THE UNIVERSITY of ADELAIDE

2022
THIRD YEAR
RESEARCH OPPORTUNITIES GUIDE

Faculty of Health and Medical Sciences

health.adelaide.edu.au

CONTENTS

THIRD YEAR RESEARCH PLACEMENTS

The purpose of the Research Placement course is to provide small group research experiences (in consecutive semesters, as parts 1 and 2) for all third year Bachelor of Health and Medical Sciences (BHMS), Bachelor of Health and Medical Sciences (Advanced) and Bachelor of Health Sciences (Advanced) students, supervised by academic and research staff. A cross-disciplinary research conference event will be a highlight of the course.

This Research Opportunities Guide provides a link to available projects for 2022 via individual's researcher profiles.

How to apply

Students will be invited by email to nominate their project preferences online during a single week in February for students who are starting part 1 at the beginning of the year (semester 1). Most of the communication will be via MyUni so it is important that you enrol for Part 1 of the Research Placement course as soon as possible.

(Mid-year entries into part 1 will be invited to nominate project preferences during a time window before semester 2, to be announced closer to the date).

Other Information

Students can only be placed in projects for which they are eligible, based on majors and other criteria as listed in the project descriptions. Students who enrol after the preference round, who do not submit preferences, or whose preferences cannot be accommodated, will be assigned by course coordinators into projects that are appropriate to their majors.

Assignments into projects by course coordinators will be final, and not open to requests for reassignment.

Students are allowed to contact supervisors only after their placement with that supervisor has been confirmed in mid February.

To best fit to the field of work, research activities may be spaced weekly, or packed into a shorter span of days, to achieve 20 hours of research contact time per semester, as determined by the supervisor in consultation with the students in the group.

Special requirements

Note that police clearances, immunisations, or other special requirements if specified in the guide must be organised by students in advance of the research project start date, at their own expense.

Timeline

- In December the Research Placement Guide will be posted online.
- In February: project preferences will be accepted from students (online poll website) for a limited time only. The precise dates will be posted on MyUni.
- Prior to commencement of semester 1: Students will be notified of their project group by e-mail.
- Week 3 of the semester: Students have their introductory meetings with their supervisors, setting the planned schedule of contact meetings for the semester, discussing relevant reports or literature to be read, and completing orientation and induction requirements as needed for the research project.

AGEING, FRAILTY AND MOBILITY

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.

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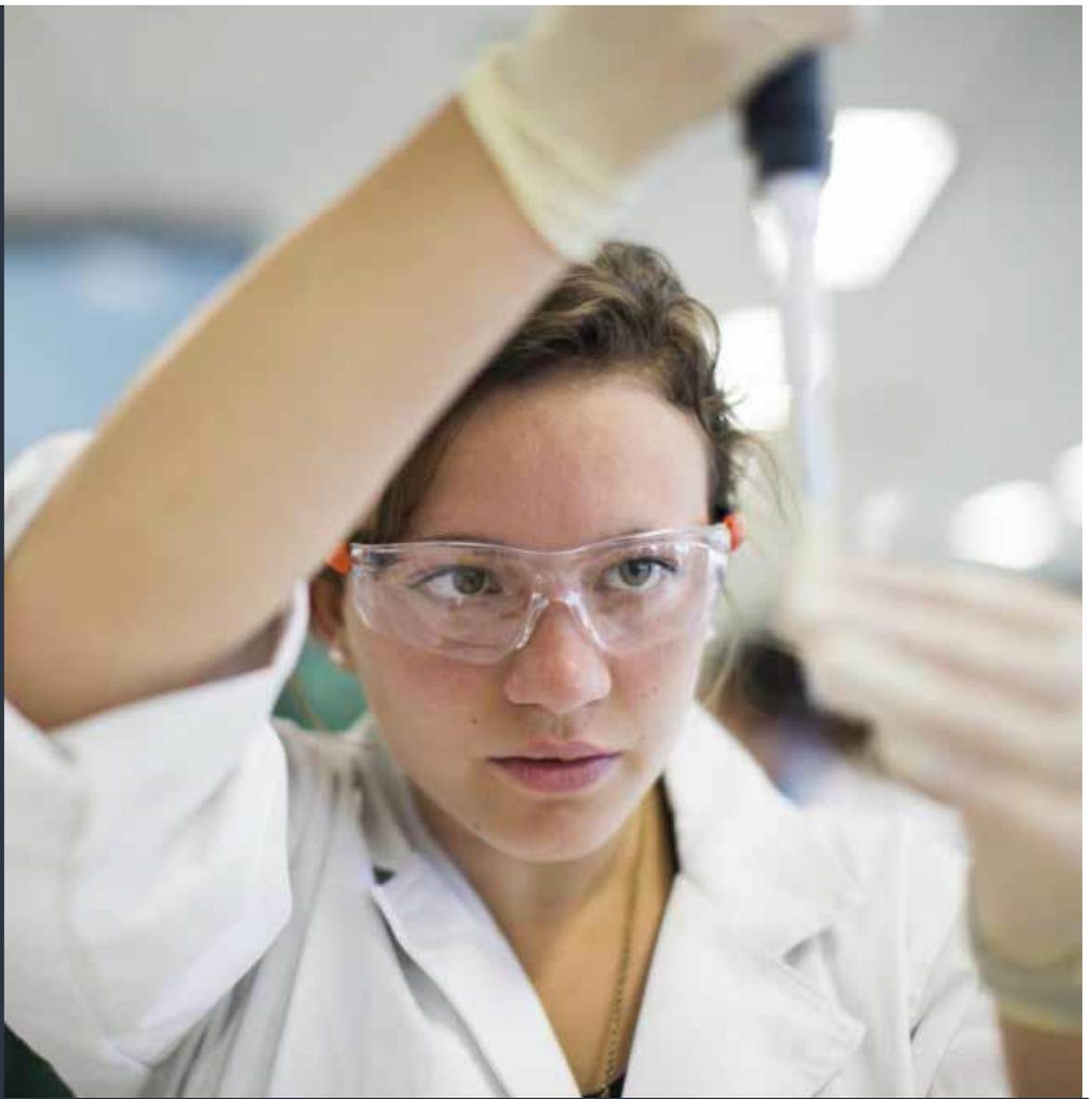
Researchers across the faculty are focused on:

