

**M** MALAGHAN  
INSTITUTE  
OF MEDICAL RESEARCH

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**Annual Report 2018**



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# About us

The Malaghan Institute is New Zealand's leading independent biomedical research institute. For more than 50 years we've been delivering cutting-edge research and clinical trials, advancing our understanding of the immune system and immunology to improve human health.

The immune system is a complex network of cell, signals and molecules that acts as our first line of defence against internal and external threats to our health. At the Malaghan Institute we believe by better understanding the immune system, and by harnessing its innate power, we can create treatments and cures for many of the most devastating diseases of our time.

Our impact on health research in New Zealand is underpinned by our commitment to recruiting and nurturing the best national and international scientists,

investing in world-class technology and collaborating with leading research organisations globally.

As a registered charity, our success is only possible thanks to the backing and philanthropic support of the community. This generosity is vital for securing the future of biomedical research in New Zealand and the health and wellbeing of generations to come.

Front Cover: 'Lymph glowed': A glowing lymph node in the process of antibody production following vaccination. Purple B-cell follicles are interspersed with pink germinal centres, with green T-cell speckled throughout. Image credit: Anna Mooney, translational immunology team.

# Chairman's report



I would like to thank you for taking the time to read this report. Everyone who takes an interest in our work is a friend and we owe you a great big thanks.

Whether you're a supporter or collaborator, a Friend of the Malaghan Institute, a student or science leader, a member of the Institute's support team, the Director or a Trustee, your contribution is critical and appreciated.

To our many funders and donors, your support is the fuel that lets us seek solutions that advance scientific knowledge and improve health outcomes for our citizens and others around the world. I'd like to acknowledge the Health Research Council, Lexus of New Zealand, the Hugh Green Foundation, the Lion Foundation, the Dr Marjorie Barclay Trust and the Thompson Family Foundation. There are many others also deserving of recognition.

Last year I reported on the Institute's work to develop a strategic plan for the next five years in detail and a vision for the next 10 years. This was accomplished and adopted by the Trustees early in 2018. The plan gives focus and clarity for the director and his teams, and guidance for setting budgets moving forward.

In putting this plan into place we found that our research programmes need more resources – both personnel and financial – to meet their goals. We also determined the likely need to establish additional research programmes to meet the everchanging landscape of biomedical research. These requirements bring challenges in funding, securing additional space, and recruiting people with the right skill sets. Such challenges will be addressed, and plans developed, to meet the overarching objectives of the strategic plan.

During the year the Institute was audited by an independent international review group, put together by the Health Research Council, to determine whether we are meeting the imperatives established for our funding as an

independent research organisation. This was a mid-term report, and the Trustees were impressed that the Director's team scored very highly, with a few excellent suggestions that will be implemented accordingly.

Our research activities continue to gain greater international recognition. Director Professor Graham Le Gros and Professor Franca Ronchese both presented at conferences in several countries during the year, including two very well attended engagements at the National Institutes of Health in Washington DC.

Our commercial entities are also progressing well, including the joint venture Wellington Zhaotai Therapies, enabling the Institute to undertake New Zealand's first CAR T-cell therapy clinical trial.

During the latter part of 2018 we said thanks and farewell to Trustee Professor Peter Crampton, who has been a strong advocate of the Institute. In his place, we will be welcoming Professor Parry Guilford, of the University of Otago, to the board. Prof Guilford has a long history of research discovery and commercial success, and is a strong contributor to health science in New Zealand.

To all who read our Annual Report, I trust you find it informative and inspiring.

Mr Graham Malaghan  
ONZM Hon DSc FCILT  
CHAIRMAN

# Director's report



The Malaghan Institute has hit several key milestones this past year as we continue to grow our scientific and technical capabilities.

The first was the Health Research Council of New Zealand's decision to renew our independent research organisation funding. The independent review panel were impressed by the high quality and impact of our various scientific programmes – a fantastic recognition for our committed and passionate team of science and support staff and of course, our many supporters.

Within the scientific programmes, the cancer immunotherapy team has made huge progress in developing CAR T-cell technology. The upcoming clinical trial, planned for 2019, will be a first for New Zealand and a major focus of the Institute's clinical programmes for several years. We also committed to building the capability for a therapeutic hookworm trial for treating human allergic disease in the coming year.

This year also saw significant investment in our allergy programme, again by the Health Research Council, towards essential big-picture understanding of dendritic cells. It's no longer enough to look only at dendritic cells associated with allergic responses. We must compare them against all types of pathological responses in order to tease out correlations that may one day lead to new treatments and cures for allergies.

We are also incredibly grateful to have received financial support from the Lion Foundation to upgrade our biomedical research unit, the 'bedrock' of the Institute's research programmes.

As mentioned by our Chairman, we have undergone a strategic review of all activities at the Malaghan Institute this year, with the view to improving and quickening the pace of discovery and translation of discoveries into tangible results. It has been an extremely thorough process, with international and national engagement accompanied by a lot of internal discussion.

Lastly, for those who have supported and collaborated with the Institute in our long history, I acknowledge and thank you for your trust which has brought us this far. It is my firm belief that the Institute is on a steady path of discovery as we enter an exciting period of impact on health.

Professor Graham Le Gros  
CNZM, FRSNZ, FRCPA(Hon)  
BSc, Dip Immunol, MPhil, PhD

DIRECTOR

# Trust Board profiles

## MR GRAHAM MALAGHAN

ONZM, FCILT, Hon DSc (VUW) (Chairman)



Graham was appointed Chairman of the Malaghan Institute Trust Board in 1990. He was first employed at General Foods Corp in 1967, and was appointed General Manager of Refrigerated Freight lines in 1970, acquiring the company in 1987. Graham was founding Chairman of Tasman Express Line and a member of the Land Transport Safety Authority for six years. In 2009 he was awarded an Honorary Doctorate of Science from Victoria University of Wellington for his key role in rebuilding the Malaghan Institute into the largest independent medical research organisation in New Zealand. Recipient of the Sir Bob Owens award in 2010 for contributions to the transport, logistics industries and the community, Graham was made an Officer of the Order of Merit for his services to medical research and philanthropy in 2012. His current directorships include several private companies.

## PROFESSOR GRAHAM LE GROS

CNZM, FRSNZ, FRCPA (Hon), BSc(Massey), Dip Immunol(Otago), MPHIL(Auckland), PhD(Auckland) (Director)



Graham was appointed to the Trust Board in 1995. Awarded a Fogarty Fellowship at the National Institutes of Health, Washington DC from 1987-1989, Graham then took a scientist position with Ciba-Geigy in Basel Switzerland for five years before returning to New Zealand to take up the position of Research Director of the Malaghan Institute in 1994. Graham is a Professor of the School of Biological Sciences, Victoria University of Wellington. A Fellow of the Royal Society of New Zealand, in 2014 he was made a Companion of the New Zealand Order of Merit for his services to medical research.

