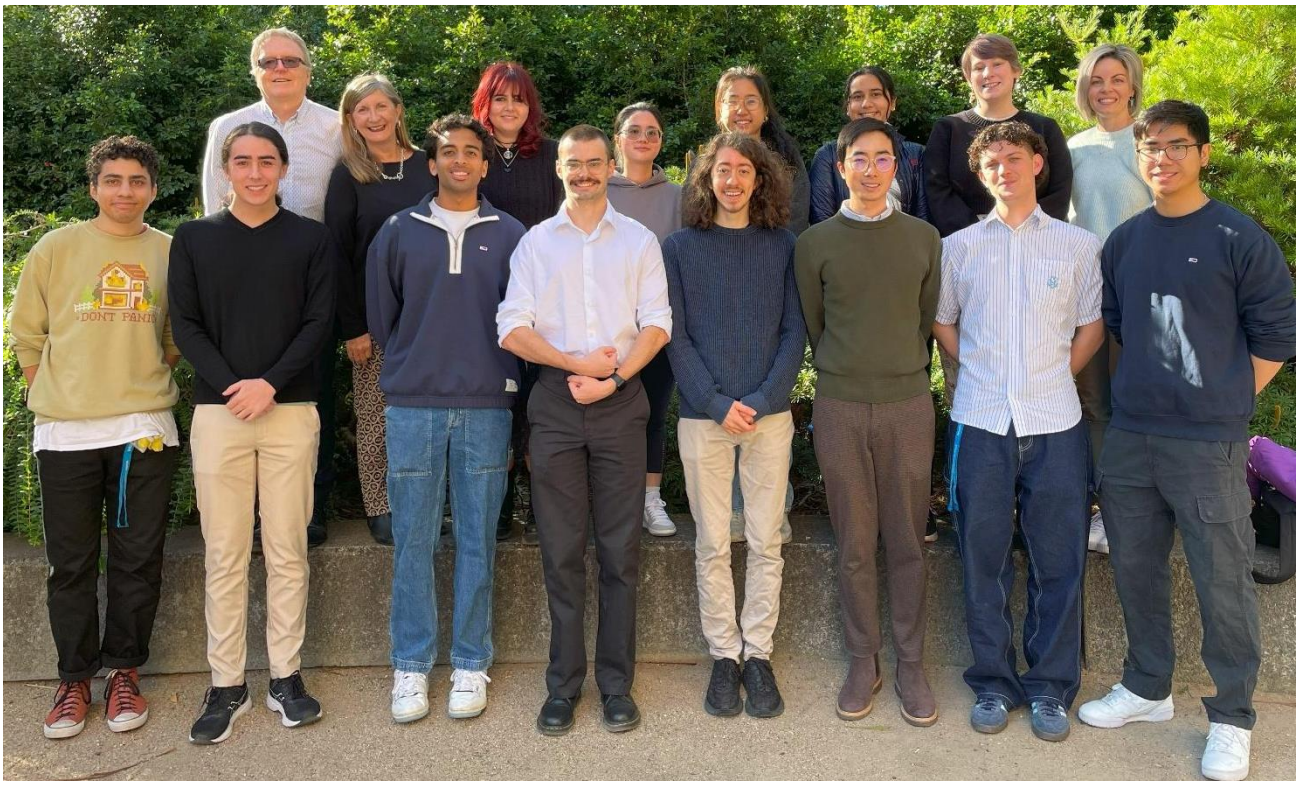
Department of Pharmacology
Honours Projects
2026



Our 2025 Honours Students!

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Welcome to the Pharmacology Department!

The Honours year represents a new adventure, very different to your undergraduate experience, in which you will have the opportunity to undertake a research project, communicate your science to colleagues and peers and learn to critically evaluate scientific concepts and literature.

Your supervisor(s) will be there to guide and advise you along this research journey.
At the very least, you are expected to bring with you the following skills set, in no particular order:

- enthusiasm
- an enquiring mind
- respect & humility
- determination & persistence
- a sense of humour
- a collegial spirit
- patience

This booklet provides information about the research projects on offer in the Department of Pharmacology and we encourage you to identify the areas of research in which you are most interested, contact potential supervisors and discuss the projects with them.

As course convenors, Prof Jane Bourke and I can advise on projects, guide you through the application process and help with any queries you may have.

We look forward to welcoming you to the Department of Pharmacology in 2026 and wish you all the best for a rewarding and exciting year of research.

Good luck!

Professor Robert Widdop
Head, Department of Pharmacology

Department of Pharmacology Honours Convenors & Support

Prof Jane Bourke
Honours Convenor
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Prof Rob Widdop
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Teaching & Student Support
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Pharmacology Honours: Pre-requisites

* There is no pre-requisite in terms of 3rd year PHA units, but the Pharmacology Honours Convenors will need to be satisfied that you have the necessary background in pharmacology to undertake your chosen research project.

	Bachelor of Biomedical Science (Hons)	**Bachelor of Science (Hons)**
Pre-requisites	A Distinction average (>70) in 24 points at 3rd year in relevant disciplines within the School of Biomedical Sciences*	A Distinction average (>70) in 24 points at 3rd year level, including 12 points in 3rd year core BMS units (BMS3021, BMS3042) and 12 points in other 3rd year units*
Application closing date	**14 November 2025**	**14 November 2025**
Links to info and application	https://www.monash.edu/discovery-institute/study/honours	https://www.monash.edu/discovery-institute/study/honours
Commencement date	**23 February 2026**	**23 February 2026**

Pharmacology Honours Course

The Pharmacology BSc Biomedicine Honours Course comprises 2 units:

- BMH4100 (36 points) – Research Unit
- BMH4200 (12 points) – Coursework Unit

BMH4100
This major focus of this unit is the research project you will conduct under the guidance of your supervisor. The assessment tasks comprise:

- Literature Review
- Research Seminars (introductory & final)
- Thesis & its defence

BMH4200
This unit provides you with the necessary skills to critically review and evaluate the scientific literature and effectively communicate concepts related to the discipline of pharmacology and your research area both in writing and orally. The assessment tasks include:

- Statistics test and assignment
- Written critique of scientific paper exam
- Journal club presentation & participation

Bachelor of Biomedical Science (BMS) Honours students undertake

- BMS4100 (identical to BMH4100)
- BMS4200 (identical to BMH4200 but administered through the School of Biomedical Sciences)

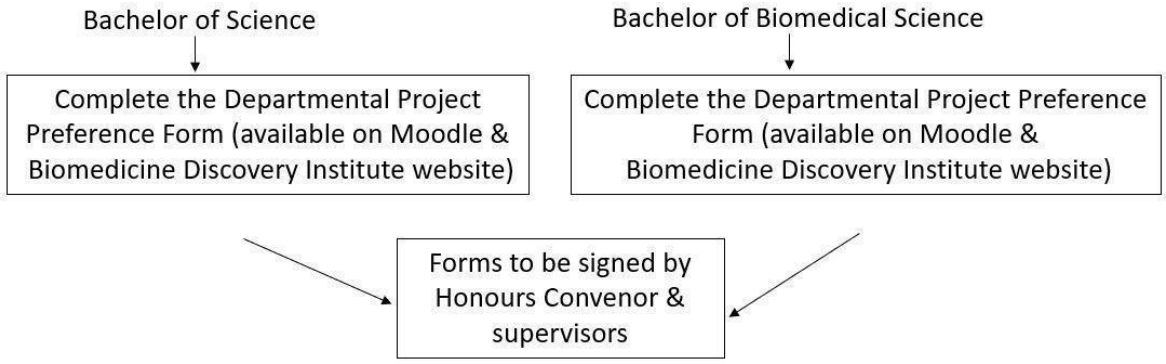
Choosing an Honours Project

The research projects on offer in the Department of Pharmacology and off-campus, with our collaborators, are outlined in the following pages. Once you have identified a few projects that you find interesting, then contact the potential supervisors by email or phone and arrange to meet with them to find out more about the projects on offer. It's a great idea to visit the research labs and meet other members of the research group in order to get a 'feel' for the people you would be working with and type of research you would be undertaking.

Please note that the availability of a supervisor to sign you on for a project will depend on that project still being available and the limit as to how many students a supervisor can take on. At least one of your supervisors must be a member of staff or an adjunct member of staff of the Department of Pharmacology.

How do I apply?

Once you, together with your potential supervisor, have identified a project that would be suitable for your Honours research program, then you will need to complete the following steps:



These forms must be signed by the Honours Convenors of the Pharmacology Department, Prof Jane Bourke or Professor Rob Widdop.

