laboratory based research into nutrition, obesity and type 2 diabetes risk:

- Studying the role of fasting and time restricted feeding to reduce diabetes and cardiovascular risk in overweight humans and in mice
- Studying how altering circadian clocks and feeding out of phase impacts the risk of type 2 diabetes in humans and mice
- How overfeeding contributes to metabolic dysfunction in human obesity, with a particular focus on adipose tissue remodelling and skeletal muscle plasticity
- How hyperbaric oxygen therapy increases insulin sensitivity in obese individuals

**Research areas**

Nutrition and metabolic health  
Early origins of health

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**Translational Health Outcomes**

*Adelaide Health and Medical Sciences building (AHMS)*

**Lead researcher:** Dr Tim Schultz  
**Email:** tim.schultz@adelaide.edu.au

**Honours project opportunities**

- Long term patient outcomes following implementation of an intervention to improve nutrition in hospital patients
  This project will follow-up the outcomes of patients exposed to nutrition screening in a hospital setting to determine whether the intervention has a long term influence over outcomes like mortality, health service utilisation and patients’ use of residential aged care.

**Higher Degree by Research project opportunities**

- Older people’s perceptions and experiences of nutritional interventions for treating and preventing weight loss
  A recently published umbrella review identified a lack of qualitative systematic reviews to help clinicians understand how to support older people to comply with interventions to treat and prevent weight loss. This project will conduct a systematic review as a Masters of Clinical Science. Further primary research could be conducted as part of a PhD.

**Research areas**

Nutrition and metabolic health  
Ageing, frailty and mobility  
Translational health outcomes

**More information**

researchers.adelaide.edu.au/profile/tim.schultz
Hypoglycaemia and the Gut
Adelaide Health and Medical Sciences building (AHMS)

Lead researcher: Dr Chinmay Marathe
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Honours project opportunities

> Hypoglycaemia and gastric emptying in diabetes

Hypoglycaemia, or low blood glucose, is a frequent and important complication of type 1 and insulin-treated type 2 diabetes. While hypoglycaemia can, generally, be self-treated (i.e. by eating or drinking carbohydrate) if symptoms are recognised promptly, a substantial number of people, particularly those who have had frequent episodes of hypoglycaemia do not experience adequate warning symptoms. This state is known as ‘impaired awareness of hypoglycaemia’ or IAH. Severe hypoglycaemia (defined as an event requiring the assistance of another person to actively treat hypoglycaemia) is particularly dangerous and may be fatal. The risk of severe hypoglycaemia is increased 3–6 fold in IAH.

The gut is the largest endocrine organ in the body and plays a major role in blood glucose homeostasis. It is known that gastric emptying (the rate at which the stomach empties food into the small intestine) exhibits a wide inter-individual variation that impacts on post-meal blood glucose. Upper gastrointestinal symptoms and delayed gastric emptying are common in longstanding diabetes and associated with increased risk of hypoglycaemia. The proposed study will determine whether an increased frequency or impaired awareness of hypoglycaemia are associated with delayed gastric emptying. If this proves to be the case, it would have major implications for the management of hypoglycaemia.

Research areas
Nutrition and metabolic health
Oral Health
Oral health is an essential component to a healthy life. Oral health is not only concerned with teeth, but the health of oral and related tissues that enables an individual to eat, speak and socialise without active disease, discomfort or embarrassment, and that contributes to general wellbeing.

Oral health research seeks to understand population and individual dental health to prevent or manage oral disease and to educate our community to maintain optimal oral health throughout their lives.

Our research spans a broad range of fields including: dental education; endodontics and pulp biology (stem cell research); periodontics; orthodontics; craniofacial biology; oral and maxillofacial surgery; forensic odontology; population oral health; and cancer treatment.

Our research activity also includes epidemiological studies focusing on the efficacy of population oral health interventions, oral health services and oral health policy analysis in relation to oral disease prevention and provision of optimal dental health services.

Researchers across the faculty are focused on:

- assessing intergenerational change in oral health in Australia
- monitoring of Indigenous oral health and the use of dental services
- performing population-based studies focusing on socioeconomic and psychosocial factors related to the use of dental services
- investigating patient-reported outcomes of dental care, such as oral health impact, health utility and quality of life.

Oral Health research groups

- Translational Research in Oral Health Science
- Dental Education Research Group
- Craniofacial Biology Research Group
- Other opportunities
Oral Health research opportunities

Translational Research in Oral Health + Science

University of Adelaide North Terrace Campus

Our research investigates the molecular stress response of microbial pathogens during the transition from health to disease in the host and utilises both continuous culture, biofilm and animal models to study bacterial responses to stress associated with prolonged antimicrobial exposure. More recently our research has focused on the relationship between extra-oral diseases as a result of the migration of oral bacterial to niches not normally associated with colonisation.

Oral diseases such as periodontitis allows oral bacteria to gain entry to the circulatory system where they can potentially migrate and infect other areas of the body. Diseases such as diabetes, cardiovascular disease, arthritis and adverse pregnancy outcomes are only a few of the pathologies linked to oral diseases.

We also investigate the development and removal of multi-species and axenic bacterial biofilms grown on natural substrates using 3D-printed flow cells. In particular we are investigating the effectiveness of D-amino acids in dispersing and inhibiting biofilm development using species of bacteria that contribute to dental caries.

We have been successful in obtaining funding from the Australian Dental Research Foundation.

Lead researchers: Dr Peter Zilm and Dr Tracy Fitzsimmons
Email: peter.zilm@adelaide.edu.au or tracy.fitzsimmons@adelaide.edu.au

Honours project opportunities

> Disruption of multi-species endodontic biofilms using D-amino acids incorporated into polymer encapsulated particles
Led by Dr Peter Zilm.

The goal is to produce an endodontic medicament that contains an antimicrobial agent (calcium hydroxide) and a biofilm breaker (D-amino acids-DAAs) that will, in combination, disrupt and destroy the bacterial biofilm associated with disease. The work is based upon our research that show DAAs dramatically reduce the biofilm growth of Enterococcus faecalis, an organism most prevalent in secondary root canal infections.

Disruption of the biofilm will render bacteria more susceptible to killing by antimicrobial agents and this will be done by incorporating DAAs as biofilm breakers into polymer encapsulated nanoparticles (N-DAAs) into the calcium hydroxide paste. This should provide a sustained release of DAAs over a similar time period consistent with established clinical protocols.

We have published research that shows that E. faecalis promotes biofilm growth as part of the organisms coordinated stress response to sub-MIC levels of the endodontic irritant, sodium hypochlorite. To counteract this, we propose the use of N-DAAs will disrupt biofilm growth and therefore reduce the organisms resistance to treatment, based on our previous in-vitro study.

> The development of ‘intelligent’ particles as a targeted antimicrobial and anti-biofilm delivery system for oral care
Led by Dr Peter Zilm.

Lifestyle and dietary changes can lead to the proliferation of particular pathogenic species which inhabit the mouth and lead to the development of significant oral diseases such as dental caries, periodontal disease and candidiasis. Their impact is significant when considering the effect on the quality of life of individuals and the cost to the community. There is also accumulating evidence showing an association between oral diseases and their impact on general human health.

We aim to provide a solution by developing a new generation of “intelligent” antimicrobial and anti-biofilm particles specifically designed to improving oral health. At the end of this project, we expect to provide a working intelligent anti-biofilm/bacterial mouthwash that could be used for preclinical and clinical trials.

> Is the dysbiosis of the gut microbiome and subsequent inflammation caused by changes in the gut metabolome of pregnant mice with periodontitis?
Led by Dr Peter Zilm.

Research in recent years has shown the gut microbiome to be a key to human health. Our research has shown that the gut microbiome is significantly altered at both the phylum and genus levels following induction of periodontitis by oral inoculation of F. nucleatum and P. gingivalis. Additionally, this modification was associated with a significant change at a physiological level, as detected by significantly increased inflammation of the gastrointestinal tract.

To better understand the link between periodontal disease, gut microbiome and increased inflammation in the GI tract, its pivotal to get a better understanding of the activity of the gut microbiome by identifying the metabolites produced. This will allow us to link changes at the physiological level, like increased inflammation of the gastrointestinal tract with observed in the gut microbiome.

Hypothesis: A dysbiosis in the gut microbiome as a result of F. nucleatum and P. gingivalis induced periodontitis in pregnant mice causes a change in the gut metabolome that maybe detrimental to the health of the mother and fetus.

> The effectiveness of D-amino acids at inhibiting and removing supra-gingival oral biofilms
Led by Dr Peter Zilm.

The goal of the research is to investigate the effectiveness of D-amino acids (DAAs) in dispersing and inhibiting biofilm development using species of bacteria that contribute to dental caries.

DAAs may disperse biofilms of mixed and axenic cultures, as well as inhibit biofilm development. We aim to back up studies that claim DAAs disassemble the extracellular anchors of the biofilm structure by mis-incorporation into the peptide side chain of peptidoglycan, which ultimately breaks down the biofilm structure. We will also investigate if DAAs are toxic to epithelial cells in vitro, as a preliminary test in the safety of their use in the oral cavity.
Our team has published work that shows DAAs have significance in the treatment of Enterococcus faecalis biofilms in the application of root canal treatment, by successfully showing these effects on supra-gingival biofilms using bacteria that contribute to dental caries, in static and flow cell conditions, further studies may see products developed which patients can use in their oral hygiene routine, or as a treatment during dental visits to maintain their oral health.

> Azithromycin modulation of osteoclasts in an induced inflammatory environment in vitro

Led by Dr Tracy Fitzsimmons.

Periodontal disease is initiated by the host immune response to bacterial infection of the subgingival tissue resulting in destruction of the tissues supporting the teeth and thought to result from the immune response and is driven by bacteria and their products. A key feature of chronic periodontal disease is alveolar bone loss resulting from increased formation and activity of osteoclasts, the cells responsible for bone resorption, driven by cytokines present in inflamed periodontal tissues. Currently, the most common non-surgical treatment for periodontal disease is routine scaling and debridement. However, in some cases persistent inflammation and tissue damage remain, therefore, adjunctive therapy may be required and are required to target both the inflammation and bone loss associated with bacterial infection.

Our group is exploring the use of azithromycin (AZM, an antibiotic) in cases where conventional periodontal therapy is inadequate. Azithromycin (AZM) has bacteriostatic and immunomodulatory properties in addition to several advantages over alternative antibiotics. Our previous publications indicate that AZM inhibits cytokine production by gingival fibroblasts exposed to Porphyromonas gingivalis (periodontopathogen) lipopolysaccharide and under normal conditions, AZM inhibits osteoclast differentiation and activity in vitro. Our current aims are to determine if AZM effects osteoclast development and function in an inflammatory environment.

> Benefits of omega-3 fatty acids and their derivatives in periodontitis and rheumatoid arthritis

Led by Dr Tracy Fitzsimmons.

The relationship between periodontitis and rheumatoid arthritis (RA) has been a longstanding research topic within our group. Key features of both diseases include local and systemic inflammatory components and significant bone loss resulting from increased formation and activity of osteoclasts, the cells responsible for bone resorption. RA patients are prescribed a number of medications to reduce pain and swelling of joints but in some cases, severity and disease progression continues. Fish oil is a source of omega-3 polyunsaturated fatty acids (PUFAs) and due to its anti-inflammatory effects is an adjunct treatment. In addition, other components of fish oil may be beneficial as they promote resolution of inflammation. Adjunctive omega-3 PUFAs reduce disease activity in RA patients (published data). Furthermore, our preliminary studies demonstrate a role for pro-resolving lipid mediators in modifying formation and activity of osteoclasts in vitro. Therefore, this project is aimed at increasing our knowledge of the benefits of fish oil and its derivatives in the management of both periodontitis, RA and other chronic disease states such as diabetes and cardiovascular disease, initially on osteoclast formation and activity and establishing if a relationship with inflammatory biomarkers exists.

Higher Degree by Research project opportunities

> Disruption of multi-species endodontic biofilms using D-amino acids incorporated into polymer encapsulated particles

> The development of ‘intelligent’ particles as a targeted antimicrobial and anti-biofilm delivery system for oral care

> Is the dysbiosis of the gut microbiome and subsequent inflammation caused by changes in the gut metabolome of pregnant mice with periodontitis?

> The effectiveness of D-amino acids at inhibiting and removing supra-gingival oral biofilms

> Exploring the relationship between periodontitis, bone loss and rheumatoid arthritis

> Benefits of omega-3 fatty acids and their derivatives in periodontitis and rheumatoid arthritis.

Please see Honours project descriptions for more information.

> The Role of Pathogen Interaction in the Development of Antibiotic Tolerance and Chronic Infections

Led by Dr Peter Zilm.

Antibiotic tolerance is a significant problem contributing to chronic and relapsing infections. Investigating the interplay between bacterial species during these infections opens avenues for more accurate diagnosis and the use of more appropriate treatment methods. Often the bacterial pathogens Pseudomonas aeruginosa and Staphylococcus aureus co-infect; such as surgical site infection, wound infection and respiratory tract infections. Cystic fibrosis lung infections are an excellent example of chronic infections that are notoriously difficult to treat with antibiotics. Their co-existence seems to result in increased morbidity and mortality. Generally, chronic and relapsing infections are frequently associated with bacteria adopting quiescent that are difficult to kill because they avoid detection by the immune system or killing by bactericidal antimicrobials.

We have developed a novel strategy to study the evolution of quiescent states in a continuous culture model. Furthermore, we have a set of clinical isolate pairs of S. aureus and P. aeruginosa from cystic fibrosis patients. We will compare the phenotypes and genotypes of strains isolated from host-relevant long-term continuous culture and those isolated from patients to determine the importance of interaction between these species in chronic lung infection.

Research areas

Oral health
Musculoskeletal health
Pregnancy and birth
Immunology and infection
Translational health outcomes

More information

researchers.adelaide.edu.au/profile/peter.zilm
researchers.adelaide.edu.au/profile/tracy.fitzsimmons
Dental Education Research Group

University of Adelaide North Terrace Campus

Lead researchers: Dr Vicki Skinner, Associate Professor Dimi Lekkas, Associate Professor Tracey Winning, Dr Suzanne Gardner
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Honours project opportunities

> Patient education in the internet age: what are practising clinicians experiences and challenges in using online health information for patient information and education?

This project aims to identify to what extent and how, general and specialist dentists in metropolitan and regional settings use online health information to communicate about oral health with their patients, and what issues or challenges may arise. Dental clinicians experiences of patients who source their own online health information and any challenges this may have presented for communication and patient education will also be investigated. This project will build on findings of a pilot undertaken with five dental clinicians and a related project with medical clinicians (Woodward-Kron et al. 2014). Recent research evidence shows that available health information on the internet presents both benefits and challenges for patients and their health professionals. Currently, only limited survey research focused on only some key issues has been undertaken in dentistry. A range of dental clinicians will be recruited to participate in a qualitative, interview-based investigation. Interview data will be analysed in terms of contexts, purposes, resources, processes, and issues related to using online health information to inform and educate patients. Project outcomes will provide an evidence-base for a subsequent project developing continuing professional development and dental curriculum learning activities to address effective patient education in the internet age.

> Optimising the educational impact of longitudinal evaluations of performance in dental workplace-based settings: experiences and outcomes of feedback discussions.

This project will investigate the experiences and outcomes of final-year dental students feedback discussions with their clinical educators in hospital and community dental clinical practice settings. These discussions are part of longitudinal clinical evaluations students when they provide direct patient care. They aim to support students achieving required patient care standards by students identifying performance gaps and learning goals, and monitoring their performance longitudinally, using clinical educator feedback. However, these outcomes are dependent on students and dental educators perceptions and experiences of the purposes, identities, relationships and experiences of these discussions. Currently, there is only limited evidence of the educational impact of these feedback discussions, particularly in dental workplace-based settings. Final year dental students and their clinical dental educators will be recruited to participate in a qualitative study involving both group and individual interviews. Interviews will focus on students and clinical educators experiences, particularly related to significant or memorable incidents of previous feedback discussions, including how these discussions helped students improve their performance. Data will be analysed thematically involving identification of recurrent patterns and themes. Project outcomes will inform the design of core learning activities for students and clinical educators to optimise the educational impact of feedback discussions.

> Exploring characteristics of oral health students and whether their socio demographic is representative of the general population

Supervised by Dr Suzanne Gardner. Data has been collected from Bachelor of Oral health student cohorts, University of Adelaide, from 2005-2017. Recent studies have reported on career aspirations of this group and intentions for further study. There is much more to explore including the level of dental anxiety and previous dental experiences of the students and how this may impact on their clinical performance.

> Exploring the predictors of high achievement for bachelor of oral health students at the University of Adelaide

Supervised by Dr Suzanne Gardner. Data has been collected from Bachelor of Oral health student cohorts, University of Adelaide, from 2005-2009. The project will be expanded to include the more recent cohorts and note if there are any significant changes since the first study published in 2012. Tracking the performance of Bachelor of Oral Health students over the three years of their degree using demographic, profile data, prior learning, work experience, schooling is important to inform selection, curricula, and marketing of the program.

> Qualitative study of dentists attitudes toward the future of dentistry in Australia

Supervised by Dr Suzanne Gardner. A nationwide survey was conducted in 2013 and included a random sample of Australian practicing dentists. The purpose of the study was to explore the characteristics of the small proportion of dentists who orientated their practice towards disadvantaged groups. The survey included an open ended question which invited comment. The Honours project would be conducting a thematic analyses of this information to identify any significant recurring themes, impressions, or opinions of the respondents.

Higher Degree by Research project opportunities

Other HDR projects may be available with this group, please contact the lead researcher(s) for more information.

> Job satisfaction of oral health practitioners and whether job satisfaction is linked to scope of practice as the terms of employment

Supervised by Dr Suzanne Gardner. Specific studies on job satisfaction have been conducted amongst Australian dentists therefore it is timely to compare whether findings are similar for oral health therapists.

