



# Alfred Research Alliance

Research Report  
2018-2019



# Contents

Chair's Report .....	3
Alfred Research Alliance .....	4
Alliance Highlights 2018-2019 .....	5
Research Performance 2018 .....	6
Our Members .....	8
<b>Our Research Strengths .....</b>	<b>10</b>
Blood Diseases and Cancer .....	12
Cardiovascular Disease .....	14
Diabetes and Obesity .....	16
Epidemiology and Public Health .....	18
Infection and Immunity .....	20
Mental Health and Neuroscience .....	22
Nursing and Allied Health .....	24
Trauma, Critical Care and Perioperative Medicine .....	26
Our People .....	28
Platform Technologies .....	30
Bioinformatics and Biostatistics .....	32
Clinical Registries and Biobanks .....	33
Ethics at the Alliance .....	34

“ Across our eight core research strengths, which span devastating conditions like heart disease and cancer to public health and prevention strategies, our researchers are making a demonstrable impact on the health of all Australians ”

## Chair's report

### Welcome to the second Annual Research Report from the Alfred Research Alliance.

Twelve months on from the Alliance's strategic review and rebrand, I am pleased to present this report showcasing the many in-roads we have made this year. These developments have not only been in the ground-breaking biomedical, translational and public health research that happens on our precinct each and every day, but also in the ongoing commitment to collaboration and communication among our member organisations.

The Alfred Research Alliance is truly unique in our ability to take research from bench to bedside – what we discover in the laboratories can be tested in clinical trials and then carried through into clinical practice at The Alfred, one of Australia's largest hospitals. These learnings in the clinical setting can then inform decision-making for health policy or future research, creating a complete translational research loop.

As you will see in the pages that follow, this translational research loop is being utilised to solve some of the greatest health challenges of our time. Across our eight core research strengths, which span devastating conditions like heart disease and cancer to public health and prevention strategies, our researchers are making a demonstrable impact on the health of all Australians.

These capabilities are only further enriched by the collaboration between the member organisations that make up the Alfred Research Alliance – Alfred Health, Monash University, Baker Heart and Diabetes Institute, Burnet Institute, Deakin University and La Trobe University. Individually, we are world-class health organisations, universities and medical institutes, but our real point of difference comes from the opportunities that are created when we combine our complementary strengths of research, education and clinical excellence.

Recently, we were delighted to expand the Alliance even further with the inclusion of two new members – Nucleus Network and 360biolabs. Both organisations are highly-regarded leaders in their respective fields, Nucleus Network as Australia's leading contract research organisation specialising in first-in-human and phase 1 trials, and 360biolabs as a provider of specialty expertise and laboratory services in preclinical studies.

Having been co-located on the Alfred precinct for some time, this membership recognises their valuable contribution to the Alliance thus far and paves the way for even greater collaboration in the future, particularly in the clinical trials space.

I am looking forward to working with Nucleus Network and 360biolabs over the coming year, as well as my fellow Council members, the Alliance Secretariat and our member organisations. As we build upon our successes of 2018-19, together we can continue to apply new thinking to create real impact.



Chair, Alfred Research Alliance  
Prof Andrew Way

# Alfred Research Alliance

**The Alfred Research Alliance is a vibrant collaborative community dedicated to excellence in research and education.**

We think in new and innovative ways and work together to translate the latest advances in medical research into outcomes which help address critical health challenges locally, nationally and internationally.

The Alliance brings together some of the world's leading experts in almost every field of biomedical, translational, clinical and public health research, and in education and healthcare. The unique integration of these fields creates an exceptional environment where new and improved diagnoses, treatments and disease prevention strategies are discovered, developed and implemented.

Our co-location with The Alfred, one of Australia's busiest hospitals, is key to linking our research directly to patient-centred practice, keeping us people-focused and outcome-driven.

## Individual excellence, collective strength

The Alfred Research Alliance comprises Alfred Health, Monash University Central Clinical School (CCS) and Public Health and Preventive Medicine (SPHPM), Baker Heart and Diabetes Institute, Burnet Institute, Deakin University, La Trobe University, Nucleus Network and 360biolabs.

These organisations are known for their excellence in research, patient engagement and education, and for their award-winning researchers and clinicians.

We actively foster collaboration, particularly between researchers and Alfred Health's clinical services, because we know that combining our skills, expertise, technology and perspectives allows us to 'solve the unsolvable' and bring new interventions to patients more quickly.

## Translating research into practice

At the Alfred Research Alliance, the latest advances in medical research are translated into the best possible clinical care and health outcomes. Our research strengths include:

-  Blood Diseases and Cancer
-  Cardiovascular Disease
-  Diabetes and Obesity
-  Epidemiology and Public Health
-  Infection and Immunity
-  Mental Health and Neuroscience
-  Nursing and Allied Health
-  Trauma, Critical Care and Perioperative Medicine

Within these categories, our researchers excel in a wide range of areas from metabolomics, bioinformatics, cancer and immunotherapy, to ophthalmology, psychology, respiratory medicine, preventive medicine, rehabilitation and health services research.

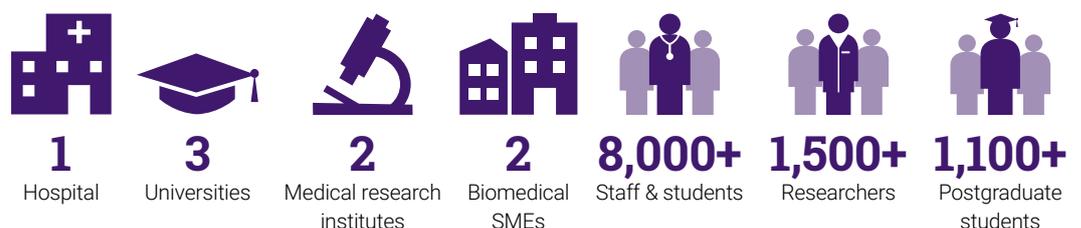
Complemented by a comprehensive capacity in pre-clinical research and Phase I to IV clinical trials, co-located start-ups and SMEs, and the clinical environment of The Alfred, a complete translational research loop is created, giving the Alliance a true point of difference.



Executive Officer,  
Alfred Research Alliance  
Dr Renée Dutton

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

“  
We think in new and innovative ways and work together to translate the latest advances in medical research into outcomes which help address critical unmet clinical and public health needs locally, nationally and internationally  
”



# 2018-19 highlights

## World-class facilities

The Alfred Research Alliance is built on a foundation of shared resources. We maximise the value of investment by sharing state-of-the-art research platforms, clinical facilities and other key infrastructure, as well as shared animal and human research ethics services.

This is supported by initiatives and resources which encourage connection, support collaboration and facilitate shared learning opportunities within and between member organisations.

## Education and training for tomorrow's leaders

**At the Alfred Research Alliance, we are proud to provide an environment where tomorrow's clinicians, scientists and health professionals can complete their studies and build a strong foundation for their future careers.**

By studying at the Alliance, students learn how to work nimbly from biomedical discovery, through translational development and clinical research, to deliver improved patient and public health outcomes.

More than 1100 postgraduate students are currently undertaking study at the Alfred precinct through Monash University, La Trobe University and Deakin University. This is complemented by a regular program of seminars and events held across the precinct, allowing students, staff and researchers to share and expand their knowledge and benefit from vital continued professional development on-site.

## Alliance welcomes two new members

One of Australia's top clinical research organisations, Nucleus Network, and leading laboratory services company 360biolabs joined the Alfred Research Alliance in 2019, an official acknowledgement of their contribution to the precinct.

Nucleus Network, Australia's only international multi-site dedicated phase I clinical research organisation, has an 80-bed facility based at the precinct. They specialise in the conduct of first-in-human and Phase I clinical trials, as well as other complex clinical trials.

360biolabs is Australia's most comprehensive speciality laboratory services organisation for therapeutic, vaccine and diagnostics development. Based within the laboratories at the Burnet Institute, 360biolabs is able to support a broad range of research and development activity.

This membership is a formal recognition of the important role played by both organisations in the precinct's translational research loop, and will help to foster even greater collaboration between Alliance members.

## Monash creates new sub-faculty on the Alfred precinct

Monash University has established a Sub-Faculty of Translational Medicine and Public Health, which will comprise the two Monash schools on the Alfred precinct – the [Central Clinical School](#) and the [School of Public Health and Preventive Medicine](#). The sub-faculty is the second of its kind within Monash's Faculty of Medicine, Nursing and Health Sciences, and will build on the synergy between the two schools.

Professor Stephen Jane, former head of Central Clinical School at Monash and Director of Research at The Alfred, has been appointed as Foundation Dean. Professor Jane's expertise and well-established leadership mean he is ideally placed to advance research and education excellence in the Sub-Faculty of Translational Medicine and Public Health.

## Clinical trials capability grows

The addition of Nucleus Network as a member has further bolstered the Alliance's ability to conduct ground-breaking clinical trials, both on the Alfred precinct and at Nucleus' other sites around the globe.

Clinical trials are fundamental to the development of new practices, medicines and devices to treat and prevent illness. Alfred Research Alliance members are leaders in clinical trials, allowing us to translate our discoveries into new interventions on-site.

The Alliance members are committed to working with each other and with industry to provide world-leading clinical trials in areas including cardiology, cardiothoracic surgery, gastroenterology, haematology, infectious diseases, medical oncology, neurology, psychiatry, respiratory medicine, endocrinology, physical activity, nephrology, rehabilitation, imaging and Indigenous health.

World-class technology platforms support our on-site expertise while a shared ethics framework smooths the approvals process and provides consistent and coordinated oversight.

## New staff appointments

A number of new staff joined the Alliance this year, further enhancing the expertise and research excellence of the precinct.

Professor Sophia Zoungas was appointed the new head of Monash Public Health and Preventive Medicine, replacing Professor John McNeil AM upon his retirement. Professor Zoungas is an academic endocrinologist with an international reputation as a clinical researcher in the fields of diabetes and vascular risk.

Dr David Ascher joined the Baker Institute to establish a structural biology and bioinformatics laboratory, bringing with him a group of 12 researchers. Dr Ascher's appointment further strengthens Baker's expertise in bioinformatics, which has been applied to study a range of genetic conditions and metabolic disorders.