## MR JOHN BEATTIE

LLB MAICD (VUW)



John was appointed to the Trust Board in 1991 and is the Chairman of Malcorp Biodiscoveries Limited, a subsidiary of the Malaghan Institute and a Trustee of Wellington Zhaotai Therapies Ltd. After obtaining a law degree from Victoria University of Wellington in 1975, John was a Fulbright Scholar to Cornell University in 1979. He is Chairman of CropLogic Ltd, Fluent Scientific Ltd and the NZ Sports Hall of Fame and a trustee of the Wanaka Festival of Colour and the NZ Diabetes Foundation. John has been a partner in national law firm Kensington Swan, General Manager of Brierley Investments Limited and was the co-founder of Genesis Research and Development Corporation Limited with the late Professor Jim Watson, a former Trustee of the Malaghan Institute.

## MR MATTHEW MALAGHAN

BCom MBA



Matthew was appointed to the Trust Board in 2008. Graduating from the University of Otago with a commerce degree in 1994, Matthew went on to work with Refrigerated Freight Lines in Auckland and Melbourne, and Sea Containers Group in London, Madrid and Buenos Aires. He is Managing Director of the AUSPERL Group with quarrying, processing, sales and engineering operations in Spain, Australia and New Zealand. Matthew is President of the Perlite Institute (USA) and a member of the New Zealand Institute of Directors.

## DR DIANNE MCCARTHY

CNZM, CRSNZ, PhD, MSc(Hons), BA, BSc



Dianne was appointed to the Trust Board in 2015. Chief Executive of the Royal Society of New Zealand from 2007-2014, Dianne has more than 20 years of experience in various management and governance roles in the tertiary education, science and health sectors. She is a Director of Powerhouse Ventures Ltd, the Cawthron Institute, the New Zealand Institute of Economic Research, and a member of the governance groups of the Dodd-Walls Centre for Photonic and Quantum Technologies, and two National Science Challenges – Ageing Well (which she chairs) and Healthier Lives. She is also a Trustee of the Hearing Research Foundation (NZ). Dianne was made an Officer of the New Zealand Order of Merit for services to education in 2008, a Companion of the Royal Society of New Zealand for services to science in 2015, and a Companion of the New Zealand Order of Merit for services to science, business and women in 2016.

## MS NICOLA SLADDEN

LLB MPH



Nicola was appointed to the Trust Board in July 2014. In 2015, Nicola was appointed Banking Ombudsman after four and a half years as Deputy Banking Ombudsman. She has more than 15 years' experience in dispute resolution, a law degree from Victoria University of Wellington and a Master of Public Health from Boston University. Nicola was previously the Chief Legal Advisor at the Office of the Health and Disability Commissioner and has worked in private practice. She has published and presented on dispute resolution in New Zealand and abroad.

## PROFESSOR MIKE WILSON

MA PhD (Cantab)



Mike was appointed to the Trust Board in 2013. He is Pro Vice-Chancellor for the Faculties of Science, Engineering, Architecture and Design at Victoria University of Wellington. Graduating with a first-class natural science degree from Cambridge University in 1980, Mike was awarded a PhD in Physics in 1984 after carrying out research with the Radio Astronomy Group at the Cavendish Laboratory. He was made Lecturer in Applied Mathematics and was subsequently promoted to Senior Lecturer, Reader and Professor of Applied Mathematics before becoming Head of the School of Mathematics at the University of Leeds in 2001. In 2005, he was appointed as Dean for the Faculty of Mathematics and Physical Sciences at the University of Leeds before joining Victoria University.

## MR BRYAN JOHNSON

ONZM BCA (VUW)



Bryan was appointed to the Trust Board in 1998. Graduating with a commerce degree from Victoria University of Wellington in 1963, he was a senior partner in the stockbroking company Jarden & Co for 25 years, becoming Chairman after the sale of the business to Credit Suisse First Boston in 1991. Bryan retired from Credit Suisse First Boston in 2000 to further develop his Marlborough winery and vineyard, Spy Valley. He has been a director of various corporations, including Brierley Investments and Royal Sun Alliance and was Chairman of the Duke of Edinburgh's Award and a Trustee of the Wellington Stadium Trust. Bryan is also the Founder President of First NZ Capital. In 2015 he was made Officer of the New Zealand Order of Merit for his services to business and philanthropy.

## DR DAVID MOSSMAN

QSM, BVSc, MRCVS, MNZIF



David was appointed to the Trust Board in 2005. He attended Lincoln College before graduating from the University of Queensland in 1965 with a veterinary degree. David was awarded the Australian College of Veterinary Scientists college prize in 1978 and in 1984 the Coopers NZ Farm Management Award for significant innovative farm management in New Zealand. He was keynote speaker at the World Angus and Hereford Conferences. A member of the Lindisfarne College Board 1981-85, David is managing director of private farming, forestry, finance and property companies. He is President of the Hawke's Bay Friends of the Malaghan Institute and retired rural veterinarian since 2001. In 2012 David was awarded the Queen's Service Medal for services to veterinary science.

## ASSOCIATE PROFESSOR JOHN CARTER

MNZM, B Med Sci, Mb ChB., FRACP, FRCPA



John was appointed to the Trust Board in 2003. He is an Associate Professor of the University of Otago and clinically practices as a haematologist with a focus on stem cell transplantation. John undertook postgraduate work at the Fred Hutchinson Cancer Research Centre and the University of Washington. He is the past Chair of both the New Zealand Blood Service and Scots College, and has recently retired as Medical Leader of the Wellington Blood and Cancer Centre.

## MR C DAN WILLIAMS

CA



Dan was appointed to the Trust Board in 2005. He joined an antecedent firm of Deloitte in 1958 and after four years with the firm in London, was admitted as a partner in 1972. He was initially the partner responsible for establishing the tax division then a business advisory partner. Retiring in 2001, Dan is now a consultant to Deloitte. He has a number of private company directorships with emphasis on financial management.

## PROFESSOR PETER CRAMPTON

MBCbB, PhD, FAFPHM, MRNZCGP



Peter was appointed to the Trust Board in 2008. He is Pro Vice-Chancellor of the Division of Health Sciences and Dean of the University of Otago Medical School. Peter is a specialist in public health medicine, with research focused on social indicators and social epidemiology, health care policy and health care organisation and funding.