- 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.



CANCER BIOLOGY AND CLINICAL ONCOLOGY

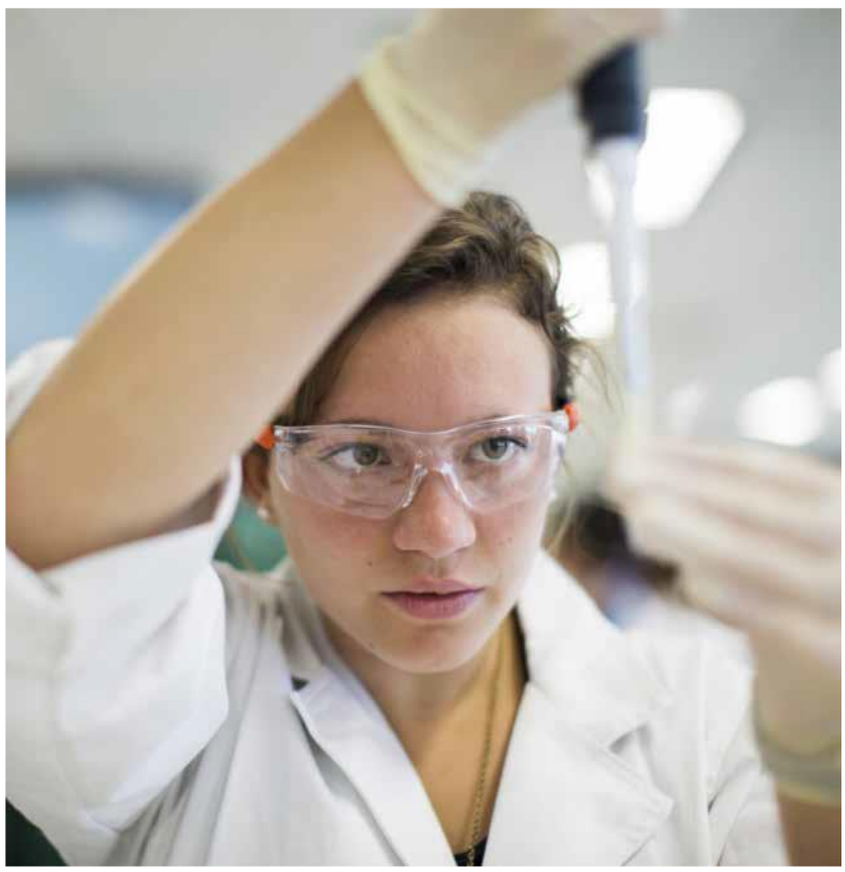
CANCER BIOLOGY AND CLINICAL ONCOLOGY

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.