> Association between perceived workplace choices in early years of the Bachelor of Oral Health program and actual work placements after graduation

Supervised by Dr Suzanne Gardner. How closely do these aspirations align? The findings would be important for recruitment, workplace retention, and career promotion.
How strong is the competitive nature of private practice for early graduates?
Supervised by Dr Suzanne Gardner. A HDR project could include a qualitative study of graduates employed in private practice for the first 1-5 years after graduating. The study would look at the degree to which the competitiveness may have on health, job satisfaction, remuneration for example of the dentists in their early years in practice.

Research areas
Oral health
Neuroscience, behaviour and brain health
Indigenous and disadvantaged health

Craniofacial Biology Research Group
University of Adelaide North Terrace Campus; Adelaide Health and Medical Sciences building (AHMS)

Associate Professor Toby Hughes’ primary research interest is identifying genes associated with dental development and oral health. Other interests include genotype x genotype interactions associated with oral micro-flora, functional genomics of oral development, and epigenetic modulation of gene expression.

He is currently involved in a number of research projects with common underlying themes. One is modelling family data to establish the relative contributions of genes and environment to observed variation in features such as tooth size and spacing, cusp spacing, 3D surface morphology, arch shape, and occlusion. He has developed longitudinal models to identify common and unique genetic factors associated with the primary, mixed and permanent dentitions.

Another project is examining two closely related developmental events in Australian newborn twins—timing of emergence of the primary teeth and timing of colonisation of the oral cavity by Mutans streptococci, a primary agent in dental decay. Evidence suggests the prevalence of delayed tooth emergence is increasing in developed populations, presenting a smaller window of opportunity for colonisation and reducing the incidence of decay in primary teeth.

Both projects establish a baseline to develop models incorporating molecular data arising from the human genome project. We are planning to conduct genetic linkage and association analyses on data arising from both studies, to identify specific genes that contribute significantly to orofacial growth and development, and to oral health.

Lead researcher: Associate Professor Toby Hughes
Email: toby.hughes@adelaide.edu.au

Honours project opportunities

> Epigenetics
Our group is interested in examining the role of DNA methylation in regulating dental development (missing and extra teeth; tooth size; dental anomalies) and disease risk (dental caries; systemic inflammatory conditions). Projects in this domain would suit students interested in genetics and epigenetics, with a particular interest in developing skills in bioinformatics and analysis/interpretation of whole-genome chip and sequencing-based approaches.

> The oral microbiome
We have a large ongoing collaboration with researchers in the US, Sydney and Melbourne examining the transmission, acquisition, proliferation and stabilisation of the oral microbiome, as well as examining its role in health and disease, both orally and systemically. Projects in this domain would suit a student interested in microbiology, with a particular interest in developing skills in bioinformatics and metagenomic sequencing.

> Craniofacial biology
Our group has a long track-record in collecting longitudinal growth records from large-scale national cohort studies, with an emphasis on craniofacial growth and development. Projects in this domain would suit a student interested in using novel methodologies (2D and 3D surface topography mapping; micro CT; geometric morphometrics) to describe normal human variation and disease states, with a particular interest in developing skills in biostatistics.
Quantitative genetics
Our group has extensive phenotypic and genealogical records from many populations nationally and internationally, with a particular focus on longitudinal data from indigenous and twin cohorts in Australia. Projects in this domain would suit students interested in population/quantitative genetics, with a particular interest in developing skills in population genetics and associated analyses. The focus will be to parse out the relative influences of the genotype, and the shared and non-shared environments of individuals, on a range of craniofacial and whole-body phenotypes.

Higher Degree by Research project opportunities
- Epigenetics
- The oral microbiome
- Craniofacial biology
- Quantitative genetics
Please see Honours project descriptions for more information.

Research areas
Oral health
Early origins of health
Child and adolescent health
Translational health outcomes

More information
researchers.adelaide.edu.au/profile/toby.hughes

Other opportunities
Higher Degree by Research or Honours project opportunities not listed here may be available with the following groups. Please contact the lead researcher(s) for more information:
- Australian Research Centre for Population Oral Health
  Led by Professor Marco Peres
  Email: marco.peres@adelaide.edu.au
- Forensic odontology
  Led by Dr Denice Higgins
  Email: denice.higgins@adelaide.edu.au
- Tooth wear and dental materials
  Led by Associate Professor John Kaidonis or Dr Sarbin Ranjitkar
  Email: john.kaidonis@adelaide.edu.au or sarbin.ranjitkar@adelaide.edu.au
- Craniofacial Research Unit
  Led by Professor Peter Anderson
- Orthodontics
  Led by Professor Craig Dreyer
  Email: craig.dreyer@adelaide.edu.au
- Endodontics
  Led by Associate Professor Giampiero Rossi-Fedele
  Email: giampiero.rossi-fedele@adelaide.edu.au
- Prosthodontics
  Led by Associate Professor James Dudley
  Email: james.dudley@adelaide.edu.au
- Paedodontics
  Led by Professor Sam Gue
Musculoskeletal Health
Good musculoskeletal health is important at every stage of life and plays a vital role in keeping us on our feet. More than six million Australians (approximately 14% of the population) suffer from some kind of musculoskeletal condition, such as back pain, arthritis, osteoporosis and fractures.

Musculoskeletal health is a multidisciplinary area of research involving connective tissue biology (including bone, cartilage and muscle), diseases of connective tissue (including arthritis and osteoporosis), biomechanics and surgical/clinical interventions to treat traumatic bone injury and other conditions.

Researchers across the faculty are focused on:
- understating the cellular and molecular basis of normal and pathological bone turnover
- how to best repair fractures after traumatic injury with novel surgical approaches and post-operative management
- how to optimise the outcomes of joint replacement surgery in order to provide better and longer lasting outcomes for patients
- performing gait analysis and activity monitoring to evaluate the success of interventions across all musculoskeletal conditions
- developing better ways to manage spinal cord injury patients to improve their outcomes
- identifying links between bone cells and the molecules they produce and bone health.
Musculoskeletal Health research opportunities

Mesenchymal Stem Cell Laboratory
South Australian Health and Medical Research Institute (SAHMRI)

The focus of the Mesenchymal Stem Cell Laboratory is to investigate the origin and biological properties of different postnatal mesenchymal stem cell (MSC) populations that give rise to supportive connective tissues such as myelosupportive stroma, adipose tissue, smooth muscle, cardiac muscle, bone, cartilage, ligament, cementum and dentin. Our work seeks to identify critical genes and epigenetic factors that regulate MSC self-renewal, proliferation and differentiation. In addition, research efforts have focused on identifying the factors central to MSC mediated regulation of haematopoiesis, angiogenesis and immune cell modulation. Importantly, many of these molecular processes are considered underlying causes of chronic diseases and tumour cell development.

Together with Professor Andrew Zannettino and our commercial partner, Mesoblast Ltd, our basic research activities have progressed into Phase II/III human clinical trials for orthopaedic, cardiovascular, cancer and immune based indications. Our continuing research into the basic properties of MSC will help develop more effective and safer stem cell based therapeutic options in the future for a wide variety of clinical diseases and conditions.

Lead researcher: Professor Stan Gronthos
Email: stan.gronthos@adelaide.edu.au

Honours project opportunities
- Identification of Twist-1 regulated microRNAs, which control cranial bone development in children
- Investigation of the importance of Eph/ephrinB1 in bone and cartilage development
- Investigating the role of Eph/ephrin interactions during tooth formation
- Identifying epigenetic enzymes involved in aging of bone marrow derived mesenchymal stem cells

Higher Degree by Research project opportunities
- Twist-1 regulation of mesenchymal stem cell osteogenic differentiation through suppression of the tyrosine kinase receptor, c-ros-oncogene 1 kinase
- The role of Eph/ephrin signalling during osteoblast maturation/ function and communication with osteoclasts during skeletal repair
- Determining the function and therapeutic potential of the histone demethylase KDM6A in craniosynostosis
- Examining the role of the DNA hydroxymethylase family, Tet, in skeletal development and Osteoporosis

Research areas
Musculoskeletal health
Oral health
Cancer biology and clinical oncology

More information
researchers.adelaide.edu.au/profile/stan.gronthos or sahMRI.com/our-research/themes/cancer/groups/mesenchymal-stem-cell-research-group

Musculoskeletal stem cells
Imaging pain in rheumatoid arthritis

Rheumatoid arthritis is a chronic systemic destructive inflammatory disorder characterised by joint inflammation, synovial hyperplasia and associated destruction of bone and cartilage impacting on joint function. The pain associated with this joint destruction is one of the most debilitating symptoms reported by RA patients. There is a recognised decrease in the threshold of the sensory nervous system’s response to certain harmful or potentially harmful stimuli (hypernociception) that also impacts on joint function.

Nociceptor sensitisation is considered to be a co-morbidity of RA and it may also be a significant problem when there is minimal disease activity or sustained remission. This study investigates the mechanism of hypernociception with concurrent joint destruction in a murine model of inflammatory arthritis. Further, we will assess the inhibition of a signalling pathway known to be involved in bone resorbing cells, inflammatory cells and hypernociception by a commercially available natural compound (Parthenolide).

Analysis will include: Micro-CT: bone volume and soft tissue swelling; Immunohistochemistry/histopathology: HE and TRAP staining of paws; markers of activation in the brain and spinal cord.

Centre for Orthopaedic and Trauma Research/Adelaide Spinal Research Group

The Centre for Orthopaedic and Trauma Research (COTR) was formed in 2012 and its members include orthopaedic surgeons, clinical researchers and biomedical scientists. This diverse combination of researcher expertise enables the scientific study of highly clinically relevant topics pertaining to the human musculoskeletal system. The research aims to better understand bone and joint diseases and conditions, including arthritis and joint replacement, pathological bone loss, infection, spinal conditions and fracture.

Adelaide Spinal Research Group comprises clinicians, engineers and scientists engaged in a multidisciplinary program of clinical, biomechanics and basic science research related to the normal, diseased, and injured spine and spinal cord. The broad aim of our research is to improve understanding of how the spine functions and is injured, and to devise and test methods to prevent injuries and repair

Lead researcher: Dr Julia Kuliwaba
Email: julia.kuliwaba@adelaide.edu.au

Honours project opportunities

Honours projects may be available with this group, please contact the lead researcher(s) for more information.

Higher Degree by Research project opportunities

TGF-beta as a critical factor in human osteoarthritis

The aetiology of the painful degenerative joint disease osteoarthritis (OA) has so far been elusive, blocking the development of disease modifying treatments. Exciting recent research in mice has found that TGF-beta over-expression in the subchondral bone (beneath the cartilage) has a critical causal role in OA pathogenesis. The OA bone changes seen in mice closely resemble what we find in human OA bone in zones that display the most severe changes, which correspond to bone marrow lesions identified by magnetic resonance imaging (MRI). This HDR project will explore the link between TGF-beta expression with structural, cellular and molecular changes in human subchondral bone marrow lesions. Honours projects are also available for this research topic.

Modic changes in the human lumbar spine: Is there a role for bacterial infection?

Modic changes identified by magnetic resonance imaging (MRI) are associated with intervertebral disc degeneration and low back pain. The underlying cause(s) of the appearance and progression of Modic type changes in the human lumbar spine remain elusive. This HDR project will investigate the aetiology of MRI-identified Modic type changes in the human lumbar spine. Honours projects are also available for this research topic.
Spinal Research Group
Royal Adelaide Hospital; Adelaide Health and Medical Sciences building (AHMS)

The Centre for Orthopaedic and Trauma Research (COTR) was formed in 2012 and its members include orthopaedic surgeons, clinical researchers and biomedical scientists. This diverse combination of researcher expertise enables the scientific study of highly clinically relevant topics pertaining to the human musculoskeletal system. The research aims to better understand bone and joint diseases and conditions, including arthritis and joint replacement, pathological bone loss, infection, spinal conditions and fracture.

Adelaide Spinal Research Group comprises clinicians, engineers and scientists engaged in a multidisciplinary program of clinical, biomechanics and basic science research related to the normal, diseased, and injured spine and spinal cord. The broad aim of our research is to improve understanding of how the spine functions and is injured, and to devise and test methods to prevent injuries and repair.

Lead researchers: Dr Claire Jones and Professor Brian Freeman
Email: claire.jones@adelaide.edu.au

Honours project opportunities

> Investigating the acute response of the spinal cord and cerebrospinal fluid to trauma, in a pre-clinical model

This project is seeking to develop, characterise and use a pre-clinical (large animal) model of spinal cord injury. The model will have specific utility to obtain serial measurements of pressure within the intrathecal space, as well as intra-operative (ultrasound) and serial measurements (MRI) measurements of spinal cord morphology, oedema and haemorrhage, and cerebrospinal fluid (CSF) flow. The ultimate aim of the research program is to investigate the effect of novel surgical interventions on these parameters, as well as on the functional recovery of the animals, and on histological markers of spinal cord damage. Students will work within a dynamic multidisciplinary team of scientists, engineers and clinicians, and will be exposed to a wide variety of novel experimental techniques. Investigators associated with this study include: Dr Claire Jones, Dr Anna Leonard, and Professor Brian Freeman—members of the Spinal Research Group in the Centre for Orthopaedics and Trauma Research.

> Investigating injury mechanisms and treatment pathways for cervical spine facet dislocation and fracture

This project seeks to understand the mechanisms by which facet dislocation and fracture occur in the cervical spine, and the patterns of clinical management and patient outcomes following such injuries. The study involves review, collation and analysis of clinical data, and data from US automotive injury databases, and may include cadaveric biomechanical modelling. This project is suited to students with an interest in musculoskeletal injury and orthopaedics. Students will work within a dynamic multidisciplinary team of scientists, engineers and clinicians. Investigators associated with this study include Dr Claire Jones and Professor Brian Freeman—members of the Spinal Research Group in the Centre for Orthopaedics and Trauma Research.

> Changes in the rotator cuff tendon microstructure and mechanical response with maturation

The aim of this project is to map the changes in microstructure and mechanical response of the sheep rotator cuff tendon during early maturation, with the goal of providing evidence for selection of age-appropriate animal specimens for human modelling. Animal models are frequently used to evaluate new and emerging surgical technique for rotator cuff repair; however, very little data is available to validate these models. This study is led by Dr Claire Jones, member of the Centre for Orthopaedics and Trauma Research.

Higher Degree by Research project opportunities

> Investigating the acute response of the spinal cord and cerebrospinal fluid to trauma, in a pre-clinical model

This project seeks to develop, characterise and use a pre-clinical (large animal) model of spinal cord injury. The model will have specific utility to obtain serial measurements of pressure within the intrathecal space, as well as intra-operative (ultrasound) and serial measurements (MRI) measurements of spinal cord morphology, oedema and haemorrhage, and cerebrospinal fluid (CSF) flow. The ultimate aim of the research program is to investigate the effect of novel surgical interventions on these parameters, as well as on the functional recovery of the animals, and on histological markers of spinal cord damage. Students will work within a dynamic multidisciplinary team of scientists, engineers and clinicians, and will be exposed to a wide variety of novel experimental techniques. Investigators associated with this study include: Dr Anna Leonard, Dr Claire Jones, and Professor Brian Freeman, members of the Spinal Research Group in the Centre for Orthopaedics and Trauma Research and the Translational Neuropathology Laboratory.

> Investigating injury mechanisms and treatment pathways for cervical spine facet dislocation and fracture

This project seeks to understand the mechanisms by which facet dislocation and fracture occur in the cervical spine, and the patterns of clinical management and patient outcomes following such injuries. The study involves review, collation and analysis of clinical data, and data from US automotive injury databases, and may include cadaveric biomechanical modelling. This project is suited to students with an interest in musculoskeletal injury and orthopaedics. Students will work within a dynamic multidisciplinary team of scientists, engineers and clinicians. Investigators associated with this study include Dr Claire Jones and Professor Brian Freeman—members of the Spinal Research Group in the Centre for Orthopaedics and Trauma Research.
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Joint Replacement Research Unit
Royal Adelaide Hospital

The Centre for Orthopaedic and Trauma Research (COTR) was formed in 2012 and its members include orthopaedic surgeons, clinical researchers and biomedical scientists. This diverse combination of researcher expertise enables the scientific study of highly clinically relevant topics pertaining to the human musculoskeletal system. The research aims to better understand bone and joint diseases and conditions, including arthritis and joint replacement, pathological bone loss, infection, spinal conditions and fracture.

The Joint Replacement and Reconstruction Research Unit conducts research into a broad range of areas related to primary and complex revision hip and knee replacement as well as joint reconstruction for congenital joint disorders. The research opportunities include epidemiology using a joint replacement registry, clinical studies, basic bone biology and pathology, diagnostics, anatomy and surgical techniques, gait analysis and biomechanical testing.

Lead researcher: Professor Donald Howie
Email: donald.howie@adelaide.edu.au

Honours project opportunities

Optimising surgical techniques for joint replacement and reconstruction

Using cadaver specimens under the supervision of orthopedic surgeons, the surgical technique used at revision total hip replacement will be improved to reduce the amount of soft tissue damage.

Higher Degree by Research project opportunities

Identifying risk factors for complications after joint replacement surgery

This project uses our 30-year hip and knee replacement outcomes registry to investigate factors that influence longevity of the prosthesis.

Research areas
Musculoskeletal health
Surgical and health systems innovation

More information
researchers.adelaide.edu.au/profile/claire.jones
Orthopaedic Trauma Research
Royal Adelaide Hospital; Adelaide Health and Medical Sciences building (AHMS)

The Centre for Orthopaedic and Trauma Research (COTR) was formed in 2012 and its members include orthopaedic surgeons, clinical researchers and biomedical scientists. This diverse combination of researcher expertise enables the scientific study of highly clinically relevant topics pertaining to the human musculoskeletal system. The research aims to better understand bone and joint diseases and conditions, including arthritis and joint replacement, pathological bone loss, infection, spinal conditions and fracture.

This research examines all aspects of total joint replacement, focusing on hip and knee TJR. It has a longstanding interest in outcomes, having established a 30-year database of all TJR by the group over that time. These more subjective outcome measures are being complemented more recently by objective measures, especially gait analysis and activity monitoring. The group performed pioneering work to identify the causes for prosthesis failure, in particular failure due to loss of bone adjacent to the prosthesis. This work, at the tissue, cell and biomaterials levels, has been world leading in understanding this process and in establishing better monitoring, better imaging, improved prosthesis materials and better surgery.

