BACHELOR OF BIOMEDICAL SCIENCE HONOURS 2020

KEY RESEARCH AREAS
What is the Honours year about?

A full-time Bachelor of Biomedical Science Honours year gives students the opportunity to undertake a specific avenue of research selected from the range of research interests in any area of biomedical science. The course is made up of a course work component and an independent research project. Students select and undertake an individual research project often working within a team or research group under close supervision. As part of the Honours course students receive training in oral communication, data analysis and advanced discipline related knowledge. At the end of the year students report their findings to School or Departmental staff and write a research thesis.

Why enrol in Honours?

- Increase employment opportunities.
- Gain experience in research.
- Allows students to determine if they are suited to a career in biomedical research.
- Contribute new knowledge to medical science.

What is the structure of the Biomedical Honours course?

The Bachelor of Biomedical Science Honours program within the Faculty of Medicine, Nursing and Health Sciences is unique in that it is devoted almost entirely to the research project. We have kept coursework and examinations to a minimum so that your major focus (75% of total assessment) will be on your chosen research project.

The Biomedical Science Honours Course comprises two units

1. BMS4100 = 75% of overall course mark
2. BMS4200 = 25% of overall course mark

<table>
<thead>
<tr>
<th>Component</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMS4100 Biomedical Research Project (36 points)</td>
<td></td>
</tr>
<tr>
<td>Literature Review</td>
<td>10% School/Department</td>
</tr>
<tr>
<td>Seminar 1</td>
<td>S or NS School/Department</td>
</tr>
<tr>
<td>Seminar 2</td>
<td>10% School/Department</td>
</tr>
<tr>
<td>Thesis</td>
<td>80% School/Department</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMS4200 Advanced Studies in Biomedical Science (12 points)</td>
<td></td>
</tr>
<tr>
<td>Discipline-Specific component</td>
<td>40% School/Department</td>
</tr>
<tr>
<td>Common Core Component</td>
<td></td>
</tr>
<tr>
<td>Statistics course and assignment</td>
<td>30% Faculty</td>
</tr>
<tr>
<td>Written Critique exam</td>
<td>30% Faculty</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

Individual Student Research Project (75%)
Individual Student Research Project (75%)
- This can be undertaken at any approved location, including all departments, affiliated institutes, and centres of the Faculty. Under some circumstances projects may also be undertaken in other Faculties.
- Must be conducted under the supervision of a member of the academic or research staff of the Faculty who has had experience in supervising honours students.
- The choice of project and supervisor will largely be left to you. You will need to identify the areas of research you are interested in and seek out opportunities for projects in those areas.
- Assessment of your research project will be through a literature review, seminars and the final thesis.

Choosing a host research group for your Honours year
The key to a successful and enjoyable Honours year is to select an interesting project, a compatible supervisor and a supportive research group. Students should take advantage of the various Honours information sessions run by individual Departments to learn about potential projects and meet supervisors. Dates for Honours information sessions are publicised on the web. Students are also encouraged to visit Departments and chat with staff about Honours projects.

How do I apply?
You are required to upload your completed BMS (Hons) application form in portable document (pdf) into E-Admissions. Students must complete and submit an application form (please check the website below for application due date). The application form may be downloaded from the Biomedical Science Honours web site: www.med.monash.edu.au/sobs/teaching/honours/index

When will I know if I have a place?
All applications will be reviewed and students who meet the eligibility criteria will be informed of their success in obtaining an Honours place by email, which will be sent out in late December 2019. Students must then notify the Faculty and supervisor of their intention to accept or reject the place. Students will be able to enrol into the Honours course via WES in January 2020.

Who administers the Biomedical Science Honours Course?
The Biomedical Science Honours Course is managed by a Management Committee, which is comprised of:
- Convenor – Associate Professor Tim Cole (Department of Biochemistry and Molecular Biology)
- Coordinator – Dr Shae-Lee Cox (School of Biomedical Sciences)
- Staff and student representatives from: School of Biomedical Sciences, Central Clinical School, Hudson Institute of Medical Research, School of Clinical Sciences, School of Public Health and Preventative Medicine, School of Primary and Allied Health Care, Australian Regenerative Medicine Institute and School of Psychological Sciences.

Discipline Specific Component (10%)
Your School/Departmental coordinators will be responsible for this component via the Schools system or within Departments based within each of the Schools. This could take the form of advanced lecture series, learning specialized techniques or critical analysis of a discipline specific journal article.

Common Core Component (15%)
This component of your assessment will be based on topics unrelated to your individual research project. It will involve a statistics module, an accompanying workshop and test and, a written critique of a scientific paper, in a three-hour examination format. Further details will be available closer to the date of the common core assessment.

Choosing a host research group for your Honours year
The key to a successful and enjoyable Honours year is to select an interesting project, a compatible supervisor and a supportive research group. Students should take advantage of the various Honours information sessions run by individual Departments to learn about potential projects and meet supervisors. Dates for Honours information sessions are publicised on the web. Students are also encouraged to visit Departments and chat with staff about Honours projects.

How do I apply?
You are required to upload your completed BMS (Hons) application form in portable document (pdf) into E-Admissions. Students must complete and submit an application form (please check the website below for application due date). The application form may be downloaded from the Biomedical Science Honours web site: www.med.monash.edu.au/sobs/teaching/honours/index

When will I know if I have a place?
All applications will be reviewed and students who meet the eligibility criteria will be informed of their success in obtaining an Honours place by email, which will be sent out in late December 2019. Students must then notify the Faculty and supervisor of their intention to accept or reject the place. Students will be able to enrol into the Honours course via WES in January 2020.

When can I start my Honours project?
The official commencement date for the Bachelor of Biomedical Science Honours is Monday 24 February 2020 which starts with the Orientation week. Students may start earlier, but only if this arrangement is acceptable to their supervisor. Students should not begin laboratory work until after the completion of the Orientation Program and safety courses which will be held during Orientation week (week 0). An early start may involve reading recommended references, preparation of the project outline and commencement of the literature review.
MONASH BIOMEDICINE DISCOVERY INSTITUTE / SCHOOL OF BIOMEDICAL SCIENCES

With more than 120 internationally-renowned research teams, the Monash Biomedicine Discovery Institute (BDI) is one of the largest and highest-quality biomedical research institutes in Australia. Monash BDI works with national and international collaborators on global health priority areas, including cancer, cardiovascular disease, development and stem cells, infection and immunity, metabolism, diabetes and obesity, and neuroscience.

Our discoveries accelerate the ability to prevent, diagnose and treat disease by leveraging our strong partnerships with researchers, health precincts and industry, together with our access to unparalleled, world-leading research infrastructure.

The Monash BDI encompasses the School of Biomedical Sciences, and is part of Monash’s Faculty of Medicine, Nursing and Health Sciences. The School of Biomedical Sciences delivers biomedical sciences education to more than 2,000 undergraduate students and 300 postgraduate students.

Based at Monash’s Clayton campus, the Monash BDI is structured to include six health-focused discovery programs and five discipline-specific departments. This allows for the cross-pollination of ideas needed to tackle the big questions in biomedical research – it is at the intersection of these global health issues that truly innovative discoveries will be made.

DISCOVERY PROGRAMS
- Cancer
- Cardiovascular Disease
- Development & Stem Cells
- Infection & Immunity
- Metabolism, Diabetes & Obesity
- Neuroscience

DEPARTMENTS
- Anatomy & Developmental Biology
- Biochemistry & Molecular Biology
- Microbiology
- Pharmacology
- Physiology

CENTRES
- Centre for Human Anatomy Education
Key research areas

The Department of Anatomy & Developmental Biology at Monash University is very active in a variety of research areas. It boasts several of the world’s leading research scientists in the field of Developmental biology and Anatomy.