Information about how to apply on-line:

- Science or Biomedical Science: Complete on-line project application form via E-admissions by **Friday 14th November**
- Links available from https://www.monash.edu/discovery-institute/study/honours
- Submit Departmental Project Preference form to Pharmacology Honours Convenor.

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 to late December 2025. 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 2026.

Honours Projects 2026 – On campus projects

LABS / SUPERVISOR(S)	PROJECT TITLE
Fibrosis Group 1. Chrishan Samuel	1. Investigating novel anti-fibrotic therapies
Integrative Cardiovascular Pharmacology Group 1. Tracey Gaspari & Robert Widdop 2. Robert Widdop & Yan Wang	1. Investigating a novel target in treatment of cardiovascular disease 2. Potential anti-inflammatory and anti-fibrotic effects of novel AT_2 receptor agonists
Cardiovascular & Pulmonary Pharmacology Group 1. Brad Broughton & Barbara Kemp-Harper	1. Novel therapeutic strategies to treat cardiovascular pathologies including stroke and pulmonary hypertension
Respiratory Pharmacology Group 1. Jane Bourke & Patrick Lelliott 2. Jane Bourke, Paris Papagianis 3. Jane Bourke, Rob Widdop & Olivia Young 4. Jane Bourke, Paris Papagianis & Simon Royce 5. Belinda Thomas, Julia Chitty & Jane Bourke	1. Lung health in a plastic planet – effects of microplastics 2. Fire! fire! the impact of bushfires on lung health 3. Targeting fibrosis – AT2R agonists for the treatment of IPF 4. Silicosis – effects of a dangerous dust on lung health 5. Repurposing pirfenidone – a better way to treat COPD exacerbations
Kidney Therapeutics and Stem Cell Laboratory 1. Sharon Ricardo & Andrea Wise	1. Pluripotent stem cell modelling of kidney disease
Cancer Drug Discovery and Cellular Aging Group 1. Iman Azimi 2. Iman Azimi 3. Iman Azimi & Sharon Ricardo	1. Towards repurposing FDA-approved drugs for paediatric medulloblastoma brain cancer 2. Identification of novel approaches to control cellular ageing 3. Exploring and targeting cellular senescence in kidney fibrosis
Biomedicine Discovery Institute 1. Jian Li & Tony Velkov 2. Tony Velkov & Jian Li	1. Pulmonary toxicity of novel polymyxin combination therapies 2. Systems Pharmacology of novel teixobactin-

	lipopeptide hybrids 3. Exploring and targeting cellular senescence in kidney fibrosis
Hypertension Research Laboratory 1. Francine Marques, Joanne O'Donnell & Matthew Snelson	1. Gut microbiome, diet and cardiovascular disease
Hepatology Research Laboratory 1. Chandana Herath & Anshuli Razdan	1. Anti-carcinogenic mechanism(s) of novel therapies in hepatocellular carcinoma (HCC) 2. Novel targeted therapy in cirrhotic portal hypertension
Pharmacology Education 1. Klaudia Budzyn, Jennifer Irvine & John Ling	1. Perceptions of teamwork implementation in the BDI

Honours Projects 2026 – Off campus projects

LABS / SUPERVISOR(S)	PROJECT TITLE
Baker Heart & Diabetes Institute 1. Judy de Haan & Arpeeta Sharma 2. Bing Wang & David Kaye 3. David Kaye, Bing Wang & Barbara Kemp- Harper 4. David Kaye & Bing Wang	1. Targeting the NLRP3-inflammasome axis in diabetic mice post an acute myocardial infarction 2. Investigating late-term cardiovascular effects of multiple pregnancies and identifying novel therapeutic targets 3. How do SGLT-2 inhibitors and GLP-1 agonists work in the setting of heart failure with preserved ejection fraction? 4. Novel, targeted therapy for heart failure with preserved ejection fraction

Not all projects listed may be available in 2026, but please contact supervisors if you are interested.

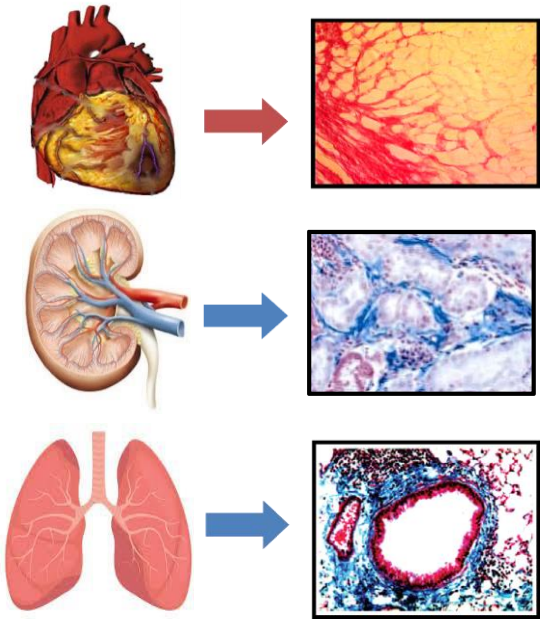
INVESTIGATING NOVEL ANTI-FIBROTIC THERAPIES

Supervisors: Prof Chrishan Samuel
Location: *Fibrosis Laboratory* Department of Pharmacology Monash University, Clayton

Background:
Fibrosis is defined as the hardening and/or scarring of various organs including the heart, kidney and lung; which usually arises from a failed wound healing response to tissue injury and is characterized by an excessive deposition of extracellular matrix components. The eventual replacement of normal tissue with scar tissue leads to organ stiffness and failure. Despite a number of available treatments for patients with various heart and kidney diseases, patients receiving these therapies still progress to end-stage organ failure due to the inability of these treatments to directly target the build-up of fibrosis. Hence, novel and more direct anti-fibrotic therapies are still required.

Project aim:
The Fibrosis Lab aims to identify novel anti-fibrotic (peptide-, stem cell-, cell repair- and combination-based) therapies that will more effectively reduce/reverse fibrosis progression. Additionally, by understanding the mechanisms of action of these potential therapies of future, we aim to delineate new targets that can be utilized to abrogate organ fibrosis and related dysfunction.

Techniques:
Depending on the project involved, animal or cell culture models of heart/kidney/lung disease, as well as blood pressure and functional measurements, protein biochemistry, histological techniques and/or molecular biology may be utilized to evaluate the therapeutic potential of novel anti-fibrotic therapies.



Contact:

Prof Chrishan Samuel

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INVESTIGATING A NOVEL TARGET IN TREATMENT OF CARDIOVASCULAR DISEASE

Supervisors: A/Prof Tracey Gaspari & Prof Robert Widdop
Location: *IRAP & Integrative Cardiovascular Pharmacology Groups*
Department of Pharmacology
Monash University, Clayton

Background:
Cardiovascular diseases (CVDs) remain the world's leading cause of morbidity and mortality, claiming 17 million deaths annually. Risk factors such as ageing, ischemia (such as myocardial infarct) or hypertension, lead to vascular dysfunction, increased fibrosis, chronic heart failure and/or end organ damage. There are few effective treatments currently available highlighting the urgent need to identify new targets and treatment options. We have identified a novel component of the renin angiotensin system, the enzyme, insulin regulated aminopeptidase (IRAP), as one such target and shown that inhibiting this enzyme prevents and reverses fibrosis in a number of disease settings, without altering blood pressure.

Research questions:
1. Evaluate efficacy of novel IRAP inhibitors alone, and in combination with current standards of care to reduce, and importantly reverse organ fibrosis, leading to improved functional outcomes in models of established CVD.
2. Understand the cellular and molecular pathways that contribute to IRAP inhibitor-mediated protective effects.
3. Determine if IRAP expression/activity are biomarkers in chronic disease states

Techniques:
Depending on the project being undertaken a range of methodologies may be used, including: use of preclinical animal models of disease (heart, kidney, lung, blood vessel diseases) or cell culture models of disease, functional measurements in conscious and anaesthetized animals (blood pressure, ultrasound, kidney function), tissue and cell histology, immunohistochemistry and protein assays, biochemical measures and/or enzyme activity assays may be used to determine the therapeutic potential and mechanisms involved in targeting IRAP.