## MR IAN PATERSON

QSM, DipAg



Ian was appointed to the Trust Board in 2016 and is Chairman of the Advocacy Group. Ian and his late wife Sally established Just Paterson Real Estate in 1990. Ian donates a considerable amount of his time to charity. He is also an award-winning REINZ auctioneer which proves to be a very useful skill when supporting charities across New Zealand. He was awarded a Queen's Service Medal for services to philanthropy in 2016.

# Cancer immunotherapy

The cancer immunotherapy team, led by Hugh Dudley Morgans Fellow Professor Ian Hermans, uses fundamental research into the immune system to explore novel mechanisms to target and treat a range of cancers.

## CAR T-CELL PROGRAMME

CAR T-cell therapy is a revolutionary new approach to fighting cancer by redirecting a patient's own immune cells to impart long-lasting protection from the disease. With the establishment of joint venture Wellington Zhaotai Therapies Ltd in May 2017, progress continues towards running New Zealand's first CAR T-cell clinical trials. Clinical Director Dr Rob Weinkove is leading the team in perfecting the third-generation CAR T-cell manufacturing process and ensuring the Malaghan Institute meets strict regulatory and safety requirements. The team aims to conduct a phase 1 trial in the first half of 2019.

## VACCINE DEVELOPMENTS

Driven by the exploration of novel chemical compounds developed by collaborators at the Ferrier Institute, the Malaghan Institute is exploring several different cancer vaccine programmes and several avenues of intellectual property associated with them.

## MAIT cells and T-cell response

In collaboration with Professor Vincenzo Cerundolo of the Weatherall Institute in Oxford, the team has been investigating whether MAIT cells (mucosal associated invariant T-cells) are involved in driving conventional T-cell responses and if this relationship can be exploited to develop targeted vaccines.

## Breast cancer

The team has received a \$248,900 research grant from the Health Research Council, Breast Cancer Cure and Breast Cancer Foundation NZ to investigate potential new vaccines for breast cancer.

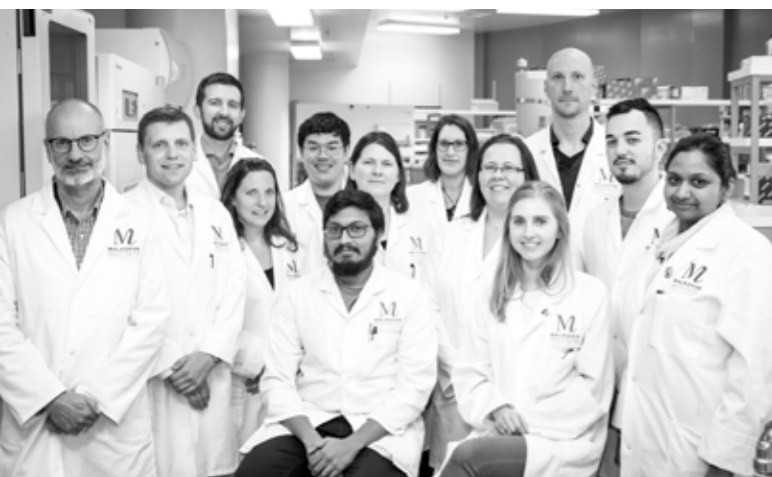
"By using targeted vaccines to induce a powerful immune response in the tissues where cancer is at risk of recurring later in life, the ultimate goal of this research is to provide protection against relapse in breast cancer patients," says Dr Weinkove.

## Melanoma

The Institute's phase II clinical trial of a novel vaccine designed to stimulate an immune response to melanoma wrapped up this year with recruitment of the final patient. The data generated from this exploratory work is now being collated and analysed, with results expected next year.

## HYPOXIA-ACTIVATED CANCER DRUGS

With funding from the Maurice Wilkins Centre and a further \$600,000 grant from the Health Research Council over the next three years, the team is continuing its investigation into a series of novel drugs developed at the University of Auckland which eliminate regions that lack oxygen (hypoxia) from solid tumours. The idea is that hypoxic regions are highly immunosuppressive, and that eliminating them will significantly improve immunotherapy.



From left: Prof Ian Hermans, Dr Robert Weinkove, Dr Philip George, Dr Laura Ferrer-Font, Kef Prasit, Dr Nathaniel Dasyam, Kathryn Farrand, Dr Astrid Authier-Hall, Dr Brigitta Mester, Olivia Burn, Dr Olivier Gasser, Joshua Lange, Dr Karmella Naidoo (not pictured: Ching-Wen Tang, Regan Fu, Dr Taryn Osmond, Bethany Andrews, Dr Giulia Giunti, Evelyn Bauer, Kirsty Wakelin, Georgina Bird, Phoebe Harmes, Bethany Andrews)

# Cancer cell biology

The fundamental discovery that mitochondria can move between cells continues to gain momentum for the cancer cell biology team led by Professor Mike Berridge. New avenues of research are unfolding, leading to further impact from this discovery.

## MITOCHONDRIAL TRANSFER IN BONE MARROW TRANSPLANTATION

The team is investigating whether mitochondrial DNA transfer, which was established in melanoma and breast tumour models, can be successfully applied to other parts of the body.

"To determine whether this phenomenon occurs elsewhere, we teamed up with Dr Melanie McConnell to develop a bone marrow transplantation model, and with Clinical Director Dr Rob Weinkove to explore mitochondrial transfer in human bone marrow transplant patients and in human cell co-cultures," says Prof Berridge.

While this Marsden-funded project is yet to demonstrate mitochondrial transfer in bone marrow transplants, the methods developed and knowledge generated have been invaluable to other ongoing cancer research projects.

## MITOCHONDRIAL TRANSFER IN THE BRAIN

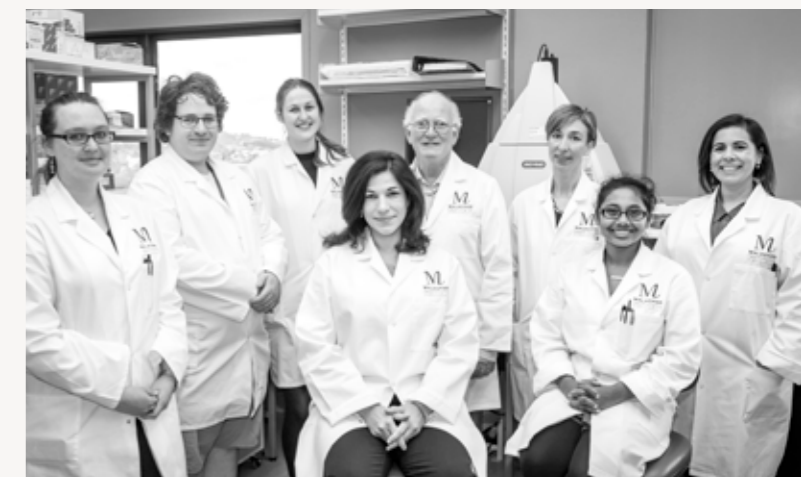
Funded by the Health Research Council and the Cancer Society NZ, the mitochondrial transfer programme has been extended to an aggressive brain tumour model. The team found that glioblastoma cells without mitochondrial DNA obtain mitochondria from normal brain cells, forming tumours after several months. The programme has also explored a number of methods of depleting mitochondrial DNA and measuring mitochondrial and nuclear DNA damage for use in ongoing and future experiments.