Major areas of research include:

- Blood cell homeostasis: cell death and disease (Prof Benjamin Kile)
- Bone biomechanics, implant design and pathologies (Dr Olga Panagiotopoulou)
- Brain development and function, stem cells (A/Prof Roger Pocock)
- Cardiovascular and renal cell biology (Prof Jane Black)
- Cell biology of the oocyte and early embryo development (Prof John Carroll)
- Comparative, evolutionary and functional anatomy (Dr Justin Adams)
- Epigenetics and Reprogramming (Prof Jose Polo)
- Gene Regulation (Dr Partha Das)
- Germine stem cells (Dr Robin Hobbs)
- Hippo signalling, organ size control and cancer (Prof Kieran Harvey)
- Immunology, development and diseases of the eye (Prof Paul McMenamin)
- Intestine development, stem cells and cancer (A/Prof Helen Abud)
- Investigating the transition from student to professional in healthcare education (Dr Michelle Lazarus)
- Kidney development and disease (Prof Ian Smyth)
- Kidney development, programming and disease (Prof John Bertram)
- Kidney stem cells and regeneration (A/Prof Sharon Ricardo)
- Nervous system development and repair (Dr Brent Neumann)
- Neurogenesis and neuroregeneration (Prof Zhi-Cheng Xiao)
- Ovarian biology and female infertility (Dr Karla Hutt)
- Palaeoanthropology, biomechanics and digital modelling (Dr Luca Fiorenza)
- Prostate health and disease (Prof Gail Risbridger)
- Sensory perception and ageing (Dr Jie Liu)
- Sex determination, limb morphogenesis (A/Prof Craig Smith)
- Stem Cells and Translational Immunology (Dr Tracy Heng)
- Thymus development, aging and regeneration (A/Prof Ann Chidgey)
Key research areas

The Department of Biochemistry and Molecular Biology at Monash University is very active in a variety of research areas, has made significant contributions in these areas and is well respected internationally as a research centre.

Major areas of research in the Department of Biochemistry and Molecular Biology:

- Signal transduction in the regulation of secretion, cytoskeletal rearrangement and cellular proliferation in cancer
- Proteases and their inhibitors and receptors in degenerative diseases
- Peptide biology
- The role of protein folding and misfolding in disease
- Nuclear protein transport in medicine and development
- Bioinformatics: Searching for novel protein domains in the human proteome
- Structural biology (crystallography) of medically important proteins
- Molecular analysis of the cause and expression of autoimmune diseases
- Peptide Folding, Protein Engineering and Drug Design
- Diabetes and renal failure, mechanisms of proteinuria in the kidney
- The molecular neurobiology of Alzheimer’s disease and related disorders
- Molecular analysis of platelet function in thrombosis and haemostasis
- The structure and function of a molecular machine: mitochondrial ATP synthase
- Mitochondrial turnover, vacuolar ATPase function and autophagy
- Fluorescent proteins with novel properties
- Functional and biochemical aspects of hyaluronan with special reference to its role in disease
- Redox homeostasis and cell death
- Adrenal steroid signaling and actions in embryonic development, stem cells and endocrine control of obesity
- Mitochondria, oxidative stress and apoptosis in neurological disease and host-pathogen interactions
- Environmental causes of type 1 diabetes
- Protein tyrosine phosphatases in cancer and diabetes
- RNAi and RNA processing mechanisms
- miRNA’s and disease
- Microbial oncogenesis
- Cell signaling and cancer
- Tumour immunology and dendritic cells
- Regulation of metabolism and metabolic disease
Department of Microbiology

Associate Professor John Boyce

EMAIL john.boyce@monash.edu
TELEPHONE +61 3 9902 9179
LOCATION Clayton Campus
WEB med.monash.edu/microbiology/teaching/honours

Key research areas

Most research projects within the Department of Microbiology are aimed at understanding how specific bacteria, viruses or parasites are able to cause disease, and how that knowledge might be used to develop more effective treatment strategies. These projects will involve training in the latest methods in microbial genetics, genomics, transcriptomic analysis, real-time PCR, and proteomics. In particular, this Department focuses on the use of genomic and post-genomic approaches to the study of bacterial pathogenesis.

Specific research projects include:

■ Characterizing cytomegalovirus using systems biology approaches
■ Understanding the function of novel proteins involved in the pathogenesis of *P. falciparum* malaria
■ Regulation of virulence genes in *Clostridium perfringens* and *Dichelobacter nodosus*
■ Conjugative transfer and maintenance of the toxin plasmids of *Clostridium perfringens*
■ Understanding antibiotic resistance in nosocomial pathogens using systems biology approaches
■ Host-pathogen interactions in clostridial myonecrosis
■ Characterising unique proteins in *Babesia bovis* and the development of a new vaccine against bovine tick fever
■ The molecular mechanisms by which *Helicobacter pylori* causes stomach cancer
■ The host immune response to *Clostridium difficile* infections
■ Antibiotic resistance, virulence and mobile genetic elements of *Clostridium sordellii*
■ How do bacterial pathogens sense environmental cues?
■ New targets for old drugs: exploring antibacterial potential of carbonic anhydrase inhibitors
■ Molecular characterisation of antibiotic resistance in coagulase negative staphylococci
■ Novel virulence mechanisms in the hospital-acquired pathogen *Acinetobacter baumannii*
■ Mechanisms of *Pasteurella multocida* pathogenesis and virulence regulation
■ Biologically-derived synthons for chemical synthesis
■ Interactomic studies to decipher the *Plasmodium falciparum* kinome network
■ Chemical biology of pathogens: Finding the molecular mechanisms of anti-malarial action
■ The molecular basis of host-pathogen interaction in innate immunity
■ How does the human fungal pathogen, *Candida albicans*, cause disease?
Department of Pharmacology

Associate Professor Barb Kemp-Harper

EMAIL barbara.kemp@monash.edu
LOCATION Clayton Campus
WEB med.monash.edu/pharmacology

Professor Robert Widdop

EMAIL robert.widdop@monash.edu
LOCATION Clayton Campus
WEB med.monash.edu/pharmacology

Key research areas

Research involves diverse areas of pharmacology, in many cases in collaboration with Australian and/or international colleagues in academia and in industry. Major research activities within the Department are aimed at increasing our understanding of various therapeutic targets for the treatments of a range of diseases including hypertension, atherosclerosis, stroke, diabetes, heart and renal failure and respiratory diseases. The Department also has active research programs focused on the pharmacology and toxicology of a range of Australasian animals including snakes and jellyfish and pharmacology education.

The Department of Pharmacology provides projects involving a range of techniques from cellular and molecular pharmacology through tissue and classical organ bath pharmacology, to complex instrumentation of experimental animals to mimic human diseases.

The broad areas of research that are offered in the Department include:

- Cardiovascular & Pulmonary Pharmacology (focused on novel pharmacological and/or cell-based therapies to treat systemic and pulmonary hypertension and stroke, including immune mechanisms and stem cells)
- Fibrosis Pharmacology (novel antifibrotic mechanisms, including relaxin and stem cells)
- Integrative Cardiovascular Pharmacology (Angiotensin II and its role in cardiovascular diseases, including hypertension, atherosclerosis, fibrosis and stroke)
- Kidney Regeneration & Stem Cell Research (application of iPS for the treatment of genetic kidney disease, stem cells to promote kidney self repair)
- Pharmacology Education (advanced education concepts in Pharmacology)
- Respiratory Pharmacology (focused on improved therapeutic strategies in chronic lung diseases, including asthma and pulmonary hypertension)
- Venoms and Toxins (including all Australian venomous creatures)
The Department of Physiology is a large, research-intensive unit, strongly supported by external research grant funding. There are ~60 scientists (academic and research) in the Department and their research programs attract over $9 million in research support each year. Staff in the Department of Physiology and affiliated institutions offer an extensive range of exciting research projects and high-calibre supervision to students undertaking Honours in biomedical science. Research within the Department covers a wide range of integrative, cellular and molecular physiology, with particular strengths in sensory and autonomic neuroscience, cardiovascular and renal physiology, neuroendocrinology, obesity and metabolic physiology, muscle and exercise, stress, development, and smooth muscle physiology. The Department of Physiology provides projects involving an array of state-of-the-art techniques from cellular and molecular physiology, through tissue and organ culture to complex instrumentation of experimental animals, and human-based research. There is special emphasis on animal models of disease and the vertical integration of animal models with cellular and sub-cellular/molecular tools of investigation. Projects may also be conducted with co-supervision through other Monash Departments. The Department encourages students who wish to take integrated approaches to major health problems, using whole animal models in conjunction with the full range of investigative tools that are available at Monash and in affiliated institutions. Opportunities exist for collaborative studies with Monash Malaysia.