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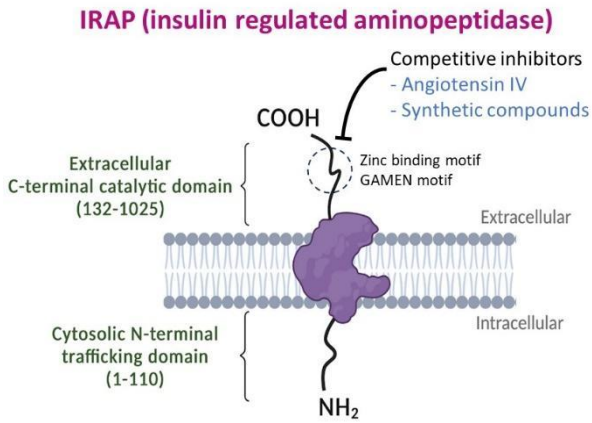
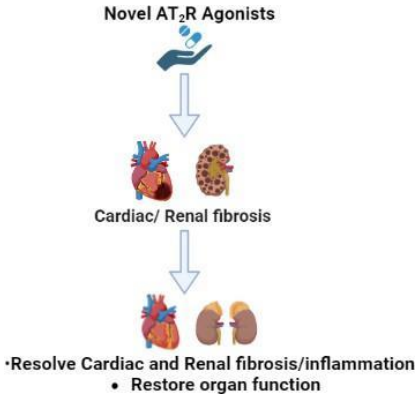


POTENTIAL ANTI-INFLAMMATORY AND ANTI-FIBROTIC EFFECTS OF NOVEL AT_2 RECEPTOR AGONISTS

Supervisors: Prof Robert Widdop and Dr Yan Wang
Location: *Integrative Cardiovascular Pharmacology Group*
Department of Pharmacology
Monash University, Clayton

Background:
The main effector hormone of the renin angiotensin system (RAS) is angiotensin II which can stimulate both angiotensin AT_1 receptors (AT_1R) and AT_2 receptors (AT_2R). There is currently intense interest focusing on the AT_2R cardiovascular function, although there are few selective AT_2R ligands available to delineate such effects. We have synthesised a range of novel angiotensin peptide analogues that exhibit high AT_2R selectivity, based on *in vitro* radioligand binding using overexpressed cells. Many of these selective AT_2R agonists have shown protective effects (e.g. anti-fibrotic and anti-inflammatory) *in vitro* and in animals with the heart and kidney diseases (e.g. high salt diet-induced organ fibrosis), and we are interested in testing such compounds in more severe models of cardiac and renal failure.

Project aim:
The current project will determine the anti-inflammatory and anti-fibrotic effects of novel AT2R ligands in mouse models of cardiac and/or renal failure, and bench mark against the standard AT2R agonist C21 (in Phase II Clinical Trial for IPF).



Techniques:
This project will involve *in vivo* and *in vitro* techniques which may include:

- Animal husbandry
- Heart imaging techniques
- Histological and biochemical tissue analyses
- Cell culture

These studies will provide important mechanistic data to help explain how a number of lead AT_2R compounds protect against organ fibrosis in cardiovascular disease settings.

Contact:
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NOVEL THERAPEUTIC STRATEGIES TO TREAT CARDIOVASCULAR PATHOLOGIES INCLUDING STROKE AND PULMONARY HYPERTENSION

Supervisors: Dr Brad Broughton & Associate Professor Barb Kemp- Harper

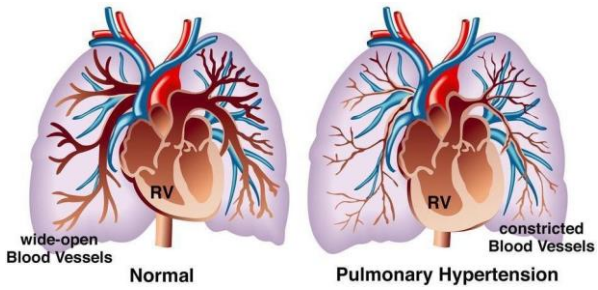
Location: *Cardiovascular & Pulmonary Pharmacology Group,* Department of Pharmacology Monash University, Clayton

Background:
Cardiovascular diseases, encompassing stroke, systemic and pulmonary hypertension, remain the leading cause of death globally, accounting for 17.9 million deaths each year.
Stroke is Australia's leading cause of disability and a high proportion of patients will unfortunately suffer a recurrent stroke. It involves numerous complex, yet poorly understood mechanisms that lead to brain cell death and has very few treatment options.
Pulmonary hypertension is an incurable disease and a major cause of death and illness throughout the world. Whilst there has been advancement in the treatment of pulmonary hypertension, current treatment is not optimal, with 5 year survival of ~50%. New therapeutic strategies are urgently needed.

Research aim:
Our research aims to identify novel pharmacological, dietary and/or cell-based therapies that can limit the pathophysiology of diseases such as stroke and pulmonary hypertension.

Potential Projects:
- Impact of high fibre diet on long-term outcomes following ischaemic stroke
- Impact of high fibre diet on long-term outcomes in pulmonary hypertension
- Novel antifibrotic therapies in the treatment of pulmonary hypertension

Techniques:
Techniques used in our research programs include pre-clinical mouse models of stroke (photothrombotic stroke) and pulmonary hypertension (chronic hypoxia) and involve the measurement of blood pressure, functional tests, cell culture and ex vivo assays to assess vascular function (myography), detect inflammation (RT-PCR, immunofluorescence) and remodeling (histochemical staining).



Contacts:
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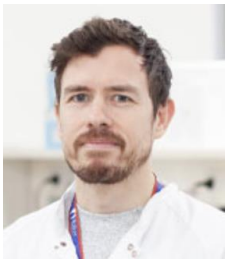
LUNG HEALTH IN A PLASTIC PLANET – EFFECTS OF MICROPLASTICS



Supervisors: Prof Jane Bourke
Dr Patrick Lelliott

Locations: *Respiratory Pharmacology*, Monash
Baker Institute, Prahran

Background:

There is increasing concern regarding the hazards of microplastic pollution to health. Microplastics are tiny particles shed from plastics into the environment, leading to unavoidable human exposure either by ingestion or inhalation. In a recent study, microplastics (and even smaller nanoplastics) were present in the majority of people undergoing major artery surgery and associated with higher risk of subsequent heart attack, a stroke or death. Microplastics have also been detected in all compartments of the lung, but the effects of direct exposure on lung health are not well described, forming the basis of this new collaboration between Dr Patrick Lelliott and Professor Jane Bourke.

Research questions:

Do ingested microparticles reach the lung to cause damage in a mouse model of exposure?

What direct effects do microparticles have on lung cell viability as well as airway inflammation and contraction?

Project description:

Patrick has established a method to generate standardized microparticles and has exposed mice to these particles via drinking water. In this project, you will be examining lung tissue from the mouse model to quantitate deposition of microparticles of different size and compositions.

Jane's research group has unique expertise in the use of precision cut lung slices (PCLS) to study lung disease. PCLS contain all the structural cells present in the lung, including intact airways, providing insights into both inflammatory and contractile responses that are not possible in cell culture studies. You will be treating PCLS with a range of microparticles to test their direct effects on tissue viability, cytokine release and airway contraction to measure potential lung damage.

Techniques: This project will combine preparation of microplastic samples; analysis of lung tissue using cutting-edge imaging; tissue culture and treatment of PCLS; assessment of viability using MTT and LDH assays; airway contraction and relaxation using phase-contrast microscopy; and inflammatory responses using RT-PCR and ELISAs.

Contacts and Research Information:

Prof Jane Bourke, *jane.bourke@monash.edu*
https://www.monash.edu/discovery-institute/bourke-lab/research

Dr Patrick Lelliott, patrick.lelliott@baker.edu.au
https://baker.edu.au/research/staff/patrick-lelliott

Not all projects listed may be available in 2026, but please contact us if you are interested.

FIRE! FIRE! THE IMPACT OF BUSHFIRES ON LUNG HEALTH

Supervisors: Prof Jane Bourke,
Dr Paris Papagianis

Location: *Respiratory Pharmacology*,
Department of Pharmacology,
Monash University, Clayton

Background: Global warming has increased the prevalence and area of burning from bushfires around the world, including in Australia. Burning generates both particulate matter (PM) and a range of chemicals including polyaromatic hydrocarbons (PAHs). These damaging substances can either be inhaled to elicit lung damage directly or enter the environment, including into drinking water, to potentially reach the lung via the circulation. These exposures have serious implications for lung health, particularly in those with pre-existing lung diseases, as evidenced by increasing hospital admissions during peak bushfire seasons.

Our lab has conducted extensive research on lung tissue *ex vivo* to establish the direct damaging impact of different size PMs (PM1, PM2.5, and PM10) as well as various types of PAH found in eucalyptus leaves (Fluoranthene, Phenanthrene, Pyrene). It is important to extend these studies to establish whether indirect exposure has similar effects based on a model where mice are exposed via ingestion.

Research questions:

Can we model the bushfire-induced lung damage by using precision cut lung slices (PCLS) treated ex vivo or obtained after in vivo exposure to PMs and/or PAHs?