# Research performance

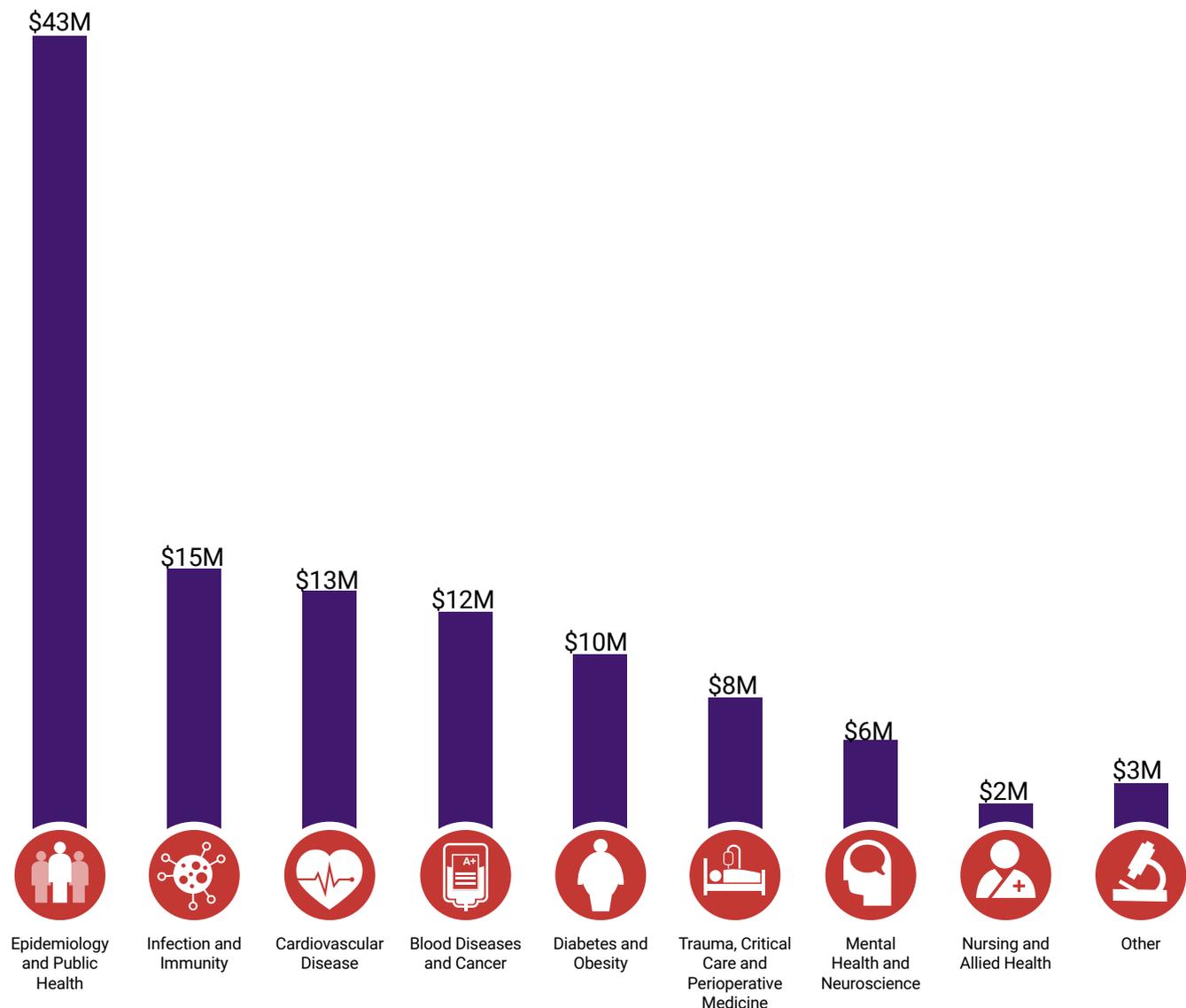


## External research funding by source – 2018

Australian competitive grants .....	\$63M
Other public sector research income .....	\$16M
Other competitive research grants .....	\$21M
Industry income .....	\$10M
Other research income .....	\$2M
<b>Total</b>	<b>\$ 112M</b>



## External research funding by research area – 2018



## 2018 funding secured for health and medical research



**\$26M**

in philanthropy and fundraising revenue



**\$112M**

in external research funding

## NHMRC funding commitments secured by Alfred Research Alliance commencing 2019



**\$48M**

total



**75%**

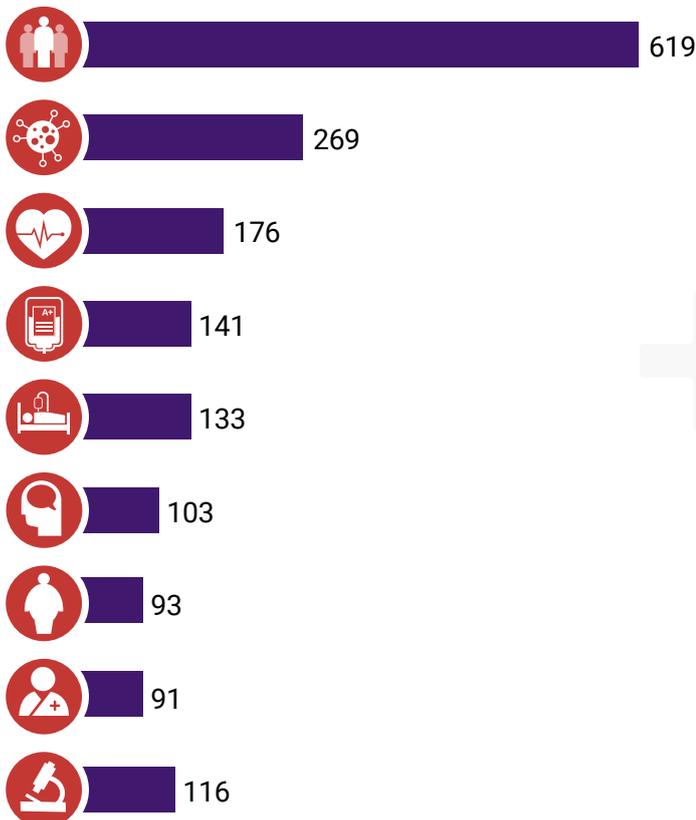
of NHMRC funding to Victoria for Cardiovascular Medicine & Haematology research went to the Alfred Research Alliance



**27%**

of NHMRC funding to Victoria for Public Health & Health Services Research went to the Alfred Research Alliance

## Original research publications by research area – 2018



## Students 2018



**1,252**

Postgraduate degree students

**150**

Masters student completions

**69**

PhD / doctoral student completions

## Commercial impact



**5**

PCT patent applications

**18**

National phase entry

**11**

Patent granted

**2**

Patents licensed

# Our members

**The Alfred Research Alliance brings together eight independent and diverse organisations to create a community of excellence for medical research and education.**

## AlfredHealth

Alfred Health is a state-wide health service comprising The Alfred, Caulfield and Sandringham Hospitals, along with a large network of community programs and 14 services across Victoria.

The Alfred is one of Australia's busiest hospitals, providing the most comprehensive range of adult specialist medical and surgical services in Victoria. The hospital is also a major tertiary referral teaching hospital with a commitment to research excellence and training for medical, nursing and allied health staff.

The Alfred sits at the epicentre of the Alfred Research Alliance, keeping our work patient-centred and outcome driven. Co-location on this site, together with close and cooperative relationships with other members, provides the opportunity for vital collaboration within the Alliance, between Alfred Health's health practitioners and clinical researchers and our partner universities and medical research institutes.



Monash Medicine, Nursing and Health Sciences is a research-focused faculty within one of the world's top universities. It is a leading provider of education for doctors, nurses and allied health professionals in Australia.

Two of the university's largest schools are located at the Alfred precinct within the newly-formed Sub-Faculty of Translational Medicine and Public Health. Monash Central Clinical School is a major centre for clinical and biomedical research and education. Monash Public Health and Preventive Medicine is a world leader in public health oriented research and education, including clinical trials and clinical registries.

Our membership of the Alfred Research Alliance aligns with our objective of research translation through collaboration with fellow researchers and clinical partners. As part of the Alliance, we can seamlessly integrate our research expertise with that of the other members, promoting excellence in healthcare.



The Baker Heart and Diabetes Institute is an independent, not-for-profit medical research facility with a proud history of discovery dating back to 1926.

The Institute's research is focused on the prevention, diagnosis and treatment of cardiovascular disease, diabetes and other related health disorders. This includes addressing the profound health disadvantage experienced by Aboriginal Australians, with a research facility in Alice Springs.

The Baker Institute's work extends from the laboratory to wide-scale community studies and intervention programs. The Institute also runs a range of specialist clinics, including cardiovascular and diabetes clinics.

The breadth of clinical and research expertise ensures that the Institute is well placed to advance understanding of the genetic and environmental determinants of disease, and to translate scientific findings into new approaches to prevention, treatment and care.



Burnet Institute is an independent, not-for-profit medical research and public health organisation that believes in equity through better health.

By linking discovery-oriented and implementation research with public health action, Burnet makes a tangible and sustainable impact on health in both developed and developing countries.

The Institute's major thematic programs – Maternal and Child Health, Disease Elimination, Behaviours and Health Risks, Health Security and Healthy Ageing – underpin innovative multidisciplinary responses to diseases of global significance and solving complex health issues. Burnet has particular expertise in HIV and AIDS, hepatitis viruses, malaria, tuberculosis, influenza and emerging infectious diseases.

Our membership of the Alfred Research Alliance is aligned with our mission: to achieve better health for vulnerable people in Australia and internationally by accelerating the translation of research, discovery and evidence into sustainable health solutions.



Deakin University's School of Nursing and Midwifery and Alfred Health Nursing Services have a long-established research and education partnership.

Through that partnership, staff at the Deakin Centre for Quality and Patient Safety Research are able to conduct high-quality research programs in the areas of patient safety and knowledge translation. This allows us to make a substantive contribution to scientific knowledge, clinical nursing practice and the quality of patient care.

As well as research training, Deakin undergraduate and postgraduate students also complete clinical placements here for their nursing, allied health and health science degrees.

Our membership of the Alfred Research Alliance supports our objectives of improving patient and organisational outcomes through high quality research, strengthening research training and support for nursing staff, and facilitating the integration of research evidence into clinical practice.



The La Trobe University Clinical School at The Alfred integrates research, teaching and clinical practice in allied health and nursing.

The broad objectives of the School are to provide national and international research leadership, conduct clinical research that makes a difference to patient outcomes, promote interdisciplinary and inter-institutional collaboration in healthcare delivery and research, provide a centre of excellence for education in nursing and allied health, and lead the translation of best evidence into clinical practice.

It is these objectives which underpin our membership of the Alfred Research Alliance, allowing us to collaborate closely with our partners on this site and contribute academic leadership in nursing and allied health research and education.



Nucleus Network is Australia's only international multi-site dedicated phase I clinical research organisation, with an 80-bed facility strategically co-located at The Alfred precinct.

Established in 2004, Nucleus Network has conducted more than 700 phase I clinical trials, with 90% of clients being international pharmaceutical and biotech companies. Nucleus runs approximately 70 phase I studies per year, and around 30 of these are true first-in-human studies. Nucleus has extensive experience with both biologics and small molecule products across most therapeutic areas.

Co-location within the Alfred Research Alliance precinct enables easy and convenient access to a range of ancillary services such as bioanalytical laboratories, clinical screening vendors i.e. MRI, lumbar punctures, chest X-rays and ophthalmology assessments among others, providing a one-stop solution for clients.



360biolabs is Australia's most comprehensive speciality laboratory services organisation for therapeutic, vaccine and diagnostics development. The company develop and conduct pharmacokinetic (PK) and pharmacodynamic (PD) assays across a wide variety of therapeutic areas, and provide extensive support services to ensure the success of preclinical studies and clinical trials.

The team at 360biolabs are driven by quality with internationally recognised ISO and GLP accreditation. Based within the laboratories at the Burnet Institute and with clients ranging from small biotechs to large multinational pharmaceutical companies, 360biolabs is able to support a broad range of research and development activity here at the Alfred Research Alliance.