The broad areas of research that are offered in the Department include:

- Sensory and cognitive neuroscience
- Cardiovascular and renal physiology
- Membrane physiology and cellular signaling
- Neuroendocrinology
- Obesity and metabolic physiology
- Physiological genomics
- Reproductive physiology
- Sleep and sleep disorders physiology
- Cancer biology
- Muscle exercise
Key research areas

ARMI is Australia’s first research centre dedicated to the important new field of regenerative medicine. It is based at the Clayton Campus of Monash University and boasts 19 research groups studying a variety of regenerative approaches.

Our key research areas include:

- **Heart and muscle development and regeneration**: ARMI researchers are studying animals with highly sophisticated and specific tissue regenerative qualities to develop cures for heart disease and other muscular disorders including dystrophies that can be translated to the patient bed-side
  
  **Groups**: Prof Currie, Prof Marcelle, Dr Ramialison, A/Prof McGlinn, Dr del Monte Nieto

- **Immunity and regeneration**: Soon after birth, our own immune systems mature and we lose capacity to respond to damage with scar free healing. ARMI scientists are exploring the relationships between immunity and regeneration in the animal kingdom to enhance tissue repair in patients with wounds or degenerative diseases
  
  **Groups**: Prof Lieschke, A/Prof Martino

- **Stem cells and regeneration**: Stem cells are integral to the development of tissues in the embryo and persist in adults as essential building blocks for our bodies. ARMI studies embryonic stem cells as a window on the mechanisms of human development, and as an essential part of the tool kit of regenerative medicine. ARMI has devised methods for growing stem cells that can be used to repair damaged tissue, investigate particular diseases, test drug candidates for therapeutic safety and effectiveness, and develop ways to enhance the intrinsic mechanisms of stem-mediated repair
  
  **Groups**: Prof Nagy, Prof Nilsson, Prof Polo, A/Prof Laslett, Dr Hobbs, Dr Zenker

- **Neural regeneration**: Unlocking the regenerative potential in the central nervous system so it can be harnessed to treat neurodegenerative disorders. ARMI scientists are tackling the fundamental obstacles in neural repair for diseases such as multiple sclerosis and Alzheimer’s disease, by uncovering neural regenerative potential across the animal kingdom
  
  **Groups**: Prof Bourne, Dr Kaslin, Dr Merson, Dr Nillegoda

- **Organ Engineering and Synthetic Biology**: ARMI is exploring a number of innovative techniques to enhance function and form that is lost as a consequence of ageing and degenerative disorders. These techniques explore various aspects of tissue engineering including organoid and organ chip technology, bioactive biomaterials and biointerfaces that simulate the cellular microenvironment at the micro and nanoscale, functional biomaterials and synthetic and biological matrices for tissue engineering and transplant development
  
  **Groups**: Prof Bourne, Dr Janovjak, Dr Rossello-Diez
The Australian Centre for Blood Diseases (ACBD) is the largest blood-focused research centre in Australia. The ACBD conducts world-leading research into malignant (blood cancers) and non-malignant (blood clots) haematology and works closely with a large network of haematologists to translate their laboratory research into clinical benefits. Our state-of-the-art facilities and high calibre scientists and clinicians provide an excellent environment for undergraduate and higher degree research students.

Major areas of research at the ACBD include:

**Non-malignant Haematology (Thrombosis & Haemostasis)**
- Platelet adhesion receptors in haemostasis and thrombosis (A/Prof Robert Andrews)
- Theranostics, molecular imaging & platelets in cancer (Dr Karen Alt)
- Molecular imaging, drug delivery, and nanotechnology (A/Prof Christoph Hagemeyer)
- Drug discovery of novel anti-thrombotics (A/Prof Justin Hamilton)
- Neurotrauma and haemostasis (Prof Rob Medcalf)
- Inflammation and thrombosis in vascular biology (Prof Harshal Nandurkar – Head of Department)
- Microfluidics platforms in thrombosis research and drug screening (Dr Warwick Nesbitt)

**Malignant Haematology (Blood Cancers)**
- Blood stem cells in haematological malignancies (Prof David Curtis)
- Mouse models of leukaemia (Dr Catherine Carmichael)
- Acute leukemias (A/Prof Ross Dickins)
- Transcription factors in leukemias (A/Prof Matt McCormack)
- Genomics of myeloproliferative disorders (Prof Andrew Perkins)
- Multiple myeloma (Prof Andrew Spencer)
- Translational leukemia research (A/Prof Andrew Wei)

**Clinical Research**
- Bone Marrow Transplant Program (Dr Sharon Avery)
- ECRU Translational Research Division (A/Prof Anthony Dear)
- The Ronald Sawers Haemophilia Centre (A/Prof Huyen Tran)
The Department of Immunology and Pathology is located at the Alfred Hospital campus in Prahran as a partner institute in the Alfred Research Alliance. Our partner organisations are the Baker Institute, the Burnet Institute and Alfred Health, which together form a strong research consortium that links basic and clinical research with excellence in student mentorship and training. The precinct is well-supported by state-of-the-art facilities that are critical for cutting edge research and high quality outcomes. The Department has a strong national and international profile, an excellent record of success in obtaining competitive grant funding, and an outstanding reputation for high quality undergraduate and postgraduate teaching. The department also trains numerous post-doctoral fellows and provides unique opportunities to young scientists for career development.

The Department’s research ranges from basic science in immunology, cell biology and molecular pathology to experimental disease models, clinical immunology and the study of human diseases. The research in the Department is driven by world leading authorities in immunology and inflammation, and our main areas of interest are:

- B cells, immune memory and autoimmunity (Prof David Tarlinton – Head of Department)
- Signalling pathways in autoimmunity and chronic inflammation (A/Prof Margaret Hibbs)
- Leukocyte membrane proteins in inflammation and cancer (A/Prof Mark Wright)
- Allergy and asthma (Prof Robyn O’Hehir)
- Interstitial lung disease (A/Prof Glen Westall)
- Human B lymphocyte differentiation (A/Prof Menno van Zelm)
- Intestinal immunity (Prof Nicola Harris)
- The microbiome, the gut-lung axis and immunology of respiratory diseases (Prof Ben Marsland)
The Department of Neuroscience, in strong partnership with the Alfred Health Department of Neurology, Neurosurgery, Radiology and Psychiatry, has 22 different research groups and over 200 staff and students. We do world-leading basic/fundamental and clinical neuroscience research and research training relevant to a broad range of neurological and related disciplines.

Major areas of research in the Department of Neuroscience include:

**Epilepsy**
- Epilepsy – Neuropharmacology (Prof Terry O’Brien)
- Epilepsy – Personalised Medicine (Prof Patrick Kwan)
- Epilepsy – Behaviour Research (A/Prof Nigel Jones)
- Molecular Epilepsy (Dr Kim Powell)

**Neuroimmunology**
- Neuroimmunology – Clinical and Translational (Prof Helmut Butzkueven)
- Neuroimmunology – Genomics and Prognostics (Dr Vilija Jokubaitis)
- Neuroimmunology – Multiple Sclerosis and Neuroophthalmology (A/Prof Anneke van der Walt)
- Neuroimmunology – Neuroinflammation (Dr Mastura Monif)
- Neuroimmunology – MS and Alzheimer’s Disease (Dr Steven Petratos)

**Cognitive Neuroscience and Neuropsychology**
- Occulomotor system (A/Prof Joanne Fielding)
- Neuropsychology (A/Prof Rubina Alpitsis)

**Headache and Pain**
- Peripheral Neuropathy, Headache, Pain (Dr Elspeth Hutton)

**Neurotrauma**
- Neurotrauma – Pediatric and Epilepsy (Dr Bridgette Semple)
- Neurotrauma – (A/Prof Sandy Shultz)

**Neuroimaging**
- AI and Immaging Informatics (Prof Meng Law)
- Brain imaging, Biomarkers, MRI and Multiple Sclerosis (Dr Scott Kolbe)
- Imaging – MRI, PET, CT, FLECT (Dr David Wright)

**Spinal cord injury**
- Spinal Cord Injury (Dr Stephen Davies)

**Stroke**
- Stroke (Prof Geoff Cloud)

**Movement disorders**
- Neuromuscular Disorders, Parkinson’s Disease (Dr Kelly Bertram)
Key research areas

The Department of Infectious Diseases, Central Clinical School, and Alfred Health, is a premier centre for clinical and biomedical research, offering undergraduate and postgraduate study programs. The clinical services work closely with research staff and laboratories are based within the Burnet Institute at the Alfred Hospital campus. The Department is therefore uniquely placed to be able to provide study opportunities that integrate clinical services with clinical and basic science research.