Project description:

Our research group has unique expertise in the use of precision cut lung slices (PCLS) to study lung disease. These multicellular preparations provide additional insights over those that can be obtained in culture of single cell types. You will be treating PCLS *ex vivo* with different exposures (PMs, PAHs, separately and in combination) and preparing PCLS from mouse models exposed to PMS and/or PAHs *in vivo.* You will then measure whether this impacts tissue viability, release of pro-inflammatory cytokines and fibrotic changes consistent with lung damage.

Techniques: This project will combine tissue culture and treatment of PCLS; assessment of viability using both MTT and LDH assays and of inflammatory and fibrotic responses using RT-PCR and ELISAs; analysis of lung tissue damage using cutting-edge imaging.

Contacts and Research Information:

Prof Jane Bourke, *jane.bourke@monash.edu*
Dr Paris Papagianis, *paris.papagianis@monash.edu*

https://www.monash.edu/discovery-institute/bourke-lab/research

Not all projects listed may be available in 2026, but please contact us if you are interested.

TARGETTING FIBROSIS – AT2R AGONISTS FOR THE TREATMENT OF IPF

Supervisors: Prof Jane Bourke,
Prof Rob Widdop
Olivia Young

Location: *Respiratory and Integrative Cardiovascular Pharmacology Laboratories*, Department of Pharmacology, Monash University, Clayton

Background: Idiopathic pulmonary fibrosis is a lung disease of unknown etiology, characterised by progressive scarring of the lung leading to reduced gas exchange and loss of lung function. While the introduction of the antifibrotic drugs pirfenidone and nintedanib has improved patient outcomes by slowing disease progression, both drugs have signifcant adverse effects that reduce patient compliance and neither drug reverses established fibrosis.

The angiotensin type 2 receptor (AT2R) is expressed on lung fibroblasts, the major collagen-secreting cells driving fibrosis. This project is based on extensive collaborative research to develop a range of novel and highly selective AT2R agonists and establish that AT2R agonists may be superior to pirfenidone and nintedanib in limiting fibrosis in human lung samples. To support clinical translation, it is critical to now assess whether the combination of AT2R agonists with these drugs, which work via different mechanisms, offers additional benefit – and even more importantly, whether established fibrosis can be reversed.

Research questions:

Can we inhibit progression and reverse lung fibrosis using AT2R agonists?

Project description:

Our research group has unique expertise in the use of precision cut lung slices (PCLS) to study lung disease. PCLS contain all the cells present in the intact lung and can be treated with a cocktail of mediators implicated in IPF to initiate inflammatory and fibrotic responses. Using this model of fibrogenesis, you will then compare the effects of AT2R agonists and anti-inflammatory and antifibrotic drugs currently used for other diseases separately and in combination. PLCS prepared from models of established fibrosis e.g. mouse bleomycin IPF model or PCLS from human IPF lung will also be treated with drugs to test for reversal.

Techniques: This project will combine tissue culture and treatment of PCLS; assessment of viability using both MTT and LDH assays and of inflammatory and fibrotic responses using RT-PCR and ELISAs; analysis of lung tissue damage using cutting-edge imaging; mechanistic studies of cell signaling.

Contacts and Research Information:

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Olivia Young, *olivia.young@monash.edu*

https://www.monash.edu/discovery-institute/bourke-lab/research

https://www.monash.edu/discovery-institute/widdop-lab/home

Not all projects listed may be available in 2026, but please contact us if you are interested.

SILICOSIS – EFFECTS OF A DANGEROUS DUST ON LUNG HEALTH

Supervisors: Prof Jane Bourke,
Dr Paris Papagianis
Dr Simon Royce

Location: *Respiratory Pharmacology,*
Department of Pharmacology,
Monash University, Clayton



Background: Silicosis is an occupational lung disease caused by inhalatation of respirable crstalline silica particles that are small enough to bypass the normal defence mechanisms in the lung. There has been a recent upsurge in cases associated with unsafe cutting of engineered stone benchtops, with an estimated prevalence of over 25% in exposed workers. Despite the recent ban on the use of this dangerous material in Australia, silicosis will continue to be a major risk in other countries, extending to the huge numbers of workers exposed to silica dust in other industries including mining and construction.

Our lab has conducted extensive research using lung samples from exposed workers which has given us some clues about mechanisms and mediators driving silicosis. We are now developing experimental models that mimic key features of silicosis, including uptake of silica into macrophages in lung tissue, to further explore disease mechanisms and assess potential novel therapeutics for this incurable disease.

Research questions:

Can we model the initiation of silicosis ex vivo using precision cut lung slices (PCLS)?

Can we inhibit damaging effects of silicosis using current and novel drugs?

Project description:

Our research group has unique expertise in the use of precision cut lung slices (PCLS) to study lung disease. PCLS contain all the cells present in the intact lung, including resident alveolar macrophages. You will be treating PCLS with different types of silica to measure uptake, and whether this leads to loss of tissue viability, release of pro-inflammatory cytokines known to be elevated in the lungs of silicosis patients and fibrotic changes consistent with lung damage. You will then test anti-inflammatory and antifibrotic drugs currently used for other diseases, as well as novel drugs we have identified as potential treatments for silicosis.

Techniques: This project will combine tissue culture and treatment of PCLS; assessment of viability using both MTT and LDH assays and of inflammatory and fibrotic responses using RT-PCR and ELISAs; analysis of silica uptake and lung tissue damage using cutting-edge imaging.

Contacts and Research Information:

Prof Jane Bourke, *jane.bourke@monash.edu*
Dr Paris Papagianis, *paris.papagianis@monash.edu*
Dr Simon Royce, *simon.royce@monash.edu*

https://www.monash.edu/discovery-institute/bourke-lab/research

Not all projects listed may be available in 2026, but please contact us if you are interested.

REPURPOSING PIRFENIDONE - A BETTER WAY TO TREAT COPD EXACERBATIONS

Supervisors: Dr Belinda Thomas
Dr Julia Chitty
Prof Jane Bourke

Locations: *Hudson Institute and Respiratory Pharmacology*, Department of Pharmacology, Monash University, Clayton

Background: Chronic obstructive pulmonary disease (COPD) is the third-most common cause of death worldwide. Patient morbidity and mortality are closely associated with acute exacerbations, commonly triggered by viruses, such as influenza. Treatment of these exacerbations with oral glucocorticoids reduces inflammation but also suppresses the immune response required to combat viral infection.

This Honours project will progress our characterization of the therapeutic potential of the anti-fibrotic drug pirfenidone (PFD) to avert damaging inflammation without suppressing the immune response to infection. We have already demonstrated that treatment with PFD has benefits over steroids in mice overexpressing the profibrotic cytokine TGF-beta and infected with influenza *in vivo*.

Research question:

Is pirfenidone superior to glucocorticoids in treating viral exacerbations of COPD?

Project description: We are now establishing a novel model of COPD, using precision cut lung slices (PCLS). PCLS contain all the structural cells present in the lung, providing additional insights not possible in cell culture studies which usually only look at one cell type. In this project, we will be treating PCLS *ex vivo* with a range of stimuli to mimic different aspects of COPD (TGFbeta-overexpression for fibrosis; acute exposure to cigarette smoke for inflammation; elastase treatment to disrupt alveoli as seen in emphysema), and infecting PCLS with influenza.

We will be comparing the effects of treatments with PFD and glucocorticoids on a range of diseases-relevant outcomes (fibrosis; inflammation; structural changes and immune responses) to support clinical translation of PFD for viral exacerbations of COPD.

Techniques: This project will combine preparation, tissue culture and treatment of PCLS with assessment of: infection using plaque assays; structural changes using morphometric analysis; immune and inflammatory responses using RT-PCR and ELISAs.

Contacts and Research Information:

Dr Belinda Thomas, *belinda.thomas@monash.edu*
Dr Julia Chitty, *julia.chitty@monash.edu*
Prof Jane Bourke, *jane.bourke@monash.edu*

https://www.monash.edu/discovery-institute/bourke-lab

Not all projects listed may be available in 2026, but please contact us if you are interested

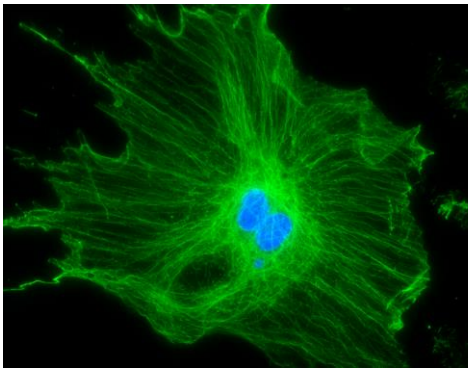
PLURIPOTENT STEM CELL MODELLING OF KIDNEY DISEASE

Supervisors: Professor Sharon Ricardo
and Dr Andrea Wise
Location: *Kidney Therapeutics and Stem Cell Laboratory*
Department of Pharmacology,
Monash University, Clayton

Background:
Fabry disease is an X-linked lysosomal disorder caused by a deficiency of the enzyme alpha-galactosidase A (α-Gal A). This deficiency leads to the accumulation of globotriaosylceramide (Gb3) resulting in severe renal and cardiovascular complications, with podocytes being the principal cell type affected. While the genetic mutation responsible for Fabry disease is well understood, the precise pathophysiological mechanisms by which Gb3 accumulation leads to the clinical manifestations remain unclear. To investigate these mechanisms and develop targeted therapies, we have generated induced pluripotent stem cells (iPSCs) from Fabry patients with different known mutations. These iPSCs are then differentiated into podocytes, which can be maintained long-term for study and comparison to healthy controls.