Lead researcher: Professor Bogdan Solomon
Email: bogdan.solomon@sa.gov.au

Honours project opportunities

Optimising the care process, the management and outcomes of hip fractures in the elderly patient using a comprehensive hip fracture registry

Higher Degree by Research project opportunities

Through orthopaedic trauma research, we aim for optimal management of musculoskeletal injury. We have a multifaceted research program, supported by a long-term prospective clinical database, covering bone biology, advanced imaging, biomechanics, anatomy, pathology, clinical trials and epidemiology. Specimens taken from trauma cases at the new Royal Adelaide Hospital will be analysed for biological markers that may predict poor surgical outcome.

Research areas
Musculoskeletal health
Surgical and health systems innovation

More information
adelaide.edu.au/directory/bogdan.solomon

Bone and Joint Research — Pathology
University of Adelaide North Terrace Campus

Our group investigates ways of manipulating bone metabolism to treat bone pathologies based on our understanding of the mechanisms of bone loss in rheumatoid arthritis, periodontal disease and orthopaedic implant related bone loss. We have developed animal models to all these diseases and in vitro assays to investigate the mechanisms in detail. Human mesenchymal stem cells, osteoblasts, osteocytes and osteoclasts are routinely used. We also have access to an array of unique drugs (e.g. epigenetic regulators of cells) and novel biomaterials.

Lead researcher: Professor David Haynes
Email: david.haynes@adelaide.edu.au

Honours project opportunities

Epigenetic regulation of bone pathologies
Histone deacetylation (HDAC) is a very important way we modify gene expression that does not involve changes in nucleotide sequences. Modulation of these enzymes using HDAC inhibitors (HDACi) is emerging as an effective treatment for a wide variety of diseases including neurodegeneration, asthma, rheumatoid arthritis and viral infections.

Recently, we were the first to demonstrate that HDACi could suppress bone loss in periodontitis (PD) using an animal model of PD. As part of our recently funded NHMRC grant, we have highlighted the importance of HDACs in the pathogenesis of PD and raised the possibility that inhibition of specific HDACs may suppress both inflammation and bone loss. This project aims to extend the current work that largely focusing on catabolic bone pathology in PD to investigate the regulation of HDAC in bone healing by bone cells.

Epigenetic regulation of Mesenchymal stem cells
Histone deacetylation (HDAC) is a very important way we modify gene expression that does not involve changes in nucleotide sequences. Modulation of these enzymes using HDAC inhibitors (HDACi) is emerging as an effective treatment for a wide variety of diseases including neurodegeneration, asthma, rheumatoid arthritis and viral infections. Our recent studies indicate that epigenetic regulation through modulating HDAC can modulate the development of stem cells. Inhibition of specific HDAC can promote the development of cell proliferation and stem cell development into bone forming cells. As part of our recently funded NHMRC grant we have highlighted the importance of HDACs in regulating stem cells that may promote bone healing in disease.

Higher Degree by Research project opportunities

Epigenetic regulation of Mesenchymal stem cells
Please see Honours project description for more information.

Research areas
Musculoskeletal health
Ageing, frailty and mobility
Oral health
Adelaide Paediatric Forensic Anthropology Research Group
University of Adelaide North Terrace Campus

Lead researcher: Dr Nicolene Lottering
Email: nicolene.lottering@adelaide.edu.au

Honours projects

- Establishing normative MSCT standards for craniometric analyses of modern Australian children for early detection of craniofacial abnormalities

The primary aim of this study is to construct modern Australian-specific standards using craniometric variables from head/neck computed tomography data of modern Australian children aged 3-10 years old. Specific skills in manual segmentation and 3D modelling of thin-slice data; trouble-shooting automated measurement protocols; and basics in non-linear statistics will be attained. In collaboration with the Australian Craniofacial Unit, this data will be used as a precursor for early detection of basal cranial growth anomalies linked to sphenoid-occipital synostosis in South Australian Children.

- Changing epidemiology of nonsyndromic metopic craniosynostosis in Australian infants

Craniosynostosis is characterised by untimely fusion of cranial sutures resulting in a variety of craniofacial deformities and neurological sequelae due to alteration in cranial volume and restriction of brain growth. This study aims to determine the incidence of metopic craniosynostosis in South Australian and Queensland children, using retrospective clinical MSCT data obtained from the Australian Craniofacial Unit and Lady Cilento Childrens Hospital. Risk factors, functional aspects and craniometric considerations correlated with synostosis will be explored using meta-data analyses, bayesian statistics and 3D CAD modelling.

Higher Degree by Research project opportunities

- Development of new age estimation standards for improved human identification of Australian children

This project aims to develop Australian-specific ossification standards for age estimation; recalibrating the age of onset and complete epiphyseal fusion of the long bones in modern Australian children aged 5-20 years using 3D computed tomography scans. In conjunction with the Department of Medical Imaging and Nuclear Medicine at the Lady Cilento Children’s Hospital, Brisbane, you will obtain specific skills in medical imaging database management, image segmentation and 3D modelling of thin-slice data.

- Temporal characterisation of ossification of the Os Coxa in modern Australian children: developing a multi-variable approach for accurate age estimation in forensic contexts

Using retrospective, thin-slice MSCT clinical data, this study aims to document the timing of the appearance and fusion of ossification centres of the bony pelvis in a sample of contemporary Australian male and female juvenile individuals. The primary outcome of this investigation strives to construct Australian-specific age standards to facilitate age-estimation and reduce the subjective error in the development of biological profiles for unidentified juvenile remains. In addition, this study will utilise morphometric modelling and reverse engineering software capabilities in the assessment of paediatric skeletal age from the analysis of skeletal growth, to assist in the development of a novel, robust and quantitative multi-variable scoring system for juvenile age-estimation. Advanced bio-statistics skills will be acquired through a statistical collaboration/supervision with Griffith University.

Research areas

Musculoskeletal health
Child and adolescent health
Surgical and health systems innovation

More information
adelaide1.academia.edu/NicoleneLottering
Neuromusculoskeletal Gait Laboratory
Adelaide Health and Medical Sciences building (AHMS)

Dr Dominic Thewlis works in the field of biomechanics, the application of mechanics to understand biological phenomena. He specifically works in orthopaedic (bones, muscles, tendons and ligaments) biomechanics. He is an NHMRC R.D Wright Fellow (2017-2021) and is recognised as an emerging leader in the field with awards from the International Society of Biomechanics, International Foot and Ankle Biomechanics community, Australian and New Zealand Orthopaedic Research Society, and the ORS (USA). He is the current President of the Australian and New Zealand Orthopaedic Research Society, and editorial board member for the Journal of Biomechanics and Gait and Posture.

He has made significant contributions in to our understanding of how mechanical loading can influence the outcome of complex orthopaedic surgeries (e.g. fracture repair, knee replacement and hip replacement) using a novel combination of experimental and computational methods to model the human musculoskeletal system. He has also used these techniques to gain new insight into the progression of some musculoskeletal diseases.

Lead researcher: Associate Professor Dominic Thewlis
Email: dominic.thewlis@adelaide.edu.au

Honours project opportunities

> Developing and evaluating a workflow for 24-hour activity monitoring in orthopaedic outpatients

Functional outcomes are of paramount importance in orthopaedic medicine. Patient-reported outcome measures fail to capture the fine details of physical activity patterns and activity limitations experienced by patients following orthopaedic surgery. However, simple wrist-worn accelerometers, which can be worn 24/7, can provide a wealth of data on movement patterns, activity levels and sleep quality with very little burden on the patients. Wrist-worn accelerometers have been used extensively in physical activity interventions, but we want to use these devices to monitor patient activity, feedback activity levels to patients and feedback activity levels to clinicians. This proof-of-principle study will develop and test a workflow for the implementation of 24-hour activity monitoring in the Department of Orthopaedics and Trauma.

> Patient-specific musculoskeletal models for complex pathology of the hip

It is possible to calculate the forces acting through a joint using an approach known as musculoskeletal modelling. This approach uses a combination of measured movement patterns and measured forces to simulate the forces generated by the muscles and eventually the forces acting the joints of the body. However, these models are based on skeletal geometry from one person and more often than not fail to come close to matching the person of interest. This is especially evident when working with injury or pathology. This project will use the example of acetabular dysplasia and develop and evaluate a workflow for generating patient-specific musculoskeletal models from medical imaging data versus generic models. The project will use an extensive atlas of geometry, hosted by the University of Auckland, combined with statistical techniques to morph known geometry to a best-match in as time effective manner as possible.

Higher Degree by Research project opportunities

> A compendium of joint loading during activities of daily living

There are two main mechanical factors that are essential when attempting to understand the demands placed on a replaced joint: (1) the magnitude of the force passing through the joint; and (2) the frequency of a given force passing through the joint. Whilst we can calculate the magnitude of load in laboratory conditions, this only gives partial insight into the mechanical environment the joint is subject to. We can quantify the frequency of different movement patterns in the real world using wrist-worn accelerometers, but these fail to provide a direct measure of the load passing through the joint. This project will establish a compendium of joint loading for different activity types so that we can relate the frequency of a given movement in the real world to an approximation of the load passing through the joint. In some instances the information on the forces will be available from the literature, however, in others it will be necessary to measure this in our laboratory.

Research areas
Musculoskeletal health
Musculoskeletal Health research opportunities

The Health Observatory/ Population Research and Outcome Studies

Basil Hetzel Institute for Translational Health Research, The Queen Elizabeth Hospital, Woodville; Adelaide Health and Medical Sciences building (AHMS); South Australian Health and Medical Research Institute (SAHMRI)

Population Research and Outcome Studies (PROS) provides information on health status, related risk factors, behaviours, determinants and satisfaction with health services among the South Australian population.

PROS provides high quality population health information to contribute to the improvement of health and wellbeing outcomes of the South Australian population. The core business of PROS is the monitoring and surveillance of population health and chronic disease epidemiology.

Epidemiology, the primary science of public health, is concerned with the monitoring and surveillance of the distribution and determinants of health and disease in human populations. Information obtained from population health surveys is used to inform policy, programs and health services that will promote the health and wellbeing of the South Australian population.

Lead researcher: Professor Catherine Hill and Dr Tiffany Gill
Email: tiffany.gill@adelaide.edu.au

Honours project opportunities

> Back pain in the community
This project utilises data from the North West Adelaide Health Study, a cohort study in the north western suburbs of Adelaide. Data has been collected over a 15 year period, with data relating to back pain available over the past 10 years. Also available are covariates such as other chronic diseases, risk factors, quality of life, Medical Benefits Scheme, Pharmaceutical Benefits Scheme, biomedical and linkages to hospital admissions/emergency and outpatient data. Originally, over 4000 participants were recruited to the study and in 2015, over 1500 took part in a postal survey. Back pain is a significant problem in the Australian population which impacts on quality of life and the ability to undertake work and leisure activities. The cost to the health system is significant and is predict to increase over the coming years. Understanding the problem and then the implementation of strategies to address the issue are of paramount importance. By using the data and examining those who 1) have back pain; 2) develop back pain over the period of the study; and 3) don’t develop back pain; we can understand the condition more fully and develop strategies to reduce the problem in the community.

> Hand pain in the community
This project utilises data from the North West Adelaide Health Study, a cohort study in the north western suburbs of Adelaide. Data has been collected over a 15 year period, with data relating to hand pain available over the past 10 years. Also available are covariates such as other chronic diseases, risk factors, quality of life, Medical Benefits Scheme, Pharmaceutical Benefits Scheme, biomedical and linkages to hospital admissions/ emergency and outpatient data. Originally, over 4000 participants were recruited to the study and in 2015, over 1500 took part in a postal survey. Hand pain impacts on quality of life and the ability to undertake work and leisure activities. The cost to the health system is unknown. Understanding the problem and then the implementation of strategies to address the issue are of paramount importance. By using the data and examining those who 1) have hand pain; 2) develop hand pain over the period of the study; and 3) don’t develop hand pain; we can understand the condition more fully and develop strategies to reduce the problem in the community.

Higher Degree by Research project opportunities

> Back pain in the community
Please see Honors project description for more information.

> Hand pain in the community
Please see Honors project description for more information.

Research areas
Musculoskeletal health

More information
researchers.adelaide.edu.au/profile/tiffany.gill
Women’s and Children’s Hospital
Orthopaedic Department Clinical
Research Group

Women’s and Children’s Hospital

The Research Team at the Department of Orthopaedic Surgery, Women’s and Children’s Hospital (WCH) comprises orthopaedic surgeons, doctors-in-training, medical and research/higher degree students. It is supported by a Clinical Research Manager, Research Scientist and Research Assistant.

The Department has a long track record of internationally recognised research activity and publications including basic science and clinical research investigating a range of paediatric musculoskeletal conditions. Current areas of interest for the Research Team at the WCH Department of Orthopaedics include mechanisms of bone growth and repair, paediatric musculoskeletal infections, the management of congenital and developmental musculoskeletal deformities such as scoliosis and lower limb deformity and paediatric trauma.

Clinical Research aims to provide the benchmarks for clinical audit and quality management issues to be undertaken in a structured manner. The Department of Orthopaedic Surgery has a high clinical workload, which enhances the opportunities for organised clinical orthopaedic research.

Lead researchers: Associate Professor Peter Cundy and Dr Nicole Williams
Email: nicole.williams01@adelaide.edu.au

Honours project opportunities

- Outcomes in paediatric septic arthritis: a long term cohort study
- Optimising management and outcomes in paediatric spinal surgery
- Optimising detection and management of developmental dysplasia of the hip in South Australia
- Streamlining a pathway for paediatric fracture management

Higher Degree by Research project opportunities

- Rate of total hip replacement surgery in patients with a previous condition affecting the hip in childhood
  This is a linkage study using the Australian Orthopaedic Association National Joint Replacement Registry.
- Optimising detection and management of developmental dysplasia of the hip in South Australia
- Optimising management and outcomes in paediatric spinal surgery
- Optimising management and outcome in paediatric musculoskeletal infections

Research areas
Musculoskeletal health
Child and adolescent health
Immunology and Infection
Our immune system is at the front line for controlling infection from foreign pathogens, including bacteria and viruses. A healthy, functioning immune system is fundamental to our overall health and wellbeing.

Our research is focused on understanding how our body’s elaborate, innate and adaptive immune systems can distinguish foreign pathogens from self-tissue. Malfunction of the immune system can result in the development of autoimmune disorders including type 1 diabetes, inflammatory bowel disease, multiple sclerosis, psoriasis and rheumatoid arthritis. Furthermore, inappropriate immune responses are also implicated in central nervous system diseases such as anxiety, depression, epilepsy and stroke and have been proposed to play a role in addictions and pain. Understanding immune responses, and how to control and modulate them is crucial to the successful treatment of patients requiring life-saving transplantation therapies. It is also critical for the development of safe and effective vaccines, which enable significant improvements worldwide in the health status of many communities.

Researchers across the faculty are focused on:

- developing new vaccines
- identifying novel targets in autoimmune diseases such as rheumatoid arthritis
- understanding the role of immune cells in neural tissue (glial cells) in normal healthy brains to elucidate their role in chronic pain, drug addiction and epilepsy and identifying new targets to treat these conditions
- developing immune interventions to prevent or modulate pathologies of pregnancy and graft rejection (in transplantation settings)
- conducting clinical trials to evaluate tolerability, safety and effectiveness of new agents to control infections in patients suffering chronic infections.
Immunology and Infection research opportunities

Chronic Inflammatory Lung Disease Laboratory
Royal Adelaide Hospital; Adelaide Health and Medical Sciences building (AHMS)

We are a multidisciplinary, internationally recognised research team. Clinically-based investigations in chronic lung diseases (CLD) including chronic obstructive pulmonary disease (COPD), severe asthma and childhood bronchiectasis include:

- Airway macrophage-targeted therapies: e.g., novel non-microbial antibiotics to overcome the problem of microbial resistance
- Understanding and overcoming steroid resistance
- Autophagy and its relationship with lung biometals: eg, Zinc in CLD and in diseased blood vessels
- Investigation of the CD1b lipid antigen presentation pathway as a contributor to the autoimmunise response in COPD
- E-cigarettes: effects on airway inflammation, function and emphysema development
- Potentially pathogenic bacteria that commonly colonise the airway in CLD: effects on airway macrophage dysfunction and inflammation
- Bacterial bronchitis and bronchiectasis in Indigenous children

Lead researcher: Sandra Hodge
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Honours project opportunities

> Steroid resistant cytotoxic/pro-inflammatory lymphocytes in the lung

Glucocorticosteroids are commonly used in management of chronic lung disease; however, steroid resistance is a major challenge and the reason for the steroid resistance is both poorly understood and a major limiting factor in treatment. We have identified changes in several mediators (glucocorticoid receptor, nuclear enzyme HDAC2 and cell membrane transport proteins including P-glycoprotein) in blood and airway lymphocytes in COPD patients and severe asthmatics, and have targeted these mediators with low doses of currently available pharmaceutical drugs (used to treat other diseases) to render these lymphocytes sensitive to glucocorticosteroids. We don’t know whether these steroid resistant lymphocytes invade the lung. We will collect lung tissue from COPD patients, extract lymphocytes and use flow cytometry and cell-stimulation to identify steroid resistant lymphocytes in the lung parenchyma. Likely methods include flow cytometry, westerns, immunohistochemistry.

> Assessing the effects of e-cigarette mods on inflammation and macrophage function

Despite what their marketing campaigns say, whether e-cigarettes are safe and assist smoking cessation remains in doubt. Up to 24% of Australian 18-24 year olds have tried using e-cigarettes, with 27% of those vaping daily. Our published data shows that even non-nicotine containing E-liquids are damaging airway cells in a similar fashion to cigarette smoke, alters cell cytokine release, and affects macrophage phagocytic function. However, these studies were performed in a generation 2 e-cigarette. Data shows that those who switch from cigarettes to e-cigarettes prefer the third generation or tank/mod devices which have the ability to alter the temperature and voltage.