The department specialises in the following areas:

- HIV associated co-morbidity
- HIV Cure clinical research
- Prevention of HIV infection
- Viral hepatitis
- Infections in the Immunocompromised host
- Fungal infections
- Infections in the Intensive Care Unit
- Antimicrobial Stewardship
- Antibiotic usage and resistance
- Influenza
- Infection control and surveillance
- International health
- Health information technology
- The Victorian Spleen Service and Registry
- Bone and joint and surgical site infections
- Infections in CF and Burns
- Resistance in Staph aureus and Gram-negative bacteria

For more information on research areas within the Department of Infectious Disease, please visit www.med.monash.edu.au/cecs/infectious-diseases/research/areas/index

For information on study opportunities within the department, please visit the Central Clinical School education web page www.med.monash.edu.au/cecs/education/index
Key research areas

The Department of Allergy, Immunology and Respiratory Medicine is one of the most comprehensive Departments in these disciplines in Australia, covering the range of respiratory conditions including asthma and allergic diseases, chronic obstructive pulmonary disease (COPD), sleep disordered breathing, general respiratory diseases, adult cystic fibrosis (State Centre of Excellence) and lung transplantation.

The Department has a very active biomedical and clinical research focus with a strong record of success in both competitive NH&MRC and other research grant funding.

The high international and national profile of the Department is reflected in numerous publications and speaking invitations to senior personnel. Allergy, Immunology and Respiratory Medicine is committed to delivering outstanding best practice clinical care, outcome driven professional education and community outreach as well as translational research of international acclaim.

The key research areas are:

- Allergy, Asthma and Clinical Immunology
- Lung Transplantation
- Cystic Fibrosis and Health Information
- Respiratory Physiology
- Pulmonary Hypertension
- Bronchiectasis and Lung Cancer
- Sleep Medicine and COPD
- Interstitial Lung Disease
Monash Alfred Psychiatry Research Centre

Dr Natalie Thomas

EMAIL  natalie.thomas@monash.edu
LOCATION  Commercial Road, Melbourne
WEB  maprc.org.au/students

Key research areas

MAPrc is based within the Alfred Hospital Precinct, in Melbourne. We carry out world-class research to help make a difference to the lives of people suffering from serious mental illnesses. MAPrc comprises a multidisciplinary team of over 100 staff and postgraduate students from medicine, nursing, psychology, engineering, allied health, neuroscience, molecular biology, and health information services.

Research at MAPrc is extraordinarily diverse. Our projects range from neuroscience techniques that are recognized around the world for the breakthrough insights they provide into brain structure and function in health and illness, to innovative new treatments to boost the effectiveness of conventional medications for psychiatric illnesses. Estrogen as a treatment for schizophrenia and Transcranial Magnetic Stimulation for depression, pain and cognitive disorders are examples of new and effective approaches that are being developed at MAPrc. Other research streams include grassroots initiatives looking at ways to make the delivery of community mental health service more efficiently.

Therapeutic Brain Stimulation Division

The Therapeutic Brain Stimulation Division at MAPrc is headed by Professor Paul Fitzgerald and is the leading brain stimulation facility in Australasia. Our projects incorporate a range of cutting-edge neuroscience techniques to improve outcomes for people with disorders of mental and brain function.

- Cognitive Therapeutics Research Program (A/Prof Kate Hoy)
- Pain & Affective Neuroscience Unit (Dr Bernadette Fitzgibbon)
- Mindfulness Neuroscience (Dr Neil Bailey)

Women's Mental Health Division

The Women's Mental Health Division at MAPrc is headed by Professor Jayashri Kulkarni and is one of the few research centres worldwide that focuses on women's mental health adopting a psychoneuroendocrinology approach. Our projects incorporate a biopsychosocial model, combined with novel interventions to improve outcomes for people with mental ill health.

- Women's Mental Health Unit (Prof Jayashri Kulkarni)
- Cognitive Neuroscience Unit (Dr Caroline Gurvich)
- Trauma & Psychopathology (Prof Jayashri Kulkarni, Dr Caroline Gurvich, Dr Natalie Thomas, Dr Gemma Sharp)
- Genital Self-Image and Body Image concerns projects (Dr Gemma Sharp)
- Hormones and the mind research program (Dr Caroline Gurvich, Dr Natalie Thomas)
Key research areas

The Department of Surgery at The Alfred Hospital’s research programme spans across all of the surgical disciplines. The broad aim of all of our research is to improve patient outcomes. This is achieved by a diverse research platform which includes: prospective patient databases recording outcomes of care, projects focused on better understanding the underlying basic science of the diseases we treat, randomised controlled trials and prospective cohort studies comparing therapies as well as innovative therapies and devices.

Our current programme includes:

- **Burns** – The Alfred is the State adult burns unit and hosts the national Burns Registry. Current research projects focus on examining and benchmarking acute burn care practices (against other units in Australia and overseas) and monitoring patient outcomes.
- **Cardiothoracic** – The Alfred is the State Heart and Lung transplant service as well as one of the busiest general cardiothoracic units.
- **Endocrine surgery** – The Alfred hosts the Monash University Endocrine database, a large population based resource with over 5000 participants.
- **ENT** – The Alfred has a large head and neck and otolaryngology unit. Research projects focus on the management of head and neck cancer and hearing loss.
- **Hepatobiliary** – The Alfred hepatobiliary unit is one of the busiest in the state. They have maintained a prospective database of cancer patients for 10 years and also have an interest in the management of hepatic trauma.
- **Colorectal surgery** – The Alfred Colorectal unit participates in the national colorectal audit and is currently undertaking randomised controlled trials as well as observational studies exploring ways of improving outcomes from Colorectal surgery.
- **Neurosurgery** – The Neurosurgery unit has a clinical interest in brain injury as well as vascular disease.
- **Orthopaedic surgery** – provides the full range of general and sub-specialised orthopaedic clinical services across the breadth of the specialty.
- **Plastic surgery** – The Plastics unit at the Alfred has a major interest in reconstruction and trauma.
- **Trauma** – The Alfred is one of the State’s level 1 trauma centres and is the host of the Victorian Trauma Registry.
- **Upper Gastrointestinal** – The Upper GI unit at the Alfred has a large prospective database of all cancer patients treated through the unit as well as those undergoing reflux surgery and bariatric surgery.
- **Urology** – The Urology Unit maintains a large prospective database of transperineal prostate biopsy and there are several projects utilising this resource.