Project Aim:
You will be included as part of a large, collaborative team of clinicians and researchers dedicated to advancing our understanding of Fabry disease The objective of this Honours project is to model Fabry disease *in vitro* as a "disease in a dish" using iPSC-derived podocytes. During this study you will use state-of-the-art imaging in our Monash Imaging Platform to observe lysosomal expression of proteins and the morphological abnormalities in Fabry podocytes compared to healthy controls. Immunofluorescence microscopy will be used to investigate the expression of lysosomal and podocyte-specific markers and Fabry disease-related markers and western blot analysis.

Techniques:
In this project you will gain hands-on experience in a variety of essential laboratory techniques that includes how to culture, passage, and maintain iPSCs over the long-term, along with inducing their differentiation into podocytes. You will learn a range of microscopy techniques and use immunofluorescence and electron microscopy to visualise the the morphological differences between iPSCs derived from Fabry disease patients and healthy controls.



iPSC-derived Podocytes in culture

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TOWARDS REPURPOSING FDA-APPROVED DRUGS FOR PAEDIATRIC MEDULLOBLASTOMA BRAIN CANCER

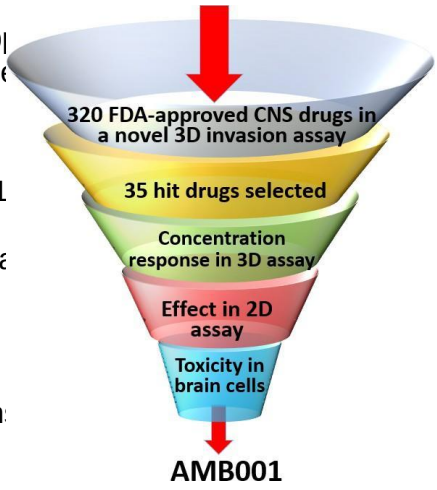
Supervisor: Dr Iman Azimi
Cancer Drug Discovery and Cellular Aging Group Department of Pharmacology
Monash University, Clayton

Background:

Medulloblastoma (MB) is the most common fatal childhood brain cancer. Current treatment options include surgery, followed by radiotherapy and chemotherapy. Surgery is highly unlikely to remove all tumour without damaging surrounding healthy brain tissue. Radiotherapy and chemotherapy are not completely effective and also harm healthy tissues. As the current treatments for these aggressive subgroups are harsh, surviving children frequently show severely impaired physical, cognitive, social and emotional function for the rest of their lives.

Clearly, new treatments are urgently needed to improve and save the lives of children with MB. One way to identify new treatment options is to identify new therapeutic uses for existing drugs that were originally developed for a different medical condition, a process that is called “drug repurposing”. This approach can significantly shorten the drug development timeline and reduce costs compared to the lengthy and expensive process of creating entirely new drugs.

In our recent studies, we developed a novel high-throughput 3D assay and used this assay to screen a unique library of 320 structurally diverse small molecule drugs currently clinically used for central nervous system diseases. Our screen (**Figure**) resulted in identification of drug AMB001 (coded due to confidentiality), which supp highest potency, and with minimal toxicity in normal brain cells. Furthe understand how AMB001 works to suppress MB cells.



Project aim:

In this project, we aim to determine the mechanism of action of AMB001 ranked lower but emerged from our screening process, in suppression lab. In addition, we aim to determine if AMB001 can ameliorate inva metastasis related processes and therapeutic resistance.

Techniques:

This project is expected to utilise in silico data analysis, cell culture techniques, cancer cell functional assays, pharmacological manipulation RNA/protein analysis.

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Identification of novel approaches to control cellular ageing

Supervisor: Dr Iman Azimi
Location: *Cancer Drug Discovery and Cellular Aging Group*
Department of Pharmacology
Monash University, Clayton

Background:

Cellular aging is a complex biological process involving a gradual decline in cellular function and increased vulnerability to disease. It is associated with a range of age-related disorders, including cancer, cardiovascular disease, and neurodegeneration. Cellular senescence, an integral component of ageing (as well as cancer), emerges as a result of diverse triggers, including telomere attrition, macromolecular damage and signalling from activated oncogenes. Cell senescence is a state in which cells enter a stable growth arrest, losing their ability to divide and proliferate. Targeting and controlling cellular senescence is a promising approach for promoting healthy aging and potentially mitigating age-related pathologies. In the lab we have identified novel drugs that target cellular senescence. These drugs are either senescence repressors (suppressing the induction of senescence), or senolytics (selectively killing senescent cells while sparing normal cells).

Project aim:

This project aims to test the effect of novel drugs on cellular senescence in an accelerated model of cellular senescence in human fibroblast cells. Different markers of cellular senescence will be assessed in this project such as expression of cell cycle arrest proteins, cell morphology, and senescence-associated secretory phenotype (SASP). The aim of this project is to develop and test novel drugs that can be used as a senotherapeutics, potentially delay ageing and ameliorate age-related diseases.

Techniques:

This project is expected to utilise cell culture techniques, cell-based assays, pharmacological manipulations, high-content cell imaging, and RNA/protein analysis.

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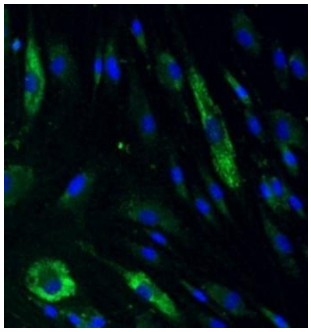
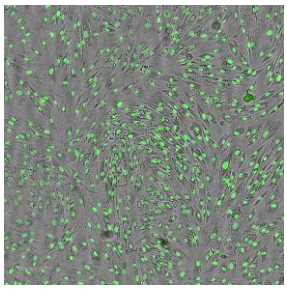


Induction of senescence in human fibroblast cells by mitomycin C (a chemotherapeutic agent), as shown by green staining senescence-associated β-galactosidase in live cell imaging



Treatment of senescent cells with one of our identified senolytics. Green shows this compound activates Caspase-3, an apoptosis marker.

PULMONARY POLYMYXIN THERAPIES

TOXICITY OF NOVEL COMBINATION

Supervisors: Prof Jian Li and Prof Tony Velkov
Location: *Laboratory of Antimicrobial Systems Pharmacology*
Biomedicine Discovery Institute
Monash University, Clayton

Background:
Current dosing recommendations of parenteral polymyxins are suboptimal for treatment of respiratory tract infections due to poor drug exposure at the infection site. Moreover, nephrotoxicity is the dose-limiting factor and can occur in up to 60% of patients. Pulmonary delivery of polymyxins as monotherapy and in combination with other antibiotics has offered a great promise for bacterial eradication in the respiratory tract. However, we have shown that polymyxins localise in mitochondria of human lung epithelial cells and activate multiple apoptotic pathways.

Project aim:
The aim of this honours project is to investigate the mechanisms of polymyxin-induced toxicity in human lung epithelial cells. The outcomes of this project will provide the much-needed pharmacological information for safer and more efficacious use of polymyxin inhalation therapy against life-threatening lung infections.

Techniques:
This multi-disciplinary project aims to investigate the effect of polymyxins and their synergistic combinations with other classes of antibiotics on lung epithelial cells, using fluorescence activated cell sorting (FACS), multi-omics and cutting-edge mass spectrometry imaging techniques.

