Medicine, Nursing and Health Sciences

Bachelor of Biomedical Science Honours 2014

Key Research Areas for Schools, Departments, Institutes and Centres
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.

The Biomedical Science Honours Course (code 3418) comprises two units:
- BMS4100 = 75% of overall course mark
- BMS4200 = 25% of overall course mark

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.

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.

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.

Who administers the Biomedical Honours Course?
The Biomedical Science Honours Course is managed by a Management Committee, which is comprised of:
- Convenor – Professor Robert Widdop (Department of Pharmacology)
- Co-ordinator – Dr Shae-Lee Cox (School of Biomedical Sciences)
- Staff representatives from: School of Biomedical Sciences, Central Clinical School, Monash Medical Centre; School of Epidemiology and Preventative Medicine and School of Psychology and Psychiatry.
- Student representatives from: School of Biomedical Sciences, Central Clinical School, Monash Medical Centre; School of Epidemiology and Preventative Medicine and School of Psychology and Psychiatry.

Choosing a host laboratory 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 laboratory 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?
Students must complete and submit an application form (please check the website below for application due date). The application form may be obtained from the Student Services Office (reception desk, Building 76/77) or may be downloaded from the Biomedical Science Honours web site: www.med.monash.edu/biomed/honours/

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 letter, which will be sent out in mid December 2013. 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 2014.

When can I start my Honours project?
The official commencement date for the Bachelor of Biomedical Science Honours is 24th February, 2014 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.

Component | Assessment
--- | ---
BMS4100 Biomedical Research Project (36 points) | School/Department
Literature Review | 10%
Seminar 1 | S or NS
Seminar 2 | 10%
Thesis | 80%
Total | 100%

BMS4200 Advanced Studies in Biomedical Science (12 points)

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<th>Component</th>
<th>Assessment</th>
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<tr>
<td>Discipline-Specific component</td>
<td>40%</td>
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<tr>
<td>Common Core Component</td>
<td>School/Department</td>
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<tr>
<td>Statistics course and assignment</td>
<td>30%</td>
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<tr>
<td>Written Critique exam</td>
<td>30%</td>
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<tr>
<td>Total</td>
<td>100%</td>
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Individual Student Research Project (75%)
Key areas of research in Biomedical Sciences at Monash University

**School of Biomedical Sciences**

**Department of Anatomy and Developmental Biology**

Contact person
Dr Robert De Matteo (Honours Coordinator) (pictured)
Dr Helen Abud
A/Prof Ann Chidgey

Dr Robert De Matteo
robert.dematteo@monash.edu
Ph: 9902 9108

http://www.med.monash.edu.au/anatomy/research/

**Description of 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:

- Germline stem cells.
- Immune regeneration.
- Reprogramming and epigenetics.
- Cardiovascular and renal cell biology.
- Male infertility and germ cell biology.
- Neurogenesis and neuroregeneration.
- Kidney development and regeneration.
- Understanding developmental disease.
- Non-coding RNA and sex determination.
- Endocrine control of fetal development.
- Prostate growth development & disease.
- Endothelial cells and kidney regeneration.
- Respiratory development and programming.
- Development, aging and diseases of the eye.
- Intestine development, stem cells and cancer.
- Kidney development, programming and disease.
- Biomechanics, comparative and evolutionary anatomy.
- Cell biology of the oocyte and early embryo development.
- Developmental switches in testis growth and spermatogenesis.
- Control systems in reproduction, inflammation and tissue repair.

**Department of Biochemistry and Molecular Biology**

Contact person
Associate Professor Martin Stone
(Honours Coordinator Semester 2 2013)
Associate Professor Tim Cole
(Honours Coordinator 2014)

martin.stone@monash.edu
Ph: 9902 9246
tim.cole@monash.edu
Ph: 9902 9118

http://www.med.monash.edu.au/biochem/research/
http://www.med.monash.edu.au/biochem/teaching/Hons_general.html

**Description of 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 platelet function in thrombosis and haemostasis.
- 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.
- Microbial oncogenesis.
Description of key research areas

Most research projects within the Department of Microbiology are aimed at understanding how specific bacteria, viruses and parasites are able to cause disease in human or animal hosts, and how that knowledge might be applied to more effectively treat or prevent the infectious disease. A common theme across most projects is the use of molecular approaches. These projects will involve training in the latest methods such as microbial genetics, genomics, microarray 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. The Department houses part of an ARC Centre of Excellence to study veterinary pathogens and has many NHMRC-funded projects that study bacterial pathogens and parasites that infect humans.