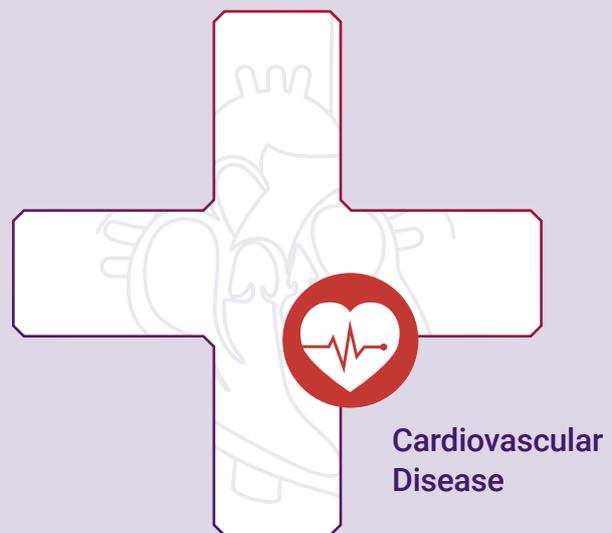
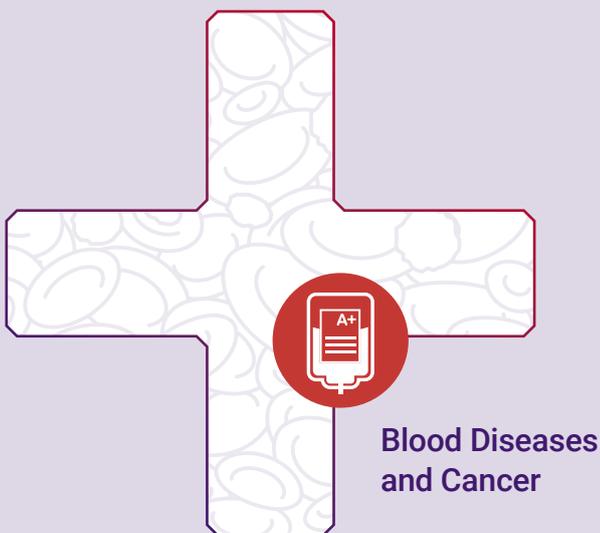
# Leading the world in research excellence

**As our name suggests, research is a priority for all members of the Alfred Research Alliance, covering everything from biomedical discovery in the laboratory to applied research, clinical research, and public health and health services research.**

The overarching aim of this research is to improve diagnosis, treatments, prevention and policy, creating better outcomes for the healthcare system and the wider community.

The research themes on the right illustrate the scope and progression of research across the Alliance, providing a complete translational research loop on one geographically distinct and unique interconnected precinct.

## Research strengths



# Research translation at work

## Biomedical discovery

Generation of new knowledge about the human body in health and disease through exploration of fundamental biological mechanisms.

## Applied research

Development of new drugs, devices, diagnostics and treatments for ultimate clinical application.

## Clinical research

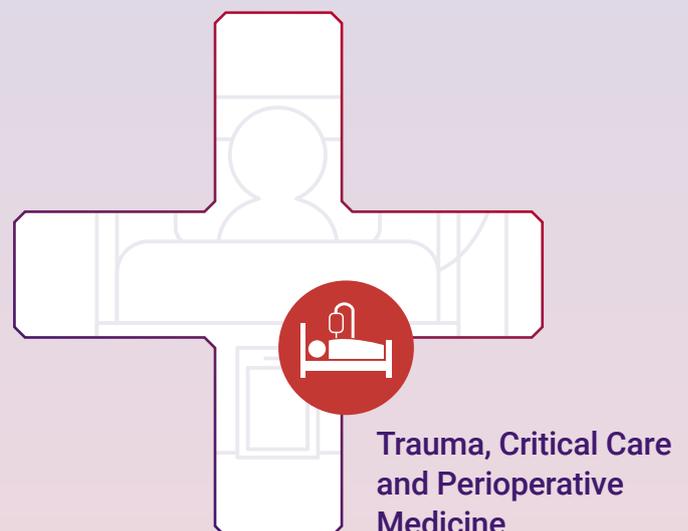
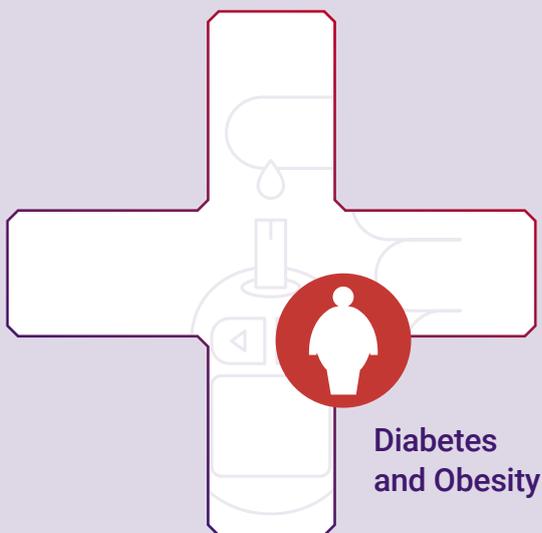
Advancement of medical knowledge by studying people either through direct interaction or collection and use of human biospecimens (e.g. clinical trials).

## Public health research

Examining the health and prevalence of disease in communities and the associated factors, including the complex link between social, environmental and biological factors, with a view to disease prevention, intervention and treatment.

### Health services research

Examining methods of effective delivery, quality, cost, access to, and outcomes of health services.





# Blood Diseases and Cancer

## Study challenges long-held understanding of leukaemia



Each year in Australia, more than 1000 people are diagnosed with acute myeloid leukaemia (AML), an aggressive blood cancer. Less than one third of AML patients survive five years beyond diagnosis.

Researchers from the Australian Centre for Blood Diseases (ACBD) at Monash University, led by Associate Professor Ross Dickins, have discovered a key reason why this disease is so difficult to treat – and therefore cure.

AML is characterised by overproduction of immature white blood cells called 'leukaemia stem cells' that fail to mature properly. These crowd the bone marrow and prevent it from making normal blood cells, causing anaemia, infections and, if untreated, death.

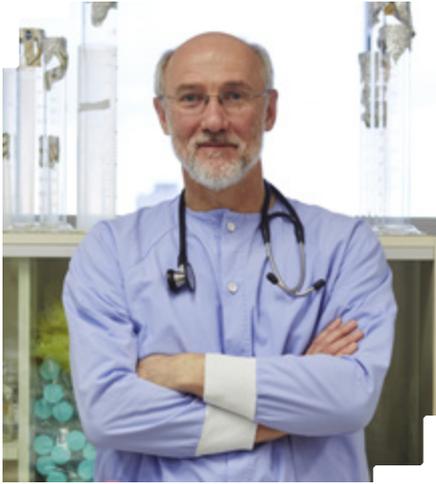
For decades it has been thought these immature cells lose their cancerous properties when they mature, prompting the development of new drugs that force cancer cells to 'grow up'.

However, Associate Professor Dickins' team found that AML cells can 'turn back the clock' to become immature again, meaning that even mature AML cells can make a major contribution to future leukaemia progression and therapy resistance.

The study, conducted with researchers from the Walter and Eliza Hall Institute of Medical Research and international collaborators, was published in the prestigious *Cell Stem Cell*.



L-R: Oliver Le Grice, A/Prof Ross Dickins, Emilia Simankovicz and Dr Margherita Ghisi



Prof Karlheinz Peter

## Heart researchers find new way to target cancer cells



The Baker Institute has developed a new imaging and platelet-targeting chemotherapy drug for the early detection and treatment of cancers. The drug was discovered while studying activated platelets in the setting of heart disease, and may now prove useful for delivering targeted treatment to cancer cells without major side effects.

The drug could be particularly effective for difficult-to-treat cancer types. Early detection of cancer is crucial, but some types do not have specific cancer surface markers that can be used to identify them. Furthermore, even the same cancer type can exhibit different properties in different patients.

However, while conducting research into platelets, Professor Karlheinz Peter, Deputy Director of Basic and Translational Science, observed that 'activated platelets' accumulate in the surrounding area of many tumour types. From this observation, his PhD student May Lin Yap was then able to develop and patent the new drug. The team is now seeking funding to test it in large-scale clinical studies.

One in two Australians will be diagnosed with cancer by the age of 85, which costs more than \$4.5 billion in direct health system costs. Important discoveries like this one increase the chance of early detection, in turn creating better outcomes for those diagnosed with cancer.

## Radiotherapy offers new hope for cancer patients

### AlfredHealth



A/Prof Sasha Senthil

Doctors at The Alfred were the only Australian researchers involved in an international randomised trial published in *The Lancet* that has shown patients live significantly longer when stereotactic ablative radiotherapy (SABR) is used to target all of their tumours.

SABR uses laser-guided imaging and robotic positioning to deliver ultra-high radiation doses to tumours without damaging the healthy tissue that surrounds it.

The trial was conducted across four countries and found that SABR resulted in almost half the patients surviving five years or more – at least one year longer than with the current standard of care therapies.

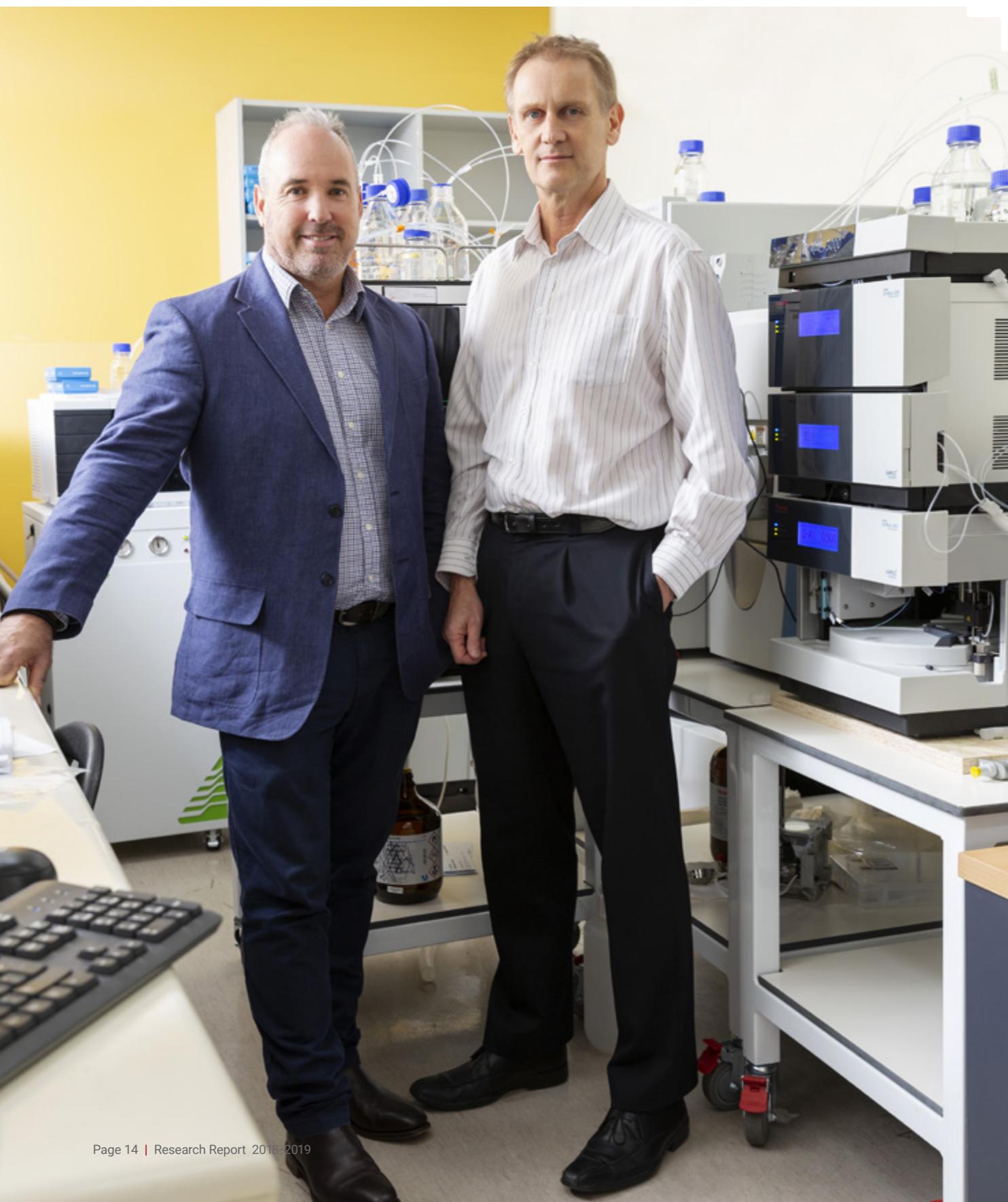
Associate Professor Sasha Senthil, Stereotactic Radiation Oncologist at The Alfred and lead investigator for the study, said until recently the best option for patients would often be gruelling courses of chemotherapy in an attempt to slow their cancer down.