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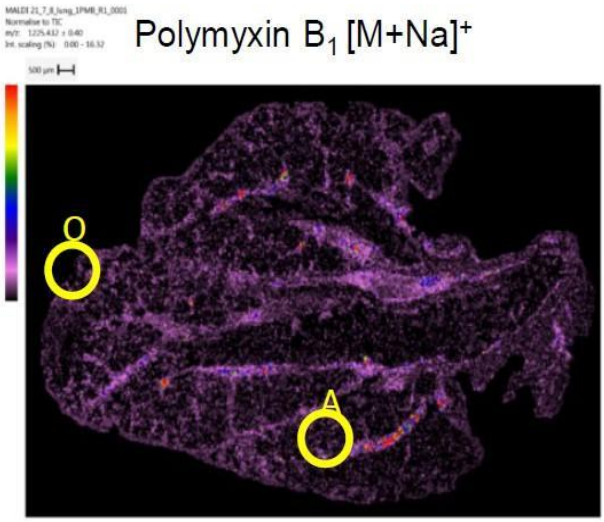


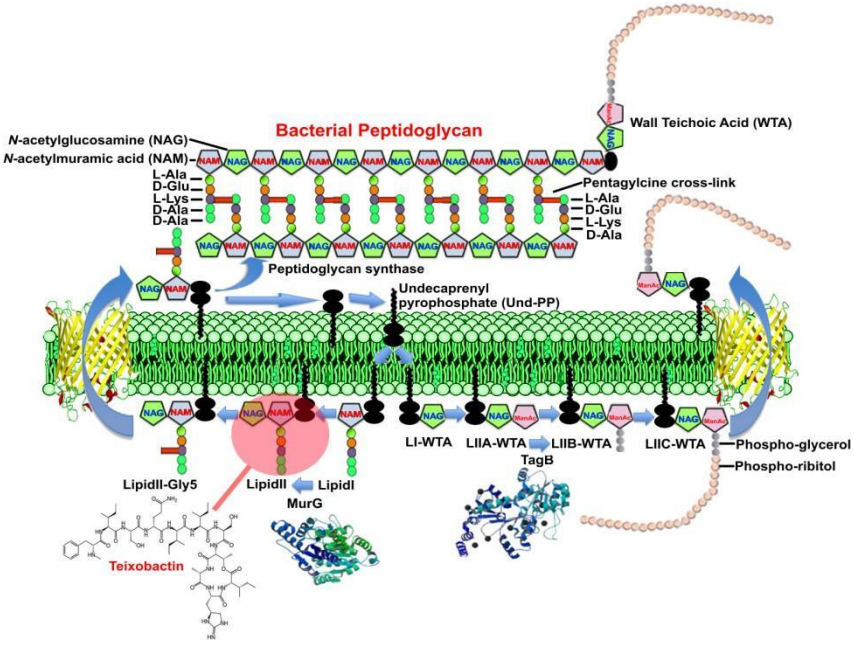
SYSTEMS PHARMACOLOGY OF NOVEL TEIXOBACTIN-LIPOPEPTIDE HYBRIDS

Supervisors: Prof Tony Velkov and Prof Jian Li
Location: Laboratory of Antimicrobial Systems Pharmacology
Biomedicine Discovery Institute
Monash University, Clayton

Background:
Our team's internationally leading research aims to develop novel therapeutics to target an urgent global medical challenge, multidrug-resistance (MDR) in Gram-negative 'superbugs'. The group has three major streams designed to provide both short-term and long-term solutions to this major global health problem: discovering and developing novel antibiotics and formulations against Gram-negative 'superbugs'; elucidating the mechanisms of activity, resistance and toxicity of antibiotics such as teixobactin; and investigating the preclinical and clinical pharmacology of antibiotics and their combinations. Numerous opportunities exist for both honors and higher degree by research student to work in these areas and applications are always welcome.

Project aim:
Teixobactins are a recently discovered novel antibiotic class that typically possess a narrow spectrum of activity against Gram-positive bacteria. The most notable property of teixobactin is that it is the first and only extremely 'resistance-resistant' antibiotic against which bacteria cannot readily evolve resistance. We have developed novel teixobactin-lipopeptide hybrids that are superior to native teixobactin as they retain this key anti-resistance property and in addition have a broader-spectrum, with potent activity against PDR Gram-negatives, as well as PDR Gram-positives.

Techniques:
This program will investigate the mechanisms of bacterial killing, lung disposition and potential lung toxicity of teixobactin-lipopeptide hybrids using systems pharmacology and cutting-edge imaging and approaches.



Contacts:

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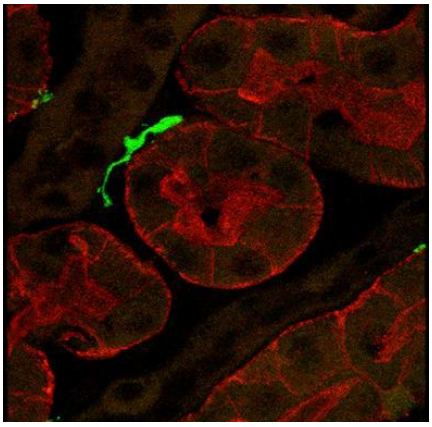
EXPLORING AND TARGETING CELLULAR SENESCENCE IN KIDNEY FIBROSIS

Supervisors: Dr Iman Azimi and Professor Sharon Ricardo
Location: *Cancer Drug Discovery and Cellular Aging Group and Kidney Therapeutics and Stem Cell Laboratory*
Department of Pharmacology,
Monash Biomedicine Discovery Institute, Monash University, Clayton

Background:
Cellular senescence is a state where cells irreversibly cease to divide, accompanied by the secretion of various pro-inflammatory and pro-fibrotic factors that significantly alter the surrounding tissue microenvironment. While senescence is vital for normal physiological processes such as wound healing and tissue repair, the accumulation of senescent cells can exacerbate the aging process and contribute to the progression of chronic kidney disease (CKD) through mechanisms like oxidative stress, mitochondrial dysfunction, and the loss of renoprotective factors. When kidneys are subjected to stresses, such as ischemia, increased blood pressure or biochemical stresses like diabetes, kidney cells may undergo premature aging that compromises their ability to function and regenerate. This accumulation of aged cells not only promotes ongoing kidney damage but also prevents the natural repair processes, leading to the progression of CKD.

The **Aim of this Honours project** is to investigate the onset and extent of cell senescence in an established experimental mouse model of CKD. By analysing key markers of senescence and stress within different compartments of the kidney tissue and systemic circulation, this study will help elucidate how cellular aging contributes to kidney dysfunction.

Techniques:
The project aims to demonstrate the correlation between increased cellular senescence and CKD progression. You will use a range of techniques such as qPCR, immunohistochemistry (IHC) and biomarker analysis in kidneys, blood and/or urine will provide a comprehensive overview of the role of senescence in kidney disease.



IHC of kidney tubular epithelium

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GUT MICROBIOME, DIET AND CARDIOVASCULAR DISEASE

Supervisors: Prof Francine Marques, Dr Joanne O'Donnell & Dr Matthew Snelson
Location: *Hypertension research Laboratory*, Victorian Heart Institute, Monash University, Clayton

Background:
The purpose of our laboratory is to ***improve cardiovascular health by building exceptional researchers***. We do this by investing in our people and harnessing a non-traditional risk factor for cardiovascular disease: the gut microbiome, and how it regulates blood pressure, the leading risk factor for death. A large body of evidence over four decades supports that diets high in fibre are associated with lower blood pressure; however, we did not understand why and how. Our research has explained that this happens via the gut microbiome and identified downstream mechanisms (e.g., Marques et al, 2017 Circulation; Kaye et al, 2020 Circulation; Jama et al, 2023 Nature Card Res, O'Donnell et al, 2023 Nature Rev Nephro), forming the cornerstone for new microbial-based therapies to treat hypertension.

Research questions:
- Understand the role of diet and the gut microbiome in the action and effects of cardiovascular drugs
- Examine the interactions between the gut microbiome and the immune system
- Determine how gut permeability and microplastics contribute to cardiovascular disease

Techniques:
We have projects involving both lab- and computational-based projects that are tailored to the student and the skills they would like to learn. We have several projects available, from drug discovery, animal models and clinical samples, as well as omics data (e.g. microbiome, RNA-seq, metabolomics, proteomics).