For more information on research areas within the Department of Surgery, please visit [www.med.monash.edu.au/surgery/alfred/research](http://www.med.monash.edu.au/surgery/alfred/research)

For information on study opportunities within the department, please visit the Central Clinical School education web page [www.med.monash.edu.au/cecs/education/index](http://www.med.monash.edu.au/cecs/education/index)
Department of Diabetes

Dr Tom Karagiannis

**EMAIL**

<table>
<thead>
<tr>
<th>EMAIL</th>
<th>TELEPHONE</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="mailto:tom.karagiannis@monash.edu">tom.karagiannis@monash.edu</a></td>
<td>+61 3 9903 0491</td>
</tr>
</tbody>
</table>

**LOCATION**

Commercial Road, Melbourne

**WEB**

monash.edu/medicine/ccs/diabetes/education

---

### Key research areas

The Department of Diabetes consists of 60 staff and postgraduate students. There are total of nine program and laboratory heads which include a combination of senior clinician and basic researchers ensuring a diverse range of projects in the field. The Jreissati Family Translational Research Laboratory is a state-of-the-art purpose-built facility on Level 3 of the Alfred Centre with dedicated facilities including communal cell culture, imaging, immunoblotting, and viral transfection rooms. The Meydan Family Translational Research Hub located on Levels 5 and 6 of the Alfred will provide open plan office space providing an appropriate scholarly environment for students. The major areas of research in the Department of Diabetes are related to understanding and investigating therapies for diabetic complications including diabetic nephropathy, retinopathy, and wounds. Apart from culture and in vivo models aimed at evaluating the molecular details of human disease progression and treatment, the department offers projects in next generation sequencing and medical bioinformatics analyses.

---

Melbourne Sexual Health Centre

**Associate Professor Eric Chow**

**EMAIL**

<table>
<thead>
<tr>
<th>EMAIL</th>
<th>TELEPHONE</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="mailto:eric.chow@monash.edu">eric.chow@monash.edu</a> / <a href="mailto:echow@mshc.org.au">echow@mshc.org.au</a></td>
<td>+61 3 9341 6233</td>
</tr>
</tbody>
</table>

**LOCATION**

Commercial Road, Melbourne

**WEB**

monash.edu/medicine/ccs/sexual-health/home

---

### Key research areas

The Melbourne Sexual Health Centre (MSHC) is a specialised unit for the diagnosis and treatment of sexually transmissible infections (STI/HIV) and is a principal centre for training health professionals in Victoria. The Centre conducts epidemiological, public health and clinical research primarily aimed at improving the services offered at MSHC.
BAKER HEART AND DIABETES INSTITUTE

Key research areas

The Baker Heart and Diabetes Institute is an independent, internationally renowned medical research facility with a focus on diagnosis, prevention and treatment of diabetes and cardiovascular disease. The comprehensive range of research undertaken to target these deadly diseases, combined with the flexibility and innovation to respond to changing health and community needs, is unique and sets the Baker Institute apart from other health and research Institutes.

With over 300 scientists, clinicians, research nurses and students, the Baker Institute provides a collaborative, stimulating and supportive environment for students to develop the skills and the confidence to launch their career. Research projects are offered for Doctorate, Masters and Honours students across cardiovascular and diabetes research with a bench to bedside approach.
The Burnet is Australia’s leading research institute that is focused on infectious diseases of global significance. Our unique blend of medical research and public health programs are aimed at reducing the impact of diseases such as HIV, hepatitis, malaria, tuberculosis, influenza and cancer in vulnerable communities. Burnet’s activities are carried out within 3 major Disciplines: Life Sciences; Public Health and International Development.

Burnet plays an important role in education, providing training in laboratory and public health research at both undergraduate and postgraduate levels. Laboratory based research at the Burnet occurs principally within the Life Sciences Discipline with an emphasis on infectious diseases, autoimmunity, cancer and vaccine development and diagnostics. The Discipline of Public Health studies the molecular epidemiology of malaria, the epidemiology and surveillance of infectious diseases in Australia and overseas, health issues relating to alcohol and other drugs, sexual health and behaviour, health promotion and policy, and is a Centre of excellence into injecting drug use research. The Discipline of International Development responds to health problems in developing countries through the provision of technical advice and support, organisational capacity-building, applied research, policy analysis and development, and training and education programs. The Centre’s expertise spans HIV prevention and care, women’s and children’s health, sexual and reproductive health, drug use, primary health care, strengthening national health systems, and education across these fields.
Biomedical Science Honours Key Research Areas

SCHOOL OF PUBLIC HEALTH AND PREVENTIVE MEDICINE

Dr Joanne Ryan

EMAIL joanne.ryan@monash.edu
TELEPHONE +61 3 9903 0200
LOCATION St Kilda Road, Melbourne
WEB monash.edu/medicine/sphpm/teaching/honours

Professor Allen Cheng

EMAIL allen.cheng@monash.edu
TELEPHONE +61 3 9903 0010
LOCATION St Kilda Road, Melbourne
WEB monash.edu/medicine/sphpm/teaching/honours

Key research areas

The School of Public Health and Preventive Medicine, undertakes research in a number of areas:

**Chronic Disease**
- Cancer Research
- Cardiovascular epidemiology
- Diabetes and Vascular Medicine
- Musculoskeletal Epidemiology
- Transfusion Research

**Health Data Science Analytics**

**Global and Population Health**
- Climate, Air and Quality Research
- Global Health
- Infectious Diseases Epidemiology
- Insurance Work and Health
- Occupational and Environmental Health

**Health Services, Policy & Research Translation**
- Cochrane Australia
- Registries
- Cabrini Epidemiology

**Preventive medicine**
- Healthy Aging
- Neuropsychiatry and Dementia
- Public Health Genomics
- Women’s Health

**Clinical Trials**
- Intensive Care
- Australian & New Zealand College of Anaesthetists
- Cardiovascular Trials
- Pre-hospital, Emergency & Trauma
Department of Forensic Medicine

Professor Olaf Drummer

EMAIL olaf.drummer@monash.edu / olaf@vifm.org
TELEPHONE +61 3 9684 4334
LOCATION Southbank
WEB monash.edu/medicine/sphpm/forensic

Key research areas

Research projects are focused on improving our understanding of medical, scientific and legal issues associated with the practice and applications of forensic medicine. Topics include adverse medical treatment related events, issues reporting of deaths to the coroner, development of more efficient procedures for nuclear DNA analysis, development of DNA technology for genetic-linked diseases that lead to sudden death, new applications drug detection methods in forensic toxicology, application of segmental hair analyses to establish drug histories in drug dependent persons and in persons dying from drug toxicity, investigation of drug uptake and release in tissues of deceased persons, estimation of the relative mortality of drugs, traffic medicine (effect of drugs on driving skills, hemianopia and driving skills, ageing drivers), sexual assault (drug facilitated assault, outcomes of paediatric and adult cases, injury patterns), and wound interpretation.
Key research areas

One in three Australians live outside a major metropolitan centre. Generally, rural populations experience poorer health and poorer access to healthcare than metropolitan populations. The School is committed to the health of rural communities and developing a sustainable rural health workforce.

Our Honours projects are based at our rural sites and are supervised by supportive research staff. We offer a range of projects where you may work in Melbourne for the duration of the project, be based at one or our rural sites for the project, or spend time in both Melbourne and a rural site.

We have a range of projects on offer for Bachelor of Biomedical Science (Hons) students. These include:

- The impacts of metamphetamine use on individuals, families and community services
- A study of the claustrum, a relatively unknown region of the human brain
- Exploring rural health care outcomes in relation to a number of issues, such as: mobile perinatal monitoring or chronic pain management, or accessing community health services, or de-prescribing medications in the elderly
- Rural health workforce recruitment and capacity building
- The development of health professionals as educators
- The impact of university community engagement on rural children’s career aspirations
- Healthcare and the Arts

Visit Supervisor Connect www.monash.edu/medicine/research/supervisorconnect for more detailed information about our projects and supervisors. We welcome candidates to contact us to further discuss your research interest.
As an honours student in the Department of General Practice you will have supervision and mentorship from internationally and nationally recognised leaders in academic primary care, and will work and study within a supportive and collaborative research environment. You will also participate in our primary care research education program which uniquely addresses the gap between general research training and the skills and knowledge needed to effectively conduct research and impact upon policy and practice in the primary care setting.
Key research areas

The School of Psychological Sciences/Turner Institute for Brain and Mental Health offers a range of 4th year research projects, which are supervised by staff members who conduct neurosciences related research across our three overarching themes – Developing Well, Living Well, and Ageing Well.