Surgery has been used to remove single tumours for decades, but patients with multiple tumours would typically not be operated on. With SABR, researchers have found a potentially curative treatment for patients with up to five tumours. The trial showed SABR gave people more time and did so without impacting their quality of life.



# Cardiovascular Disease

Heart attack survivor Damien  
Sorensen with Prof Peter Meikle



## New blood test to screen for recurrent heart attack



Scientists at the Baker Institute are developing a blood test that quickly and easily detects whether a person is at risk of a secondary heart attack.

The test identifies plasma lipid biomarkers (fats in the blood) that improve upon traditional risk factors in predicting heart disease and stroke, and is part of a broader personalised precision health program currently under development.

The revolutionary blood test is proposed to be trialled in Australia over the next two to three years, and will enable GPs to better assess a patient's risk of developing heart disease.

The Baker Institute's Head of Metabolomics, Professor Peter Meikle, and his team developed the test on the back of a study that examined 10,000 samples to find the biomarkers that determine whether a person is at risk of having another heart attack.

Cardiovascular disease is the leading cause of death and disease burden in Australia, claiming one life every 12 minutes. Encompassing heart, stroke and blood vessel diseases, it was responsible for nearly 30% of all deaths in 2017.

## World-first registry to tackle sudden cardiac death in Australia



A world-first registry and genetic database is being established in Australia to better understand and prevent sudden cardiac death in young people.

The Baker Institute's Associate Professor André La Gerche is leading the project along with Professor Chris Semsarian from the University of Sydney and the Royal Prince Alfred Hospital to aid diagnosis and help establish preventative measures to address the issue of why seemingly fit and healthy people under the age of 50 die suddenly of cardiac arrest.

The registry will include blood samples from deceased individuals aged up to 50 years affected by sudden cardiac arrest. Notably, it will also be the first to include samples from at-risk family members, monitoring clinical assessments, interventions and outcomes.

State-of-the-art Sudden Cardiac Arrest Clinics have recently opened in Victoria at The Alfred and St Vincent's Hospital, alongside existing clinics at The Royal Melbourne Hospital and The Royal Children's Hospital. The clinics will serve as points of contact, support and evaluation for registry participants.

The registry project is funded by the Ross Dennerstein Foundation, which was established to spearhead research into the causes and prevention of unexplained cardiac deaths in young people. The foundation's namesake was a pilot, father of three and an active member of the community whose cardiac death at age 47 in 2016 was unexpected and remains unexplained.





# Diabetes and Obesity

## Population-based study of diabetes complications a world first



The Baker Institute and La Trobe University are spearheading a major study to understand the progression of diabetes complications, believed to be the first of its kind globally.

Working with collaborators from Monash University, Centre for Eye Research Australia and Deakin University, researchers will recruit 1500 adults from across metropolitan and regional Victoria with type 2 diabetes, who will be monitored over the next 5-10 years to track the development of any complications from their diabetes. The study will examine biological factors and behavioural aspects such as adherence to medication and lifestyle modification, as well as psychological factors like stress, anxiety and depression.

In addition to tracking classical complications of the disease, the study will look at lesser-known complications such as cognitive impairment and physical disabilities. Researchers hope the study will assist in earlier identification of those who are at risk of developing complications, enabling clinicians to improve patients' quality of life and informing future prevention and treatment strategies.

The researchers believe it is the first study in the world to take a population-based approach to understanding diabetes complications. Diabetes is the fastest growing chronic condition in Australia, with more than 1.7 million Australians living with type 1 or type 2 diabetes.



Lead researchers: La Trobe University's Prof Rachel Huxley and the Baker Institute's Prof Jonathan Shaw



Prof Merlin Thomas (second from right) with RAGE researchers

## RAGE breakthrough could put a stop to deadly diseases



The Receptor for Advanced Glycation End-products (RAGE) is an important player in many diseases, from atherosclerosis and diabetes to cancer and neurodegenerative disease. In each of these conditions RAGE kindles inflammation, cell proliferation and death. But there has been no way to block its effects.

Monash researchers, led by Professor Merlin Thomas from the Department of Diabetes, have discovered a possible way of doing this.

In an article published in *The Journal of Clinical Investigation* (JCI), the researchers describe a new pathway by which RAGE can be transactivated by the angiotensin receptor with which it forms a complex. Angiotensin is a peptide hormone that causes constriction of blood vessels and an increase in blood pressure, but in the presence of RAGE it also triggers inflammation.

This pathway likely represents the major way that RAGE is activated, Professor Thomas said. To test it, the researchers developed a selective inhibitor of the inner tail of RAGE, which was able to block inflammation and atherosclerosis.

More therapeutics are being developed based on these novel discoveries that may be applicable across a broad range of conditions in which RAGE has been implicated.

## Researchers uncover predictors that determine toxic fats in the liver



A team of researchers from the Baker Institute, University of California and University of Sydney has discovered biomarkers in the blood that can predict the accumulation of toxic fats in the liver, which are a sign of early fatty liver disease.

This discovery, published in the prestigious journal *Nature*, is an important step in treating the disease, which typically has no early symptoms. With current technologies, diagnoses mostly come too late to prevent major illness. Fatty liver is a risk factor for diabetes and heart disease, and left unchecked it can lead to liver cancer and failure.

The team identified the group of fats in the blood that may be reflective of fatty liver

disease progression using a combination of human samples and preclinical models. They're hoping this discovery might lead to a blood test to avoid invasive biopsy or surgery to determine those most at risk of advanced fatty liver disease.

The scientists also found new links to molecules important for the development of fatty liver disease that represent potential new drug targets.

Fatty liver disease is a growing concern in Australia and globally. It affects more than 5.5 million Australians, including more than 40% of all adults over the age of 50.



Dr Anna Calkin, Dr Brian Drew and Belinda Dixon-Smith, who has fatty liver disease



# Epidemiology and Public Health

## Brain health boosted by morning exercise



A study of older Australians has found a morning bout of moderate-intensity exercise improves cognitive performance like decision-making across the day, compared to prolonged sitting without exercise.

The 'Brain Breaks' study, led by the Baker Institute and The University of Western Australia, followed more than 65 participants aged between 55 and 80 years. Researchers examined the effects of acute morning exercise on a treadmill with and without brief three-minute walking breaks during an eight-hour day of prolonged sitting. They assessed aspects of cognition and concentration including psychomotor function, attention and executive function such as decision-making, visual learning and working memory.

The study found that a morning exercise session combined with brief light-intensity walking breaks throughout an eight-hour day can boost short-term memory compared to uninterrupted sitting. It also revealed that one day we may be able to do specific types of exercise to enhance specific cognitive skills such as memory or learning.

The Baker Institute is widely recognised as a global leader in sedentary behaviour and physical activity research. As Australia's population ages, studies such as this one play an important role in helping people enjoy improved quality of life and live healthier for longer.

## Coordinated national response to eliminate hepatitis C in Australia



**AlfredHealth**



Burnet Institute is spearheading a coordinated response involving more than 65 collaborators to eradicate hepatitis C across Australia.

Eliminate Hepatitis C Australia (EC Australia) is a targeted program designed to reach the 170,000+ Australians who have yet to start life-saving hepatitis C treatment. The program is a response to the serious decline in the use of highly effective drugs to cure hepatitis C among Australians living with the deadly virus.

Burnet Institute is joined by more than 65 other organisations, including Alfred Research Alliance partners The Alfred and Monash University, in its quest to meet the three key aims of the EC Australia project: to eliminate hepatitis C as a public health threat in Australia by 2030; to inform government policy; and to increase hepatitis C awareness, testing and treatment for high-risk and vulnerable communities.

As well as improving quality of life for those with chronic hepatitis C, EC Australia benefits the Australian public through the savings to the health system and in the reduction of hepatitis C incidence and prevalence.



## Creating healthier environments for better human health



Monash University's Co-Head of Infectious Diseases Epidemiology, Professor Karin Leder, is assessing the ways healthier environments can lead to improved human health in a major research program rolling out now in Fiji and Indonesia.

More than 2 billion people around the world lack adequate sanitation, and almost 600,000 children under the age of five die from profound dehydration caused by diarrhoea each year. The Monash-led Revitalising Informal Settlements and their Environments (RISE) program is working to change this.

RISE is a randomised controlled trial involving 12 settlements in Suva, Fiji, and 12 in Makassar, Indonesia. Researchers will randomly choose six settlements in each country to undergo a water and sanitation upgrade. For the next two years, they will monitor the impacts of this upgrade on the health of both the environment and residents. Following that, the other six settlements in each city will be upgraded.

Researchers will study the impact in many different ways, predominantly through survey data and the collection of water, soil, faecal and blood samples, as well as examining samples from mosquitoes and rodents as carriers of disease that may cause diarrhoea.

If the researchers observe changes in the environment and improvements in health, this type of intervention could be rolled out in other areas.



Prof Gilda Tachedjian leads the EVE-M project

## Cutting-edge collaboration a game-changer for women's sexual health



**AlfredHealth**



A bold and innovative collaborative research project into women's sexual and reproductive health, led by Burnet Institute's Professor Gilda Tachedjian, has won a major competitive funding grant from the Medical Research Future Fund (MRFF) Frontier Health and Medical Research Program to fast track its development from concept to outcome.

The EVE-M (Enhancing the Vaginal Environment and Microbiome) project is the only one of 10 MRFF Frontier Stage One projects focused on women's health. It aims to create a novel device with the potential to regulate the vaginal microbiota over a woman's lifetime, helping to prevent the transmission of sexually transmitted infections (STIs) and HIV, as well as providing contraception.

The project brings together a multidisciplinary team including the Melbourne Sexual Health Centre, which is part of Alfred Health.

This new cutting-edge research has the potential to have a transformative impact on human health and immediate global impact. Currently, the global burden of the health and economic cost of STIs, bacterial vaginosis and unplanned pregnancies is estimated at more than US\$70 billion dollars a year.



## Heatwave deaths to rise as Earth warms



A new Monash-led study has examined the public health impacts of climate change, finding that if people cannot adapt to future temperatures, deaths caused by severe heatwaves will increase dramatically in tropical and subtropical regions, followed closely by Australia, Europe and the United States.

It is the first global study to predict future heatwave-related deaths and aims to help decision makers in planning adaptation and mitigation strategies for climate change. Associate Professor Yuming Guo from Occupational and Environmental Health Sciences led the study.

Researchers developed a model to estimate the number of deaths related to heatwaves in 412 communities across 20

countries for the period 2031 to 2080. The most extreme scenario showed a 471% increase in deaths caused by heatwaves in Brisbane, Sydney and Melbourne, when compared with the period 1971-2010.

The study projected excess mortality in relation to heatwaves in the future under different scenarios characterised by levels of greenhouse gas emissions, preparedness and adaptation strategies, and population density across these regions.