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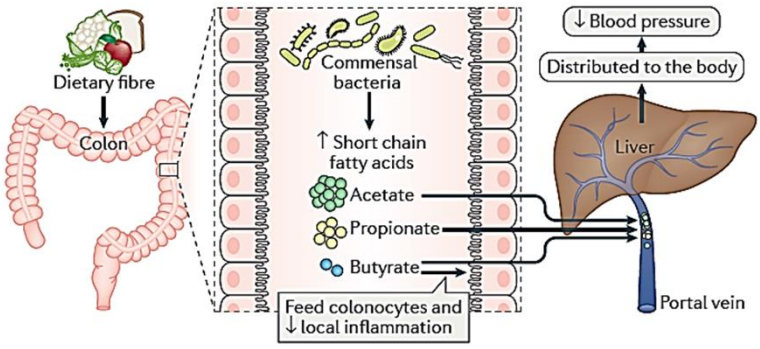

*SEQ Figura * ARABIC 1. From Marques et al., 2018 Nature Rev Cardiology*

ANTI-CARCINOGENIC MECHANISM(S) OF NOVEL THERAPIES IN HEPATOCELLULAR CARCINOMA (HCC)

Supervisors: Associate Professor Chandana Herath
and Dr Anshuli Razdan
Location: *Hepatology Research Group*,
Department of Pharmacology,
Monash University, Clayton

Background:
Primary liver cancer (hepatocellular carcinoma or HCC) is the sixth most common cancer worldwide and the world's third leading cause of cancer death. HCC occurs primarily in the presence of advanced liver scarring (cirrhosis of the liver) due to chronic liver disease. Unfortunately, at diagnosis, many patients already have inoperable advanced stage HCC. At this stage, the overall response rate to currently available anticancer drugs is less than 30% and average 5-year patient survival is only 2.5%. Thus, there is a major unmet need to develop better organ-specific or cancer cell-specific treatments for both the treatment and prevention of HCC and of liver diseases which promote HCC.
The renin angiotensin system (RAS) which has two arms plays a crucial role in blood pressure regulation and fluid homeostasis in normal physiology. However, in diseased conditions, the classical arm comprising angiotensin converting enzyme (ACE), angiotensin II (Ang II) hormone and its type 1 receptor (AT1 receptor), is upregulated and causes liver fibrosis and shows pro-carcinogenic activity (**Fig. 1**). In marked contrast, the alternate arm of the RAS which comprises angiotensin converting enzyme 2 (ACE2), angiotensin-(1-7) (Ang-(1-7)) hormone and the Mas receptor has antifibrotic and anticarcinogenic effects. This protective arm of ACE2/Ang-(1-7)/Mas receptor is thought to intrinsically regulate the RAS activity by reducing Ang II levels and producing Ang-(1-7) levels, thus counterbalancing the potentially harmful effects of Ang II (**Fig. 1**). Therefore, we have developed liver-targeted ACE2 gene therapy and cancer cell-targeted therapy with the main peptide product of ACE2, Ang-(1-7) for the studies.

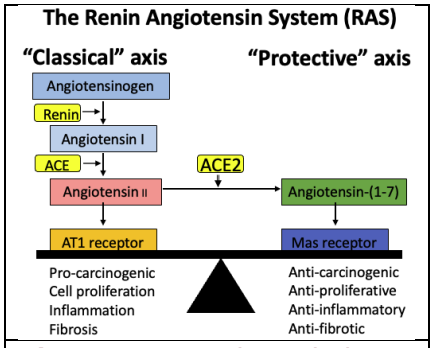

Figure 1. The balance between the two axes of the renin angiotensin system determines the disease progression.

Project hypothesis: Liver-targeted ACE2 gene therapy and cancer cell-targeted therapy with the main peptide product of ACE2, Ang-(1-7) inhibit liver cancer growth and that ACE2 therapy can also prevent the development of HCC as well as the progression of underlying liver fibrosis and cirrhosis.

Project aim: To investigate the mechanisms by which liver-specific ACE2 and cancer cell-specific Ang-(1-7) peptide inhibit cancer cell growth in established cell lines such as HepG2 cells and isolated human liver cancer cells and inhibit cancer growth in human liver cancer cell-derived and induced pluripotent stem cell- (iPSC) derived organoids.

Techniques:
This project will involve *in vitro* techniques which may include:

- Cell culture
- Generation of iPSCs-derived organoids
- Laboratory analysis of protein expression by Western blot and gene expression by RT-qPCR
- Cell growth and proliferation assays

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NOVEL TARGETED THERAPY IN CIRRHOTIC PORTAL HYPERTENSION

Supervisors: Associate Professor Chandana Herath
and Dr Anshuli Razdan
Location: *Hepatology Research Group*,
Department of Pharmacology,
Monash University, Clayton

Background:
As a result of burgeoning rates of chronic liver disease, in Australia as in the rest of the world, cirrhosis of the liver (severe liver scarring) has become a leading cause of chronic illness and death. Approximately 90% of cirrhotic patients eventually develop portal hypertension (PHT) which is a life-threatening complication of cirrhosis and responsible for most of the mortality and morbidity in those patients. Lowering of portal pressure with current "gold-standard" non-selective beta-blockers (NSBBs) has been shown to reduce the risks of life-threatening oesophageal variceal bleeding, liver failure and overall mortality in cirrhosis. However, approximately 15% of patients are intolerant to these drugs and up to 60% fail to achieve a therapeutically beneficial response. Thus, there is a major unmet need for the development of more effective and better tolerated treatments.[3]

We have made pioneering contributions to understanding of the central role of the renin angiotensin system (RAS) in the pathogenesis of hepatic fibrosis, liver cirrhosis and PHT. One key finding is that the RAS hormone angiotensin-(1-7) (Ang-1-7), acting via the Mas receptor (MasR), and Mas related G protein-coupled receptor-type D (MrgD) contribute to PHT by promoting mesenteric (i.e. splanchnic) vasodilatation in cirrhosis (**Fig. 1**). We also showed that blockade of MrgD markedly reduced mesenteric vasodilatation and lowered portal pressure to a greater extent than beta blockade.

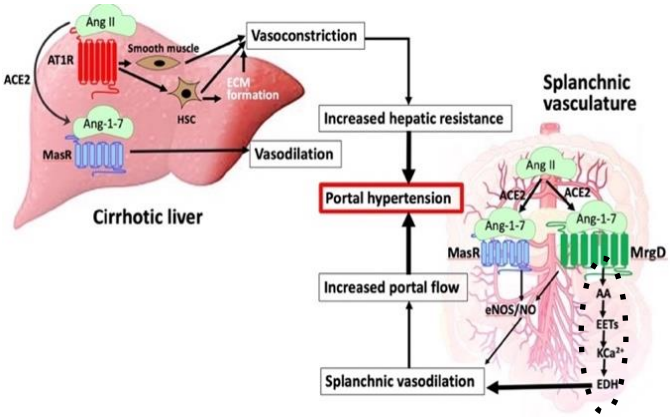

***Figure 1**. Association between the splanchnic vasculature and the liver in the development of portal hypertension (PHT) with predicted downstream pathways of Mas related G protein-coupled receptor-type D (MrgD) activation.*

We have developed the fastest drug screening pipeline in Australia to identify small molecules from small molecule-databases such as the ZINC database, and to develop them into drug leads, resulting in novel targeted therapy for the prevention and treatment of PHT and its complications.

Project aims:
1. To discover small molecule MrgD blockers, computational drug screening using a homology model of MrgD will be performed and identified molecules will be subject to *in-vitro* reporter assays.
2. To determine mechanisms of action of the characterised MrgD blocking molecules, they will be studied for their MrgD blocking ability in mesenteric resistance vessels obtained from cirrhotic rats and liver transplant recipients using myograph/organ bath technique.

Techniques: This project will include:
- Computational drug screening
- In-vitro reporter assay
- Rat and mouse studies to isolate resistance vessels
- Myography

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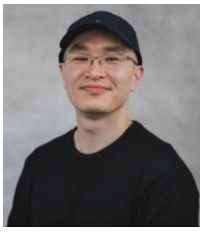
PERCEPTIONS OF TEAMWORK IMPLEMENTATION IN THE BDI

Supervisors: Dr Klaudia Budzyn
Dr Jennifer Irvine
Dr John Ling





Location: *Monash Pharmacology Education Research Initiative (PERI)*
Department of Pharmacology
Monash University, Clayton

Background

This research project aims to investigate how educators across the Biomedicine Discovery Institute (BDI) currently implement teamwork in their curriculum, and how they perceive their experiences of guiding students through common teamwork challenges. We seek to build on our group's recent findings relating to student perceptions of teamwork, by assessing educators' approaches to employing teamwork activities and assessments in their teaching, across several biomedical disciplines. We also plan to investigate whether educators feel they have sufficient expertise in supporting students to navigate commonly cited teamwork problems such as conflict, lack of communication and accountability.

A secondary aim of this project will include investigating employer expectations of teamwork abilities in newly recruited employees, and whether higher education equips graduates to meet these expectations.

The findings of this study will provide insight into the approaches currently used by educators across the BDI in fostering teamwork skills in undergraduate students. In addition, these findings will form a preliminary evidence base that could be used to underpin supports for educators to further upskill their students in teamwork settings.

Project aims

1. To investigate how educators in the Biomedicine Discovery Institute (BDI) currently implement teamwork in their curriculum and how they guide students through teamwork challenges; and
2. To explore employer perceptions of how well higher education develops teamwork skills in recent graduates.