CARDIAC, RESPIRATORY AND VASCULAR HEALTH

CARDIAC, RESPIRATORY AND CASCULAR 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.

CHILD AND ADOLESCENT HEALTH

CHILD AND ADOLESCENT HEALTH RESEARCH GROUPS

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**.

EARLY ORIGINS OF HEALTH

EARLY ORIGINS OF HEALTH RESEARCH GROUPS

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.

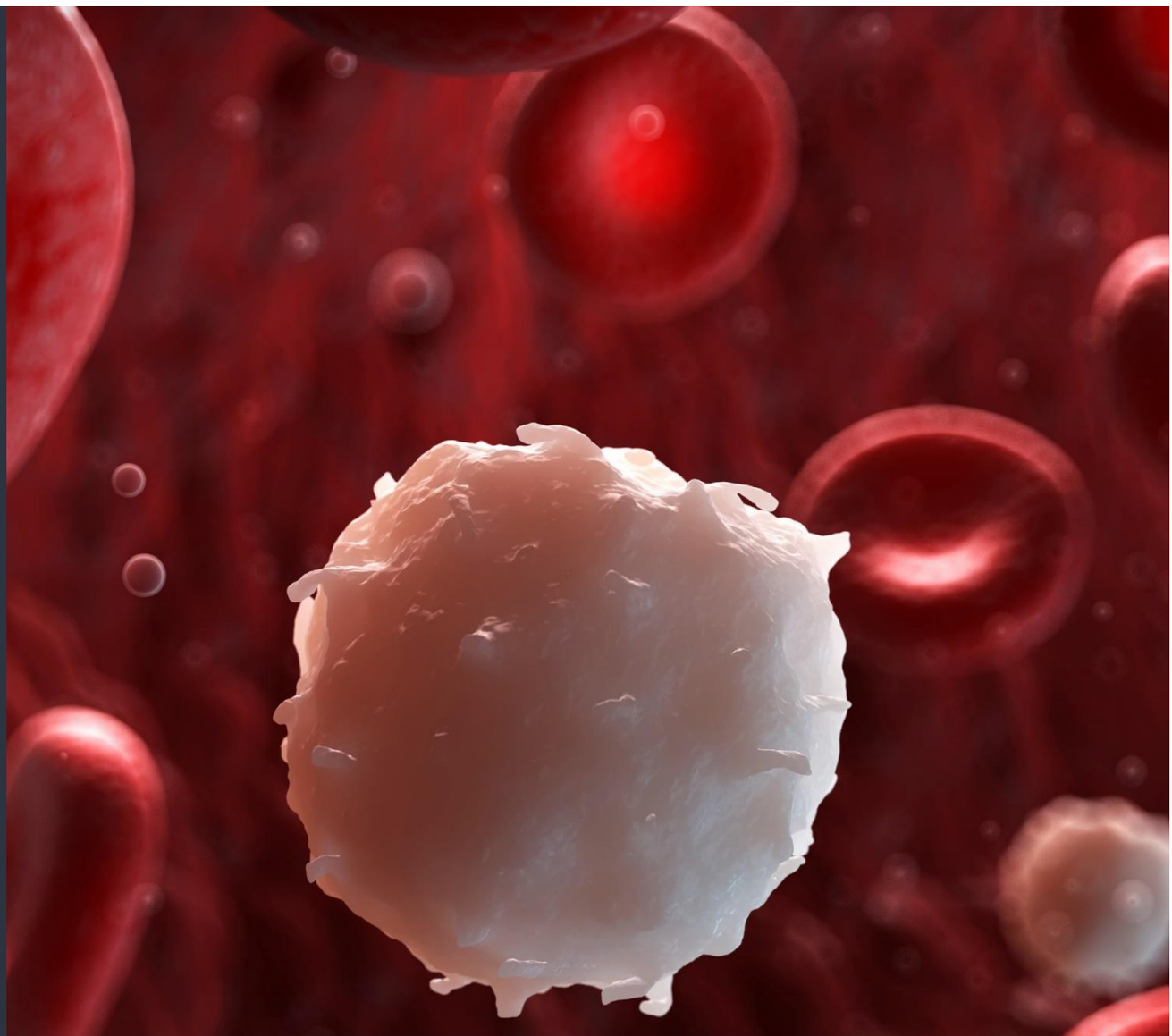
A more in-depth explanation of this research area is available on the **Robinson Research Institute's website**.

FERTILITY AND CONCEPTION

FERTILITY AND CONCEPTION RESEARCH GROUPS

with every child'sdevelopment, growth trajectory and health over the life course set in motionfrom 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.