In order to prevent mass population death due to increasingly severe heatwaves, the study recommends six adaptation interventions, particularly significant for developing countries and tropical and subtropical regions.



# Infection and Immunity

## New research opens door for world-first malaria vaccine



Research led by Burnet Institute's Deputy Director, Professor James Beeson, and Dr Jo-Anne Chan has revealed important insights into malaria immunity in young children that could be used to inform the development of a world-first effective malaria vaccine.

The work, based on a cohort study of children living in Papua New Guinea, is particularly important as previous studies on human immunity to malaria have mainly focused on African populations, and few have investigated immunity outside of Africa.

Severe malaria only affects a small proportion of young children, particularly those under the age of five, but it's unclear why some of these children progress to severe disease, while others only experience mild malaria.

The study found that children with antibodies to a particular antigen expressed by the parasite within the infected red blood cell were protected against severe disease, and only contracted a mild form of malaria. Researchers used novel techniques involving the genetic modification of malaria parasites to understand the importance of this antigen.

These significant findings mean researchers are closer to understanding how this immune response can be boosted through vaccination. Globally, more than 400,000 people die each year from malaria and there remains no commercially available, highly effective malaria vaccine.



L-R: Dr Mhairi Maxwell, A/Prof Margaret Hibbs and Dr Evelyn Tsantikos

## New treatment provides hope for lung disease



Research by Associate Professor Margaret Hibbs' laboratory in the Department of Immunology has paved the way for a potential new treatment for Chronic Obstructive Pulmonary Disease (COPD), a debilitating lung disease that is the third leading cause of death worldwide.

The laboratory investigated the role of granulocyte-colony-stimulating factor (G-CSF) in the disease and found that genetic removal of this factor in a COPD experimental model significantly reduced lung inflammation. G-CSF is a protein in the body that encourages some types of white blood cells to grow.

The study, reported in the highly regarded *Journal of Clinical Investigation*, also found that G-CSF deficiency suppressed extra-pulmonary co-morbid diseases including cardiovascular disease, body wasting and bone disease that reduce quality of life in COPD patients.

Associate Professor Hibbs said this would be the first-ever strategy to treat the lung disease and its co-associated medical conditions at the same time. If successful, it has the potential to benefit millions of COPD sufferers.

This work is now being translated into a new disease therapy. It was a collaboration between researchers at Monash and Melbourne University and St Vincent's Institute with clinical colleagues at the Royal Melbourne Hospital.

## Rapid point-of-care test could revolutionise sepsis treatment



Burnet Institute's Global Health Diagnostics Laboratory, co-led by Associate Professor David Anderson and Mary Garcia, was awarded a prestigious NHMRC Research Excellence Award for their ground-breaking work in developing a point-of-care test for the diagnosis of sepsis.

The test is based on the detection of CD64, a type of integral membrane glycoprotein. Recognising the critical need for a fast and simple test for sepsis, the Burnet team discovered new aspects of the biology of CD64 that allowed them to reach almost 100% sensitivity for the detection of sepsis.



A/Prof David Anderson, Dr Riya Palchaudhuri and Mary Garcia

The next major challenge is to turn the lab tests into a point-of-care test. Sepsis is a potentially lethal condition caused by the body's response to an infection, and survival depends on early intervention – a patient's chance of survival drops by 8% for every hour without treatment. While the current method to test for sepsis can take up to five days to deliver a result, this research aims to develop a device that could detect sepsis in just 20 minutes.

The World Health Organization estimates that sepsis affects more than 30 million people around the world each year, potentially leading to six million deaths.

## Study highlights need for greater STI testing



PrEP (pre-exposure prophylaxis) has been proven to be a highly effective form of HIV prevention that can reduce HIV transmission by up to 99% for those at risk of infection. However, a Central Clinical School study revealed a 20% increase in sexually transmitted infections (STIs) among gay and bisexual men using the treatment.

The PrEPX Study, led by Associate Professor Edwina Wright in the Department of Infectious Diseases, collated data from nearly 3000 participants. Interestingly, it found condom use did not play a significant part in acquiring an STI when using PrEP.

The study, published in the *Journal of the American Medical Association*, found participants reporting having higher numbers of casual sex partners and participating in group sex were at greater risk.

The rise in STIs reinforces the importance of frequent testing among men using PrEP.

Associate Professor Wright said the findings are important because they highlight the need to target sexual health messaging about STI risks to a relatively small proportion of PrEP users to help reduce STI rates.

Researchers will now engage in more research to prevent STIs, including into STI vaccines and antibiotics that may prevent STIs.



# Mental Health and Neuroscience

## Novel drug may be 'Holy Grail' of epilepsy treatment



A drug being tested by Monash University Department of Neuroscience researchers may prevent the development of Temporal Lobe Epilepsy (TLE), the most common form of acquired epilepsy in adults.

TLE develops after a brain insult such as injury, stroke, infection or tumour. While drugs can be given to patients to suppress seizures, the disease is incurable.

The Monash researchers found the compound Z944 prevented the development of TLE in 80% of animals, and also significantly improved depression, memory and learning problems associated with the disease.

Lead researcher Dr Pablo Casillas-Espinosa said it could be transformative

for patients who would potentially go on to develop epilepsy after a brain insult, as there is currently nothing that can be administered to avoid it.

Head of the Department, Professor Terry O'Brien, said the 'Holy Grail' for therapy development was to find a medical treatment to prevent or reverse epilepsy development, rather than just suppressing seizures, and that the results of the study suggest Z944 could be such a treatment.

The study was published in the high-impact journal *Progress in Neurobiology*. Approximately 3% to 3.5% of Australians will experience epilepsy at some stage, and more than 250,000 Australians live with it.

## Trialling laughing gas for depression



A study is underway at The Alfred that will trial using laughing gas to treat patients with depression after studies overseas showed promising results.

Nitrous oxide, or laughing gas, is commonly used for sedation and pain relief. Researchers believe it could also target a different type of neural pathway to common antidepressant medication, which could alleviate symptoms for patients with treatment-resistant depression.

The trial, which is a collaboration between Monash Alfred Psychiatry Research Centre (MapRC) Director Jayashri Kulkarni and Director of Anaesthesia and Perioperative Medicine Paul Myles, is currently enrolling participants.

Professor Myles said in studies overseas, patients experienced reduced symptoms of depression long after the effects of the gas had worn off. Current medication for severe depression can take up to four weeks to work, so this could help to provide people with more immediate relief.



Dr Pablo Casillas-Espinosa

## World-first trial provides hope for incurable disease

### AlfredHealth

Professor Kulkarni said exploring other pathways to treat depression was important as different types of depression affect different areas of the brain, which means traditional medication is not effective for everyone.

One in seven Australians will experience depression in their lifetime. In any one year, approximately one million Australian adults have depression.



Dr Carolyn Deng, Prof Paul Myles and Prof Jayashri Kulkarni



Prof Terry O'Brien

The Alfred has launched a world-first clinical trial to investigate whether an existing medication can be used to treat people with Rett syndrome – a rare and catastrophic neurodevelopmental disease that currently has no cure.

ANAVEX@2-73 has previously been trialed to treat people with Alzheimer's disease. The first Rett syndrome patient received the first dose of the study medication at The Alfred this year.

Professor Terry O'Brien, Director of Neurology and Deputy Director of Research at Alfred Health, said this trial would provide hope for patients with Rett syndrome, who urgently need high quality, evidence-based treatments.

The Alfred is home to the only in-patient neurology clinical trials ward in the country, which offers patients the opportunity to participate in exciting new medical trials in the safety and comfort of a hospital ward setting.

The study will enrol around 30 patients across The Alfred and The Royal Melbourne hospitals. Patients will receive a once-daily dose of oral liquid, to evaluate the efficacy of ANAVEX@2-73 medication for Rett syndrome.

Rett syndrome is a rare, non-inherited genetic disorder that occurs almost exclusively in girls and leads to severe neurodevelopmental impairments.





# Nursing and Allied Health

## Clinical trial explores new recovery options for lung transplant patients



### AlfredHealth

A La Trobe University researcher has received a grant from The International Society for Heart and Lung Transplantation to continue an important clinical trial examining new ways to rehabilitate patients after a lung transplant.

Ben Tarrant from La Trobe University and Alfred Health is leading the trial, which will explore the benefits of doubling the daily amount of physical rehabilitation during the post-operative period following lung transplantation.

Currently, patients undergo a once daily session of physiotherapy for the duration of their initial inpatient stay, which consists of early mobility, aerobic exercise, upper and lower limb strengthening, and flexibility or core muscle re-training.

This trial aims to assess the feasibility and safety of increasing this to twice daily physical rehabilitation sessions during the post-operative period. The additional physical rehabilitation session will complement current standard care, and be delivered by a trained research assistant or physiotherapist.

The investigators hypothesise that participants in the intensive rehabilitation group will be more active at both 10 days and 10 weeks than those receiving standard post lung transplant physical rehabilitation.

## New guidelines put a stop to harmful healthcare practices



Healthcare systems across the globe are under increasing pressure to ensure both efficient and effective care. In a joint study with several UK partner organisations, Deakin researchers focused on understanding how managers and service leaders stop existing practices and interventions that are not evidence based, have marginal gain or, at worst, cause harm to patients.

Making any change to existing practices is not always easy, so this study aimed to explore the best ways of successfully stopping or replacing those practices. After conducting a literature review, researchers engaged with stakeholders to develop ideas and resources that would help clinicians and managers change or stop low-value practices.

One such recommendation was supporting clinicians to be aware of their day-to-day decision-making habits when ordering investigations and treatments through feedback on their performance. Another was developing systems that support clinicians' decisions by making it harder to order low-value treatments, as well as ensuring health care organisations give implementation and de-implementation equal consideration in health policy strategies.

The findings from this study offer the first practical guidance for policy makers, managers and clinicians to help them with de-implementation processes and procedures.

## Nursing network takes home major industry award



A Deakin University program that works to better embed nursing research into health practice has been awarded the Business Higher Education Round Table (BHERT) Award for Outstanding Collaboration in Higher Education & Training.

The award recognises outstanding contributions to enhancing the quality of learning and teaching in higher education by members of tertiary education institutions and industry partners.

The Deakin University Partners in Nursing and Midwifery Research Network is a unique university-health services partnership focused on improving the quality and safety of health care. The network includes Alfred Health, Barwon Health, Eastern Health, Monash Health, Western Health and Epworth HealthCare.

The partnership network was commended by the judging panel for their world-leading ability to translate research with immediacy and scalability. Their significant reach establishes a critical feedback loop that ensures the implementation of research findings into clinical practice and the continued development of the workforce.

Through this partnership, nursing and midwifery academics have the ability to use the evidence and expertise they've built to positively influence the care of more than three million Victorians annually in 29 hospitals and 11 residential aged care facilities, as well as impacting the practice of more than 30,000 nurses and midwives.

## Patient and family perspectives crucial for better outcomes



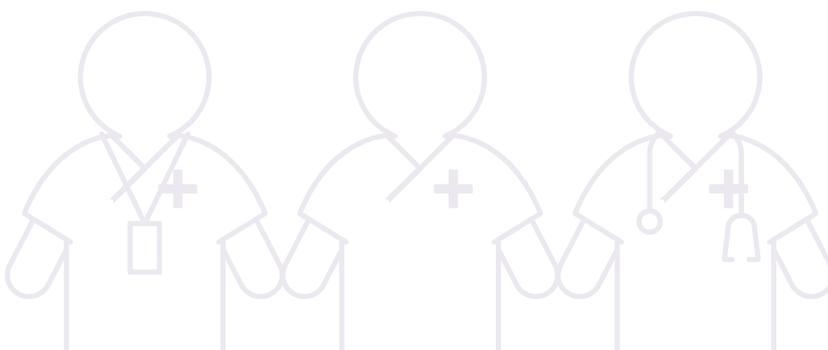
A study led by Deakin University has provided the first evidence of how clinicians use patient and family experiences in critical patient deterioration, identifying how communication can be optimised to improve patient outcomes.