We hypothesise that hotter temperatures and higher voltages may increase the toxicity of e-cigarette vapour on lung cells. This project will:

1. Test cell death and apoptosis in airway cells and macrophages
2. Test whether phagocytosis of bacteria and apoptotic airway cells by macrophages is decreased
3. Assess whether higher temperatures release metals from the heating coils

Likely research methods include cell culture, kit based assays, ELISA, Flow cytometry, immunohistochemistry, ICP-MS and westerns. This project requires someone with a strong disposition given pushback from lobbying groups.

> Sphingosine kinases (SPHK): novel therapeutic targets in COPD and lung cancer

COPD is a leading cause of death worldwide, and there are currently no effective therapies. We showed defective clearance of apoptotic cells by airway macrophages (efferocytosis) as a contributor to chronic inflammation in COPD and identified SPHK as essential regulators of efferocytosis. Effects of cigarette smoke on SPHK and efferocytosis in macrophages were negated by Fingolimod, a clinically approved modulator of S1PRs. We will collect lung tissue obtained during lung lobectomy operations from COPD and lung cancer patients and assess whether SPHK are dislocated from their normal subcellular localisation, and have decreased enzyme activity as found in our cigarette smoke exposed cell culture models. We hope to identify potential therapy targets for this disease. Likely research methods include cell culture and immunohistochemistry.

> Exploiting increased autophagy as a new therapeutic approach for COPD

Autophagy is an important cellular responses to cell stress. Our preliminary studies show that increased autophagy is associated with COPD and smoking. This project will investigate the specific molecular mechanisms underlying the increased autophagy in response to cigarette smoke, including the causative role of autophagy in the cell death process, and evaluate the effects of therapies on autophagy and autophagy-associated apoptosis at the cellular, tissue and whole animal level and ex vivo in human COPD subjects. These studies will (a) advance our understanding of autophagy in COPD and (b) indicate novel therapeutic approaches with translational potential. Likely research methods include cell culture, westerns and microscopy.
Higher Degree by Research project opportunities

> The effect of non-typeable H. influenza (NTHI) on sphingosine-1 phosphate (S1P), and its therapeutic targeting in COPD

COPD/emphysema is an incurable, cigarette-smoke related, chronic inflammatory airways disease. It is likely to be the third leading cause of death in the world by 2020. No available treatments prevent disease progression. There is a defect in the capacity of airway macrophages to clear NTHI bacteria (potentially contributing to bacterial persistence and biofilm formation).

Sphingosine is part of a complicated rheostat. Tip the scales to one side and cells die, tip to the other and they become protected. The effects of NTHI bacteria and COPD on the S1P rheostat are unknown. We will investigate phagocytosis of bacteria and apoptotic airway cells on the S1P rheostat in airway and lung macrophages from COPD patients as well as THP-1 macrophages exposed to NTHI Δcigarette smoke.

This project will also assess the capacity of current candidate therapies to restore macrophage function (eg, azithromycin, FTY720, P2X7R antagonists and new macrolides which are lacking antibiotic properties but retain their anti-inflammatory properties).

Likely research methods include westerns, cell culture, PCR, flow cytometry, immunohistochemistry and ELISA.

This project can be broken down for honours projects.

> Understanding and therapeutically targeting the migration of inflammatory/cytotoxic CD8+CD28null T-cells to the epithelium in chronic obstructive pulmonary disease

Corticosteroids are widely applied in COPD management but they do not improve survival or alter its progression. In COPD there is an increase in prematurely senescent CD28null T-cells (derived from CD28+ precursors that have undergone repeated antigenic stimulation during chronic inflammation). These cells are significant contributors to chronic inflammation in COPD and are resistant to corticosteroids. Intra-epithelial T-cells in COPD are predominantly CD8+ and most of these are CD28null. Sphingosine 1 phosphate (S1P), a signalling lipid, is a major regulator of lymphocyte trafficking via its interaction with S1PR1. We will investigate a) S1P involvement in the preferential migration of lymphocyte precursors that have undergone repeated antigenic stimulation during chronic inflammation. These cells are significant contributors to chronic inflammation in COPD and are resistant to corticosteroids. Intra-epithelial T-cells in COPD are predominantly CD8+ and most of these are CD28null. Sphingosine 1 phosphate (S1P), a signalling lipid, is a major regulator of lymphocyte trafficking via its interaction with S1PR1. We will investigate a) S1P involvement in the preferential migration of lymphocyte precursors that have undergone repeated antigenic stimulation during chronic inflammation.

Likely research methods include migration assays, flow cytometry, westerns, immunohistochemistry and cell culture.

This project can be broken down for honours projects.

> Understanding the role of cigarette smoke induced oxidised lipids in COPD

COPD patients lungs do not continue to repair even after cessation unlike those who smoke without the disease. The reason for this remains unknown, but a growing body of evidence suggest an altered immune response may be at play. We have shown that there are increased apoptotic cells in the airways of COPD patients and that macrophages fail to effectively clear these, leading to a build up of material in the airway, including oxidised lipids. Our preliminary data shows that cigarette smoke oxidised lipids cause an increase in the expression of a lipid antigen presenting molecule called CD1b on macrophages, similar to increased levels seen in alveolar macrophages of COPD patients. It also hinders their phagocytic ability. This study will investigate this phenomenon further assessing whether T cells recognise oxidised lipid loaded CD1b and launch an immune response to lipids on airway cells causing ongoing damage after cessation of smoking.

Likely research methods include cell culture, flow cytometry/ sorting, PCR, westerns and ELISA.

This project can be broken down for honours projects.

> Investigating NTHi in the pathogenesis of COPD

Reprogramming and dysfunction of the airway epithelium are hypothesised to initiate COPD, a disease that is set to become the third leading cause of death by 2020. A major aspect of this is the colonisation of the airway epithelium by Nontypeable Haemophilus influenza, which is responsible for approximately 50% of all COPD exacerbations. To date there is no effective treatment for COPD or NTHi colonisations, and the manner in which this bacteria persists in the airways remains elusive.

This project will investigate the mechanisms that NTHi employs, and though its secreted products (secretome), to invade and colonise the airway epithelium in the context of COPD. Specific aims will be to:

1. Characterise the NTHi secretome using proteomic techniques.
2. Infect and expose human epithelial cultures to NTHi and the secretome products (respectively) and characterise disease-related alterations to the epithelium that contribute to the pathogenesis of COPD.
3. Use therapeutics tailored to the targets identified in 1 and 2 and examine amelioration to the epithelium while treated with COPD-related exposures, such as cigarette smoke.

The candidate will gain a solid understanding of the immunological and cellular/molecular consequence of COPD and bacterial infection.

This project can be broken down for honours projects.

Research areas

Immunology and infection
Indigenous and disadvantaged health
Child and adolescent health
Translational health outcomes

More information

researchers.adelaide.edu.au/profile/sandra.hodge

Chronic Inflammatory Lung Disease Laboratory: Includes HDR supervisors Professor Sandra Hodge, Associate Professor Greg Hodge, Dr Hai Tran, Dr Miranda Ween and Dr Eugene Roscioli (absent)
Translational Health Outcomes
Translational health research applies basic scientific findings from laboratory and preclinical studies to enhance human health and wellbeing at the personal and community level—taking experimental findings ‘from bench to bedside’ through new treatments and improved health policy.

High quality preclinical, clinical and epidemiological research is the foundation stone of optimised health care provision that serves to improve the quality of life of patients who are managed in the health system. Effective translational research is crucial to the continued improvement and sustainability of the Australian health system, and requires significant engagement with industry and service sectors within government.

Our researchers are developing new and innovative ways to transfer new knowledge to health service professionals, to: change practice; improve skills; and influence policy and procedures system-wide. Researchers across the faculty are focused on:

- undertaking population surveys to develop and test new interventions to improve the mental health of children and adolescents
- undertaking evidence-based practice development to manage at-risk populations for trauma and mental disorders across the lifespan
- elucidating genetic factors that may serve as new targets for therapy, or are predictive of responses to pharmaceutical treatments
- performing longitudinal studies of patients undergoing invasive procedures to review and improve standard practice in the health care system
- developing evidence-based assessments of novel surgical techniques and postoperative care to enhance skills and promote knowledge transfer to health service professionals.
Translational Health Outcomes research opportunities

Knowledge Translation Group
University of Adelaide North Terrace Campus

We are interested in improving how research evidence is used for health care decision-making at a clinical, organisational and health system level. The Knowledge Translation Group studies the methods, processes and roles that can be used to facilitate the ‘evidence-to-practice’ components of knowledge translation. We work with theories and frameworks that recognise the complex, dynamic and iterative process of implementing research, in particular, the ‘Promoting Action on Research Implementation in Health Services’ (PARIHS) framework (recently revised as the integrated or i-PARIHS framework).

Our research areas include:

- Synthesising evidence of best practice. We undertake, and offer training in the methodology of, systematic reviewing of evidence relevant to nursing practice. This takes place within the Centre for Evidence-Based Practice South Australia (CEPSA), a Joanna Briggs Institute Centre of Excellence.
- Examining the evidence-practice gap to identify potential for improvement. Here we focus on current practices and compare to known best practice, for example, in relation to improving the coordination of care for older people living in the community.
- Implementing and evaluating the implementation of evidence into clinical practice. Ongoing research is focused on topics such as implementing evidence-based guidance for stroke rehabilitation and improving renal care for Aboriginal patients.
- Understanding processes of disinvestment and de-implementation to stop the use of practices that are known to be ineffective or potentially harmful, for example, in wound care.
- Examining key roles in the translational process. We are looking at facilitator roles and facilitation processes and how these can be developed and embedded within health service settings in an effective and cost-effective way.

Lead researchers: Dr Elizabeth Lynch and Dr Tim Schultz
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Honours project opportunities

> How can nurses help to promote walking practice after stroke?

In hospitals around the world, people with stroke are consistently very inactive. There is clear evidence that dose of walking is important with regard to recovery of walking function, so it is recommended in the Stroke Clinical Guidelines that people with difficulty walking should be given the opportunity to practice walking as much as possible. Observational studies conducted in Australian rehabilitation hospitals provide evidence that people with stroke spend most of their day sitting or lying in bed on the ward, so it is important to consider how nurses can contribute to walking recovery after stroke.

In this study, we will use a model of facilitation (the integrated Promoting Action on Research Implementation in Health Services model, co-developed by a researcher currently working in Adelaide Nursing School) to work with nurses on one stroke rehabilitation ward to develop and test strategies to promote walking practice on the ward.

> Translation and psychometric testing of a tool to measure the context of Indonesian primary health care

Led by Dr Tim Schultz.

Understanding the context in which knowledge translation occurs is essential. This project will adapt an existing tool (Alberta Context Tool) to support the implementation of best practice in neonatal care for Indonesian primary health care nurses, midwives and doctors.

> Understanding nursing care and patient experience in single bedded rooms

Led by Dr Tim Schultz.

About 10% of patients are harmed in hospitals from their care. While single bedded rooms in hospitals offer advantages for patients such as greater privacy, and potentially less chance for infection, patient safety in single bedded rooms has been little studied. This study will address that gap, while also investigating how nurses provide care in single bedded rooms.

Higher Degree by Research project opportunities

> Developing and testing an arts-based knowledge translation intervention for people with stroke

Stroke is a leading cause of adult disability in Australia, and the numbers of people living with stroke are increasing. People who have recently experienced a stroke report they lack appropriate information about what a stroke is, what a person with stroke should do to promote recovery, and how much to expect in terms of recovery. When information is provided, people with stroke report this is often difficult to understand.

The Australian Stroke Clinical Guidelines have been updated in 2017, providing a series of best practice recommendations to assist decision-making in the management of stroke. One recommendation is that all stroke survivors should be offered information tailored to meet their individual needs using relevant language and communication formats. Different forms of art have been to promote health literacy and change health-related behaviours. As such, developing an arts-based approach (such as a graphic novel) to interpret sections of the 2017 Stroke Clinical Guidelines offers a novel strategy to address the information needs of patients with stroke, by providing them up-to-date evidence about stroke using non-text-based media. This resource would be developed and evaluated through a program of research.
Models of care for home nursing of people with chronic illness
Led by Dr Tim Schultz.
There is increasing pressure on hospitals to deal with larger numbers of sicker patients. Providing care in the home is an option for some patients who are living with a chronic illness. This project will identify candidate conditions for home care nursing, develop, and potentially evaluate, new models of nursing care.

Research areas
Translational health outcomes
Cardiac, respiratory and vascular health

Clinical Pharmacogenomics: Personalised Medicine
University of Adelaide North Terrace Campus

The Clinical Pharmacogenomics group has an active research program focused on elucidating the genetic factors that contribute to an altered response to medicines and to adverse drug reactions. Pharmacogenomics is the study of variations in our genome (DNA and RNA) that alter our response to drugs. We aim to personalise medicine by studying DNA variations to better target a drug, or its dose, to improve health and prevent toxic reactions.

The group investigates pharmacogenetic factors involved in pain therapeutics (acute and chronic postsurgical pain, cancer pain and opioids), cancer therapy (chronic myeloid leukaemia drugs), kidney transplantation (immunosuppressants), antidepressant drugs, HIV drugs and drugs to treat opioid addiction.

Research involves human genetic factors that affect pharmacokinetics, metabolism, pharmacodynamics (receptors, signalling messengers) and immune markers of drug hypersensitivity reactions. The group also has a large research programme investigating pharmacogenomics of Aboriginal Australians, as discovery of interethnic differences in drug response (good and bad) and the genetic factors that contribute to such differences are of importance for drug and dosing guidelines.

Translation of these genetic findings into clinical practice is called personalised or precision medicine and is an overarching theme of the group. The Clinical Pharmacogenomics group works on the development and implementation of clinical use of personalised medicine.

Research from this group incorporates the examination of genetic variants that impact on drug responses and those that impact on a person's immune response to drugs. Studies include drug metabolism and response (cancer, addiction, solid-organ transplantation outcomes), neurogastroenterology and molecular toxicity (via a chemotherapy-induced model of mucositis), drug abuse and addiction (alcohol, opioid and behavioural), pain (chronic pain in spinal cord injury and fibromyalgia), gulf-war illness and epilepsy.

Lead researcher: Professor Andrew Somogyi
Email: andrew.somogyi@adelaide.edu.au

Honours project opportunities
Genetic causes of post surgical pain
Investigations into the genetic control of chronic persistent pain following surgery will allow us to identify those people who will require a different approach to post surgical pain including the use of nonopioids. In particular, variants in potassium channel genes affect pain following breast cancer surgery. We have a cohort of 300 patients following total knee reconstruction in whom 20% at 6 months have moderate to severe pain. This honours project will investigate the contribution of potassium channel genes to this pain syndrome.

Higher Degree by Research project opportunities
Pharmacogenetic studies in Aboriginal Australians
We are conducting unique studies to identify whether personalised medicine for our First Peoples should be the same as Caucasians.
Our initial studies indicate that a different personalised approach needs to be used in order that the medicines work better and don’t cause harm. This is funded by the NHMRC and involves pharmacogenetic testing of the most common drug receptors, metabolising enzymes and transporters in cohorts of Aboriginal Australians.

> Ancient DNA and pharmacogenetics
Genetic polymorphisms for drug receptors and metabolizing enzymes show enormous variability between different ethnicities leading to different drug dosages in specific populations. The evolution of these polymorphisms is not known. In collaboration with Professor Alan Cooper (Director Australian Centre for Ancient DNA), we are in a unique position to track the evolution of some of these polymorphisms as people migrated out of Africa. The project would be ideally suited to a student with an anthropology, pharmacology and genetics background.

> Pain genetics
Investigations into the genetic control of chronic persistent pain following surgery will allow us to identify those people who will require a different approach to post surgical pain including the use of nonopioids. Studies will require knowledge of pain mechanisms, immunology and epigenetics.

> Pharmacogenetic studies in Papua New Guinea (PNG)
We are conducting translational studies for the treatment of HIV/AIDS and tuberculosis in PNG. The medicines that are used all have a genetic footprint. Variants in the genes that control the metabolism and transport of these medicines affect how well they work and their toxicity. These variants also have a very large interethnic variability. The project would be ideally suited for a candidate who has pharmacology and genetics as majors in undergraduate studies.

Research areas
Translational health outcomes
Immunology and infection
Neuroscience, behaviour and brain health
Indigenous and disadvantaged health

More information
adelaide.edu.au/directory/andrew.somogyi

Knowledge Translation
The Knowledge Translation Group’s program is focused on advancing the science of knowledge translation in health care. This includes studying the methods, processes and roles that can be used to facilitate the translation and implementation of research evidence into health care decision-making and practice at a clinical, organisational and health system level.

Lead researcher: Professor Gill Harvey
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Honours project opportunities
> Translating research evidence into improved practice and patient care: examining how this happens in the real world
This project will involve secondary analysis of qualitative data from a number of implementation research studies to examine the key roles and processes involved in achieving effective facilitation of evidence-based practice.

> Facilitating evidence-based practice in acute hospital settings
Research in primary care settings suggests that employing practice facilitators to support the implementation of clinical guideline recommendations increases the uptake of evidence-based practice almost three-fold. This project will involve undertaking a similar systematic review of facilitation in acute hospital settings to evaluate the impact on clinical guideline implementation.

> Reducing complications associated with hospital admission for older people
Eat-Walk-Engage is an intervention that has been developed and tested by a team of researchers in Queensland to help older people achieve faster and better recovery in hospital. This project will involve undertaking a hospital-based audit to examine the potential for reducing the risk of hospital-related complications for older people in South Australia.

Higher Degree by Research project opportunities
HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas
Translational health outcomes
Innovative Therapeutics
Research in innovative therapeutics aims to identify new, economically sustainable therapeutic approaches that can deliver better outcomes for patients and the community.

From 2001 to 2014, health care expenditure in Australia doubled to $140 billion (9.5% GDP), and has since been increasing at a rate of 7.7% per annum. The various tiers of government fund 68% of these costs, 11.5% of which can be attributed to pharmaceuticals alone.