Specific research projects include:
- Regulation of toxin production in *Clostridium perfringens*.
- Pathogenesis and molecular biology of leptospirosis.
- Understanding the function of unique *P. falciparum* FIKK kinases.
- Characterisation of novel *Babesia bovis* exported parasite proteins.
- The molecular mechanisms by which *Helicobacter pylori* causes stomach cancer.
- The host immune response to *Clostridium difficile* infections.
- Virulence and hypervirulence genes of *Clostridium difficile*.
- Maintenance of the toxin plasmids of *Clostridium perfringens*.
- Structure and dynamics of *Helicobacter pylori* motility protein B.
- Characterisation of two-component signal transduction systems in *B. pseudomallei*.
- Antibiotic resistance in *Acinetobacter baumannii*.
- The use of modified HBV VLPs as vaccination tools.
- *Candida albicans* filamentation and virulence using a *Caenorhabditis elegans* model.
- Kinomics of the human malaria parasite *Plasmodium falciparum*.
- Expression and characterization of Hendravirus proteins.
- Chemical biology of pathogens.


Description of 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, cancer, respiratory diseases, influenza, Alzheimer’s disease and autism. The Department also has active research programs focused on clinical cardiotoxicity, the pharmacology and toxicology of a range of Australian 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:
- Vascular Biology & Immunopharmacology (focused on immune and oxidative mechanisms in stroke, hypertension and atherosclerosis).
- Oxidant and Inflammation Biology (identification of cellular pathways influenced by reactive oxygen species relevant to cancer and influenza A virus infections).
- Integrative Cardiovascular Pharmacology (Angiotensin II & its role in cardiovascular diseases, including hypertension, atherosclerosis, stroke).
- Pharmacology of relaxin and antifibrotic mechanisms.
- T cells in hypertension & the role of the adaptive immune system in hypertension.
- Neuropharmacology (CNS-based diseases).
- Cardiotoxicity: clinic to lab modeling.
- Venoms and Toxins (including all Australian venomous creatures).
- Drug Discovery Biology (molecular pharmacology focus on GPCRs).
- Pharmacology Education (advanced education concepts in Pharmacology).

www.med.monash.edu/pharmacology
### Department of Physiology

**Contact person**  
Roger Evans  
Dr Siew Chai  
Dr Marianne Tare

- Roger.evans@monash.edu  
- Ph: 9905 1466  
- siew.chai@monash.edu  
- Ph: 9905 2515  
- marianne.tare@monash.edu  
- Ph: 9905 2557

**http://www.med.monash.edu.au/physiology/honours/**

#### Description of key research areas

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 $4 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 respiratory pathophysiology, cardiovascular and renal physiology, neurosciences, neuroendocrinology, metabolism, 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:
- Asthma, allergy & airway pathophysiology.
- Aged related memory loss and neurodegenerative diseases.
- Cardiac and smooth muscle function in health and disease.
- Exercise physiology including study of muscle and movement.
- Epigenetic phenomena, including developmental perturbations.
- High blood pressure, renal disease and diabetes; causes and consequences.
- Immunobiology of parasite infections and vaccine development.
- Metabolic neuroscience, including control of appetite, thirst and energy expenditure.
- Obesity and appetite, including brain and peripheral mechanisms.
- Perinatal brain damage and its prevention.
- Sensory neuroscience, with emphasis on cerebral cortical mechanisms.
- Sex and reproduction, especially neuroendocrine control.
- Stress and body function, especially neuroendocrine control.

### Australian Regenerative Medicine Institute (ARMI)

**Contact person**  
Associate Professor James Bourne  
ARMI, Level 1, Building 75  
james.bourne@monash.edu  
Ph: 9902 9622

**http://www.armi.org.au/**

#### Description of key research areas

The Australian Regenerative Medicine Institute is located at the Clayton Campus of Monash University. It opened in 2009 and was established through a joint venture between Monash University and the Victorian Government. ARMI aims to be one of the world’s largest regenerative medicine and stem cell research centers and its research aims to understand the mechanisms underlying regenerative processes.