Working with seven partner organisations, the aim of the Deakin study was to investigate the role and influence of patients and relatives in triggering responses from health professionals to critical patient deterioration in hospital. The researchers also wanted to identify communication strategies that may decrease preventable serious adverse events.

Although patients and families are able to identify subtle cues of early deterioration prior to changes in vital signs, there had been no research that focused on the contribution of patients and their families to patient safety.

Led by Professor Tracey Bucknall from Alfred Health and Deakin University, the study provided a unique insight into patient and family involvement in hospital care and their critical role in communicating health concerns to nurses.

As a result of the study, the Deakin team has developed recommendations for Australian health services, including exemplars for improving health professionals' training to promote early recognition and active response to patient and family member concerns, regardless of physical symptoms being present or not.





# Trauma, Critical Care and Perioperative Medicine

## Elderly at risk of hypothermia at home

### AlfredHealth

Elderly Australians are dying in hospital of hypothermia developed living in their own homes, a study by The Alfred's Dr Michelle Ananda-Rajah has found.

The study, conducted across The Alfred and Sandringham emergency departments, found 217 people presented with hypothermia between 2009 and 2016. Of those, 11% died. Nearly 80% of the patients were found indoors and were more likely to be elderly with several health conditions.

The researchers analysed retrospective data from patients with body temperatures lower than 35°C from The Alfred and Sandringham hospital emergency departments for the study.

The research paper, published in *Internal Medicine Journal*, raises the issue of poverty and the cost of energy bills during winter. However, factors other than just the winter cold were involved, Dr Ananda-Rajah said. Certain medications as well as older age can affect the ability of the body to raise its own temperature. Elderly patients who had heart failure, cancer, chronic kidney disease or sepsis infection were especially likely to die in hospital.

Researchers found that 27% of patients coming in with hypothermia had an infection developing, highlighting the need for clinicians to also consider infection as a cause of hypothermia and manage it appropriately.

## Marked bicycle lanes not the best way to keep cyclists safe



A Monash University study has found that marked on-road bicycle lanes are not the optimal solution for protecting cyclists, particularly alongside parked cars. 'Passing events' that occurred on a road with a bicycle lane and a parked car had an average passing distance that was 40cm smaller than a road without a bicycle lane or parked car.

The study, led by Dr Ben Beck, Deputy Head of Prehospital, Emergency and Trauma Research, is the largest of its kind globally. Data was collected from 60 Melbourne cyclists who rode their bicycles with a custom device to measure the distance of each passing car. The devices recorded more than 18,000 vehicle-passing events from 422 trips.

Researchers found that one in every 17 cars came within one metre of the cyclist. Alarming, 124 cars came within less than 60cm. In higher speed zones (greater than 60 km/h), roughly one in three passing events was a 'close' pass of less than 150cm. There were approximately 1.7 passing events of less than 100cm for every 10km travelled.

As cities around the world seek to reduce traffic congestion and encourage more environmentally-friendly forms of transport, the findings of this study will inform the design of cycling-related infrastructure.





## International trial to benefit patients having major surgery



Each year, at least 310 million patients undergo major surgery worldwide in procedures that involve the administration of intravenous fluids.

Clinicians have traditionally delivered generous amounts of these fluids to patients both during and after surgery to correct for preoperative fasting and haemorrhage, and to ensure adequate oxygen gets to tissue and that the output of urine is maintained.

In abdominal surgery, administering intravenous fluid liberally can cause adverse effects such as oedema (swelling caused by excess fluid in tissue) and weight gain, meaning patients may stay longer in hospital. However, evidence about the effects of restricting fluid for patients undergoing major surgery is conflicting.

To investigate, Professor Paul Myles, Head of the Department of Anaesthesia and Perioperative Medicine at Monash University, lead the international Restrictive versus Liberal Fluid Therapy in Major Abdominal Surgery (RELIEF).

The trial of 3000 patients found those on a restricted regimen experienced less disability-free survival compared to patients on a liberal one, and that they had a higher rate of acute kidney injury. Researchers now have clear evidence that moderately liberal intravenous fluids can protect the kidneys during major surgery.

The study is one of a number conducted by Professor Myles and his Central Clinical School team aimed at reviewing and improving clinical practice globally.

## Study finds truck driving among Australia's most dangerous jobs



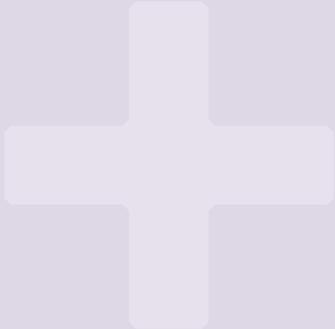
A landmark 12-year study into the wellbeing of Australia's truck drivers has revealed that they have a 13-fold higher risk of dying at work than other Australian workers, making it one of the most dangerous occupations in the country.

The Monash public health-led Driving Health Study also found that more than 120,000 claims for work-related injury and disease were lodged by truck drivers over the study period. Only 17% of these claims came from vehicle crashes, with the rest caused by physical and psychological stress, falls and other reasons. The claims added up to more than one million lost weeks of work.

Lead researcher Professor Alex Collie, Director of the Insurance Work and Health Research Group, said that truck driving is among the unhealthiest jobs in Australia because of long working hours, lots of sitting, poor nutrition, social isolation, shift work, time pressure and low levels of job control, in addition to the risk of road crashes.

Truck driving is the most common occupation among male Australians, employing one in every 33 male workers. And the industry is growing – demand for on-road freight is expected to double from 2010 to 2030. Combined with an ageing driving workforce, the report calls for an overhaul of the way that truck driver health is monitored and promoted.





# Our People

The researchers, administrators and executive of the Alfred Research Alliance are regularly recognised for their contribution to biomedical research both nationally and internationally. Here is just a sample of the awards, prizes and fellowships received by our members this year.

## Industry awards and fellowships

**Australian Clinical Trials Alliance (ACTA) Trial of the Year Award**

ASPREE (Aspirin in Reducing Events in the Elderly), Monash University

**Australian Diabetes Society – Ranji and Amara Wikramanayake Clinical Diabetes Research Award**

Associate Professor Barbora de Courten, Monash University

**Australian Red Cross Distinguished Service Award**

Professor John Zalcberg OAM, Monash University

**Australian Society for Infectious Diseases – Frank Fenner Award**

Professor Karin Leder, Monash University

**Cochrane 2018 Bill Silverman Prize**

Dr Matthew Page, Monash University

**Endocrine Society of Australia Senior Plenary Award 2019**

Professor Susan Davis, Monash University

**Fellowship of the American Academy of Nursing**

Professor Tracey Bucknall, Deakin University

**Health Research Council of New Zealand – 2018 Beaven Medal**

Dr Colin McArthur (Adjunct Associate Professor), Monash University

**Heart Foundation's Kempson Maddox Award**

Professor Paul Nestel, Baker Institute

**NHMRC Research Excellence Awards – Career Development Fellowships: Population Health Level 2**

Associate Professor Yuming Guo, Monash University

**NHMRC Research Excellence Awards – Development Grant**

Associate Professor David Anderson, Burnet Institute

**Premier's Awards for Health and Medical Research – Health Services Researcher Award**

Dr Kylie Dyson, Monash University

**Premier's Awards for Health and Medical Research – Public Health Researcher Award**

Dr Vincent Cornelisse, Monash University

**Sax Institute 2018 Research Action Award**

Associate Professor Anne Abbott, Monash University





## Australia Day Honours

### **Officer of the Order of Australia**

- Professor Olaf Drummer AO, Monash University
- Professor Jane Fisher AO, Monash University
- Professor Catriona McLean AO, Alfred Health
- Professor John McNeil AO, Monash University

### **Member of the Order of Australia**

- Professor Rodney Cooter AM (Adjunct Clinical Professor), Monash University
- Professor Margaret Hellard AM, Burnet Institute
- Professor Jennifer Hoy AM, Alfred Health
- Associate Professor Bill Johnson AM, Alfred Health
- Professor Andrew Way AM, Alfred Health

### **Ambulance Service Medal**

- Dr Kathryn Eastwood ASM, Monash University

### **Medal of the Order of Australia**

- Ross Cooke OAM, Burnet Institute
- Dr Bryan Walpole OAM, Alfred Health

## Queen's Birthday Honours

### **Officer of the Order of Australia**

- Professor Christina Mitchell AO, Monash University

### **Member of the Order of Australia**

- Dr Christine Ball AM, Monash University
- Hon Professor Anthony Buzzard AM, Monash University
- Dr Malcolm Douglas Dobbin AM, Monash University
- Professor Michael Grayson AM, Monash University/Alfred Health
- Retired Professor Michael Grigg AM, Monash University
- Professor Jayashri Kulkarni AM, Monash University/Alfred Health
- Professor Malcolm Ross Sim AM, Monash University
- Dr Richard James Stark AM, Monash University/Alfred Health
- Dr David Thurin AM, Baker Institute



# Platform Technologies

**Several platforms support research at the Alfred Research Alliance by providing specialised services, equipment and staff.**

## Alfred Research Alliance Flow Cytometry Core Facility

The Alfred Research Alliance Flow Cytometry Core Facility is a state-of-the-art cell sorting and analysis laboratory. The facility has capacity for animal and human cell sorting in a PC2 environment, as well as infectious sample sorting in a dedicated PC3 environment. It is equipped with four high-throughput cell sorting platforms, nine cell analysis platforms and an imaging flow cytometer. Effective data generation and interpretation is a focus of the facility staff, who offer comprehensive training in platform use and experimental design.

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### Contact

[amrepflow@burnet.edu.au](mailto:amrepflow@burnet.edu.au)

### Visit

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

### Collaborative Partners

Monash University, Burnet Institute, Baker Heart and Diabetes Institute, Alfred Health

## Monash Micro Imaging at Alfred Precinct

The Alfred precinct arm of Monash Micro Imaging manages core imaging resources within the Baker Heart and Diabetes Institute, Monash Central Clinical School and Burnet Institute. Resources include three confocal and several conventional fluorescence microscopes within PC2 laboratories and a dedicated deconvolution microscope within a PC3 laboratory. Super resolution technologies are also available that enable imaging beyond the capability of conventional microscopes.

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### Contact

[stephen.cody@monash.edu](mailto:stephen.cody@monash.edu)

### Visit

[platforms.monash.edu/mmi](http://platforms.monash.edu/mmi)

### Collaborative Partners

Monash University, Burnet Institute, Baker Heart and Diabetes Institute

## Monash Histology Platform at Alfred Precinct

A node of the Monash Histology Platform is located at the Alfred precinct for both Alliance and external researchers to use on a fee-for-service basis. The platform offers a professional histology service as well as access to equipment for do-it-yourself histology (including a paraffin embeddor, microtomes, H&E staining area and a cryostat).

The platform also provides access to highly experienced staff who can assist with all histological requirements. This ensures high quality and timely processing, frozen and paraffin sectioning, as well as access to a wide array of special stains, IHC and IF staining, tissue microarray production, vibratome sectioning and image creation via brightfield and fluorescent scanners.