The team is collaborating with Professor Jiri Neuzil, Dr Stepana Boukalova (who is visiting the Malaghan Institute for six months from the Czech Republic), and Dr Lanfeng Dong from Griffith University, to consolidate and extend this work for high impact publications.

## CELLULAR COMMUNICATION IN TUMOUR BIOLOGY

Nanopore-based MinION sequencing is a key investigative tool at the Institute. Used to sequence mitochondrial and nuclear genes, it enables us to explore changes in gene expression associated with mitochondrial DNA deletion and acquisition, and communication between mitochondria and the cell nucleus.

"By comparing the gene expression profiles of tumour cells with and without mitochondrial DNA, we have discovered that a small group of genes which regulate immune and stress responses in breast cancer are controlled by the presence of mitochondrial DNA," says Prof Berridge. "This project will contribute to our growing interest in tumour immunology and cell-based immunotherapy."



From left: Georgia Carson, Matt Rowe, Rebecca Dawson, Carole Grasso, Prof Mike Berridge, Marie-Sophie Fabre, Catherine Edwards, Leticia Castro (not pictured: Dr Melanie McConnell, Dr Patries Herst, Dr James Baty, Dr David Eccles, Nicole Jones, Remy Schneider, Dinindu Senanayake, Brittany Lewer, Dr Stepana Boukalova)

# Asthma, allergy and parasitic disease

With several key research projects completed in the past year, Professor Graham Le Gros' asthma, allergy and parasitic disease team is on the cusp of delivering real breakthroughs for human health using therapeutic hookworm.

## IL-4 RESEARCH

Honouring the outstanding 30-year collaboration with the late Dr William Paul, of the National Institutes of Health in Washington DC, the team was invited to publish a collection of work in tribute to Dr Paul.

"The purpose of the paper was to understand how a key hormone, IL-4 – which has long been associated with allergic disease – may actually control the development of the disease in the first place," says Professor Le Gros.

The work underpins cutting-edge anti-IL4 receptor therapeutic antibodies, which thus far have proven a success in clinical trials.

"It emphasises that what we see in preclinical models is also occurring in human disease – paving a way for a very exciting future for treating a lifetime suffering of allergic disease."

## THERAPEUTIC HOOKWORM TRIAL ON THE HORIZON

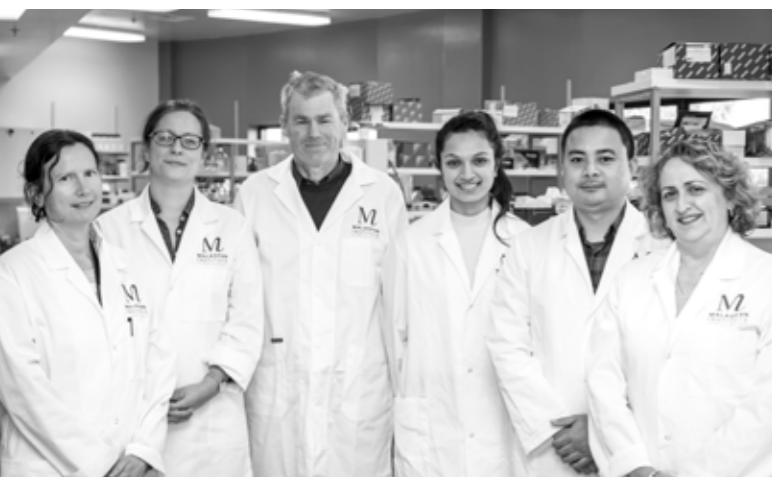
Through cumulative work spanning several years, the team now has a high level of understanding how certain species of worms may modulate the human immune system.

The parasitology team is working to establish good manufacturing practice (GMP) grade therapeutic products from hookworm to use in clinical trials. The ultimate goal of this work is to investigate treatment options for gut disease such as colon cancer and prevent inflammatory conditions in areas like the asthmatic lung.

## POTENTIAL NEW AVENUE FOR TARGETED HOOKWORM THERAPY

Asthma research originally carried out by postdoctoral researcher Tiffany Bouchery has identified a novel feeding mechanism of certain pathogenic parasites, with the results published in *PLOS Pathogens* this year.

"We're pleased to have made a significant contribution to global knowledge about tropical diseases with a novel strategy to target the blood feeding behaviour of hookworm, a disease that affects more than one billion people worldwide each year," says Prof Le Gros.



From left: Melanie Prout, Dr Kara Filbey, Prof Graham Le Gros, Palak Mehta, Bibek Yumnam, Mali Camberis (not pictured: Dr Christophe Pellefigues, Kimberly Meijlink, Jodie Chandler)

# Immune cell biology

Led by Professor Franca Ronchese, the immune cell biology team's focus has been on characterising dendritic cells – the sentinels of the immune system – in both allergic and non-allergic responses.

## TSLP: A KEY MOLECULE IN IMMUNE REACTIONS

Health Research Council funded research has uncovered a new role for a key molecule in the development of the allergic response. The team has been characterising the effect thymic stromal lymphopoietin (TSLP), an important cytokine in the immune response, on different types of cell populations besides dendritic cells.

"We found that within the 'chain' of immune responses that occur during an allergic reaction, TSLP has multiple entry points," says Prof Ronchese "Not only does it affect dendritic cells which help to initiate immune responses, it also sets up the T helper cells to become a more aggressive type of Th2 cells from the very beginning."

## BIOINFORMATICS IN PROFILING DENDRITIC CELLS

By comparing the genetic and transcriptomic profiles of dendritic cells that initiate allergic responses and those that do not, the team is isolating and exploring several genetic 'candidates' that are heavily involved in allergic diseases such as eczema.

"Using computational analysis, we've investigated databases of patients with and without eczema, which has helped us identify several genes associated with this disease. This work led us to the same molecules previously identified through our own preclinical research into the allergic response," says Prof Ronchese. "This observation gives us much greater confidence in focussing our studies on these candidates."

The team received a \$1.2 million Health Research Council grant to compare the transcriptomic profiles of dendritic cells in different preclinical models, in order to understand which features are unique to the allergic response.

## COLLABORATIVE GROWTH

Several staff within the immune cell biology programme have made important career advancements this year.