The development of new and cost-effective therapeutics is critical for sustaining and advancing the delivery of health care to the Australian community. Our research aims to produce novel therapeutic approaches to enhance efficacy and specificity; lower the side effects; provide greater safety; and reduced need for hospitalisation or other health services.

Researchers across the faculty are focused on:

- identifying novel targets for therapy to prevent metastasis and modulate the progression of cancers
- identifying new biomarkers to identify disease, predict disease trajectories and monitor response to treatment
- developing tissue regeneration technologies to address tissue injuries and disease
- developing cost-effective in vitro models to replace animal models for testing therapeutic efficacy
- developing rigorous clinical evaluation approaches of novel combinations of existing therapeutic agents, including development of novel modes of delivery.
Innovative Therapeutics research opportunities

Translational Medicine
Adelaide Health and Medical Sciences building (AHMS); Women’s and Children’s Hospital

Lead researcher: Associate Professor Maria Fuller
Email: maria.fuller@adelaide.edu.au

Honours project opportunities

> Improving diagnostic outcomes for children with leukoencephalopathies

The childhood leukoencephalopathies constitute a group of inherited and acquired disorders of the cerebral white matter, characterised by abnormalities in the formation and maintenance of myelin within the central nervous system. Presenting throughout life, disease burden amongst the genetic forms of disease is greatest in childhood, with a collective incidence of 1 in 7,500 live births. In such cases, disease results in a progressive loss of neurocognitive function with inevitable declination to a dependent vegetative state and premature death.

Diagnostic pathways are limited and often necessitate a protracted and invasive course of investigation, an extremely stressful process for child and family and further delaying treatment. Therapeutic intervention is limited to a small subset of cases, however contemporary strategies are evolving with the advent of pharmaceuticals and gene transfer strategies; the success of which are predicated upon accurate and timely diagnosis.

Employing state-of-the-art mass spectrometry this project will perform metabolomics profiling on plasma from children with clinical indications of leukoencephalopathy and use this information to define diagnostic ‘signatures’ of disease. This project will afford opportunity to translate these research outcomes into the diagnostic setting within the state-wide pathology service to improve the diagnostic accuracy and efficiency for children with these disorders.

> Understanding and exploring treatment approaches for inherited neurological disease

Neurological disease in many treatable inherited metabolic disorders manifests progressive neurological decline in infancy leading to premature death. The primary biochemical insult the accumulation of a metabolite and compromises the normal metabolic state. How the cell responds to this metabolic defect involves a multitude of cellular processes and it is this complex interplay of largely unknown events that underlies disease pathophysiology. It has been known for 30 years that amongst these metabolic aberrations transpires an abnormal accumulation of lipids within the brain.

Lipids are crucial for brain function and temporal regulation highly important for neuronal development, therefore brain lipid homeostasis is tightly regulated.

This project seeks first to define the extent of lipid dyshomeostasis within the brain of a mouse model and/or neuronal cultures (student choice) and second, manipulate lipid metabolism via pharmaceutical intervention as a therapeutic proof-of-principle.

The project will employ a range of biochemical, cell and molecular techniques, including neuronal cell culture, next generation lipidomic analysis by mass spectrometry, gene expression technologies, immunohistochemistry and confocal microscopy as well as Western blot and cytokine profiling. Experience with the management and utilisation of animal disease models will also be gained if desired.

Higher Degree by Research project opportunities

> Targeting the neuronal lipidome: developing therapeutic avenues in neurodegenerative disease

Pathological disruption of the neuronal lipidome is implicated in a range of neurodegenerative disorders, spanning the fatal monogenetic neurolipidoses of childhood to late-onset neurocognitive disorders such as Parkinson’s disease. Through improved understanding of the pathogenic mechanisms underpinning lipid dyshomeostasis in these diseases, we seek to identify novel therapeutic targets and develop strategies for intervention where effective treatments remain an unmet clinical need.

We are seeking a motivated PhD candidate to join our research team and lead a project exploring the pathobiology of primary neurodegenerative disease and neuronal lipid dyshomeostasis, with a view to informing therapeutic strategies for physiological restoration of the neuronal lipidome. The project will employ a range of biochemical, cell and molecular techniques, including neuronal cell culture, next generation lipidomic analysis by mass spectrometry, gene expression technologies, immunohistochemistry and confocal microscopy as well as Western blot and cytokine profiling. Experience with the management and utilisation of animal disease models will also be gained.

Opportunities to work with local and internationally collaborating laboratories also exist over the course of the experimental program. An RTP stipend is available to the successful applicant, with ‘top-up funds’ provided for those students awarded a competitive PhD scholarship.
Treating the inherited metabolic disorder, Sanfilippo syndrome

Developing treatment for children with disorders that affect the brain is extremely important, but at the same time significantly challenging. Access to the brain is hindered by the blood brain barrier, which although necessary for protection, often restricts the penetration of substances that would otherwise be considered therapeutic. Sanfilippo syndrome is an autosomal, recessively-inherited disease caused by a deficiency in an enzyme required for heparan sulphate degradation. Consequently, progressive retention of incompletely degraded heparan sulphate results, manifesting as neurological regression accelerating from late childhood, with a loss of acquired skills including the ability to speak, walk, eat, and culminating in premature death.

The first-in-man gene therapy trial for Sanfilippo syndrome has commenced here at the Women’s and Children’s Hospital and this project will explore the impact and efficacy of treatment. Parallel studies will be undertaken in the Sanfilippo mouse model and primary neuronal cultures to assess the biochemical consequences of treatment on neuropathology and cell function. The project will employ a range of biochemical, cell and molecular techniques and will be undertaken collaboratively with local and internationally laboratories throughout the duration of the project.

An RTP stipend is available to the successful applicant, with ‘top-up funds’ provided for students awarded a competitive PhD scholarship.

Research areas

Innovative therapeutics
Neuroscience, behaviour and brain health
Translational health outcomes
Reproductive Immunology
Adelaide Health and Medical Sciences building (AHMS)

We are interested in what activates the female immune system at the time of conception, allowing for the conferment of immunological tolerance before the embryo implants into the placenta.

In pregnancy, the female immune system recognises the fetus as foreign and as such, special adaptation is required to prevent rejection. An active state of immunological tolerance must be present to allow embryo implantation and development. Many common reproductive and pregnancy disorders—including unexplained infertility, recurrent miscarriage, pre-eclampsia and preterm birth—have their origins in immune and inflammatory disturbances that impact on placental development and leave the fetus vulnerable to immune and inflammatory attack.

The Reproductive Immunology Group focuses on events at conception that illicit a sequence that acts to stimulate the generation of regulatory T cells (Treg cells). Treg cells are anti-inflammatory and protect the implanting embryo and developing placenta. Recently, we made significant progress in understanding molecular pathways by which the immune response contributes to pregnancy and offspring health. We are expanding our studies to explore how both sperm and seminal plasma factors interact with cells in the female reproductive tract, regulating gene expression to impact pathways that control uterine receptivity to embryo implantation.

Additionally, we are investigating new drug compounds for tackling preterm birth. By suppressing the pro-inflammatory pathway activated by infection or by sterile insults, small molecules that block Toll-like receptor 4 and/or peptide antagonists of Interleukin-1 signalling (that is, molecules involved in immune responses to foreign agents) are showing great promise in inhibiting the steps that would otherwise lead to premature birth.

Lead researcher: Dr Kerrilyn Diener
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Honours project opportunities

> Therapeutic targeting of alarmin HMGB1 for the control of sepsis

Led by supervisors Dr Kerrilyn Diener and Professor John Hayball. Sepsis remains a significant health burden, with a major clinical need for therapeutics to control the dysregulated immune response that results in high levels of mortality and morbidity. Adult survivors are often left immunosuppressed, and surviving neonates are at increased risk of compromised neurodevelopmental outcomes.

The nuclear protein HMGB1 is highly conserved and released from cells in response to cellular insult or stress. It is a late immune mediator in sepsis with a wide therapeutic window. We have generated anti-HMGB1 antibodies and shown that therapeutic administration to adult and neonatal mice with sepsis improves survival. Furthermore, treated mice do not exhibit secondary morbidities such as immunosuppression of developmental abnormalities.

This project will determine the mechanism by which our antibody therapy improves outcomes. Using established models of disease, and genetically-modified mice, cells and tissues at specific times will be analysed by quantitative RT-PCR, flow cytometry and ex vivo assays to assess the interactions between HMGB1 and cell fate in sepsis and how administered antibodies inhibit this response. These findings will be reported in a publication, and used to support progression of our therapeutic antibodies into clinical trials.

> Regulatory B cells and role in development of maternal tolerance

Led by supervisors Dr Kerrilyn Diener, Professor Sarah Robertson.

For a successful pregnancy, the mother’s immune response must become tolerant of the implanting embryo which expresses foreign antigens of paternal origin. Regulatory T cells are important mediators of maternal tolerance, with lower than normal levels associated with many pregnancy pathologies.

Regulatory B cells include all sub-populations of B cells with suppressive qualities. Evidence suggests that B cells are fundamental in sustaining T regulatory cells, with B cell-deficient mice exhibiting reduced frequency of T regulatory cells. Adding back B cells to these mice restores the T regulatory cell compartment and results in the restoration of tolerance to oral antigens and tumour growth.

These results suggest that an intimate relationship between B regulatory cells and T regulatory cells might be necessary for a robust and uneventful pregnancy. This project will investigate the role of B regulatory cells in the development of maternal tolerance. Methods will use mouse models, RT-PCR, flow cytometry, and human and mouse cell based culture assays to determine the interactions between B regulatory and T regulatory cells in the induction of maternal tolerance.

> Vaccination during pregnancy

Led by supervisors Dr Kerrilyn Diener and Professor John Hayball. Two vaccines are currently recommended for pregnant women: the influenza vaccine and a diphtheria-tetanus-acellular pertussis vaccine. It is likely that vaccination against respiratory syncytial virus and group B streptococcus will also become recommended, potentially resulting in 4 or more vaccinations administered during pregnancy.

Many vaccines do not produce strong immune response and require multiple doses for optimal protection. For pregnant women, ideally a vaccine should produce a strong immune response quickly and with one dose. This is particularly apparent for protection against emerging infectious diseases such as Zika virus.

This project will investigate whether an additive approach to vaccination results in best outcomes for the pregnancy and offspring, or whether other new vaccine delivery platforms can be utilised to combine antigens to generate equal or better immune responses with one vaccination. This would result in minimal intervention during pregnancy.

Non-specific effects of vaccination will also be investigated, as vaccination may potentially guard against pregnancy loss after pathogen challenge. Preclinical mouse studies will be performed to generate safety data for novel vaccine platforms, and investigate immune outputs in side-by-side comparisons of traditional vaccine protocols against next generation vaccines during pregnancy.

Higher Degree by Research project opportunities
Expansion of above projects.

Research areas
Innovative therapeutics
Immunology and infection

More information
Adelaide Medical School
Ageing, Frailty and Mobility
An increasing number of Australians are living for several decades beyond their retirement. As such, up to 4 million Australians are predicted to be impacted by frailty by 2050, making it a major personal, public, societal and economic health issue for our community.

Experts from geriatric medicine, general practice, nursing, pharmacy, orthopaedics and rehabilitation medicine, together with researchers in knowledge translation, health economics, epidemiology and demography are working together to identify the prevalence, impact and distribution of frailty in the community and developing health care interventions that are appropriate and translatable to patient care.

Furthermore, researchers are working collaboratively to explore the nature of ageing and frailty in order to develop and deliver models of care—benefiting individuals and our entire community.

Researchers across the faculty are focused on:

- identifying the associations and long-term impact of frailty on health outcomes such as resilience, quality of life, susceptibility to disease complications and disability
- examining the impact of medications on frailty to determine if frailty is a driver of susceptibility to adverse drug events
- understanding the community environment and its contribution to frailty to enable design of new environments that support healthy ageing
- developing and testing frailty health economics models
- developing and testing new interventions and technologies to support, treat and reverse frailty in older people
- identifying early predictors of frailty to evaluate early interventions to minimise or avoid the progression of the individual to frailty
- developing and assessing technologies in hospital to monitor movement and behaviours of elderly patients at high risk of falling to minimise these events.
Ageing, Frailty and Mobility research opportunities

Clinical Autoimmunity and Inflammation Research Group
Royal Adelaide Hospital

The Clinical Autoimmunity and Inflammation Research Group undertakes research into the aetiology and outcomes of autoimmune diseases through the study of well-characterised patient cohorts. Studies of biological samples, paired with clinical data, aim to discover and validate novel biomarkers of disease. Associate Professor Proudman’s research focuses on recent onset rheumatoid arthritis and systemic sclerosis, with Dr Hissaria. Associate Professor Limaye’s research focus is inflammatory muscle disease with an emphasis on autoantibodies.

Lead researchers: Associate Professor Susanna Proudman, Associate Professor Vidya Limaye, Dr Pravin Hissaria
Email: susanna.proudman@sa.gov.au

Honours project opportunities

- Recent onset rheumatoid arthritis
  Led by Associate Professor Susanna Proudman.
  Examination of the clinical and biochemical effects of fish oil in patients with rheumatoid arthritis. Models for predicting outcomes of treat-to-target therapy including pharmacogenetics. Association with periodontal disease

- Systemic sclerosis
  Led by Associate Professor Susanna Proudman.
  Studies of complications such as calcinosis and gastrointestinal disease.
  Collaborative studies looking at the cellular mechanisms of fibrosis and vasculopathy, which are the principal pathophysiological mechanisms responsible for disease manifestations such as pulmonary arterial hypertension.

- Inflammatory muscle disease
  Led by Associate Professor Vidya Limaye.
  Studies of the epidemiology, clinical, serological, and genetic features of inflammatory muscle disease, as well as the role of the innate immune system in myositis.

- ANCA-vasculitis
  Led by Dr Pravin Hissaria.
  The research group and in particular, Dr Hissaria, also has an interest in ANCA vasculitis. Research into the and immunopathogenetic mechanisms underlying this condition, its responses to immunosuppressive therapies, and the role of autoantibodies in this condition is being explored.

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas

Ageing, frailty and mobility
Immunology and infection

Dr Pravin Hissaria, A/Prof Susanna Proudman and A/Prof Vidya Limaye (left to right)
Ageing, Frailty and Mobility research opportunities

The Adelaide Health Economics Group
Adelaide Health and Medical Sciences building (AHMS)

Lead researcher: Professor Jon Karnon
Email: jonathan.karnon@adelaide.edu.au

Honours project opportunities
Honours projects may be available with this group, please contact the lead researcher(s) for more information.

Higher Degree by Research project opportunities
> Using longitudinal data to estimate the costs and consequences of frailty

Frailty is a state of increased vulnerability to functional decline, dependence and/or death arising from impairment of many body functions. Frailty is associated with increased risk of significant clinical events (e.g. fracture and depression) leading to hospitalisation and use of aged care services and loss of independence—a key component of quality of life in older people. It is expected that 4 million Australians will be frail by 2050.

There is emerging evidence that frailty can be prevented, halted or reversed in some people. There is an urgent need to develop and evaluate interventions to prevent, delay and manage frailty with the potential for important benefits for older people and health services. To inform public funding decisions, where the overall budget situation is tight, it will be necessary to demonstrate that these interventions provide value for money.

For this project you will be part of the NHMRC Centre of Research Excellence in Frailty and Healthy Ageing at the University of Adelaide. The project will use major longitudinal datasets to assess the costs and health effects of frailty and to further develop a cost-effectiveness model to identify high-value interventions and programs targeted at prevention, delay or management of frailty.

Research areas
Ageing, frailty and mobility
Child and adolescent health

Forensic Science/CASR Research
University of Adelaide North Terrace Campus

The Adelaide Centre for Forensic Research has a focus on accidental and inflicted trauma in infants and children, and also on many other aspects of paediatric forensic pathology, including sudden infant death syndrome, child safety issues and natural diseases that may be responsible for unexpected death in the young. Additional research has involved the characterization and dating of injuries, the analyses of various aspects of suicides and homicides, and the investigation of wildlife forensic issues.

Lead researchers: Professor Roger Byard and Associate Professor Corinna Van Den Heuvel
Email: corinna.vandenheuvel@adelaide.edu.au

Honours project opportunities
> A pathological and demographic analysis of motor accident deaths in the elderly (>70) in South Australia over 30 years (1985-2015)

The objective of this study is to undertake a comprehensive review of the nature of injuries, risk factors and epidemiology of vehicle-related deaths in the elderly (>70 yrs) in South Australia over the past 30 years. Crash scene investigation data and pathological changes will be correlated with advances in road safety and vehicular safety. This project is in collaboration with the Centre for Automotive Research (CASR) and Forensic Science South Australia (FSSA). A data search for fatal motor vehicle accidents between 1985-2015 will be conducted at FSSA to obtain de-identified autopsy files in conjunction with a search of the TARS database at CASR to gain fatal crash data. The TARS databases contain de-identified crash scene investigation data categorised by TARS unique identification number. These two data sets will then be cross-matched, linking autopsy findings with crash information. Correlating the two data sets will provide context to pathological trends, as well as highlighting differences between demographic groups and crash circumstances with fatal outcomes.

There are no longitudinal studies of this nature that link the pathological findings with crash scene investigation data to identify and link potential external influences in vehicle-related deaths in the elderly.

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas
Ageing, frailty and mobility

More information
researchers.adelaide.edu.au/profile/corinna.vandenheuvel
Multimorbidity Research Centre — Clinical Pharmacology
University of Adelaide North Terrace Campus; Royal Adelaide Hospital
Lead researcher: Professor Shakib
Email: sepehr.shakib@adelaide.edu.au
Honours project opportunities

> Relevance of Australian clinical guidelines to older patients with multimorbidity
The presence of multiple chronic conditions (multimorbidity) is common in the older population with more than 65% of patients having four or more chronic conditions. However, clinical guidelines that provide treatment and management recommendations for clinicians generally focus on one chronic condition. In 2008, a review of Australian clinical guidelines showed that only one out of 17 guidelines for chronic conditions addressed multiple comorbid conditions. This proposed study will evaluate whether any improvements in addressing comorbidity in current chronic disease clinical guidelines have been made over the past decade in Australia and the extent of these changes. This project will involve a review of clinical guidelines and extraction of relevant data.