Projects are organized in six integrated research programs:

- Addiction and Mental Health
- Ageing and Neurodegeneration
- Brain Injury and Rehabilitation
- Brain Mapping and Modelling
- Neurodevelopment
- Sleep and Circadian Rhythms
The School of Clinical Sciences at Monash Health (SCS) is composed of four main hospital campuses, Monash Medical Centre (Clayton and Moorabbin), Dandenong Hospital, Kingston Centre and Casey Hospital. The SCS represents the largest hospital network in Australia and covers all medical specialties (medicine, surgery, psychiatry, obstetrics and gynaecology and paediatrics). The SCS offers a comprehensive range of research projects from patient based projects to basic science. Our main emphasis is on translational projects that combine both basic science and clinical medicine. Reflecting on the SCS’s strengths in discovery and translational research, the School has an established track-record in the training of basic and clinician scientists both at undergraduate and postgraduate (PhD) levels. Opportunities for formal research training exist within all departments of the School. The administration is based at Monash Medical Centre.

Key research areas

The School of Clinical Sciences has groups working in key areas of biomedicine:

**Immune and Inflammatory Diseases**

The Centre for Inflammatory Diseases (CID) runs active programs in key areas of inflammation with an emphasis on translational research. With the use of clinical and laboratory based experimental techniques, researchers in CID explores the basic mechanisms of inflammatory injury in important human diseases, and relate these to unmet needs in patient treatment and management. Current research in CID includes:

- Mechanisms of autoimmune kidney disease and vasculitis
- Antigen presentation and immune tolerance
- Mechanisms of injury in rheumatoid arthritis (RA) and treatments
- Inflammation and treatment of systemic lupus erythematosus (SLE)
- Immune cell interactions in inflamed vasculature of the skin and kidney
- Modulation of host immune responses following neuroinflammation
- Mechanisms of liver/gut inflammation and fibrosis
- Inflammation in Type 2 diabetes and diabetic kidney disease
- Clinical microbiology, infectious diseases and infection control
- Respiratory infection and immunity, and mechanisms of inflammation in asthma
Nutrition, Dietetics and Food

Department Head: Professor Gary Williamson

Our research falls under Metabolism, Public Health, Clinical Nutrition and Education. These themes allow us to perform cutting edge research to make new discoveries in nutrition science through to translation into evidenced-based nutrition best practice within healthcare.

Our researchers are working to achieve:

- Better metabolic health for shift workers
- Novel dietary strategies to improve biomarkers of type 2 diabetes and cardiovascular disease
- Better gut health for ultra-endurance athletes through optimal nutrition and hydration
- Reduction in inflammation through better food choices
- Improved fertility and pregnancy outcomes
- Novel bioinformatic analysis techniques to understand complex nutrient-metabolism interactions
- Better food environments to improve the health of our population
- Reduce inequities in food supply and security
- Optimal nutrition interventions for the elderly population

Professor Gary Williamson and his team are discovering how dietary bioactive compounds such as polyphenols can reduce the risk of type 2 diabetes and heart disease, including both cellular mechanistic studies and human interventions.

Professor Helen Truby’s research group focuses on weight management across the lifespan. Combating obesity is hard because we don’t know why it affects some children in a family but not others. You’re obviously born with your genetic profile but your early environment – what you eat and what you do may lead to interactions between your genes and environment that trigger changes that lay the foundations of your health.

A/Prof Maxine Bonham’s research group focuses on meal timing and circadian rhythms and the consequences of eating at unusual times on metabolic health outcomes. In particular, the group are working with shift workers to develop novel dietary strategies that will improve biomarkers for type 2 diabetes and cardiovascular disease.

A/Prof Julie Brimblecombe and her team’s research interest includes Indigenous food systems, real-world systems approaches to improving population level nutrition, addressing social inequities in food access, modifying food environments to support healthier food choices, capacity building for evidence informed decision-making and capacity building in research conduct.

A/Prof Judi Porter and her research team are determining new ways to improve nutritional status of older elderly. Using the gold standard measurement of doubly labelled water to determine total energy expenditure, this team will develop accurate ways to quantify energy requirements in the elderly.
Stroke and Ageing

Group Director: Professor Amanda Thrift
The group offers research projects related to cerebrovascular disease and brain ageing within the following divisions:

Clinical trials, Imaging and Informatics Division
Research in this division is centered around clinical trials in acute stroke and secondary stroke prevention, advanced imaging studies in stroke, and novel techniques of computational analyses using BIG data. Potential projects include:

- Impact of social network on health
- Ham and spam analysis of medical records to classify stroke versus non-stroke cases
- Discovering themes in Twitter activity related to neurological disorders
- Learning clinical features from patterns on PET scan in patients with dementia
- Mapping topography and network of brain injury in patients with disorders of consciousness
- Phenotyping patients with neurological disorders using machine learning
- Cost-effectiveness analysis of clot retrieval services
- Using Google maps to identify regions for service delivery
- Evaluation of 3D printing of carotid artery anatomy
- Mapping salvageable brain tissue using multimodality CT

Contact persons: A/Prof Henry Ma Email: henry.ma@monash.edu Prof Thanh Phan Email: thanh.phan@monash.edu

Translational Public Health and Evaluation Division and National Stroke Data Linkage Interest Group
Students will have an opportunity to undertake research that investigate the quality of stroke care in hospitals and improving outcomes after stroke using data obtained from clinical trials and data linkage. Potential projects include:

- Data linkage to identify factors associated with hospital readmissions
- Cost-effectiveness of implementing new models of care in stroke – acute and chronic therapies
- Randomised controlled trials in goals setting, eHealth and recovery support including mindfulness interventions
- Health services research and observational studies

Contact persons:
Prof Dominique Cadilhac Email: dominique.cadilhac@monash.edu
Dr Monique Kilkenny Head: National Stroke Data Linkage Interest Group Email: monique.kilkenny@monash.edu
Dr Jan Cameron Email: jan.cameron@monash.edu

For more information go to monash.edu/medicine/scs/medicine/research/star

Clinical Medicine

A large number of areas are available including critical care, emergency medicine, haematology, imaging, supportive and palliative care and surgery.
Bone and Muscle Health Research

Centre Head: Professor Peter Ebeling

The Bone and Muscle Research Group conduct clinical trials of new and current pharmaceuticals on muscle and bone, the effect of calcium, vitamin D and exercise on musculoskeletal health, and population-based studies of osteoporosis, sarcopenia and obesity in older age.

Key areas include:

- Assessing Bone Health in Sarcopenic Obese Older Adults
- Effects of Weight Loss on Bone Health in Obese Older Adults
- Wearable Activity Trackers for Monitoring Physical Activity and Mobility in Older Adults
- Exercise for Reducing Risk Factors for Falls in Obese Older Adults
- Associations Between Cardiovascular Health and Osteoporosis in Older Age
- The effects of lifestyle differences on musculoskeletal health in ethnic populations
- A New Wearable Technology for Assessing Osteogenic Exercise
- Vitamin D and Musculoskeletal Health in Older Adults

For more information go to https://www.monash.edu/medicine/scs/medicine/research/bone-muscle/student-opportunities

SCS Oncology Research

Translational Laboratory

Major themes: improving response to immunotherapy, ctDNA and blood biomarkers, genomic adaptation, Immunological adaptation and response, neoadjuvant therapies, Tumour immunogenicity

Cancer services Implementation Sciences

Major themes: Oncology teletrials; PREMS and PROMS (patient reported outcomes measures and patient reported experience measures); Survivorship; AYA services (Adolescent and Young Adult Services).