Dr Lisa Connor was awarded a prestigious \$500,000 Sir Charles Hercus Health Research Fellowship to establish her own independent research programme. Lisa has also been appointed as a Lecturer in immunology at Victoria University of Wellington, and will remain a collaborator with the Malaghan Institute.

Kerry Hilligan, who recently completed her PhD at the Malaghan Institute, will take up a two-year postdoctoral position at the National Institutes of Health (NIH) in Maryland, under the guidance of Dr Alan Sher and Dr Dragana Jankovic. At the NIH Kerry will extend her studies on dendritic cells and the programming of immune responses, returning to the Malaghan Institute with a wealth of accumulated knowledge and expertise.



From left: Evelyn Hyde, Dr Olivier Lamiable, Dr Jianping (Mark) Yang, Prof Franca Ronchese, Dr Johannes Mayer, Kerry Hilligan, Kirsty Wakelin, Shiao-Choot Tang (not pictured: Dr Lisa Connor, Rihannon Sexton)

# Translational immunology

Translating fundamental discoveries in the relationship between human health and the immune system to meaningful and practical clinical outcomes underpins the work of Dr Olivier Gasser and his team.

## ATOPIC DERMATITIS PRECLINICAL MODEL

Establishing a preclinical model of atopic dermatitis (eczema) was the focus of Karmella Naidoo's PhD thesis and was published in the *Journal of Investigative Dermatology*. Dr Naidoo is now in a consultancy position within the translational immunology team, with her research laying the foundation for other areas of research within the programme and in the Institute.

## SKIN-GUT AXIS

Funded by the Dairy Goat Co-operative, the team is uncovering the relationship between allergic responses in the skin and subsequent reactions in the gut and lung.

"Using experimental data from Dr Naidoo's research, we've branched into other mucosal tissues. In particular, we want to know what's happening in the gut and lung if you challenge the skin with an allergens, and how it relates to the development of the allergic march in infants," says Dr Gasser.

The team is using high-end assays to investigate whether microbiota-reactive T-cell subsets, such as NKT and MAIT cells, are mechanistically involved in the allergic march using various models of disease.

## MECHANISMS OF ACTION: PHOTOTHERAPY

Phototherapy is an established second line of treatment for dermatological conditions such as atopic dermatitis and psoriasis. Using the preclinical model of atopic dermatitis, the team is investigating phototherapy's largely unknown mechanisms of action, and pursuing avenues to enhance its clinical efficacy. In collaboration with the Ferrier Institute, work is underway to generate novel and proprietary therapeutics that mimic its effects on the skin ("phototherapy in a bottle").

"We're trying to elucidate what we believe is the real mechanism of phototherapy," says Dr Gasser. "We're also planning to do a human trial with eczema patients with Dr Scott Barker from the New Zealand Dermatology and Skin Cancer Centre."

## FLU VACCINE EFFICACY AND PREBIOTIC INTERVENTION

As part of the High-Value Nutrition National Sciences Challenge, the team is looking at the role of the microbiome in enhancing influenza vaccine efficacy.

"Based on the data we have generated so far, we believe that probiotics can restore the waning responsiveness to repeated seasonal influenza vaccination," says Dr Gasser. "Now, we are returning to preclinical models to confirm this hypothesis."



From left: Dr Katherine Woods, Dr Olivier Gasser, Yanyan Li, Dr Karmella Naidoo (not pictured: Aurelie Gestin, Anna Mooney, Angela Jones, Andrew Wilson)

# Multiple sclerosis

Several key advancements in Professor Anne La Flamme's multiple sclerosis (MS) team have been acknowledged in various publications, gaining international recognition.

## MIS416 CLINICAL TRIAL RESULTS

A previous clinical trial determining the optimal dose of the drug MIS416 in patients found that the type of immune response induced plays an important role in determining its efficacy. Developed by Innate Immunotherapeutics, the particle has shown promise for use in regulating immune responses associated with MS.

"The trial ended up being really important in understanding how MIS416 could work and provide benefit – and what you need to get that benefit," says Prof Anne La Flamme.

MIS416 targets myeloid cells which, once activated, calm down the immune response and migrate to the central nervous system, reducing the type of inflammation that leads to MS symptoms. Because a patient's immune system plays a determinant role on the effectiveness of drugs such as MIS416, patients with a slightly different immune system profile had a less effective response to treatment. Work is now underway to apply this knowledge to a recent exploratory clinical trial, completed last year.

The research was a collaborative effort led by Dr Gill Webster (Innate Immunotherapeutics Ltd) with Professor Nancy Mayo (McGill University) and Dr Dalice Sim (Otago University).

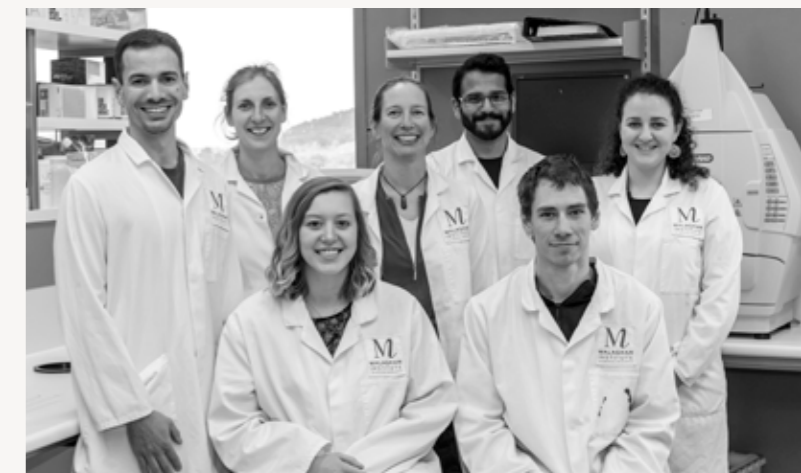
## AWARD-WINNING MONOCYTE RESEARCH

Research into a type of white blood cell has received international recognition by the journal *Immunology & Cell Biology*. The paper, 'Glatiramer acetate treatment normalised the monocyte activation profile in MS patients to that of healthy control' was named runner up publication of the year by the journal's editorial board.

"It was really interesting comparing what monocytes look like in MS patients versus healthy subjects – and what happens when you treat MS patients with glatiramer acetate, a common therapy for relapsing-remitting MS," says Prof La Flamme.

Monocytes – a key white blood cell associated with MS – differ visually between healthy and MS patients. The research found that when MS patients were treated with glatiramer acetate it resulted in monocytes looking more like the healthy subjects.

"No one knows quite how this drug works in MS," says Prof La Flamme, "but this research provides evidence that this monocyte alteration is one of the ways glatiramer acetate modifies the immune system positively."