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### Contact

[ali.shad@monash.edu](mailto:ali.shad@monash.edu)  
[camilla.cohen@monash.edu](mailto:camilla.cohen@monash.edu)

### Visit

[platforms.monash.edu/histology](http://platforms.monash.edu/histology)

## Antiviral Testing Facility

The Burnet Institute's Antiviral Testing Facility has the capacity to evaluate chemical agents for inhibitory activity against HIV and herpes simplex (HSV) type 1 and 2 viruses in cell culture assays. This enables the development of new molecules that may lead to better treatments and/or prophylactics for these chronic infections. All work undertaken by the facility uses principles outlined in the FDA guidelines for Antiviral Product Development.

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### Contact

[gilda.tachedjian@burnet.edu.au](mailto:gilda.tachedjian@burnet.edu.au)

## Monash's ARA-MBI Preclinical Imaging Facility

Opened in 2018, the Alfred precinct's purpose-built preclinical imaging facility includes a new 9.4T MRI scanner capable of a range of imaging, including brain, abdominal, cardiovascular, muscular and articular. The facility also houses a NanoPET-CT, capable of high-resolution, high-efficiency PET and X-Ray CT scanning, and FLECT, capable of 3D fluorescence imaging. Future plans include the addition of a magnetic particle imaging (MPI) scanner. The new facility is in addition to existing IVIS Lumina XR Series III equipment, which can be used for multi-modal fluorescent, bioluminescent and X-ray imaging in vivo.

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### Contact

[robert.brkljaca@monash.edu](mailto:robert.brkljaca@monash.edu)

### Collaborative Partners

Monash University, Baker Heart and Diabetes Institute

## Clinical Research Domain

The Baker Institute's Clinical Research Domain offers a range of imaging and diagnostic tools that are used to better understand disease development and treatment. Equipment includes state-of-the-art MRI, transthoracic and stress echocardiography, and body composition (DEXA) scanning.

The MRI scanner is capable of detailed morphologic and functional cardiac imaging, including the ability to acquire real-time data during exercise. Research and investigational services include ECG, Holter and ambulatory BP monitoring, ankle:brachial indices and cardiopulmonary exercise testing. The Alfred Centre clinical research facilities comprise a clinical and research gymnasium, and dedicated clinical research rooms.

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### Contact

[andre.lagerche@baker.edu.au](mailto:andre.lagerche@baker.edu.au)

## Metabolomics Platform

The Baker Institute's Metabolomics Laboratory uses state-of-the-art tandem mass spectrometry to obtain metabolic profiles (primarily lipids and fats) from cell and animal models, in addition to clinically relevant human samples. The platform has developed a targeted lipidomics approach that enables quantification of more than 750 lipid species across 30 lipid classes and subclasses. The analysis is performed by liquid chromatography tandem mass spectrometry.

### Contact

[peter.meikle@baker.edu.au](mailto:peter.meikle@baker.edu.au)

## Preclinical Cardiology Microsurgery and Imaging Platform (PCMIP)

PCMIP at the Baker Institute has established facilities and techniques specialising in mouse microsurgery and cardiac physiology, enabling scientists to conduct echocardiography (non-invasive), micromanometry (hemodynamic assessment) and microsurgery to replicate conditions of heart disease. The platform allows scientists to comprehensively assess heart function in genetic models under basal and diseased conditions, and to trial new therapies of cardiovascular and metabolic disease.

### Contact

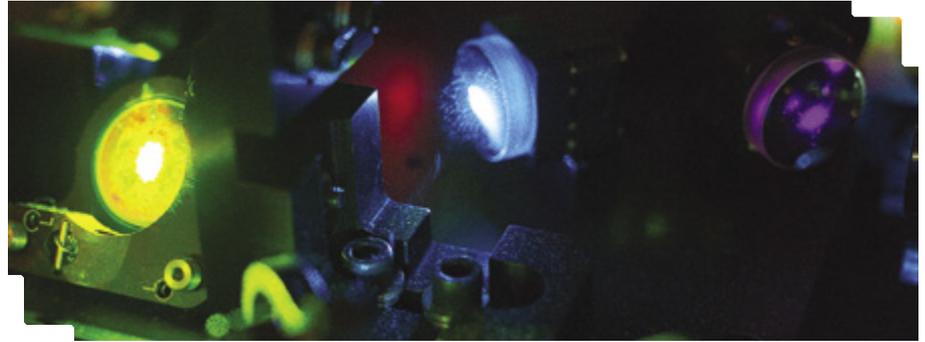
[daniel.donner@baker.edu.au](mailto:daniel.donner@baker.edu.au)  
[julie.mcmullen@baker.edu.au](mailto:julie.mcmullen@baker.edu.au)

## Preclinical Metabolic Phenotyping/Bioenergetics Facility

The Baker Institute's Preclinical Metabolic Phenotyping Facility enables high-quality metabolic and physiologic phenotyping to study models of obesity, diabetes, cardiovascular disease and other metabolic diseases. The Bioenergetics Facility equipment allows the measurement of mitochondrial and glycolytic functionality, the two main energy pathways of the cell. Collaborative projects are welcome, with access to equipment provided to external researchers for a fee.

### Contact

[brian.drew@baker.edu.au](mailto:brian.drew@baker.edu.au)



## Genomics Capability

The collective genomics capabilities of the Alliance enable researchers to share resources, equipment and learnings to stay at the cutting edge of this ever-changing field. State-of-the-art sequencing facilities including Illumina NextSeq 500, MiniSeq, MiSeq and NovaSeq 6000 Sequencers; Bio-Rad QX200 ddPCR system with AutoDG and ddSeq (single cell) capability; Covaris M220; MultiNA Fragment Analysis (Shimadzu); Agilent TapeStation 4200; EpMotion liquid handler; microarray analysis using the Affymetrix GeneChip System 3000Dx v.2; and Intellicyt iQue high content screener. Access to the equipment is through collaboration and/or cost recovery.

The Monash Central Clinical School provides next-generation sequencing expertise and training on a collaborative basis, including experimental design, sample preparation (transcriptome, whole genome and epigenome profiling), single-cell transcriptome (Drop Seq, 10X Genomics Chromium) sample preparation, sequencing and basic bioinformatics. Equipment includes a DolomiteBio platform (Drop-Seq), 10x Genomics Chromium (via Baker collaboration), and Illumina MiSeq, MiniSeq, NextSeq500, and NovaSeq 6000 machines, as well as Oxford Nanopore MinION sequencing systems.

### Contact

[helen.mitchell@monash.edu](mailto:helen.mitchell@monash.edu)

### Visit

[alfredresearchalliance.org.au/resources/genomics](http://alfredresearchalliance.org.au/resources/genomics)

### Collaborative Partners

Monash University, Alfred Health, Burnet Institute

## Global Health Diagnostics Laboratory

Burnet Institute's Global Health Diagnostics Laboratory focuses on the development of prototype rapid, point-of-care tests for infectious diseases and other priority global health conditions. The team's innovations have enabled the development of products for diagnosis of infections (hepatitis E, active syphilis), measurement of CD4 T-cells, and plasma separation for HIV viral load, which have been successfully out-licensed for manufacture, as well as for liver disease (ALT1) in partnership with Burnet's spin-off company, Nanjing BioPoint Diagnostics. The team is currently working with Alfred Health to develop a point-of-care test to detect signs of severe infection that contribute to sepsis.

### Contact

[david.anderson@burnet.edu.au](mailto:david.anderson@burnet.edu.au)

## Optima

Optima is a sophisticated tool to help decision-makers choose the best public health investments in areas such as tuberculosis, HIV, nutrition, and maternal and child health. Developed by the Optima Consortium for Decision Science, in partnership with the World Bank, the software is open-access and available via a web-based interface. It consists of a mathematical model of disease transmission and progression integrated with an economic analysis framework and a formal mathematical optimisation routine. Optima has been used by more than 40 countries to guide resource allocation and to assist with national strategic and operational planning.

### Contact

[david.wilson@burnet.edu.au](mailto:david.wilson@burnet.edu.au)

# Bioinformatics and Biostatistics

**Both Monash University, through its Central Clinical School and School of Public Health and Preventive Medicine, and the Baker Heart and Diabetes Institute provide important bioinformatics and biostatistical support for researchers at the Alfred Research Alliance.**

## Biostatistics Consulting Platform

The Biostatistics Consulting Platform (BCP), located within Monash Public Health and Preventive Medicine, provides high-quality biostatistical support to Alfred precinct-based researchers from Monash and Alfred Health. BCP biostatisticians can provide consulting and collaborative assistance with:

- Design of experiments, clinical trials and other studies, including sample size calculations and the development of proposals and protocols
- Statistical analysis and reporting of results
- Biostatistical appraisal of protocols and manuscripts
- Research into new or specialised biostatistical methods
- Statistical software advice and guidance

BCP biostatisticians have experience with a wide range of statistical methods and specialist software.

### Visit

[monash.edu/medicine/sphpm/epidemiology/about/units-centres/biostats-consulting](http://monash.edu/medicine/sphpm/epidemiology/about/units-centres/biostats-consulting)

### Collaborative Partners

Monash University, Alfred Health

## Monash Bioinformatics Platform at the Alfred Research Alliance

The Monash Bioinformatics Platform is a hub for the network of bioinformaticians working within Monash University and its affiliates. The platform offers bioinformatics tools and computing resources for data analysis, visualisation and exploration across a variety of experiments and research projects.

Dr Nick Wong was appointed in 2017 as the liaison between Monash Central Clinical School, Alfred Health and the main bioinformatics team on the Clayton campus. Drawing on his expertise in genomics and bioinformatics, Dr Wong's role is to offer advice, consultancy and training around genomic analysis with next-generation sequencing (NGS) and nucleic acid (RNA / DNA) platforms to Alliance members.

### Contact

[nick.wong@monash.edu](mailto:nick.wong@monash.edu)

### Visit

[monash.edu/researchinfrastructure/bioinformatics/](http://monash.edu/researchinfrastructure/bioinformatics/)

### Collaborative Partners

Monash University, Alfred Health

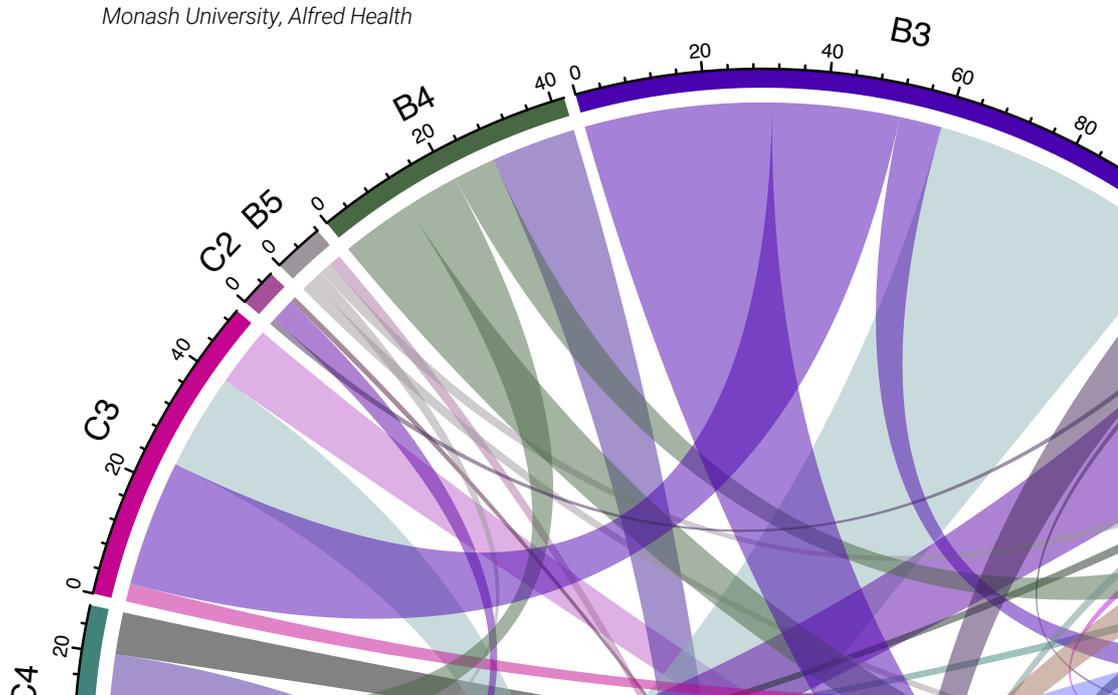
## Bioinformatics Program at the Baker Institute

The Bioinformatics Program at the Baker Institute aims to build bioinformatics capacity through collaboration (internal and external), support and training. The program offers data analysis through a range of different technologies, including genomics, epigenomics, transcriptomics, proteomics, metabolomics and metagenomics / microbiota, as well as cross-omic integration.