> The Opioid Epidemic: utilisation of state-wide electronic health records to improve medication safety, reduce harm and improve efficiency of health care
The increasing prevalence of opioid use and subsequent adverse events associated with inappropriate use is a major public health issue for not only Australia but globally. The potential for harm in the older population with multimorbidity is increased due to the use of concomitant medicines that may increase the risk of harm, including respiratory depression and death. Acute pain is a common presentation for hospitalisation and also occurs commonly in hospital patients. This project will examine opioid use in the acute care setting to explore the demographics of the population receiving opioids, indication, and prevalence of concomitant medicines that are contraindicated with opioids and the rate of opioid-related hospital admissions. The prevalence of adverse outcomes associated with the use of these medications such as opioid induced ventilatory impairment, requirement for naloxone administration, readmission within 28 days and death will be examined as well as the incidence and potential predictors of opioid related hospital admissions. This project will focus on analysis of health care data from multiple data sources.

> Impact of national safety warnings on medicine utilisation in Australia
Adverse effects associated with medicines may not be identified in randomised clinical trials due to the studies generally conducted in younger people, with few comorbid conditions and short duration of follow-up. As a consequence, when new medicines are used in clinical practice at the population level safety issues can be subsequently identified, months to years after the medicine is released on the market. In response to safety signals of potential adverse events and harm, Australia’s Therapeutic Goods Administration (TGA) provides continual monitoring and reporting of safety issues to health care providers and patients. Understanding the efficacy of these safety studies and announcements on subsequent utilisation of the specific medicines has not been evaluated. The aim of this study is to examine the impact of safety warnings on utilisation patterns of medicines before and after the safety warning in the Australian population using national prescribing data. Data analysis will include examination of trends in the rate of dispensing of medicines of interest in a period before and after the safety warning/release.

> Eliciting patient preferences in multimorbidity
Understanding patients’ preferences for treatment in the setting of multimorbidity is especially important because of multiple medication use and competing health outcomes. Incorporation of patient preferences in terms of benefits and harms of a patients’ overall treatment regimen and patient priorities for their health will help to optimise outcomes for these patients. This project will examine patient preferences for treatments in terms of global health outcomes rather than disease specific outcomes and how to best elicit and incorporate in care planning. This project will involve interviewing of patients and the clinicians who care for them and prospective data collection.

Higher Degree by Research project opportunities

> Disentangling multimorbidity from polypharmacy as causes of adverse outcomes
Patients with multimorbidity have a high treatment burden in terms of understanding and self-managing the multiple conditions, and managing polypharmacy and complex drug regimens. The benefits and harms of prescribing and deprescribing in patients with multimorbidity need to be examined. Efficacy and safety of medicines, including effects on mortality risk and patient-centred health outcomes, may differ in older adults with multimorbidity from results reported in randomised clinical trials which generally exclude patients with multimorbidity, that inform disease-specific guidelines. Strategies to determine medicine effects in those with multiple conditions are needed to minimise these potential harms (adverse outcomes) and burdens and to guide prescribing decisions that maximise benefits. Evaluating the effect of medication use on universal health outcomes, such as survival, function, and symptom burden, that are affected by most chronic conditions present—and that are most important to patients—could lay the foundation for an evidence based approach to medication decision-making for people with multimorbidity. This project will have a strong clinical focus, utilising data from multiple sources for analyses.

> Development and assessment of models of care for older patients with multimorbidity: multidisciplinary and patient-centred care
There is increasing evidence from both Australian and international studies that multimorbidity—the presence of two or more chronic conditions in an individual—is becoming the norm rather than the exception, particularly in the older population. Multimorbidity is associated with poor health outcomes; including decreased quality of life, functional decline, as well as with increased health care utilisation including emergency admissions and health care costs. The management and care of patients with multimorbidity is often complex and frequently results in polypharmacy (multiple different health care providers involved in their care), leading to uncoordinated and disintegrated care with an increased potential for medication misadventure and adverse effects. Although
evidence-based chronic disease programs exist for single conditions that result in improved health outcomes, there is little evidence-base for the care of patients with multimorbidity. This clinical project will examine the effect of multidisciplinary patient-centred integrated models of care for patients with multimorbidity on clinical and patient-centred health outcomes.

> Impact of penicillin allergy de-labelling in clinical practice

Antimicrobial resistance is a major global public health issue, in part due to inappropriate use of available antibiotics. Antibiotics are one of the most frequently prescribed drugs and one of the most commonly reported causes of drug allergy. Whilst the reported prevalence of antibiotic allergy in patient medical records ranges from 5-16%, when patients are appropriately tested the vast majority of these patients (>95%) have a negative immunological assessment and are able to tolerate penicillins. Patients with a penicillin allergy label have higher rates of treatment failure, increased length of hospital stay and higher rates of readmission. The avoidance of penicillins also leads to more expensive and less effective second line antibiotic therapies used, potentially contributing to antibiotic resistance. Appropriate evaluation of patients with penicillin allergy label is required and should be a focus for de-labelling initiatives. This research aims to improve the completeness of penicillin allergy documentation in patients’ electronic health records by conducting a clinical intervention study focusing on de-labelling of patients with appropriate screening and testing with subsequent evaluation of drug utilisation and health outcomes.

Research areas
Ageing, frailty and mobility
Translational health outcomes
While the gap is narrowing, there remains a long-standing difference between the sexes in relation to risk factors for poor health and health outcomes, with males having five years less ‘healthy life’ than females.

The research area of men’s health focuses on the common and interrelated conditions that constitute the bulk of the disease burden in men, and have the most significant effects on wellbeing and quality of life, families and workforce participation. These include:

- prostate cancer
- diabetes and heart disease
- anxiety and depression
- urological disease
- sexual health
- reproductive health
- sleep health.

Our researchers are using an interdisciplinary approach to narrow the gap between male and female health. This comprises a network of basic scientists, public health, clinical, behavioural and social science researchers, health practitioners, educators, economists, consumers and expert advisors working together to share expertise and knowledge to advance men’s health.

Our research emphasises the biopsychosocial determinants of health across all our men’s health research and training programs. Our programs have a strong focus on:

- healthy male ageing
- clinical consequences of obesity
- health literacy
- preventative health and e-health measures
- vulnerable populations of men at greater risk
- innovation in screening, diagnostic and prognostic tools and therapies
- health economics
- healthy paternity.
Men’s Health research opportunities

Mental Health and Chronic Disease, Freemasons Foundation Centre for Men’s Health

Adelaide Health and Medical Sciences building (AHMS); South Australian Health and Medical Research Institute (SAHMRI)

Physical ailment significantly increases the risk for depression and suicide, and the highest suicide rates for males are in middle-aged Australian men. The three leading chronic diseases in men; cardiac disease, Type 2 diabetes and depression increasingly occur together and share risk factors. Depression is also linked to sleep apnoea and lower urinary tract symptoms, also common in men. Our research aims to trial new mental health screening and cost effective interventions offered at the point of primary care and specialist care for conditions commonly affecting men in order to reduce the burden of undetected depression.

Lead researcher: Dr Phillip Tully
Email: menshealth@adelaide.edu.au

Honours project opportunities

> Poo time! Pooing on occupational over time

Work hours and shift work are linked with risk of gastrointestinal disorders including cancer, gastroesophageal reflux disease, colitis, and change in defecation routines. It remains largely unknown whether disturbances in gastrointestinal functioning are related to changes in dietary pattern, sleep and stress or occupational factors such as workload. The project aims are twofold and students may participate in one or both aspects; 1) to analyse shift work, occupational stress, sleep and diet in relation to gastroesophageal reflux disease using a well-defined dataset, and 2) perform a systematic review of work hours and shift work in relation to gastrointestinal outcomes. Scholarship available.

> i-Share: Internet-based students health research enterprise

Improving student health and welfare is an important pursuit for universities and the future workforce worldwide. Unfortunately, university students face increasing demands to balance their studies with work, sport and social lives, leading to compromised sleep, mental health and unhealthy coping strategies. This project aims to explore university student health and wellbeing using an ongoing survey of French university students (www.i-share.fr/). Potential projects include evaluating university students internet use, sleep, alcohol and tobacco use, academic stress, and factors relating to wellbeing and mental health. Scholarship available.

> Adverse childhood events and health and well-being in men

There is a known link between adverse childhood events (ACEs) and subsequent anxiety and depression, but less is known about whether ACEs increase the risk of cardiovascular disease (CVD) and type 2 diabetes mellitus (T2DM) in later life. It also remains unclear whether at-risk behaviours are directly related to ACEs or other psychosocial factors or whether ACEs independently raise the risk of CVD and T2DM. Using a longitudinal cohort of community-based men with an extensive bio-psychosocial dataset, this project will examine the association between self-reported ACEs and health outcomes in adulthood. The student will examine i) the prevalence of CVD and T2DM; ii) the proportion of men with high-risk behaviours, and iii) psychosocial mediating factors that prevent the development of CVD, T2DM, or adoption of at-risk behaviours in adulthood. Scholarship available.

> The relationship between mental health and use of health care services in middle-aged to elderly men

We have shown that despite middle-aged men’s use of health care being comparable to age-matched women, depression and anxiety remain undiagnosed. Using a longitudinal cohort of community-based men with an extensive bio-psychosocial dataset, this project will determine how men with incident depression and anxiety differ in their use of health services and what other demographic, lifestyle, and behavioural factors may act as mediating influences in this usage. A mixed methods program of research will also investigate how General Practitioners treat theoretical patients and compare these approaches to standard guidelines; the goal being to optimise use and delivery of services to reduce mental illness in men. Scholarship available.

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas

Men’s health
Neuroscience, behaviour and brain health

More information

adelaide.edu.au/menshealth/research
Prostate Cancer Research Group, Freemasons Foundation Centre for Men’s Health

South Australian Health and Medical Research Institute (SAHMRI)

The Prostate Cancer Research Group has established an internationally-recognised research program focused on targeting androgen signalling in prostate cancer, discovering innovative biomarkers of response to treatment, and developing new preclinical models of disease.

Prostate cancer is a major public health issue, killing approximately 3,300 men in Australia annually. While early stage cancers can be treated with surgery, advanced and metastatic cancers are treated with drugs which either prevent the synthesis of, or block the actions of, male hormones, which are known as androgens. Androgens, such as testosterone and dihydrotestosterone, are critical for normal prostate development and for the growth of prostate cancers. They bind to the androgen receptor (AR) protein which mediates their effects in prostate cells.

While drugs which target AR pathways are initially effective, patients eventually relapse and progress to an incurable stage of the disease. A confounding issue with prostate cancer treatment is the unreliable nature of the standard PSA (Prostate Specific Antigen) test for monitoring how tumours respond to prostate cancer drugs.

Our research aims to develop robust diagnostic tests to better assess prostate cancer development, progression and response to treatment with existing prostate cancer drugs as well as new drugs undergoing clinical development.

Lead researcher: Associate Professor Lisa Butler
Email: menshealth@adelaide.edu.au

Honours project opportunities

- Importance of lipid metabolism in the response of prostate cancer cells to therapeutics

  We have shown that prostate cancer cells respond to current therapeutic drugs with characteristic changes in lipid metabolism. This project will determine whether these lipid changes are necessary for reduced proliferation or enhanced death of prostate cancer cells in response to these drug therapies. For this laboratory based project, you will be using a unique human prostate cancer tissue explant culture system to examine prostate cancer cell growth and lipid profiles. The role of specific lipid metabolism enzymes will also be examined using a range of prostate cancer cell line models and molecular biology techniques such as quantitative PCR, western blotting and assays for growth, apoptosis, invasion and migration. Scholarship available.

- Defining biomarkers of response to novel prostate cancer drugs

  There is a critical need in cancer drug development for better ways to accurately predict which patients are likely to respond to new molecular targeted drugs. This project will characterise changes in expression of specific proteins in prostate cancer cells treated with developmental drugs. We have previously identified differential expression of several candidate proteins through proteomic screening. For this laboratory based project, you will be using prostate cancer cell lines as well as a unique human prostate cancer tissue explant culture system along with western blotting, immunohistochemistry and quantitative PCR to validate and characterise changes in these candidate genes and proteins. Tools such as siRNA will then be used to better define the role of these candidates in prostate cancer drug responses. Scholarship available.

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas

Men’s health
Cancer biology and clinical oncology

More information
adelaide.edu.au/menshealth/research

WHAT LIPIDS CAN TELL US

Lipid profiling of prostate cancer to predict behaviour and personalise treatment
E-health and Cancer Survivorship, Freemasons Foundation Centre for Men’s Health

University of Adelaide North Terrace Campus; Adelaide Health and Medical Sciences building (AHMS); South Australian Health and Medical Research Institute (SAHMRI)

The internet has potential to be a powerful tool for health care and health promotion. Now more than ever, it is possible to reach those most at need and deliver personalised, comprehensive and on-going health support in a cost-effective way. Unfortunately, this potential is underutilised in men’s health with the vast majority of websites and apps offering ‘one-size-fits all’ information, and failing to incorporate evidence based strategies to engage men and support decision making or behaviour change. This program aims to design and evaluate apps and websites to support healthy lifestyle changes and reduce psychological distress, investigating what digital solutions work for who and how best to present content based on the individual to enhance engagement and intervention impact, and developing new methods of capturing and understanding behaviour based on new digital data sources.

Lead researcher: Dr Camille Short
Email: menshealth@adelaide.edu.au

Honours project opportunities

Designing an online exercise guidance tool for men with metastatic prostate cancer

Exercise is a recommended adjuvant treatment for men with metastatic prostate cancer. It reduces treatment toxicities, delays disease progression and possibly even increases survival. Despite this, many men with metastatic disease often miss out on exercise opportunities in lieu of expert guidance about the type and amount of exercise that is safe to perform. We have access to exercise prescription modules for men with metastatic prostate cancer that have been shown to be effective in a face to face setting. These modules will form the basis for the tailored exercise advice in an online tool. The project will involve conducting interviews with men, making educational videos, writing articles on behaviour change and the benefits of exercise and conducting a pilot evaluation of the developed tool. The student(s) will be involved in one or more of these tasks depending on their skill level, interest, discipline (degree) and the project needs at the time. The project is being conducted in collaboration with the Exercise Medicine Research Institute at the Edith Cowan University, Central Queensland University and the NHMRC Centre for Research Excellence in Prostate Cancer Survivorship. Multiple projects, scholarships available.

Higher Degree by Research project opportunities

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

Research areas
Men’s health
Cancer biology and clinical oncology
Neuroscience, behaviour and brain health

More information
menshealth@adelaide.edu.au
Uro-reproductive Health Group, Freemasons Foundation Centre for Men’s Health

University of Adelaide North Terrace Campus; Basil Hetzel Institute for Translational Health Research, The Queen Elizabeth Hospital, Woodville; Adelaide Health and Medical Sciences building (AHMS); South Australian Health and Medical Research Institute (SAHMRI)

The Freemasons Foundation Centre for Men’s Health (FFCMH) has and continues to develop and support world-class research programs within each of four major themes; clinical and population studies, basic science, preventative health and health services. These programs not only target the most pressing issues in men’s health but also concurrently address many of the National Health Priority Areas of cardiovascular disease, diabetes, mental health/depression and obesity. The Centre’s achievements have been made possible by engaging with, investing in, and bringing together multidisciplinary teams of world-class scientists and clinicians from the campuses and teaching hospitals of the University of Adelaide, other universities and local, national and international research institutions.

The FFCMH encourages researchers with an interest in men’s health to join up as a member of the Centre to input into and interact with the mix of expertise available across the Centre. FFCMH engages with research leaders and stakeholders to ensure our research programs remain clinically relevant, comprehensive, are successfully translated and that it appropriately represents and consider the needs of vulnerable populations of men.

**Lead researchers:** Dr Sean Martin and Professor Gary Wittert

**Email:** menshealth@adelaide.edu.au

**Honours project opportunities**

> The association between diabetes and lower urinary tract symptoms in men

Diabetes is the epidemic of the 21st century and the biggest challenge confronting Australia’s health system. Around 1.7 million Australians have diabetes. This includes all diagnosed diabetes (1.2 million) and silent, undiagnosed type 2 diabetes (~500,000). Diabetic urinary dysfunction (DUD) is an under-reported but far more common complication of diabetes (80% with type 2 diabetes), than the more widely recognised complications such as neuropathy (60%) and nephropathy (50%). Despite this, it remains unclear what the direction of the association between diabetes and urinary function is in men, with many novel mechanisms yet to be explored. This project will utilise data from a large, representative cohort of men (the Men, Androgen, Inflammation, Lifestyle, Environment, and Stress (MAILES) study) to examine: i) whether urinary dysfunction predicts the onset of type 2 diabetes, and vice versa; ii) which covariates best explain the association between urinary dysfunction and diabetes (e.g. prostatic enlargement via increased inflammation; oxidative stress due to high serum glucose). These results will contribute to better identifying men at risk of these diabetes complications, and have implications for the treatment options available. Honours scholarship available.

**Higher Degree by Research project opportunities**

HDR projects may be available with this group, please contact the lead researcher(s) for more information.

**Research areas**

- Men’s health
- Nutrition and metabolic health
- Cardiac, respiratory and vascular health
- Neuroscience, behaviour and brain health

**More information**
adelaide.edu.au/menshealth/research

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**UROLOGY**

**THE LOW DOWN ON LUTS**

Optimising the screening and treatment of male lower urinary tract symptoms
2018
Psychology Honours Research Opportunities
Selecting a research project for Honours

Attend the information session
Attend the 2018 Psychology Honours Induction Session on 19 February 2018; you will be emailed with the date and location once you have enrolled in the course.