Techniques

This project will involve a mixed methods approach, using both quantitative (e.g. surveys) and qualitative (e.g. focus groups, interviews) techniques.

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TARGETING THE NLRP3-INFLAMMASOME AXIS IN DIABETIC MICE POST AN ACUTE MYOCARDIAL INFARCTION.

Supervisors: Prof Judy de Haan, Dr Arpeeta Sharma

Location: *Oxidative Stress Laboratory*,
Baker Heart and Diabetes Institute
75 Commercial Rd, Melbourne.

Background:

Patients living with Type2 diabetes are at increased risk of developing cardiovascular disease. In particular, diabetes doubles the risk of dying in the months after a heart attack due to a significantly weakened heart muscle. Currently, treatment options for patients that survive a heart attack are limited, with no treatment specifically targeted at the underlying cause of the worsened cardiac function that occurs after an acute myocardial infarction (AMI).

Inflammation has been shown to play an important role, and interest in developing small molecules to target inflammation has been buoyed with the recent success of the clinical trial called CANTOS. In this trial, use of the antibody canakinumab, specifically designed to lessen Il-1β, a cytokine matured on the NLRP3-inflammasome, showed lower rates of recurrent cardiovascular events independent of lipid lowering, in AMI patients.

Project aim: This project aims to investigate whether targeting the NLRP3 inflammasome pathway in a diabetic mouse model, will lessen inflammation to improve cardiac function after an AMI.

Techniques:

The student will receive training in in vivo mouse models of diabetes and AMI, cell culture,
immunohistochemistry, histology, real time PCR and Western Blotting.

Contacts:

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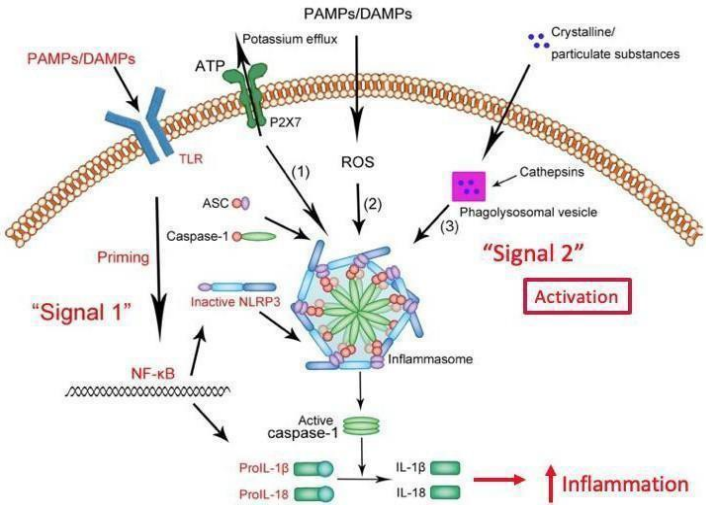

INVESTIGATING LATE-TERM CARDIOVASCULAR EFFECTS OF MULTIPLE PREGNANCIES AND IDENTIFYING NOVEL THERAPEUTIC TARGETS

Supervisors: Dr Bing Wang & Prof David Kaye

Location: *Heart Failure Research Group*,
Baker Heart and Diabetes Institute, Melbourne

Background:
Clinical studies from our group have shown women who have had more than two pregnancies are at higher risk of developing a sub-type of heart failure known as heart failure with preserved ejection fraction (HFpEF). HFpEF accounts for over 50% of patients with heart failure and current therapies and treatments are ineffective. HFpEF typically occurs in older women who present with other clinical disorders including high blood pressure (hypertension). Importantly, high blood pressure can be caused by detrimental lifestyle choices and behaviour such as lack of exercise and unhealthy eating habits, which are highly prevalent during pregnancy and may continue after child birth. The cellular mechanism(s) by which multiple pregnancies establishes an environment of increased risk for HFpEF is not known. This project will examine the relationship between pregnancy history in mice and cardiac remodelling during aging and hypertension.

Project aim:
The aim of this honours project is to investigate the mechanisms by which multiple pregnancies promotes heart failure. Further, we will investigate whether a drug we have developed (VCP979) can prevent or reverse the development of pregnancy-associated heart damage. This study will have significant implications for the treatment of HFpEF associated with cardiovascular risk factors by identifying a novel therapeutic treatment strategy for this patient population.

Techniques:
It is anticipated that this project will involve developing and monitoring an animal model of pregnancy-related cardiovascular disease, histological and biochemical analysis of fibrosis and inflammation, behavioural and functional assessments (echocardiography, metabolic cages, echoMRI), and assessing immune populations via flow cytometry.

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Biomarker Discovery Laboratory

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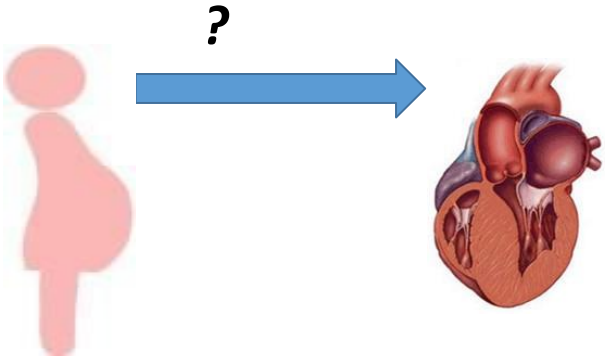

HOW DO SGLT-2 INHIBITORS and GLP-1 AGONISTS WORK IN THE SETTING OF HEART FAILURE WITH PRESERVED EJECTION FRACTION?

Supervisors: Prof David Kaye, A/Prof Bing Wang and A/Prof Barbara Kemp-Harper

Location: *Heart Failure Research Group and Biomarker Discovery Laboratory*, Baker Heart and Diabetes Institute; and *Cardiovascular & Pulmonary Pharmacology Group* Department of Pharmacology Monash University, Clayton

Background:
Heart failure is the commonest cardiovascular cause for hospital admission in people aged >65years. It has become increasingly evident that HF with preserved ejection fraction (HFpEF) is the commonest form of HF, accounting for more than 50% of all cases. The pathophysiology of HFpEF is complex, with major cardiovascular elements related to increased myocardial and arterial stiffness. These features are related to aging and concomitant hypertension. Some evidence suggests that drugs including GLP-1 agonists and SGLT-2 inhibitors may be useful therapies, but their mechanisms of action remain uncertain.

Project aim:
Our laboratory has established models in mice designed to recapitulate features of HFpEF. These studies are performed in aging hypertensive mice and in obese mice. In this study, we will also investigate the physiological, histological, cellular, and molecular properties to explore the mechanisms involved in the effects of SGLT-2 and/or GLP-1 agonists in both the heart and kidney.
.

Techniques:
It is anticipated that this project will involve developing and monitoring an animal model of hypertension- or diet-induced CVD, histological and biochemical analysis of fibrosis and inflammation, behavioral and functional assessments (echocardiography, metabolic cages, echoMRI), and vascular function assessment with myography as well as gene expression (RNA extractions and qPCR).

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NOVEL TARGETED THERAPY FOR HEART FAILURE WITH A PRESERVED EJECTION FRACTION

Supervisors: Prof David Kaye and A/Prof Bing Wang

Location: *Heart Failure Research Group and Biomarker Discovery Laboratory*, Baker Heart and Diabetes Institute

Background:

Heart failure with preserved ejection fraction (HFpEF) is increasing in prevalence and is associated with high morbidity and mortality currently no effective evidence-based therapies are available, resulting in an emerging epidemic. The cellular and molecular pathophysiology underpinning HFpEF are complex. Accumulating evidence demonstrates that pro-inflammatory and oxidative stress (excessive production of reactive oxygen species (ROS)) pathways are critical contributors to the development and progression of HFpEF. Among many of the pathways activated by inflammation and oxidative stress, apoptosis signalling-regulated kinase 1 (ASK1) is the convergence point and regulates multiple downstream signalling networks that respond to the dual challenges of inflammatory and oxidative stress and are major factors that promote the development of HFpEF pathologies. Hence, ASK1 is likely to be a novel target for HFpEF therapy.

Project aim:

This project is to investigate novel ASK1 inhibitors for the treatment of cardiovascular disease including HFpEF using suitable animal models established in our group. This study will test the ability of the compound/s to both prevent and/or reverse myocardial fibrosis and inflammation associated with the HFpEF phenotype.

Techniques:

It is anticipated that this study will involve the use of animal models in mice, cardiac function measurement with echocardiography and pressure-volume relationship analysis, Western blotting, immunohistochemistry, and gene expression analysis with PCR.

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