IMMUNOLOGY AND INFECTION

IMMUNOLOGY AND INFECTION RESEARCH GROUPS

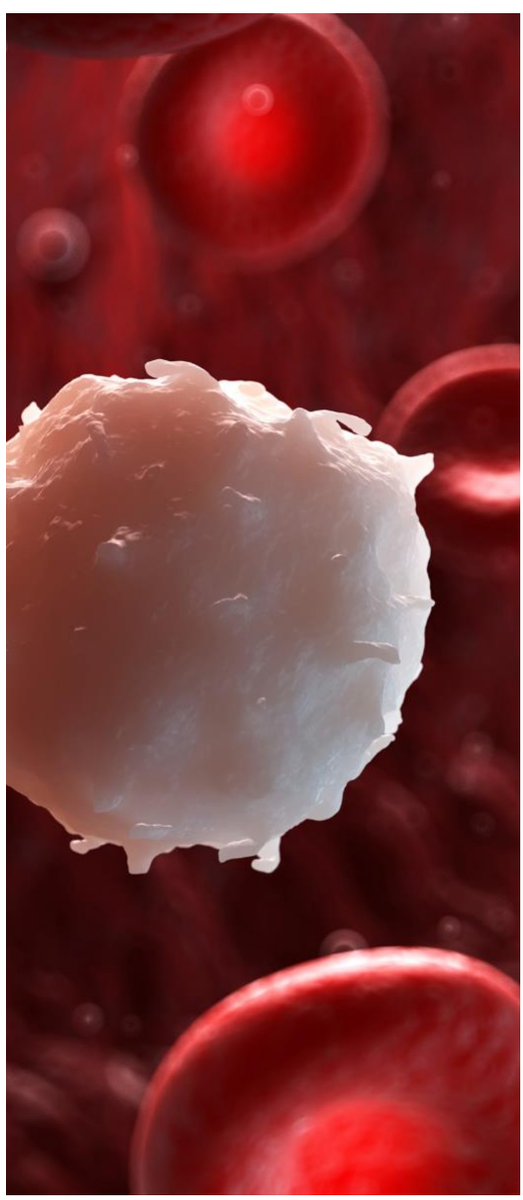
Our immune system is at the front line for controlling infection from foreign pathogens, including bacteria and viruses. A healthy, functioning immune system is fundamental to our overall health and wellbeing.

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



INNOVATIVE THERAPEUTICS

INNOVATIVE THERAPEUTICS RESEARCH GROUPS

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.

INDIGENOUS HEALTH AND HEALTH EQUITY

INDIGENOUS HEALTH AND HEALTH EQUITY

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.

MEN'S HEALTH

MEN'S HEALTH

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.

MUSCULOSKELETAL HEALTH

MUSCULOSKELETAL HEALTH RESEARCH GROUPS

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.

NEUROSCIENCE, BEHAVIOUR AND BRAIN HEALTH

NEUROSCIENCE, BEHAVIOUR & BRAIN HEALTH RESEARCH GROUPS

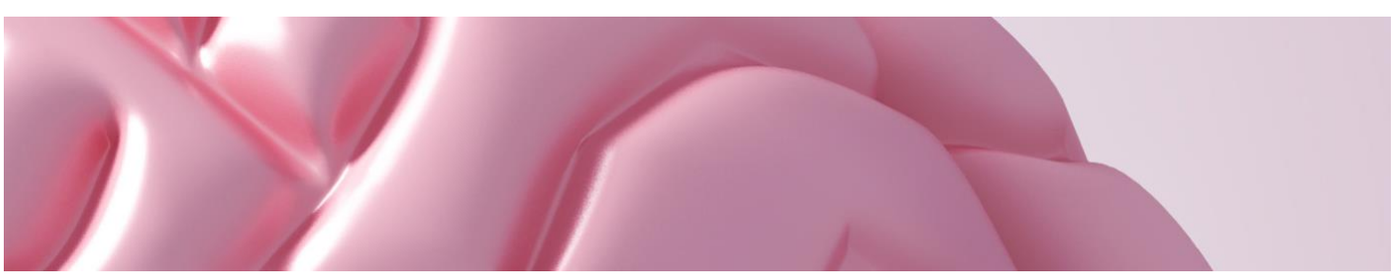
The brain and spinal cord comprise the central nervous system of the body. Damage and disease of the brain or spinal cord can lead to developmental delay, intellectual or physical disability, loss of cognitive function and behavioural and psychological disorders.

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.