A diverse set of analytical techniques is employed, from statistical analysis and machine learning to network analysis, high-dimensional data visualisation and computational algorithms. This facilitates the identification of genetic variants, genes and other biomolecular/organismal entities that differ between conditions, in turn enabling researchers to make disease predictions, infer pathogenesis and identify targets for intervention.

### Contact

[michael.inouye@baker.edu.au](mailto:michael.inouye@baker.edu.au)



# Clinical Registries and Biobanks

**The Alfred Research Alliance is home to the largest concentration of clinical registries in Australia and also houses biospecimens, samples and other datasets which provide important resources for researchers.**

## Monash clinical registries

Monash Public Health and Preventive Medicine maintains approximately 30 clinical registries at the Alfred Research Alliance. Clinical registries are databases that systematically collect health-related information on people who have undergone a particular treatment, been diagnosed with a certain illness or managed via a specific healthcare resource.

With this information, the registries can benchmark outcomes of clinical procedures, report on the quality of care, and monitor the safety of new drugs, devices and surgical procedures. The registries at the Alfred precinct include state and national databases, as well as providing data to international registries. They also supply the School with important health research data.

Some of the medical conditions, devices and clinical procedures captured in the registries include:

- Transfusions
- Cardiac and thoracic surgery
- Bariatric surgery
- Rheumatology
- Trauma
- Spine and orthopaedic trauma
- Burns
- Cardiovascular conditions
- Blood disorders
- Kidney diseases
- Various cancers, including lung, gastrointestinal, prostate, lymphoma and myeloma
- Cystic fibrosis
- Breast devices.

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### Contact

[med-clinicalregistries@monash.edu](mailto:med-clinicalregistries@monash.edu)

### Visit

[monash.edu/medicine/sphpm/registries](http://monash.edu/medicine/sphpm/registries)

## AusDiab

Coordinated by the Baker Heart and Diabetes Institute, the AusDiab study is the largest Australian longitudinal population-based study designed to examine the natural history of diabetes, heart disease and kidney disease in Australians over 25 years of age. The baseline study of 11,247 participants provided benchmark national data on the prevalence of diabetes, obesity, hypertension and kidney disease in Australia.

Researchers and potential collaborators wishing to access the AusDiab datasets or biological samples are able to do so via completing a data access form.

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### Visit

[baker.edu.au/impact/ausdiab/about#data](http://baker.edu.au/impact/ausdiab/about#data)

## Victorian HIV Blood and Tissue Storage Bank

Established in the 1990s, the Victorian HIV Blood and Tissue Storage Bank is an initiative of the state-wide Victorian HIV Service at The Alfred and Burnet Institute. It has prospectively stored leftover serum samples from requested HIV viral load tests for patients managed at The Alfred. The biobank is active and growing, and currently holds nearly 70,000 samples linked with relevant clinical information from close to 5000 HIV patients. It has the ability to track individual patients from naïve to treatment suppressed, and also contains historical samples from before the widespread use of antiretroviral therapy. It is available as a research tool.

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### Contact

[j.roney@alfred.org.au](mailto:j.roney@alfred.org.au)

[jennifer.hoy@monash.edu](mailto:jennifer.hoy@monash.edu)

### Collaborative Partners

Burnet Institute, Alfred Health, Monash University

## The ASPREE Healthy Ageing Biobank

Located on the Alfred precinct, Monash University's state-of-the-art biorepository houses biospecimens from a diverse range of studies, including blood and urine specimens collected from Australian participants of the NIH/NHMRC-funded ASPREE (ASPIrin in Reducing Events in the Elderly) clinical trial.

The ASPREE Healthy Ageing Biobank includes both baseline and three-year follow-up biospecimens from more than 10,500 ASPREE participants. Together with clinical data from the participants, they represent a unique global resource for genetic and biomarker discoveries in older Australians. The biorepository also houses tumour tissue samples collected for ACES (ASPREE Cancer Endpoints Study), an ASPREE sub-study examining the effect of low-dose aspirin on cancer.

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### Visit

[aspree.org/aus/sub-studies/](http://aspree.org/aus/sub-studies/)



# Ethics at the Alliance

**The Alfred Research Alliance members are committed to maintaining the highest standards of ethics and compliance in all research endeavours.**

We work closely together to ensure that current standards are applied consistently across the precinct and that the relevant legislation, regulations, guidelines and codes of practice for all ethical research conduct are actively met at every level.

Shared resources also help our member organisations to navigate ethics approval processes in an efficient and streamlined manner, which enables us to get research underway sooner.

## Human Research Ethics

The Alfred Hospital Ethics Committee is a NHMRC-registered and certified Human Research Ethics Committee, which undertakes ethical review of human research for all Alliance members and can also review applications for any site participating in the Victorian or national 'single ethical review' (or 'streamlined') scheme.

The Ethics Committee is supported by two sub-committees: the Research Review Committee, which undertakes a preliminary specialised scientific/medical and safety review of drug, device and risky interventions; and the General Ethical Issues Sub-Committee, which considers more general ethical issues, including but not restricted to human research, of relevance to Alfred Health and the wider community.

## Animal ethics

The Alfred Research Alliance Animal Ethics Committees (AECs) undertake the ethical review of proposals for the use and breeding of animals for scientific purposes for Alliance-based organisations.

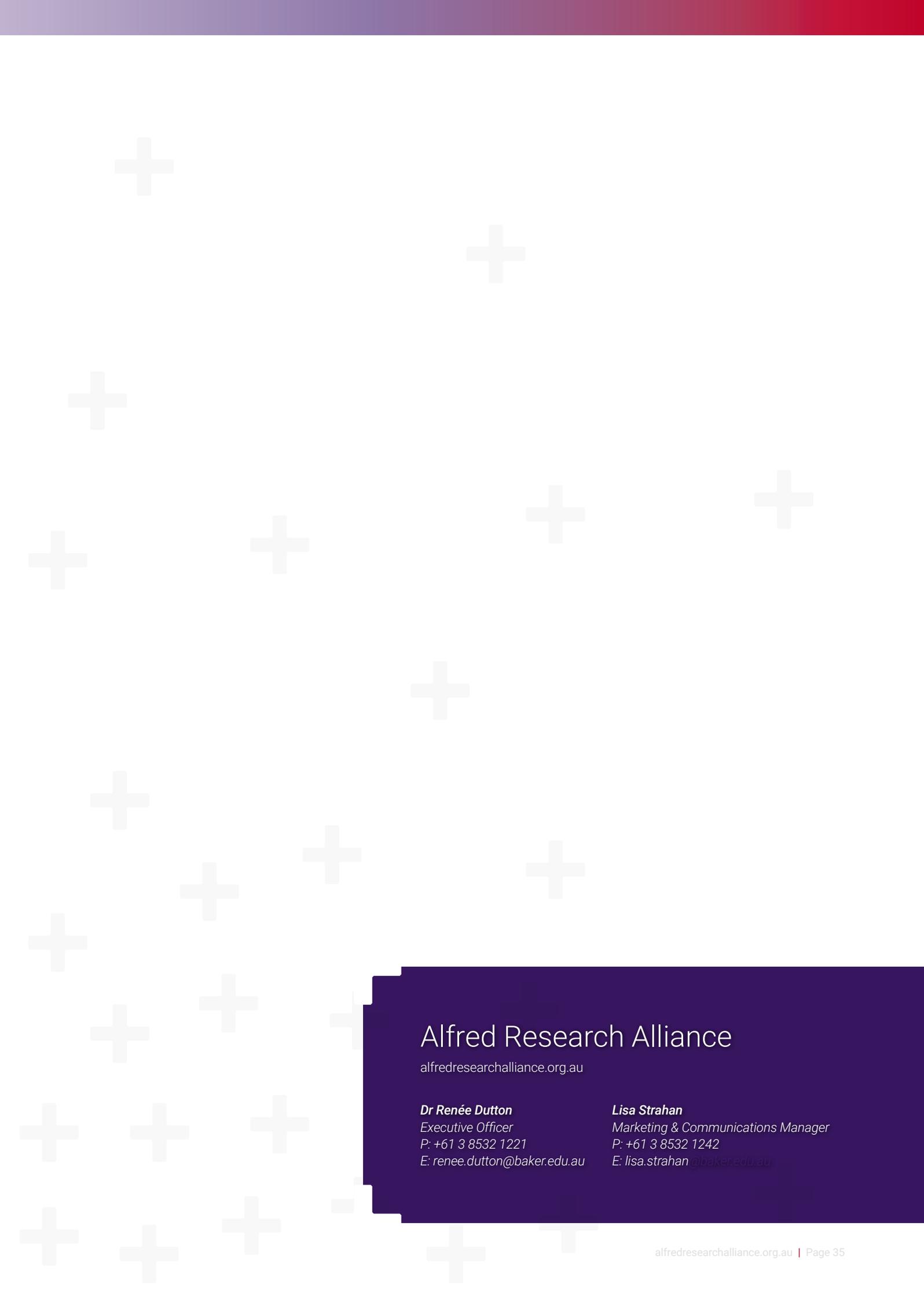
There are two AECs in operation, each meeting on a monthly basis, resulting in the ethical review of proposals on a fortnightly basis. The AECs are supported by the Alfred Research Alliance AEC Secretariat, which also coordinates post-approval monitoring of research projects and annual reporting to state government on behalf of Alliance members licensed for the use of animals for scientific purposes.

## Dealings with Genetically Modified Organisms

The Monash University Biosafety Committee, via the Monash Research Office, administers compliance with regulations covering genetically modified organisms for Alfred Health, Baker Institute and Burnet Institute, as well as Monash University.

**+** Visit [alfredresearchalliance.org.au/research/research-ethics-and-compliance](http://alfredresearchalliance.org.au/research/research-ethics-and-compliance) to find out more about ethics across the precinct.





## Alfred Research Alliance

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

**Dr Renée Dutton**

*Executive Officer*

*P: +61 3 8532 1221*

*E: [renee.dutton@baker.edu.au](mailto:renee.dutton@baker.edu.au)*

**Lisa Strahan**

*Marketing & Communications Manager*

*P: +61 3 8532 1242*

*E: [lisa.strahan@baker.edu.au](mailto:lisa.strahan@baker.edu.au)*