Review the research projects on offer
You can review the projects and topics listed under each of the research groups within the school and take a look at the researcher profiles of staff members at http://researchers.adelaide.edu.au.

Make a time to speak to a researcher
Contact the researcher to make a time to see them about potential projects – be prepared! Researchers will be more interested in you, if you have some knowledge of what they do.

Fill out and submit your Supervisor Preference Form
There are two types of projects:
1) confirmed (these are the projects that your supervisor has indicated they will be willing to supervise and you can only choose one), and
2) unconfirmed (these are the projects that are a ‘maybe’ and you can indicate two). Make sure you make it clear which are which and that you get your supervisor to sign off on the confirmed projects.

Submit the Supervisor Preference Form to the School of Psychology office by Friday 23rd of February. Download the form Psychology Supervisor Preference Form

Further information and next steps
Honours coordinators Dr Carolyn Semmler & Professor Deb Turnbull will contact you on Monday 19 February 2018 with the date for the first meeting of the program.
Lead researcher: Professor Anna Chur-Hansen
Email: anna.churhansen@adelaide.edu.au
Location: North Terrace
Phone: 8313 5738

Project 1
Any projects related to Health Psychology. I am interested in speaking to students about projects related to food and eating, sex and relationships, physical pain, and death and dying. I am interested in thematic analysis, survey methods or mixed methods.

Project 2
Any projects related to teaching and learning in the health professions, but particularly, in psychology. Please see https://health.adelaide.edu.au/psychology/perg/ for some examples of relevant projects that might be pursued.

Project 3
Background for proposed Honours project in placebo medicines
Lead researcher: Oliver Frank
Email: oliver.frank@adelaide.edu.au
There is a need and a place for a range of genuine explicit placebo medicines that medical practitioners and other health professionals can advise or prescribe when a, or an additional, pharmacologically active medicine either is unlikely to be of benefit, or has a significant risk of causing harm for no or little benefit, or both.

However, no genuine placebo medicines that are declared as such are available to medical practitioners and other prescribers. Promoters and prescribers of homeopathic and some other kinds of purported medicines claim that those medicines contain active ingredients, despite pharmacological analysis finding otherwise. While we can regard them as ‘genuine’ placebos, the claims that they contain active ingredients means that we can’t view them as ‘explicit’ or ‘open label’ placebos.

Placebo controlled trials of medicines have found significant positive effects of placebo, as have studies specifically studying the effects of placebos. The benefits of placebo medicines is now an area of active research, including by reputable institutions such as Harvard University, which has established a Program in Placebo Studies and the Therapeutic Encounter http://programinplacebostudies.org

It is known that the presentation of a medicine, including the size, shape and colour of tablets, and other features including the name, packaging and promotional pitch all influence its effects. Anecdotal reports and a small number of clinical trials conducted to date suggest that ‘explicit’ or ‘open label’ placebo medicines, where the user knows that the medicine contains no pharmacologically active ingredients, are effective.

Ethical issues in the use of placebo medicines have usually been about deceiving patients by not telling them that the medicine was a placebo. Telling patients that the medicine that is being proposed to be used contains no pharmacologically active ingredients makes this a quite different situation.

To provide a basis for the development and preparation for market of a prototype genuine ‘explicit’ or ‘open label’ placebo medicine, we propose a review of the literature about placebo medicines, with special attention to studies of the effects of ‘explicit’ or ‘open label’ placebo medicines.

Project 4
Any projects in the area of anthrozoology, and specifically, the human-animal bond.

Project 5
I am more than happy to discuss students’ ideas about potential projects, according to their interests and career goals. In all cases, I expect the student to take an active role in deciding upon the specific project and formulation of the research question. I will discuss the most appropriate methodologies with students - but prefer thematic analysis, survey methods, and mixed methods.
I completed my PhD in 1992 at the University of Adelaide on social representations theory under the supervision of Professor Mike Innes. My main research focus has been in the relatively new field of discourse and social psychology. My most significant contribution to the field in the last ten years has been to re-theorise and empirically examine traditional social psychological topics from a discursive psychological framework. This has included topics such as race, gender, prejudice, social identity and social exclusion. I have been strongly influenced by many of my postgraduate students who have dragged me kicking and screaming into the ‘real world’ to examine issues such as the crisis in foster care (Assoc Prof Damien Riggs), refugees and asylum seekers (Dr Clemence Due, Dr Scott Hason-Easey, Dr Danielle Every), child sexual abuse (Dr Kathy Fogarty), and climate change (Dr Peta Callaghan).

Project 1: Associative learning
I supervise projects that investigate learning and memory processes in healthy individuals. This involves running lab-based experiments in which participants learn by trial-and-error to associate co-occurring stimuli. The aim of this research is to test different theories of learning (oftentimes mathematical models), or to investigate individual differences in learning.
Psychology Honours Research Opportunities

Lead researcher: Professor Nicholas Burns
Email: nicholas.burns@adelaide.edu.au
Location: North Terrace
Phone: 8313 3965

My research has a common theme: the assessment of subtle changes in cognitive function that arise as a result of, for example, environmental neurotoxins, nootropic supplements, other drugs, or both normal and pathological ageing. More recently, we have begun to investigate the genetics of individual differences in learning; as well as examining relationships between learning and intelligence.

I can also supervise projects that relate to people's involvement with, or understanding, of financial decision-making.

Project 1: Illusion of control and gambling
I can supervise projects that examine people's susceptibility to erroneous beliefs and whether this relates to individual differences in gambling behaviour. I am also interested in work that examines the overlap between video-gaming/skill-task involvement and chance-based tasks.

Project 2: The psychology of conspiracy theories/conspiracy theory logic
I have an interest in people's proneness for conspiracy beliefs and how this might relate to susceptibility to cognitive biases and personality factors.

Project 3: Risk and harm
I would be happy to supervise projects that examine how people conceptualise the harms and risks associated with what are considered higher risk behaviours, e.g., gambling, alcohol consumption.

Project 4: Economic psychology
I can also supervise projects that relate to people's involvement with, or understanding, of financial decision-making.

Lead researcher: Professor Paul Delfabbro
Email: paul.delfabbro@adelaide.edu.au
Location: North Terrace
Phone: 8313 4936

Project 1: Illusion of control and gambling
I can supervise projects that examine people's susceptibility to erroneous beliefs and whether this relates to individual differences in gambling behaviour. I am also interested in work that examines the overlap between video-gaming/skill-task involvement and chance-based tasks.

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Project 3: Risk and harm
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Project 4: Economic psychology
I can also supervise projects that relate to people's involvement with, or understanding, of financial decision-making.
Psychology Honours Research Opportunities

Lead researcher: Dr Diana Dorstyn
Email: diana.dorstyn@adelaide.edu.au
Location: North Terrace
Phone: 8313 0649

**Project 1**
I supervise research projects in the broad areas of rehabilitation, clinical and health psychology.
Topics of interest include:
> quality of life and resilience in adults with a chronic physical illness or disability (i.e. multiple sclerosis, spinal cord injury)
> psychological health and well-being of caregivers
> effectiveness of technology-based interventions to improve rehabilitation outcomes
> meta-analyses and systematic reviews as a methodology

For more information:

Lead researcher: Dr Matt Dry
Email: matthew.dry@adelaide.edu.au
Location: North Terrace
Phone: 8313 3856

**Project 1: Predictors of academic achievement.**
Investigating the role of personality, intellectual ability and factors such as stress, motivation, meta-cognition, creativity, perfectionism, etc on academic outcomes such as grades, satisfaction, post-graduate employment etc.

**Project 2**
Human performance on the Traveling Salesperson Problem (TSP). The TSP is a computationally difficult optimisation problem - understanding the cognitive processes underlying human performance on this task provides insight into our ability to perform computationally difficult tasks with apparent ease.
Psychology Honours Research Opportunities

Lead researcher: Dr Clemence Due
Email: clemence.due@adelaide.edu.au
Location: North Terrace
Phone: 8313 6096

Project 1
Refugee mental health and wellbeing - a range of projects including the relationship between mental and oral health; early childhood trauma; cultural understandings of health and illness

Project 2
Pregnancy loss - with a focus on men's experiences of pregnancy loss; perceived social support; health and wellbeing outcomes

Project 3
Children with Autism Spectrum Disorders and their families - including psychosocial outcomes, family functioning and child development

For more information:
http://researchers.adelaide.edu.au/profile/clemence.due
Psychology Honours Research Opportunities

Lead researcher: Dr Neil Kirby
Email: neil.kirby@adelaide.edu.au
Location: North Terrace
Phone: 8313 5739

Project 1: What makes an interesting job?
This study would replicate a study by Jurgensen (1978) who identified key factors that employees found desirable in an interesting job at that time. Although there have been some follow up studies, there is an opportunity to replicate this study to assess changes over time in what potential employees would consider desirable in an interesting job and also to consider the extent to which type of job and personality impact on the factors identified. This study could, for example, compare psychology students with students from another discipline such as Commerce or management. The results would have implications for personnel selection and management of employees.

Project 2: Theory X and Theory Y and its relationship to personality
McGregor’s Theory X and Theory Y concepts have been influential in the fields of management and organisational psychology but there has been little research into their relationship to personality factors that might influence the extent to which managers can adopt a Theory X or Theory Y approach to management. This study would assess the extent to which measures of Theory X and Theory Y are related to measures of basic personality characteristics. The results would have implications for teaching strategies for managing employees.

Project 3: Perceptions of personality characteristics that can and can’t be changed.
According to Seligman there are some aspects of personality that are more difficult to change than others. This study would use the NEO personality inventory to assess the personality characteristics of psychology students, the extent to which they would like to change any of those characteristics, and their evaluation of how difficult they believe it would be to change different aspect of their personality. It would also investigate whether they have tried to change any of those characteristics and if so, how successful they believe they have been.

Project 4: The relationship between reaction time and IQ
The aim of this study would be to compare the correlation between IQ and reaction time based on the traditional use of random sequences of stimuli in the reaction time task compared with the use of predictable sequences that can be learned and which become progressively more complex. It is predicated that the correlation would be higher in the latter case and this relationship could be investigated for different groups including university students, the elderly, children, and / or people with an intellectual disability. The practical advantage of such a reaction time measure is that it could be used as a quick nonverbal assessment of IQ suitable for a wide variety of different types of people.

Project 5: Scientific versus humanistic psychology replication
Kimble (1984) devised a measure of scientific versus humanistic attitudes towards psychology as a discipline and found significant differences in the expected directions between psychologists in different areas of psychology. The aim of this study would be to assess the relationship between personality and such attitudes across the undergraduate years in psychology and in graduate alumni in psychology across previous decades. The aim of the study would be to investigate individual differences in such attitudes and whether there has been any trend in changes in such attitudes in the discipline of psychology over time.

Project 6: Best and Worst managers
What personality characteristics distinguish between best and worst managers as rated by their employees? The aim of this study would be to use undergraduate experiences of management in retail and hospitality to investigate the extent to which there are common personality traits that characterise good and bad managers and whether these assessments depend of the personality of the employee. The results of this study would have implications for the training of managers.
Psychology Honours Research Opportunities

Lead researcher: Amanda LeCouteur  
Email: amanda.lecouteur@adelaide.edu.au  
Location: North Terrace  
Phone: 8313 5557

I am the Associate Professor, Psychology, at the University of Adelaide, Australia, where I teach in the fields of gender, research methods and philosophy of science. I have published in the areas of racism, education, gender and health. I also have a long-standing interest in the field of elite achievement, and act as a recruiting and development consultant in the Australian Football League. My current research involves analysis of real-life interaction in contexts such as help-line, medical and counseling interactions.

Lead researcher: Professor Jane Mathias  
Email: jane.mathias@adelaide.edu.au  
Location: North Terrace  
Phone: 8313 5266

Project 1: Cognitive problems and multiple sclerosis: A meta-analysis

There is an opportunity in 2018 to conduct a meta-analysis examining the cognitive problems associated with multiple sclerosis, jointly supervised with Dr Diana Dorstyn. Meta-analyses provide a rigorous method by which all available research evidence is compiled and analysed to answer a clinical or research question.
Psychology Honours Research Opportunities

Project 1: How do people anticipate the movement of an object in space?
Tracking a target and predicting its trajectory is a key task in everyday life. Consider an attempt to cross a road; you must watch the traffic and make a prediction about whether your path will intercept a moving car. How do people do this task and what role does attention play? In this project, you will use a combination of eye tracking and visual psychophysics to quantify how attention is deployed when tracking a moving target. This project may be co-supervised by Dr Steven Wiederman (Physiology).

Project 2: Do people use the same representations of space to predict where a moving object is going, and to interact with it?
Tracking a target and predicting its trajectory is a key task in everyday life. You might need to catch a ball, or avoid an oncoming object like a car. In this project, you will use visual psychophysics, eye tracking and hand tracking to investigate whether people use the same representations of space to make a perceptual judgment about a target or intercept it.

Project 3: What eye movements do people make as they reach to pick up an object amongst obstacles?
Goal directed movements (like the ones we make to pick up a cup of tea) are critical for daily living. Previous work has shown that eye and hand movements typically land on the same location when reaching to a target in isolation. In this project, you will use eye tracking and hand tracking to quantify how reaching in depth amongst obstacles affects eye-hand coordination. The results will improve our understanding of the dynamics of depth perception and will have implications for augmented reality.

Project 4: How does attention shift as people make a sequence of movements?
We have recently demonstrated that the spatiotemporal profile of attention changes depending on whether one is making an eye movement or hand movement, or both an eye and hand movement to an isolated target (e.g. Stewart and Ma-Wyatt, 2017). However, in a real world environment, people often make a sequence of movements at a time (e.g. making a cup of tea). In this project, you will use eye tracking and hand tracking to investigate how attention shifts when people make a sequence of movements to interact with a display.

Project 5: Is attention uniform in time and space as people make movements to interact with the world?
When people reach to pick up an object, they tend to shift their attention to the goal of the target, and also around the target location (e.g. Stewart and Ma-Wyatt, 2017). However, it is not yet clear how changes in this attentional profile change over time and space for targets presented with lots of other potential targets around. In this project, you will use eye tracking and hand tracking to investigate how attention changes over space and time when reaching to a target amongst distractors.

For more information: https://researchers.adelaide.edu.au/profile/anna.mawyatt
Psychology Honours Research Opportunities

Lead researcher: Associate Professor Rachel Roberts
Email: rachel.roberts@adelaide.edu.au
Location: North Terrace
Phone: 8313 5228

Project 1: Fish oil (omega-3) supplements for reducing child behavioural problems.
This Psychology Honours project would be supervised by A/Prof Rachel Roberts from within the School of Psychology, and Dr Jacqueline Gould, MS McLeod Postdoctoral Research Fellow, Healthy Mothers, Babies and Children Theme, South Australian Health and Medical Research Institute.

The fats found in fish oil are also present in the brain, and are thought by many to help treat behavioural problems in children. This project would involve a systematic review and meta-analysis of trials exploring the effect of fish oil or a placebo on child behavior. An example of a study to be included in the review is: Parletta et al. 2013. Effects of fish oil supplementation on learning and behavior of Children from Australian Indigenous remote community schools: A Randomized controlled trial. Prostaglandins, Leukotrienes and Essential Fatty Acids.

For more information: https://researchers.adelaide.edu.au/profile/rachel.roberts

Lead researcher: Dr Aspa Sarris
Email: aspa.sarris@adelaide.edu.au
Location: North Terrace
Phone: 8313 6144

Project 1: Burnout and engagement in university students.
The relationship between burnout and engagement in university students has not been fully explored. This study will contribute to the knowledge about burnout and engagement in university students. In particular, the study will examine the role of personal resources, including psychological flexibility on outcomes.

Project 2: The need to study and the need to work:
This study will examine the demands of study and work on University students. In particular, the relationship between paid work, burnout, engagement and vocational preferences will be examined.

Project 3: Burnout and resilience in university students.
The relationship between burnout and resilience in University students has not been fully explored. This study will contribute to the knowledge about burnout and resilience in university students. In particular, the study will examine the role of personal resources, including psychological flexibility on outcomes.

I would be willing to discuss supervision of any other research study relating to work, organisational culture and/or person-culture fit.
Psychology Honours Research Opportunities

Lead researcher: Dr Carolyn Sammler
Email: carolyn.sammler@adelaide.edu.au
Location: North Terrace
Phone: 8313 4628

Police use many differing techniques to test the memory of eyewitnesses and determine the identity of a perpetrator. This project will investigate the effectiveness of a procedure called a “show-up”. You will be involved in the planning, design and implementation of the research. It will involve collection of data from people in outdoor settings. It will involve the application of models using signal detection frameworks to understand the data. The work is funded by an Australian Research Council Discovery grant.

Unfamiliar face matching is a task that is used in many security and surveillance settings. This project will investigate the individual differences predictive of proficiency in this task. It will also map the time course of the decision process using drift diffusion modelling. Proficiency in using R is desirable for this project.

Sustainable consumption of meat is a major challenge facing the world, with agriculture for meat production producing large amounts of carbon emissions and having important consequences for the health of individuals. This project will explore the psychological aspects of meat consumption and apply cognitive dissonance models to understand how emotional responses can determine the maintenance and change of consumption behavior. This project will be carried out in collaboration with Professor Anna Chur-Hansen, Professor Rachel Ankeny and Dr Heather Bray.

Medical tribunals make important decisions regarding the professional practice of doctors. They have to interpret detailed submissions and determine the chances that doctors’ behaviour will lead to harm, and how to mitigate that harm through orders to suspend or modify their practice. This project will investigate the features of cases where ongoing harm has occurred. It will be carried out in collaboration with Dr Frida Cheok.

Jurors are required to engage in careful processing of evidence in criminal trials. Recent concerns regarding the reliability of various forensic sciences and the evidence given by experts had led to a body of research exploring the factors determining the way that jurors perceive and use this evidence to reach conclusions. This project will involve the investigation of factors impacting juror comprehension of forensic evidence.