Projects:

- Interferon epsilon and the inflammatory microenvironment as biomarkers for gynaecological malignancies: Prof Eva Segelov/Dr Sophia Frentzas/Prof Paul Herzog
- Use of a targeted multigene mutation panel on circulating tumour DNA to predict relapse in patients with high risk early colorectal cancer enrolled in the ASCOLT study: Prof Eva Segelov/Dr Sophia Frentzas
- Establishing human xenograft model platform for “Live Cancer Biobanking” – Dr Gwo Ho
- DNA methylation in predicting cancer outcomes – Dr Gwo Ho
- Barriers and enablers of establishing clinical trial centres in regional Australia – Prof Eva Segelov
- Implementation of real time PROMS and PREMS – Dr Kate Webber and Dr Olivia Cook
- Understanding impact of diet on microbiome of patients undergoing cancer immunotherapy – Prof Eva Segelov and Prof Helen Truby
- Novel cellular targets for new anticancer therapies – Dr Sam Grenall and Dr Ashlyn Watt

For more information:
monash.edu/medicine/scs/research/cancer-haematology/translational-oncology-research-laboratory

Oncology Clinical Trials

monash.edu/medicine/scs/research/cancer-haematology/clinical-trials-centre

Department of Oncology, Monash Health
monashhealth.org/services/services-o-z-monash-health/oncology-monash-health/

Womens’ and Children’s Health

Research projects are available in all areas of paediatrics and women’s health.
Key research areas

Psychiatry encompasses a wide range of subspecialties. The Department of Psychiatry offers a range of 4th year research projects, which are supervised by staff members who conduct research in a wide range of areas from laboratory-based research to clinical interventions.

**Behavioural Neuroscience and Molecular Psychiatry**

The Behavioural Neuroscience laboratory uses pre-clinical animal models to better understand the pathophysiology of severe psychiatric illnesses such as schizophrenia, so that we may design and test novel therapeutic strategies. Genetic and environmental risk factors are modelled in mice to better understand their impact on the brain and behaviour. Novel treatments are then designed and tested in these preclinical models to trial their efficacy. The lab uses a number of innovative techniques, including mouse touchscreen-based behavioural testing, molecular biology, and vivo electrophysiology.

We are currently offering a range of PhD, Masters and Honours projects assessing the impact of specific genetic variants, and environmental insults (such as infection) on the development and function of critical brain circuits associated with psychiatric disorders. The Behavioural Neuroscience laboratory work closely with the molecular psychiatry laboratory to translate preclinical findings to new treatment strategies.

**Contact person:** Dr Rachel Hill. Email: rachel.hill@monash.edu

The Molecular Psychiatry laboratory aims to develop disease modifying novel treatments for psychotic disorders, in particular, schizophrenia using a broad translational approach. Starting from clinically derived insights and samples, we probe the cellular and molecular characteristics of post-mortem human and animal brain relevant to psychotic disorders. From these laboratory studies we investigate animal behaviour (in collaboration with the behavioural neuroscience laboratory) using transgenic models of psychosis, identifying relevant neuronal signalling pathways. These laboratory-based findings can then be re-applied to investigate new biomarkers in clinical samples using genetic, protein, and electrophysiological measures.

We are also establishing a clinical trials research group evaluating new treatments for these disorders in the hope to build a unique translational research program in psychotic disorders that utilise clinical and biomarker data to understand the molecular bases of psychotic disorders, and in turn generate novel treatments and diagnostics for these patient groups.

**Contact person:** Prof Suresh Sundram. Email: suresh.sundram@monash.edu

**Centre for Developmental Psychiatry & Psychology**

Child & Adolescent Mental Health – Child & Adolescent Mental Health – suicide prevention using smartphone applications, assessment and treatment of school refusal and anxiety disorders, novel treatments of adolescent depressive disorders, neurodevelopmental disorders, Autism Spectrum Disorder (including genetics)

**Contact person:** A/Prof Glenn Melvin. Email: glenn.melvin@monash.edu

**Centre for Mental Health Education and Research, Delmont Private Hospital**

Suicide Prevention through effective psychiatric treatment.

**Contact person:** Prof Nicholas Keks. Email: nicholas.keks@monash.edu

**Neuropsychiatry and Neuroimaging**

Psychosocial aspects of Progressive Neurological Disorders, Neuroimaging Study of limb-onset Motor Neurone Disease.

**Contact person:** Dr Phyllis Chua. Email: phyllis.chua@monash.edu
Department of Surgery

Professor Julian Smith

EMAIL julian.smith@monash.edu
TELEPHONE +61 3 8572 2563
OFFICE Monash Medical Centre, Clayton
WEB monash.edu/medicine/scs/surgery/research

Key research areas

The Department of Surgery at The School of Clinical Sciences at Monash Health has research activity within all surgical specialties. There are strong collaborations within the Monash Health Translation Precinct. There exist opportunities in basic surgical sciences, laboratory, clinical, database, surgical simulation and health services research.

Particular areas of strength are:

- **Breast Surgery** – Large patient database, patient reported outcomes, intra-operative radiotherapy, breast cancer trials
- **Cardiothoracic Surgery** – Less invasive and robotic assisted cardiac surgery, cardiopulmonary bypass and perfusion, acute kidney injury after cardiac surgery, studies arising from the ANZSCTS Database
- **ENT/Head & Neck Surgery** – Monash Health has the large services covering all facets of the specialty at all ages; head and neck cancer, laryngology & otology projects available
- **Upper Gastrointestinal/Hepatobiliary Surgery** – Large patient database, strong interest in oesophageal and pancreatic cancer; access to large biobank of tumour tissue
- **Colorectal Surgery** – national database; inflammatory bowel disease and colorectal cancer research
- **Neurosurgery** – particular interest in neurovascular and spine research
- **Orthopaedic surgery** – large patient load, adult and paediatric, major joint surgery; strong interest in shoulder, upper limb and hand research
- **Plastic surgery** – breast reconstruction, trauma, hand surgery, microsurgery
- **Paediatric Surgery** – Based at Monash Children’s Hospital; projects available within all subspecialties (General, Urology, Orthopaedic, Thoracic, Neurosurgery, Plastic) across all paediatric age groups; links to Hudson Institute and Ritchie Centre
- **Urology** – strong interest in prostate cancer research and in benign urological conditions
- **Vascular Surgery & Transplantation** – very active in endovascular intervention and renal/pancreas transplantation research
- **Surgical Simulation** – based at Monash Children's Hospital in a state of the art facility; projects across multiple surgical specialties

For more information on research areas within the Department of Surgery at the School of Clinical Sciences at Monash Health, please visit https://www.monash.edu/medicine/scs/surgery/research
Hudson Institute of Medical Research continues to grow as it attracts talented scientists from Australia and overseas. Hudson’s research into preterm babies, stem cells, cancer, inflammation, women’s health and paediatric sleep has changed the way diseases are understood and treated.

Key research areas

Centre for Cancer Research

Centre Head: Associate Professor Ron Firestein

Scientists working in the centre undertake basic research into the molecular mechanisms underlying the development, growth and metastasis of tumours, as well as the relationship between the innate immune system and cancer. The discovery and development of novel therapies for the treatment of cancers is also an important aspect of the team’s work.

Current key areas of interest include:

- Links between innate immunity, inflammatory processes and cancer – role of embryonic signalling pathways in cancer
- The targeting of these pathways with novel therapies
- Cell signalling pathways involved in tumour survival and growth, and the development of monoclonal antibodies to treat glioma and other cancers
- Role of integrin-linked kinase in cell migration and oncogenesis
- Molecular pathways involved in the metastasis of tumours, including colorectal, ovarian, prostate and bladder cancers
- Role of steroid hormones and nuclear receptors in breast cancer development and progression
- Role of peptidase activity on inflammatory signalling and tumour microenvironment in ovarian cancer
- Molecular links between obesity, oestrogens and cancer, and therapies aimed at breaking the linkage
- Role of the microenvironment in tumour progression, chemo-resistance, and metastasis

A Phase I Clinical Trials Program has been established at the centre in collaboration with Monash Health, to conduct clinical trials of new cancer-targeting therapies.

More information at hudson.org.au/research-centre/centre-for-cancer-research
Centre for Innate Immunity and Infectious Diseases

Centre Head: Professor Paul Hertzog

The Centre for Innate Immunity and Infectious Diseases (CiiiD) researches the molecular regulation of the innate immune response. This early immune response determines how the body responds to infection or the presence of cancer cells, providing immediate protection and sculpting the ensuing adaptive (sustained) immune responses. It initiates the inflammatory response and can modulate the development of inflammatory diseases. Our aim is to understand the molecular pathways that regulate these processes as well as their normal physiological roles. In this way, CiiiD scientists aim to develop new approaches to preventing, diagnosing and treating infections such as influenza, herpes and HIV, inflammatory diseases such as gastritis and chronic obstructive pulmonary disease, and cancers of the stomach, lung and breast.