NUTRITION AND METABOLIC HEALTH

NUTRITION AND METABOLIC HEALTH RESEARCH GROUPS

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 longitudinal, large cohort studies to assess associations between diet and chronic diseases.

ORAL HEALTH

ORAL HEALTH RESEARCH GROUPS

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.

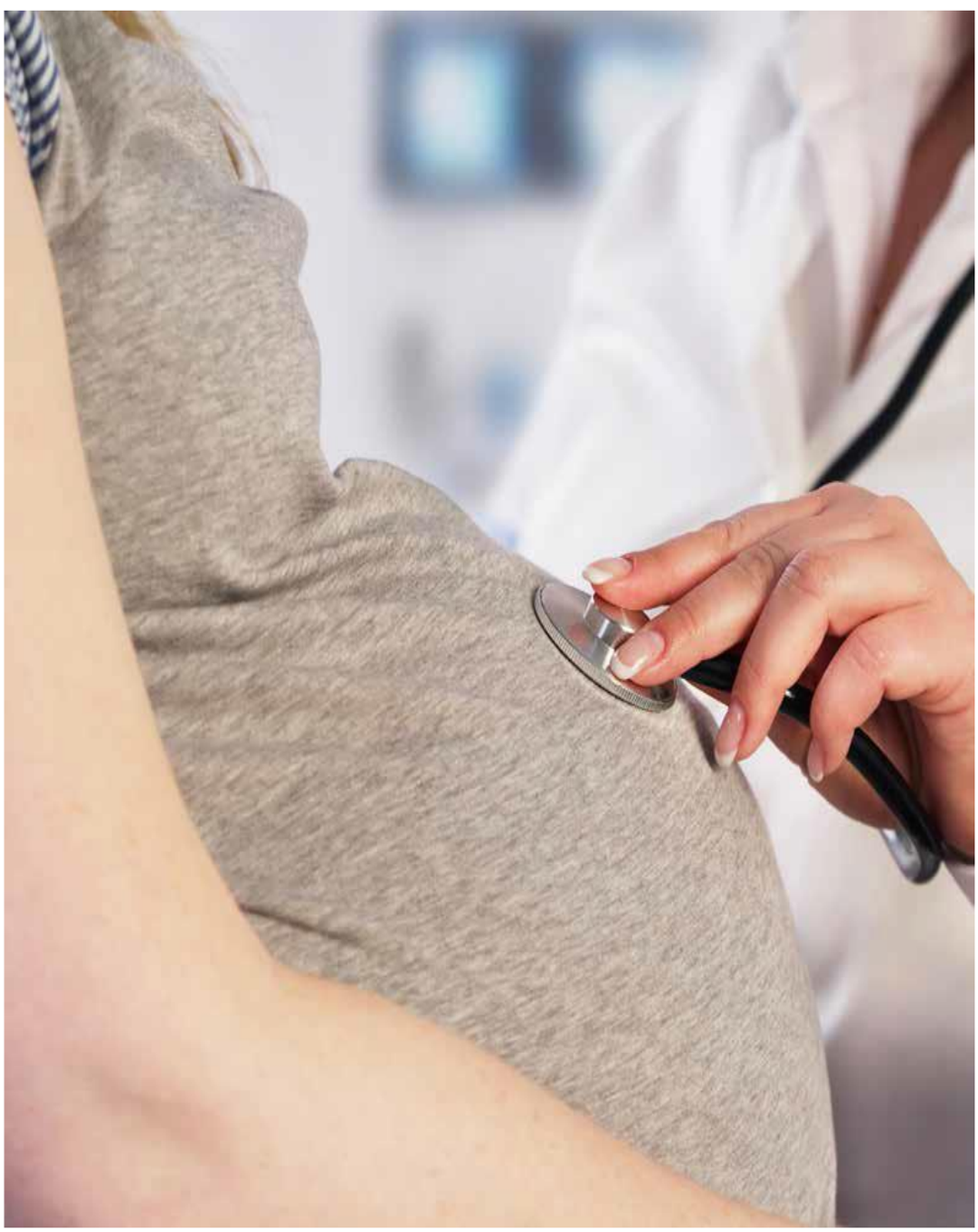
PREGNANCY AND BIRTH

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



SURGICAL AND HEALTH SYSTEMS INNOVATION

SURGICAL AND HEALTH SYSTEMS INNOVATION RESEARCH GROUPS

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.

TRANSLATIONAL HEALTH OUTCOMES

TRANSLATIONAL HEALTH OUTCOMES RESEARCH GROUPS

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 professionaL