From left: Carl Beyers, Katharina Robichon, Sarah Ross, Prof Anne La Flamme, Vimal Patel, Sven Sondhauss, Nikki Templeton (not pictured: Lisa Denny, Isabelle Cornfoot, Augustus Anderson)

# Hugh Green Cytometry Core



The Hugh Green Cytometry Core supports scientists to use the Institute's state-of-the-art cytometry, microscopy and immunohistochemistry equipment, including new Cytex Aurora spectral cytometers, funded by the Hugh Green Foundation.

## ISAC COUNCIL: A NEW ZEALAND FIRST

Hugh Green Cytometry Fellow and Head of Research Technology Kylie Price has become the first Kiwi to be elected to the International Society for the Advancement of Cytometry (ISAC) council.

As part of the ISAC council, Kylie will work to further strengthen the ISAC's Shared Research Laboratories program and expand the availability of online and live cytometry education.

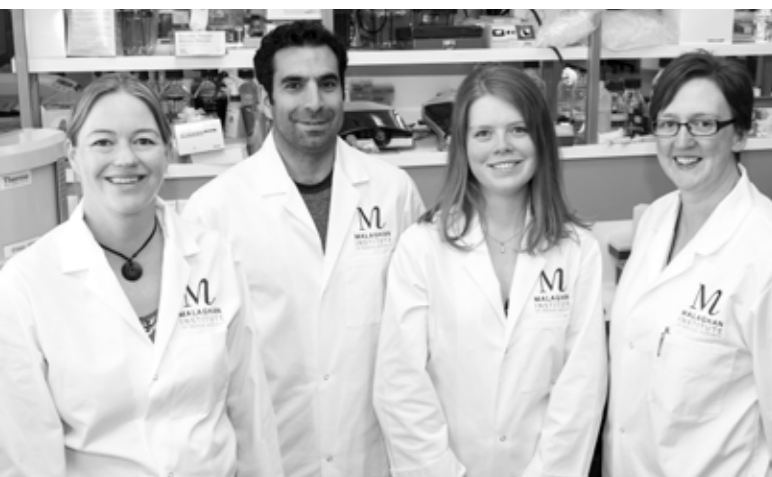
Kylie's appointment recognises her tireless work over the past decade advocating for the use of cytometry in research and her ability to extend her expertise and influence internationally. The appointment also acknowledges the Institute's commitment to using cutting-edge technologies to provide new discovery opportunities for New Zealand scientists.

## AURORA OFFERS QUANTUM LEAP FOR SCIENTIFIC RESEARCH

Another first – for both New Zealand and Southern Hemisphere – was the Institute's purchase of a Cytex Aurora spectral cytometer in late 2017. The Aurora has changed the complexity of experiments that can be carried out in the Hugh Green Cytometry Core, dramatically increasing our discovery potential.

Unlike regular flow cytometry, a spectral cytometer takes the fingerprint of the whole emission spectrum for each fluorescent dye attached rather than a single segment. This unique fingerprint allows us to reliably analyse over 20 different parameters on a cell instantly with only three lasers – something not possible with standard flow cytometry.

The purchase of a second instrument was brought forward to meet demand from the Institute's scientists and the wider scientific community. The instruments will be upgraded with additional lasers to further increase their capability.



From left: Kylie Price, Alfonso Schmidt, Samantha Small, Sally Chappell



# Commercial development

Contributing to the health and wealth of New Zealand underpins the Malaghan Institute's strategic approach. This year the Institute has brought its immunology expertise to bear in a number of commercial applications, working with industry partners and securing new intellectual property to help grow New Zealand's economy.

## COMMERCIAL ENTITIES

### AVALIA IMMUNOTHERAPIES

Following promising results in the infectious diseases space, Avalia Immunotherapies has transitioned its focus towards the development of a hepatitis B vaccine. Working with research partners in Australia and Europe, Avalia will continue to work towards clinical trials for this exciting technology.

### WELLINGTON ZHAOTAI THERAPIES

The Malaghan Institute continues to work closely with our joint venture partners in China to refine production methodologies for New Zealand's first CAR T-cell clinical trials, ensuring all safety and regulatory approvals are met prior to a Phase 1 trial in 2019.

## INTELLECTUAL PROPERTY

The Institute has filed a provisional application in New Zealand (No. 735668) for a patent involving a new way of stimulating T-cell responses against different diseases using peptide conjugates. This work came from our long-standing chemical immunology partnership with Victoria University of Wellington's Ferrier Research Institute.

The patent 'Chimeric antigen receptor containing a Toll-like receptor intracellular domain', licensed to Wellington Zhaotai Therapies (PCT No. PCT/CN2015/086352) was granted in Australia in April 2018.

## COMMERCIAL PARTNERSHIPS

### HIGH VALUE NUTRITION NATIONAL SCIENCE CHALLENGE

Leading on from the clinical study looking at the correlation between the microbiome and responses to the flu vaccine, the high value nutrition programme team is working with industry partners to explore different ways food products can impact human health in both flu vaccine efficacy and immune development in infants.

### DAIRY GOAT CO-OPERATIVE

As part of the Dairy Goat Co-operative's interest in prebiotic benefits for human health, the organisation has funded both a postdoctoral position and research looking into skin-gut interactions and allergic march at the Malaghan Institute.

### AGRESEARCH

AgResearch recently contracted the Malaghan Institute to investigate therapeutic agents and the microbiota in chronic inflammation.