This fundamental knowledge is essential if we want to advance treatments for degenerative diseases such as muscular dystrophies, dementia, cardiac diseases and ageing.

ARMI is also committed to contributing to undergraduate teaching programs and establish a major site for postgraduate training.

The state of the art laboratories at ARMI draw together some of the world’s best scientists in exciting new innovative research programs.

At ARMI, our scientists delve deep into research to gain a comprehensive insight into the following key areas:
- Heart and muscle development and regeneration.
- Immunity and regeneration.
- Stem cells, cancer and regeneration.
- Neural regeneration.
- Heart and muscle development and regeneration.
- Immunity and regeneration.
- Stem cells, cancer and regeneration.
- Neural regeneration.
### Key areas of research at AMREP

#### Alfred Medical Research and Education Precinct (AMREP)

**Baker Research Institute**

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<th>Description of key research areas</th>
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<td>Baker Institute is an independent medical research institute with the objective to reduce death and disability from cardiovascular disease, diabetes and related conditions by research programs across the continuum from fundamental discovery to health translation. The research is multi-disciplinary and extends from the laboratory to wide-scale community studies with a focus on diagnosis, prevention and treatment. Research projects are offered for Doctorate, Masters and Honours students across the programs: Basic and Clinical Cardiology; Hypertension, Obesity and Stress; Cell Biology and Atherosclerosis; Vascular, Lipids and Lipoproteins; Human Physiology and Behavioural Science; Preventative Cardiology; Diabetes – Clinical and Population Health; Diabetic Complications; Epigenetics; Cell Signalling and Metabolism.</td>
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**Contact person**

- **Julie McHale**
- **Leonie Cullen**

- **Ph: 8532 1194**
- **Ph: 8532 1161**


#### Burnet Institute

**Description of key research areas**

Burnet Institute 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. Activities are divided between our Centre for Biomedical Research, Centre for Population Health and Centre for International Health. Burnet plays an important role in education, providing training in laboratory and public health research at both postgraduate and undergraduate levels. Laboratory based research occurs principally within the Centre Biomedical Research with an emphasis on HIV, HCV, influenza, tuberculosis, malaria, immune cell function, structural biology, vaccine development and diagnostics. The Centre for Population Health studies the molecular epidemiology of malaria, alcohol and other drugs, and is a Centre of Excellence into injecting drug use.

**Contact person**

- **Dr Heidi Drummer**
- **Dr Julie Cullen (Administrative assistant)**

- **Ph: 9282 2290**
- **leonie.cullen@baker.edu.au**


### Australian Centre for Blood Diseases (ACBD)

**Description of key research areas**

As the only blood-focussed centre of its kind in Australia, the Australian Centre for Blood Diseases (ACBD) boasts an international reputation as a world-leading blood clot research centre, and has many affiliated haematologists and medical scientists with active research programmes in haematology. The Centre is at the forefront of understanding the process of blood clotting and blood cancers such as lymphoma, leukemia and myeloma. In addition, ACBD’s network of clinical haematologists will aid the translation of laboratory research into clinical benefits.

Our state-of the art facilities, combined with the high calibre of our research scientists, provides an excellent environment for undergraduate and higher degree research students as well as postdoctoral scientists.

Current areas of Medical Research at ACBD include:

- **Fibrinolysis and Gene regulation** - focussed on the molecular and cellular biology of the plasminogen activating system, critical for the clearance of blood clots. Studies are also underway into the role of this system in the central nervous system.
- **Fibrinolysis and Plasminogen Modulation** - focussed on characterising members of this family of protease inhibitors involved in blood cell development, with an ultimate aim to give new insights into the control of blood cell development.
- **Haemostasis and Thrombosis (Platelet and Leukocyte Biology)** - focussed towards improving our understanding of the basic principals behind physiological haemostasis (blood clotting), ultimately working towards the identification of new targets to treat pathological thrombosis.
- **Systems Haematology** - focussed on characterising the adhesion, signalling and proteolytic regulation of platelet adhesion receptors, including receptors for VWF (Glycoprotein GP Ib-IX-V) and collagen (GPVI), to provide insight into their role in thrombotic diseases such as heart attack and stroke.
- **Leukaemia** - Focussed on understanding the mechanisms by which intracellular signalling pathways become corrupted in acute myeloid leukaemia (AML) cells leading to deregulated cell survival, proliferation and growth.
- **Red Cell Research** - Focusing on the process behind Globin switching and ENU-mutagenesis.
- **Stem Cell Research** - The goal of the Stem Cell Research Group is to understand the regulation of self-renewal and cell quiescence in normal HSCs and how these processes are perturbed in acute leukaemia.
- **Multiple Myeloma** - focusses on the pre-clinical development of novel therapeutic agents for multiple myeloma and the identification of new therapeutic targets through the study of disease resistance and disease progression mechanisms.
- **Cancer and Immune Cell Signalling** - Focusing on understanding how the NF-kappaB (NF-kB) and MAP kinase signal transduction pathways control the development and function of normal and malignant haemopoietic cells, with the aim to use this knowledge to improve therapeutic outcomes for human blood diseases.
- **Platelet and Megakaryocyte Cells** - Our research examines the cell biology of blood platelets and their precursor cell, the megakaryocyte, in order to understand the mechanisms by which platelets are produced and function.
- **Mammalian Functional Genetics** - Focuses on understanding cellular fate and memory at the molecular level.

Current areas of Clinical/Translational Research at ACBD include:

- The Ronald Sayers Haemophilia Centre.
- Myeloma Research Unit.
- Bone Marrow Transplant Program.
### Department of Immunology, The Alfred Hospital

**Contact person**
Associate Professor Mark Wright  
mrk.wright@monash.edu  
Ph: 9903 0703


**Description of key research areas**

The Department of Immunology is located at the Alfred Hospital campus in Prahran in AMREP (Alfred Medical Research and Educational Precinct) that co-locates the Department with the Baker and Burnet Research Institutes to form a cutting edge well funded research consortium that links research with student training.

The Department supports research, ranging from basic sciences in immunology, cell biology and molecular pathology to human diseases. The Department’s main areas of interest include:

- Autoimmune diseases.
- Arthritis and lupus (Prof Fabienne Mackay).
- Diabetes immunopathogenesis.
- Genetically engineered models of autoimmunity (A/Prof Robyn Slattery).
- Multiple Sclerosis/EAE.
- Treatment of autoimmunity with stem cell transplants (A/Prof Frank Alderuccio).
- Diabetic retinopathy (A/Prof Wilkinson-Berka).
- Allergy and asthma (Prof Jennifer Rolland / Prof Robyn O’Hehir).
- Infectious diseases (Prof Magdalena Plebanski).
- Leucocyte Membrane Proteins and their role in inflammation and cancer (A/Prof Mark Wright).

### Department of Infectious Disease, The Alfred Hospital

**Contact person**
Dr Jasminka Sterjovski  
jasminka.sterjovski@monash.edu.au  
Ph: 9076 8589


**Description of key research areas**

The Department of Infectious Diseases is located within the Burnet building at the Alfred Medical Research and Educational Precinct (AMREP) in Prahran. Our research ranges from basic laboratory studies through to clinical research and public health, with an emphasis on the following areas of infectious diseases research:

- HIV – Finding a cure (Prof Sharon Lewin / Dr Paul Cameron).
- HIV - Pathogenesis (Prof Sharon Lewin / Dr Paul Cameron / Dr Judy Chang).
- HIV – Immunology of HIV latency and cure (Dr Paul Cameron).
- HIV – Clinical Research (A/Prof Julian Elliott / Professor Jennifer Hoy / A/Prof Edwina Wright).
- HIV – Health Information Technology (HealthMap program – A/Prof Julian Elliott).
- Viral hepatitis and HIV co-infections – (Dr Megan Crane).
- Infections in the immunosuppressed – (Dr Orla Morrissey).
- Influenza - (A/Prof Allen Cheng).
- Drug resistant organisms, Antibiotic Use and Infection Prevention and Epidemiology Team (Prof Denis Spelman / A/Prof Allen Cheng / A/Prof Anton Peleg).
Monash Alfred Psychiatry Research Centre, The Alfred Hospital
Contact person
Dr Kate Hoy
kate.hoy@monash.edu
Ph: 9076 6564