Staff and students working in CiiiD have collective multidisciplinary expertise in molecular biology, signal transduction, protein interactions, cell biology, immunology, infectious disease, functional genomics and bioinformatics and transgenic techniques for generating and characterising gene knockout and transgenic mice as models of human disease. The multidisciplinary teaching and training environment within CiiiD provides students with a strong range of skills in biomedical research that will be recognised internationally for a research career. The Centre students include UROP, Honours degrees, Masters and PhD.

Research projects available in the Centre for Innate Immunity & Infectious Diseases are offered in the following research areas:

- Regulation of Interferon and Innate Signalling
- Cytokine Signalling in Cancer and Inflammation
- Pattern Recognition Receptors and Inflammation
- Gastrointestinal Infection and Inflammation
- Respiratory and Lung Research
- Cell Death and Inflammatory Signalling
- Host-Pathogen Interactions
- Innate Immune Responses to Infection
- Microbiota and Systems Biology
- Molecular Immunity
- Nucleic Acids and Innate Immunity
- Viral Immunity and Immunopathology

More information at hudson.org.au/research-centre/centre-for-innate-immunity-infectious-diseases/

Centre for Endocrinology and Metabolism

Centre Head: Professor Peter Fuller

The complex endocrine system impacts all aspects of health and disease. As a preeminent centre for endocrinology research originating from the former Prince Henry’s Institute, our laboratories undertake basic and clinical research. Our goal is to improve understanding of the role of hormones in human biology and disease to tackle key health challenges facing Australian and global communities, including reproductive health, bone health and cancer metastasis, cardiovascular disease, endocrine cancer and obesity. Clinical translation of these findings to improve diagnosis, therapeutic intervention, and prevention of disease remains a key focus for the group.

Current key areas of interest:

- Improvement of health outcomes in patients with metabolic bone disorders and osteoporosis including the optimisation of bone health in adults with neurological disability, understanding osteoporosis in haemoglobinopathies, the evaluation and management of bone disorders in chronic kidney disease and the management of bone health in premature ovarian insufficiency.
- The investigation of reproductive hormones in men, primarily testosterone and its role in maintaining health and fertility and management of ageing, and treatment and prevention of disease such as cardiovascular disease and diabetes.
- Genetic and epigenetic causes of infertility, particularly in the context of in vitro fertilisation treatment.
- Cardiovascular disease and the mineralocorticoid receptor (MR), primarily how the MR controls fibrosis and inflammation in the heart muscle and immune cells (macrophages). The interaction of the MR with the circadian clock as well as its role in hypertension.
- Primary aldosteronism, or endocrine hypertension prevalence, screening and management guidelines, as well as identification of biomarkers.
The role of steroid hormones and their interactions with intracellular nuclear receptors (regulators of gene expression) and cell signalling proteins in the development, treatment and prevention of serious health challenges including breast cancer, ovarian cancer and cardiovascular disease. Other investigations include a collaborative thyroid cancer study and ongoing research to understand the underlying activating mechanisms of nuclear receptors and reproductive hormones secreted by the ovary.

- Genes and gene targets involved in disorders of sex development, including gender identity disorders.
- The roles of sex-specific genes in sex-biased conditions such as Parkinson’s disease and ADHD and autism.

Exploring novel therapeutic targets in Parkinson’s disease.


The Ritchie Centre

Centre Head: Professor Stuart Hooper

The Ritchie Centre is the largest of the six Research Centres within Hudson and is within the Monash University School of Clinical Sciences at Monash Health through the Departments of Obstetrics and Gynaecology and Paediatrics. The Ritchie Centre has a world-leading reputation in women's health research; fetal development and neonatal research; sleep medicine; and stem cell biology. The Ritchie Centre is one of the few research centres that have world-class laboratories and access to clinical patients (women and babies) in a major teaching hospital, allowing seamless translation of experimental work to clinical trials and healthcare.

There are five Research Themes in The Ritchie Centre:

- Women's Health
- Fetal & Neonatal Health – Respiratory and Cardiovascular
- Fetal & Neonatal Health – Brain Injury and Neurodevelopment
- Infant & Child Health
- Cell Therapy & Regenerative Medicine

Honours and PhD Projects are available in all of these themes and some projects involve more than one theme. Some examples of projects are listed here:

- Endometrial regeneration and regulation
- Role of endometrial stem cells in endometriosis
- Stem cell therapies in lung disease, pelvic floor prolapse, and spinal surgery disc injury and degeneration
- Fetal and neonatal development of the lungs, heart, brain and kidney
- Transition of the cardiorespiratory system at birth
- Disorders of the circulation and breathing during sleep in preterm infants
- Understanding sudden infant death syndrome
- Novel bedside tests of brain function in extremely low birth weight babies
- Physiological and mathematical models of the control of breathing in the newborn
- Causes of apnoea and its consequences on heart and brain function
- Causes and treatment of obstructive sleep apnoea in infants and children
- New therapies for preterm lung disease
- Pathophysiology of preeclampsia and the development of new therapies
- Prevention of perinatal brain injury (cerebral palsy)
- Evaluating the outcomes of undergraduate research

Researchers at Hudson Institute have been internationally recognised for their outstanding research into reproductive processes for more than 40 years. The current research program of the Hudson Institute's Centre for Reproductive Health is strongly based in both basic and translational science.

Reproductive Health is now a key global challenge, with impacts of the environment and changes in societies strongly impacting not only on both male and female reproduction but also on the long-term health of their offspring. The latter detrimental changes are established both in the sperm and egg, and during early development of the conceptus. With a rapidly increasing world population, the need for new contraceptive options has never been greater. Furthermore, translation of advances in reproductive sciences also impacts on cancer biology, animal food production, and conservation of endangered species. In addition, proteins involved in the regulation of reproduction also have wider actions influencing inflammation and tissue repair in a wide variety of organs.

Our research areas include:

- **Uterine Biology** – Three teams undertaking highly complementary work on uterine receptivity, implantation and placentation, endometrial cancer, and contraceptive development. Individual team focus:
  - **Endometrial Remodelling.** The intrauterine microenvironment of implantation; endometrial repair: embryo-maternal interactions via exosomes, tests for endometrial receptivity
  - **Embryo Implantation.** Embryo-maternal interactions: miRNA and embryo factors; placental development; endometrial cancer
  - **Implantation and Placentation.** Molecular changes during placentation; pre-eclampsia; post-translational changes during implantation and placentation

- **Ovarian Biology** – Mechanisms that control egg supply and health during ovarian development and throughout reproductive life. Strategies for preservation of fertility during chemotherapy and radiation treatment

- **Gonadal Development** – Genetic mechanisms underlying testis and ovary formation in the embryo, to improve diagnosis of disorders of sex development (DSD)

- **Male Reproductive Immunology and Inflammation Biology** – Understanding immune privilege in reproductive tissues; roles of the ‘reproductive hormones’ inhibin, activin and follistatin in the control of inflammation and tissue repair; lymphocytes and macrophages in male reproductive function

- **Spermatozoal Development** – Potential sites of action of male contraception: hormonal regulation of Sertoli cell junctions; minimally invasive diagnostic testing for testicular function

- **Brain and Gender Brain** sexual differentiation and gender bias in diseases such as Parkinson’s disease, ADHD and schizophrenia towards improved therapies.

More information at hudson.org.au/research-centre/centre-for-reproductive-health/
FURTHER INFORMATION

Dr Shae-Lee Cox
Coordinator
Monash Biomedicine Discovery Institute
Telephone: +61 3 9905 5673
Email: Shae.Cox@monash.edu

facebook.com/Monash.University
@Monash_FMNHSS

monash.edu/medicine