# Publications

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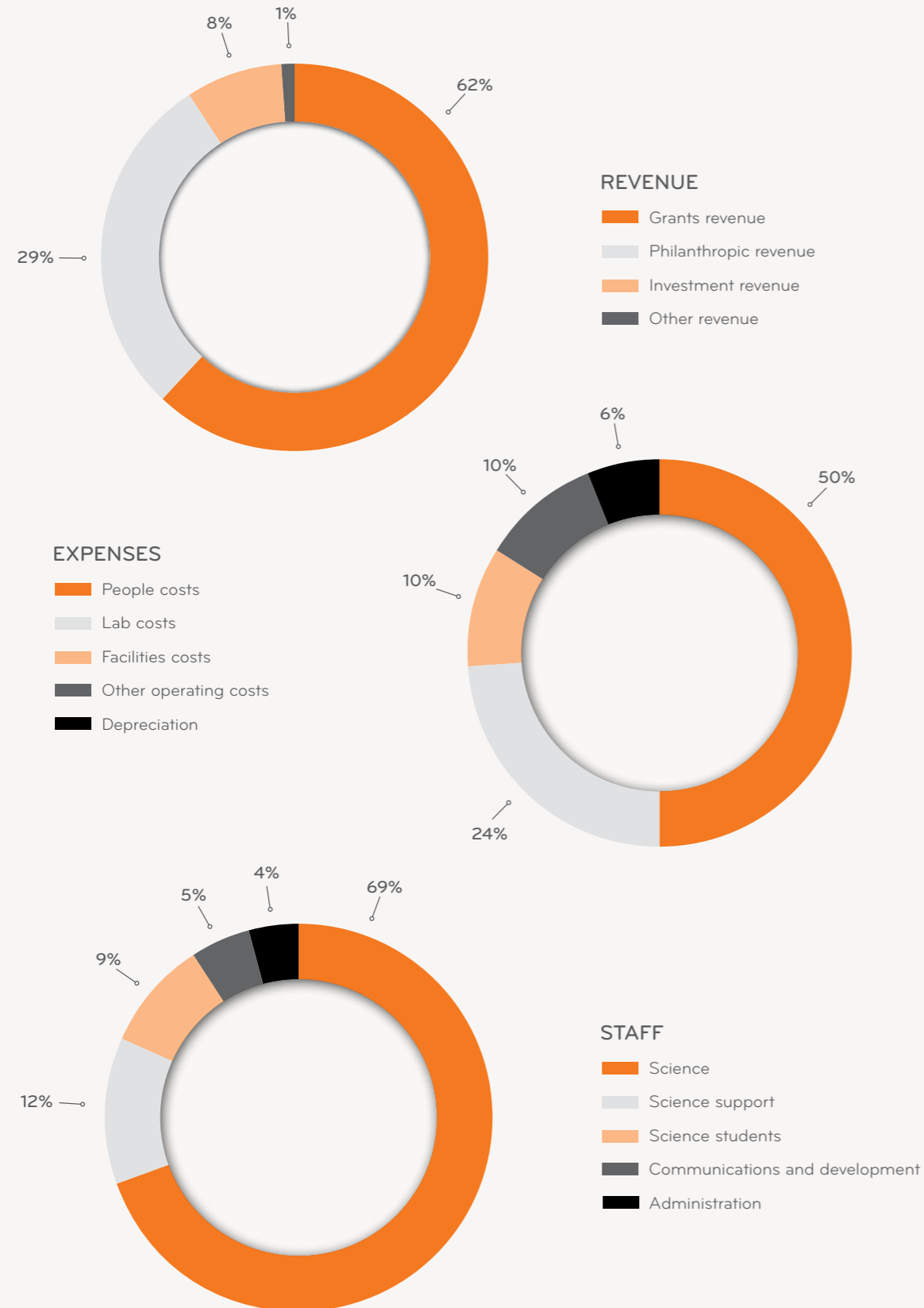
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Berridge M, Grasso C, Neuzil J (2018) Mitochondrial Genome Transfer to Tumor Cells Breaks The Rules and Establishes a New Precedent in Cancer Biology. **Mol Cell Oncol** 5(5).

# Financial overview



## FINANCIAL PERFORMANCE

For the year ended 31 July 2018

	2018 Consolidated	2017 Consolidated
<b>INCOME</b>		
Grants revenue	7,836,393	7,753,381
Philanthropic revenue	3,706,812	7,462,680
Investment revenue	1,053,918	635,655
Other revenue	101,164	973,826
	<b>12,698,287</b>	<b>16,825,542</b>
<b>EXPENSES</b>		
People costs	5,745,723	5,378,371
Lab costs	2,724,901	2,682,474
Other operating costs	1,206,830	1,482,197
Facilities costs	1,175,765	1,177,905
Depreciation	694,000	578,429
	<b>11,547,219</b>	<b>11,299,376</b>
<b>SURPLUS/(DEFICIT)</b>		
Share of surplus/(deficit) of associates	(252,397)	(588,791)
Total comprehensive revenue and expense	<b>898,671</b>	<b>4,937,375</b>

## FINANCIAL POSITION

As at 31 July 2018

	2018 Consolidated	2017 Consolidated
<b>ASSETS</b>		
Current assets	12,469,016	11,552,956
Non-current assets	8,567,984	8,225,604
	<b>21,037,000</b>	<b>19,778,561</b>
<b>LIABILITIES</b>		
Current liabilities	2,040,656	1,680,887
	<b>2,040,656</b>	<b>1,680,887</b>
<b>NET ASSETS</b>	<b>18,996,344</b>	<b>18,097,673</b>

# Funding sources

We are honoured to receive support from the following organisations, businesses, trusts and individuals.

## GRANTS, TRUSTS AND FOUNDATIONS

AgResearch	Gwen Malden Charitable Trust	Maurice Wilkins Centre	The Estates of Ellen, Sinclair, Barbara and Alison Wallace
Albert (Pat) Devine Charitable Trust	Health Research Council of New Zealand	Ministry for Business, Innovation and Employment	The Giltrap Family Trust
BEA Trust	Hugh Green Foundation	NZ Community Trust	The Great New Zealand Trek Charitable Trust Inc.
Cancer Research Trust New Zealand	Infinity Foundation Limited	NZ Society of Oncology	The Herbert Teagle Masonic Perpetual Trust
Cancer Society, National Body	James Russell Lewis Trust	Pelorus Trust	The Lion Foundation
Carol Tse (No 2) Family Trust	Jennifer Smith Family Trust	Rex and Betty Coker Foundation	The Nick Lingard Foundation
Colin Williamson Charitable Trust	Joan Fernie Charitable Trust	S J Shayle-George Charitable Trust	The Paddy Brow Charitable Trust
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Glenpark Foundation			

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The following people generously left bequests to the Institute:	Michael W Foster	Catherine Mary Miles	The Margaret Ann Tibbles Charitable Trust
Erica Florence Brodie	Paul Kingsley Garner	Edward Malcolm Morgan	Max Tuohy Wilkinson
Walter Arthur Clark	Lois Karen Goodger	Rowena Somogyváry	Howard Ivan Witheford
Barbara Anne Clunis-Ross	Elizabeth Anne Harley	Betty Stoker Charitable Trust	
Beth Donald Trust	Margaret Livingstone	Ronald John Thomson	

## IN MEMORIAM

Gifts were received in memory of the following people:	Marjorie Jean Duffy	Greg McKay	John Henry White
Yvonne Cattermole	Russell Gould	Trevor Melville	Ashley Wright
Mary Clarke	Lesley Grant	Mark Robertshawe	Joy Vickers
Daniel D'Esposito	Edna Mae Jamieson	Stan Witkowski	