Description of key research areas
The Monash Alfred Psychiatry Research Centre is a vibrant, busy clinical research centre. We conduct a large number of clinical research projects – all related to people experiencing mental illnesses such as depression, schizophrenia, bipolar disorder, autism and anxiety. Our goal is to develop new understanding, new treatments and new services for people with mental disorders. We offer research projects using state-of-the-art technology combined with a dynamic integration of psychological and social approaches that allow us to better understand that the cause and offer new treatment for a number of psychiatric disorders. To do this we use a range of tools including clinical therapies and interactions, structural and functional neuromaging, electroencephalography (EEG), near infrared spectroscopy and transcranial magnetic stimulation. Studies are organized within a number of research streams including (but not limited to):
- Women’s mental health
- Brain stimulation and neuromaging
- Health outcomes
- Psychopharmacology

A variety of studies are possible for 2014 across a number of these areas. For example, we are using transcranial magnetic stimulation of the brain to enhance cognition in people with mental disorders and in healthy controls; there are a number of possible studies in the area of structural neuromaging and EEG. There is also the possibility of studies looking at the integration of several research methods (for example using EEG to measure responses to brain stimulation). We also have a number of studies that involve with working with pregnant women who have mental disorders and their babies, understanding more about perimenopausal depression and working with women who have a range of hormone related mood disorders. We are also happy to assist students who have worked up feasible mental health research projects to complete these.

Department of Surgery, The Alfred Hospital
Contact person
Professor Jeffrey V. Rosenthal
Ph: 9903 0190

Description of key research areas
The Department of Surgery at The Alfred Hospital carries out research in a number of areas:
- Burns
- Cardiothoracic surgery
- Endocrine surgery including thyroid cancer
- General Surgery including colon cancer, gastro-esophageal reflux, hepatobiliary disease and surgery for obesity
- National Trauma Research Institute (Professor R. Guen)
- Neurosurgery
- Orthopaedic surgery
- Trauma
- Urology including prostate cancer

Department of Medicine, The Alfred Hospital
Contact person
Ms Ashleigh Clarke
ashleigh.clarke@monash.edu
Ph: 9903 0669

Description of key research areas
The Department of Medicine laboratories based at AMREP engage in a broad and diverse range of basic and clinically focused research topics. In many instances the research is undertaken in collaboration with other departments located at the Alfred campus.

The Department consists of different research groups offering a number of research projects aimed at honours and PhD levels:
- Experimental Pathology Laboratory: research focusses on latent viral infections of the central nervous system.
- Epidermal Development Laboratory: focusses in understanding the mechanisms underpinning epidermal development and homeostasis. This includes projects on epidermal migration in wound repair and neural tube closure, skin barrier formation and maintenance and more recently skin cancer.
- Hormones & Vasculature Laboratory: research has a specific interest in the impact of sex hormones and natural chemicals with hormone-like effects on cardiovascular physiology. Sex hormones, including androgens (male) and oestrogens (female) hormone, are associated with cardiovascular disease (CVD).
- Molecular Endocrinology Laboratory: has two research areas: (1) Insulin growth factors (IGFs) and cancer and (2) Development of diabetic complications.
- Van Cleeve/Roet Centre for Nervous Diseases: our principal areas of research are the neurobiology of movement disorders, and clinical aspects of cognitive disorders.
- Respiratory Laboratory: works in close association with the Lung Transplant Service within the Department of Allergy, Immunology and Respiratory Medicine (Alfred hospital). The main focus of our laboratory is elucidating the mechanisms and risk factors associated with maintenance of the lung allograft.
Key areas of research in the School of Public Health and Preventive Medicine

School of Public Health and Preventive Medicine

Department of Epidemiology and Preventive Medicine

Contact person: A/Prof Allen Cheng, Dr Jayamini (Jay) Illesinghe
The Alfred Hospital, Commercial Rd, Prahran 3181
allen.cheng@monash.edu, jayamini.illesinghe@monash.edu
Ph: 9903 0929


Description of key research areas
The Department of Epidemiology and Preventative Medicine, situated at The Alfred Hospital, undertakes research in a number of areas:

- Cardiovascular epidemiology
  - Cost effectiveness of health services for cardiovascular disease (CVD) and heart failure (HF).
  - Primary prevention model of CVD.
- Preventive Medicine
  - Chronic disease and ageing.
  - Overweight and obesity in Australia.
- Clinical pharmacology
  - Clinical and basic studies of new drug therapies for HF.
  - Effect of drugs on autonomic and endothelial parameters in HF.
- Occupational and environmental health
  - Environmental arsenic exposure health effects.
  - Gulf War veterans’ health.
- Health services research

- Occupational Health
  - Occupational exposures and workers’ health.
  - Surveillance of workplace-based adverse events.
- Respiratory epidemiology
  - Diet, pollution and chronic lung disease.
- Rheumatology
  - Lifestyles factors and MRI evaluation of osteoarthritis.
  - Preventing disability from back pain.
- Sports injury prevention
- Trauma epidemiology
  - Emergency medicine.
  - Ambulance Service delivery.
- Bioethics and Human Rights
  - Public health law and human rights.
  - International research ethics.
## Department of Forensic Medicine

**Contact person**

Professor Olaf Drummer

57-83 Kavanagh St, Southbank 3006

olaf.drummer@monash.edu or

olaf@vifm.org

Ph: 9684 4334


### Description of 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, 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.

## Centre for Obesity Research and Education (CORE)

**Contact person**

Dr Anna Peeters

Tania Richter

The Alfred Hospital, Commercial Rd, Prahran 3181

anna.peeters@monash.edu,

Tania.Richter@monash.edu

Ph: 9903 0177

www.core.monash.org

### Description of key research areas

Management and treatment of obesity, severe obesity and related co-morbidities such as diabetes. The mission of the Centre for Obesity Research and Education (CORE) is to understand the disease of obesity, to identify optimal methods for its long-term management that are safe and cost effective, and to determine preventive strategies that can be implemented. Key studies include randomised clinical trials of laparoscopic adjustable gastric band surgery, evaluation of changes in physical and mental health following surgery, and the mechanisms of action of weight loss.

## Monash Institute for Health Services Research

**Contact person**

A/Prof Allen Cheng

Dr Jayamini (Jay) Illesinghe

The Alfred Hospital, Commercial Rd, Prahran 3181

allen.cheng@monash.edu,

jayamini.illesinghe@monash.edu

Ph: 9903 0929

### Description of key research areas

The Monash Institute for Health Services Research (MIHSR) was established in 1999 as a conjoint entity of Southern Health and Monash University in response to the challenge of ensuring people have a safe and effective encounter with the healthcare system. We improve healthcare outcomes through applied research, education, advocacy and innovation in the areas of clinical management, service delivery and health policy. The Institute incorporates a multidisciplinary team with expertise in the synthesis of evidence, implementation of best practice and evaluation of change. It includes the following centres: the Australasian Cochrane Centre, Turning Point Drug and Alcohol Centre and the Jean Hailes Foundation Research Centre, Monash Ageing Research Centre, and the Centre for Clinical Effectiveness. We work together with clinicians, consumers, managers and policy makers to provide an independent perspective. Key topic areas include healthy ageing, evidence based medicine, health informatics, drug and alcohol research and women’s health.
Key areas of research in the School of Psychology and Psychiatry

Description of key research areas in department or centre
Research projects are available in a wide range of areas including:
- Addiction and Consciousness
- Brain Injury and Rehabilitation
- Culture and Mental Health
- Forensic Mental Health and Behavioural Science
- Mental Illness and Mood Disorders
- Movement Disorders and Ageing
- Neurodevelopment and Disorders
- Sleep Health and Sleep Disorders
For more details about research projects:
http://www.med.monash.edu.au/psych/research/students/projects.html
### Description of key research areas in department

The Department of Medicine has groups working in five key areas of biomedicine:

- **Immune and Inflammatory diseases** - The Centre for Inflammatory Diseases runs active programs in key areas of inflammation with an emphasis on translational research, including:
  - Mechanisms by which immune cells induce renal injury (particularly antigen presentation, autoimmunity, cytokines, co-stimulation, leucocyte-resident tissue cell interaction).
  - New roles for coagulation molecules in enhancing inflammation.
  - Mechanisms of injury in arthritis.
  - Development of inhibitors of inflammation.
  - Mechanisms of fibrosis in the liver and kidney.
  - Mechanisms of cell adhesion in inflammation, including in systemic autoimmunity, the brain and kidney.
  - Mechanisms of inflammation in asthma.
  - Tolerance and its breakdown in autoimmunity.
  - Innate immunity and infection.
  - Respiratory infection and immunity.