Health Care Workers (HCW) represent a major group of individuals at the forefront of reducing the transmission of contagious diseases, particularly to vulnerable people such as the very young and the elderly (Influenza Specialists Group, 2016). Yet, this group shows particularly low rates of vaccination for diseases such as influenza. Despite best efforts to improve vaccination rates, there remains a significant challenge, with only around 50% of HCWs maintaining annual influenza vaccination (Seale & MacIntyre, 2011). This project will aim to understand individual differences in risk propensity and personality on vaccination rates in these individuals.

For more information:
http://researchers.adelaide.edu.au/profile/carolyn.sammler


Psychology Honours Research Opportunities

Lead researcher: Dr Peter Strelan
Email: peter.strelan@adelaide.edu.au
Location: North Terrace
Phone: 8313 5662

Project 1: Just world beliefs.
I have up to 10 different (and new) ideas for research projects testing the concept of just world beliefs, for example:
> the relation between BJW-self and conspiracy theorising
> BJW-self predicts prosocial behaviour because people want to compensate for being treated more fairly than others
> BJW-self and positive personality characteristics (e.g., humility)
> BJW-self predicting positive responses to others’ misfortune
> what is the process by which BJW-self encourages prosocial responding?
> BJW-self predicts fallacious predictions about the future/seeing patterns in random events
> BJW-self predicts deserving a bad outcome for those with low self-esteem

Project 2: Scale development: self-reported revenge and forgiveness behavioural indicators

Project 3: Meta-analysis of relationship quality predictors of forgiveness

Project 4: When its a bad idea to forgive: Forgiving under conditions of high intent encourages rumination and negative affective and relationship outcomes
Project 5
This project is being offered in partnership with the Equal Opportunity Commission. It examines the psychological impact of heteronormativity on LGBTIQ people. It involves quantitative and qualitative methods.

Project 6
This project is being offered in partnership with the Equal Opportunity Commission. It involves the development of an employer charter or set of requirements for employers to have in place for best practice employment conditions for Aboriginal employees. (developed using focus groups, surveys, interviews, qualitative and quantitative data)

Lead researcher: Professor Deborah Turnbull
Email: deborah.turnbull@adelaide.edu.au
Location: North Terrace
Phone: 83131229

Project 1
The project uses quantitative methods and is being co-supervised by Dr Matt Dry and Dr Edward Palmer from the School of Education. The project examines the relationship between wellbeing and academic performance in high school students. The work is being conducted in partnership with Blackwood High School.

Project 2
This project uses mainly quantitative methods (with an option of adding qualitative approaches) and is being co-supervised by Dr Matt Dry and Dr Edward Palmer from the School of Education. The project examines the experience of bullying and its relationship with social media. The work is being conducted in partnership with Blackwood High School.

Project 3
This project is being offered in partnership with the Equal Opportunity Commission. It involves undertaking a review of programs designed to prevent violence against women.

Project 4
This project is being offered in partnership with the Equal Opportunity Commission. It involves undertaking a review of programs designed to promote the mainstream employment of people with disabilities.
Psychology Honours Research Opportunities

Lead researcher: Dr Lynn Ward
Email: lynn.ward@adelaide.edu.au
Location: North Terrace
Phone: 8313 3182

I am interested in factors that influence adult development and ageing. I have used both qualitative and quantitative methods to study psychosocial development in midlife and older adults. Specific interests include:

> age-related changes in cognitive functioning, both normal and dementia related
> the impact of lifestyle choices and health habits on cognitive functioning and psychosocial well-being in older adults
> resilience, emotional functioning in parents of children with Autism Spectrum Disorder
> resilience and successful ageing
> cross-cultural issues in ageing.

Lead researcher: Dr Yvonne Clark
Email: yvonne.clark@adelaide.edu.au
Location: North Terrace
Phone: 8313 7464

I am passionate about working on topics related to Indigenous people and culture. I am of Kokatha/Wirangu descent from the West Coast of SA and have lived in Adelaide on Kaurna country for many years. I am a Clinical Psychologist who has had extensive experience working with local Aboriginal people in various settings. As an academic my main research interests include racism, lateral violence, children and adolescents.
2018
Psychology
Higher Degree Research Project Opportunities
Applying for a Higher Degree by Research (HDR)

Determine what type of HDR you wish to apply for, and check the entry requirements

The research activities available to you within the School of Psychology fall within three overarching areas: Health, Disability and Lifespan Development Research, Brain and Cognition Research, and Social and Organisational Research.

To find out more about opportunities to study at postgraduate level – Master of Philosophy or Doctor of Philosophy (PhD) or Master of Psychology in Clinical, Health or Organisational and Human Factors Psychology/PhD – please contact the relevant staff member, whose research interests and areas align with your own. Alternatively, please contact the Head of School, Professor Anna Chur-Hansen (anna.churhansen@adelaide.edu.au), or the Postgraduate Coordinator, Associate Professor Amanda LeCouteur (amanda.lecouteur@adelaide.edu.au).

Information on the different degrees and their eligibility is available on the Degree Finder website at adelaide.edu.au/degree-finder.

Information on scholarships is available at adelaide.edu.au/scholarships.

Secure a supervisor

Before applying online; you need to secure the support of a supervisor in the School of Psychology. Note that this can take weeks or months, so ensure that you start this process well before any scholarship closing dates.

To secure a supervisor email your initial inquiry to fhresed@adelaide.edu.au. The Office of Research Development and Research Education can advise you on preparing the necessary documents, and liaise with the relevant postgraduate coordinator on your behalf. We are aiming to help you present the strongest possible application to attract potential supervisors.

A list of postgraduate coordinators is available at adelaide.edu.au/graduatecentre/staff/postgraduate-coordinators/pgc-list.

Refining your research topic and supervisor interview

You should email potential supervisors within the School to discuss your research topic. If the supervisor agrees to support your application, you will then be in a position to advise the Postgraduate Coordinator and proceed with your application.

Apply online

Having secured the support of a supervisor within the School; the next step is to formally apply online through the Adelaide Graduate Centre at adelaide.edu.au/graduatecentre/admission.

University ranking and award

Scholarship applications undergo ranking and selection through a series of faculty and university selection panels. There is strong competition for scholarship places, so preparing a compelling application (per steps 1-3 above) is essential. The administration and admission of HDR students is managed through the Adelaide Graduate Centre adelaide.edu.au/graduatecentre/admission.

Further information

Please direct all inquiries to fhresed@adelaide.edu.au.
Health, Disability and Lifespan Development Research

This research encompasses health psychology, disability, rehabilitation and health service delivery, and healthy development across the human lifespan.

Researchers in this area are linked by a common interest in: the assessment and theoretical explanation of the determinants of individual wellbeing, both physical and psychosocial; how these are affected by age, gender, socioeconomic status and psychological variables; the evaluation of interventions to promote health and wellbeing; and associated health policy implications.

Supervisor: Professor Anna Chur-Hansen
Email: anna.churhansen@adelaide.edu.au

I am a Registered Psychologist with Endorsement in Health Psychology. I hold a PhD in Medical Education, which I completed in the Discipline of Psychiatry in the School of Medicine at the University of Adelaide, where I was on staff from 1987 to 2013. As well as a focus on research in best practice education for health professionals, my research interests are broadly around food and eating; sex and relationships; physical pain; and death and dying. I am also interested in companion animals and their impact on human health (psychological, social and physical). Much of my research and teaching is around a biopsychosociocultural framework, and I use qualitative methods (as well as quantitative and mixed methods).

Supervisor: Professor Paul Delfabbro
Email: paul.delfabbro@adelaide.edu.au

I have worked at the University of Adelaide since 2001 and I lecture in the areas of learning theory as well as methodology and statistics. My principal research interests are in the area of behavioural addictions (gambling and technology) as well as child protection and out-of-home care. Most of my research work involves statistical analysis of cross-sectional and longitudinal surveys and experimental studies.

Supervisor: Dr Yvonne Clark
Email: yvonne.clark@adelaide.edu.au

I am passionate about working on topics related to Indigenous people and culture. I am of Kokatha/Wirangu descent from the West Coast of SA and have lived in Adelaide on Kaurna country for many years. I am a Clinical Psychologist who has had extensive experience working with local Aboriginal people in various settings. As an academic, my main research interests include racism, lateral violence, children and adolescents.
Health, Disability and Lifespan Development Research

Supervisor: Dr Diana Dorstyn
Email: diana.dorstyn@adelaide.edu.au

I am a Senior Lecturer in the School of Psychology and a registered psychologist with over 15 years’ experience in the fields of injury rehabilitation and clinical psychology. I would be interested in supervising topics relating to psychological adjustment in individuals and families living with chronic illness or disability, effectiveness of telecommunication technologies in the provision of psychological services, and medical rehabilitation processes and outcomes. I use quantitative research methods, with a specialist interest in systematic reviews and meta-analyses.

Supervisor: Dr Clemence Due
Email: clemence.due@adelaide.edu.au

My research areas are diverse, but linked by research concerning the health and wellbeing of individuals and families who are considered to be marginalised or vulnerable. My research areas also include racism and prejudice, psychology education, and lifespan development. Specifically, my research expertise includes the health and wellbeing of the following groups:

> Adults and children with refugee or migrant backgrounds
> Children with developmental disorders
> Gender and sexuality diverse children and their parents
> People who have experienced pregnancy loss.

Supervisor: Professor Jane Mathias
Email: jane.mathias@adelaide.edu.au

My research falls within the field of clinical neuropsychology, which examines the cognitive, emotional and behavioural changes associated with different types of brain damage and brain dysfunction. I am particularly interested in adult traumatic brain injury, but I am also involved in research examining paediatric traumatic brain injury, stroke, chronic fatigue syndrome, and a variety of other conditions that can affect cognitive or emotional functioning. I am also involved in meta-analyses that consolidate existing research in various areas of clinical neuropsychology.
Health, Disability and Lifespan Development Research

Supervisor: Dr Michael Proeve
Email: michael.proeve@adelaide.edu.au

I am a registered psychologist with endorsement in clinical and forensic psychology and a senior lecturer in the School of Psychology at The University of Adelaide. I have more than twelve years' professional experience as a practitioner and manager in clinical and forensic psychology settings. I teach primarily into the Master of Psychology (Clinical) program, and my research interests are in the moral emotions of remorse and shame in clinical and legal contexts, assessment and treatment of sexual offenders, and mindfulness and self-compassion.

Supervisor: Dr Daniel King
Email: daniel.king@adelaide.edu.au

I am a Senior Research Fellow and clinical psychologist in the School of Psychology at the University of Adelaide. My research expertise is technology-based problems, with a specific focus on young people's digital gambling, Internet gaming, and social media use.

Supervisor: Associate Professor Rachel Roberts
Email: rachel.roberts@adelaide.edu.au

Following 15 years clinical experience primarily working with children and their families as a psychologist, I now am an Associate Professor in the School of Psychology. I teach primarily into the Master of Psychology (Clinical) and (Health) programs, and have research interests in clinical, health and neuropsychology, using qualitative and quantitative methods, as well as meta-analyses.
Health, Disability and Lifespan Development Research

Supervisor: Dr Lynn Ward
Email: lynn.ward@adelaide.edu.au

I am interested in factors that influence adult development and ageing. I have used both qualitative and quantitative methods to study psychosocial development in midlife and older adults. Specific interests include:

> age-related changes in cognitive functioning, both normal and dementia related
> the impact of lifestyle choices and health habits on cognitive functioning and psychosocial well-being in older adults
> resilience, emotional functioning in parents of children with Autism Spectrum Disorder
> resilience and successful ageing
> cross-cultural issues in ageing.

Supervisor: Professor Deborah Turnbull
Email: deborah.turnbull@adelaide.edu.au

Deborah Turnbull is an active teacher and researcher and combines these roles with senior administration activities at The University of Adelaide. She chairs the Gender Equity and Diversity Committee and sits on the Freemasons Foundation Centre for Men’s Health Management Committee, as well as serving on Council of the Kathleen Lumley College. She also chairs the Board of the Hut Community Centre. She teaches across all levels of psychology and is active in supervision of students enrolled in higher degrees by research.
Brain and Cognition Research

Researchers in this area are engaged in the fields of cognition, perception, neuropsychology, and individual differences. As well as conducting basic research into psychological processes, the unit also has a strong interest in applied research conducted in association with several industry partners, including the Defence Science and Technology Group.

**Supervisor: Dr Irina Baetu**
**Email:** irina.baetu@adelaide.edu.au

My research focuses on understanding the mechanisms that underpin human learning and memory. I am particularly interested in genetic individual differences in learning and memory processes, and how such individual differences may contribute to the development of anxiety disorders.

**Supervisor: Dr Matthew Dry**
**Email:** matthew.dry@adelaide.edu.au

Matt completed his PhD in Psychology in 2007 at the University of Adelaide, and then took up a post-doctoral research position at the University of Leuven in Belgium. He has been a lecturer in the School of Psychology at the University of Adelaide since 2011. His research has focused on the mathematical modelling of cognitive and perceptual processes, psychopharmacology, and (more recently) pedagogical research into tertiary education teaching and learning. He holds an Office of Learning and Teaching (OLT) grant investigating the impact of adaptive learning software, such as McGraw-Hill Education’s LearnSmart, on academic outcomes.

**Supervisor: Professor Nick Burns**
**Email:** nicholas.burns@adelaide.edu.au

My research has as a common theme the assessment of subtle changes in cognitive function that arise as a result of, for example, environmental neurotoxins, nootropic supplements, other drugs, or both normal and pathological ageing. More recently, we have begun to investigate the genetics of individual differences in learning, as well as examining relationships between learning and intelligence. Critically, my work is very much cross-disciplinary and large scale whereby my expertise in cognitive assessment, psychometrics and statistical methods complements the expertise of my colleagues.
Psychology Higher Degree Research Project Opportunities

Supervisor: Associate Professor Anna Ma-Wyatt
Email: anna.mawyatt@adelaide.edu.au

In my lab, we study how people use vision to guide goal directed movements to interact with the environment. We use techniques including eye tracking, hand tracking and visual psychophysics. Recently, we have investigated how attention is deployed when making eye and hand movements, and how visual information is used to constrain eye-hand coordination. We have also been working on how ageing and visual field loss affect eye-hand coordination. In our applied work, we collaborate with Defence on questions related to active vision and human machine interfaces.

Supervisor: Dr Carolyn Semmler
Email: carolyn.semmler@adelaide.edu.au

My research applies psychological theories to the law. I am interested in understanding how memory reports become distorted by post-decision feedback, how confidence and accuracy are related in recognition memory and in unfamiliar face matching. I have also worked on methods to improve juror comprehension of legal concepts, how to limit the impact of misleading drug promotion marketing and how to improve the use of forensic science evidence in legal settings.

Brain and Cognition Research
Social and Organisational Research

Staff and students engaged in research and teaching in this area focus on social psychology, critical social psychology, discursive psychology, conversation analysis, and organisational psychology.

Key research topics include analysis of real life interaction in contexts such as: racism; the needs of refugees; helpline and counselling effectiveness; organisational culture; work stress; social and psychological issues associated with elite performance in sport; and forgiveness and justice.

Supervisor: Professor Martha Augoustinos
Email: martha.augoustinos@adelaide.edu.au

I completed my PhD in 1992 at the University of Adelaide on social representations theory under the supervision of Professor Mike Innes. My main research focus has been in the relatively new field of discourse and social psychology. My most significant contribution to the field in the last ten years has been to re-theorise and empirically examine traditional social psychological topics from a discursive psychological framework. This has included topics such as race, gender, prejudice, social identity and social exclusion.

I have been strongly influenced by many of my postgraduate students who have dragged me kicking and screaming into the ‘real world’ to examine issues such as: the crisis in foster care (Associate Professor Damien Riggs), refugees and asylum seekers (Dr Clemence Due, Dr Scott Hason-Easey, Dr Danielle Every), child sexual abuse (Dr Kathy Fogarty), and climate change (Dr Peta Callaghan).

Supervisor: Associate Professor Amanda LeCouteur
Email: amanda.lecouteur@adelaide.edu.au

I am Associate Professor, Psychology, at the University of Adelaide, Australia, where I teach in the fields of gender, research methods and philosophy of science. I have published in the areas of racism, education, gender and health. I also have a long-standing interest in the field of elite achievement, and acts as a recruiting and development consultant in the Australian Football League. My current research involves analysis of real-life interaction in contexts such as help-line, medical and counselling interactions.
Social and Organisational Research

Supervisor: Dr Neil Kirby
Email: neil.kirby@adelaide.edu.au

I am a Senior Lecturer in the School of Psychology at the University of Adelaide. My teaching and research interests in organisational psychology include organisational culture, the historical development of organisational theories, the role of the organisational psychologist, and person/organisation fit. I am also Director of the Wellbeing Research Unit (WRU) in the School of Psychology. The WRU comprises researchers with interests in wellbeing and the quality of life of people across their lifespan with specific research interests in disability, rehabilitation, ageing, healthy development, and organisational psychology.

Supervisor: Dr Aspa Sarris
Email: aspa.sarris@adelaide.edu.au

My main research interest is work or organisational psychology. My research aims to contribute to our understanding of the factors in the workplace that impact upon individual and organisational well-being. My specific areas of research interest include organisational behaviour, organisational culture, and the behaviour of groups in isolated and confined environments.

Supervisor: Dr Peter Strelan
Email: peter.strelan@adelaide.edu.au

I work at the intersection of social psychology and individual differences. My broad research interest is in the area of forgiveness, with a specific focus on the relation between justice and forgiveness. I also have an interest in body image, in particular the application of objectification theory to explaining the antecedents and consequences of negative body image.
Adelaide BioMed City: Located in the western end of the city, the A$3.6 billion Adelaide BioMed City is one of the largest health and life sciences clusters in the Southern Hemisphere. Comprising the new Royal Adelaide Hospital, South Australian Health and Medical Research Institute (SAHMRI), SAHMRI 2, and the Adelaide Health and Medical Sciences building, the precinct brings together research, education, clinical care and business development.

For further enquiries
Office of Research Development and Research Education
Faculty of Health and Medical Sciences
The University of Adelaide
SA 5005 Australia

Email: fhsresed@adelaide.edu.au

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