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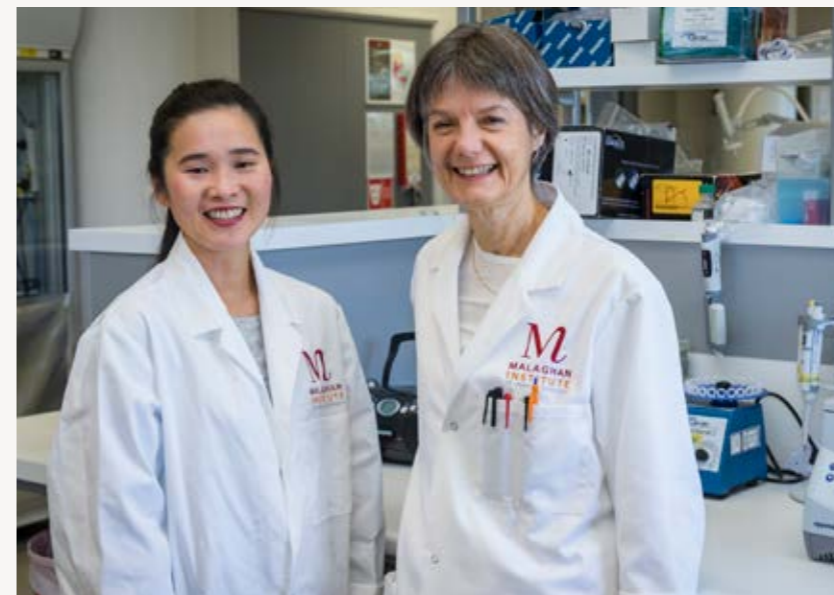
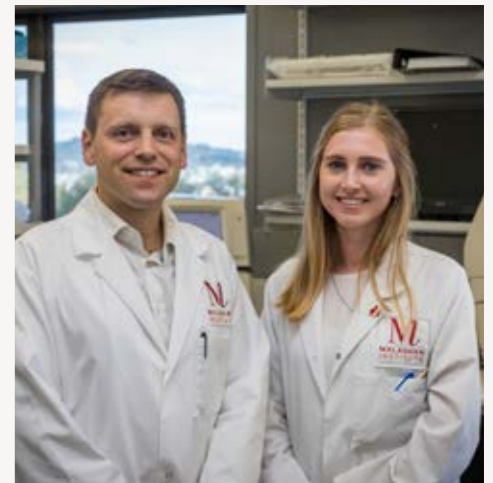
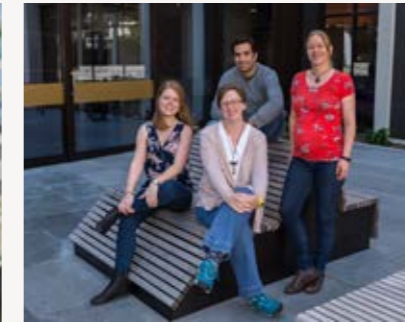
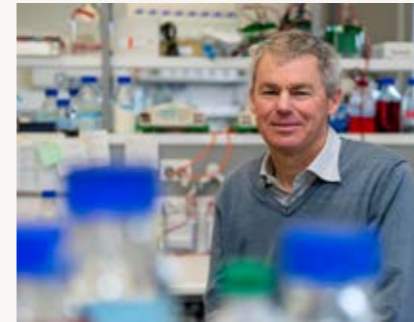
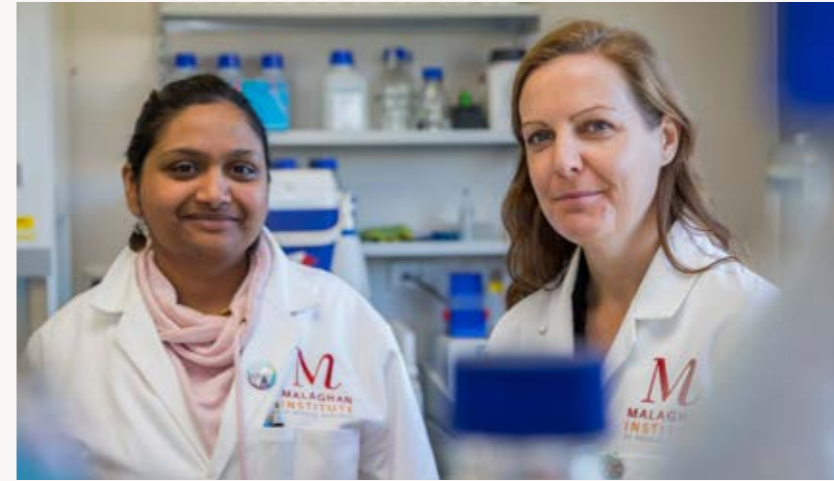
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We would like to acknowledge and thank the Friends of the Malaghan Institute including Chairs Linda Robert (Auckland), Rick Hart (Taupo), Denise Bull (Hawke's Bay), Kelly Sutton (Wellington), as well as all our event supporters and community groups. Their generosity with their time and fundraising efforts is gratefully appreciated.



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**Dr Jianping (Mark) Yang** | BM(Shanxi) – Senior Research Officer

**Bibek Yumnam** | MSc(India) – Research Officer

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**Sally Culbert** | BBS – Finance(Massey) – Management Accountant (part-time)

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**David Lin** | CA(NZICA), MBA(VUW), MAF(VUW) – Head of Finance

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**Gail Marshall** | BA, GDipArts(VUW) – Head of Communications (part-time)

**Heike Menne–Spohr** | MCom(VUW), BCom(Hons)(UNISA) – Head of HR and Research Office

**Maree O'Connor** | DipBusStuds, DipMgt (NZIML) – Assistant Accountant (part-time)

**Nicola Olson** | CA(NZICA), BCA(VUW), BA(VUW) – Financial Accountant (part-time)

**Lucy Pearce** | BSc (Otago) – Business Development Officer (to Jan 2018)

**Lene Petersen** | Accounts Payable (part-time)

**Ilse Potes Morales** | BMktg and Advertising(San Martin) – EA to Director and General Manager

**Raewyn Roberts** | Trained Teachers Certificate – Funding Manager Auckland (part-time)

**Tony Robinson** | BA(Cantab), MA(Hons)(Aberdeen), PGCE(Oxford) – Funding Manager (to Feb 2018)

**Jennifer Sheil** | MSc Science Communication(Otago NZ) – HR and Research Office Advisor (to Jul 2017)

**Jenny Sim** | Head of Development

**Darrell Smith** | MSc(Hons)(VUW), BSA(Massey) – Head of Facilities (Part-time)

**Jo Timewell** | Facilities Assistant

**Apii Ulberg** | Cleaner

**Laura Van Til** | BSc – Casual Science Writer

**Nicholas Walshe** | Head of HR and Research Office (to Oct 2017)

**Maggie Weber** | MComm(Mgmt) – Fundraising Administrator

**Mike Zablocki** | BA(Hons)(Bristol), PGDipBA(VUW) – General Manager



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