- **Cardiovascular biology** - focusing on the endothelium and its relationship to key events in atherosclerosis.

- **Nutrition and dietetics** - Current research includes dietary treatment of hyperglycaemia, iodine nutrition of pregnant women, therapeutic uses of the Mediterranean diet, television advertising of food to children, food labeling and sources of dietary sodium.

- **The Neurosciences group** - offers honours projects which utilise human disease models to study structure function relationships in the human brain. The methodologies include advanced imaging techniques to estimate physiological parameters such as blood flow, volume using magnetic resonance imaging, functional MRI and positron emission tomography. Studies also use cognitive and behavioural probes. Opportunities are also available for studies looking at specific receptor subunit mutations causing epilepsy in humans.

- **Development, MIMR**
  - Cancer & Innate Immunity
  - Cell Adhesion Signalling
  - Structural Biology

Centre for Innate Immunity and Infectious Diseases

The Centre for Innate Immunity & Infectious Diseases (CIIID) researches the molecular regulation of the innate immune response. This early immune response determines how the body responds to infection by pathogens and other stresses. It initiates the inflammatory response and can modulate the development of some cancers. By understanding the molecular pathways that regulate these processes as well as their normal, physiological roles, CIIID scientists aim to contribute to the development of new approaches to the prevention, diagnosis and treatment of disease.

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 research multidisciplinary teaching and training environment within CIIID provides students with a strong range of skills in biomedical research that are 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:

- Molecular Regulation of Immunity
- Cytokine Signalling in Cancer & Inflammation
- Toll-like Receptors in Innate Immunity
- Gastrointestinal Infection & Inflammation
- Respiratory & Lung Research
- DNA Damage & Repair & Genomics


Centre for Reproduction and Development

Research at the Centre for Genetic Diseases focuses on understanding the underlying causes of disease. We undertake our research using a range of genetic, epigenetic, reproductive and developmental biology models and strategies, utilising the most up-to-date analytical approaches.

Current work in the stem cell field involves understanding how amnion stem cells, which are derived from the placenta, can be used for transplantation purposes. Researchers are also studying how genes are regulated in embryonic stem cells and reprogrammed somatic cells, which will help us to understand the genetic and epigenetic basis of disease. These investigators are also determining how genes are expressed during early germ cell development and, when this process goes wrong, how this can give rise to germ cell tumours.

The centre also has a major interest in another form of heritable disease, the transmission of mitochondrial DNA mutations, which are transmitted from the mother to her children. Our researchers are also using stem cell models to understand this. Furthermore, they are developing specific assisted reproductive technologies to prevent the transmission of mutant mitochondrial DNA from one generation to the next. They are also working on how the complexes of the mitochondrial electron transfer chain are assembled and how mutations to its nuclear and mitochondrial DNA genes affect this process.

The centre's expertise in hormonal function and immune responses in the male reproductive system is also providing insights into cardiology and gastroenterology to help address problems such as inflammatory disorders and organ transplant rejection. Understanding the underlying mechanisms of disease will provide a platform for the development of tomorrow's therapies.

Student projects are available in the following research areas:

- Mitochondrial Genetics
- Biomedical Genomics
- Germ Cell Development & Epigenetics
- Molecular Basic of Mitochondrial Disease
- Male Reproductive Health
- Endocrinology & Immunophysiology
- Activin & Follistatin in Inflammatory Disease, Fibrosis & Immunity


The Ritchie Centre

The Ritchie Centre is one of four Research Centres within Monash Institute of Medical Research and is affiliated with the Monash University Southern Clinical School through the Department of Obstetrics and Gynaecology, and the Department of 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 units 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 four Research Themes in The Ritchie Centre:

- Women's Health
- Fetal & Neonatal Health
- 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)
