

A smiling woman with grey hair tied back, wearing a white lab coat and pink gloves, is seated in a laboratory. In the background, there are various lab equipment, including a rack of test tubes and a blue chair.

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MALAGHAN
INSTITUTE
OF MEDICAL RESEARCH

ANNUAL REPORT

2023

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TE URUNGI MĀORI

Year in review

Thank you! Our research would not be possible without the wonderful support from our community.

THANKS TO YOU WE:

RAISED OVER

\$**340,000**

IN OUR RECORD-BREAKING 2023 ANNUAL APPEAL

AND GAINED

1,248 NEW SUPPORTERS

– THAT’S A LOT OF PASSIONATE KIWIS HELPING US HARNESS THE POWER OF THE IMMUNE SYSTEM!

WE HAD SOME AMAZING FUNDRAISERS



Kate Twigg’s
Mohawk Madness

RAISED
\$17,650



March for Myeloma

RAISED
\$8,476

“By supporting the Malaghan’s research, you are giving hope to people like me, now and into the future, that they will have the best chance available to fight their disease.”

– Colin MacDonald, cancer survivor and fundraiser

OUR RESEARCH

All your support translates into life-saving research! Here are some of this year’s highlights:



MORE DIETARY FIBRE FOODS COULD HELP BRING DOWN ALARMING DIABETES TYPE-2 RATES IN MĀORI

NZ Herald, 21 September 2022



COVID-19: KIWI-MADE BOOSTER EDGES CLOSER TO HUMAN TRIALS

NZ Herald, 13 January 2023



DISCOVERY OFFERS CLUES ON WHAT CAUSES IMMUNE CELLS TO DRIVE ALLERGIC DISEASE

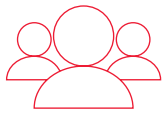
Allergy Today, 21 December 2023



WAHINE MĀORI SCIENTIST’S ‘GROUND-BREAKING’ CANCER RESEARCH

Te Ao Māori News, 29 April 2023

OUR PEOPLE



131 STAFF

75% RESEARCH STAFF

7 PHD + MASTER'S STUDENTS

STAFF ACHIEVEMENTS



DANIELLE SWORD

MĀORI CANCER RESEARCHER AWARD

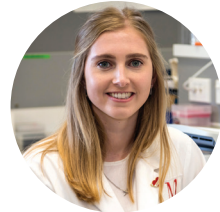
from Te Kāhui Matepukupuku o Aotearoa and Hei Āhuru Mōwai



PROFESSOR MIKE BERRIDGE

HIGHER DOCTORATE

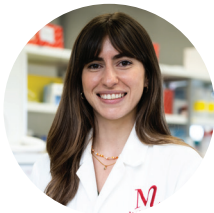
from Te Herenga Waka – Victoria University of Wellington



DR OLIVIA BURN

20TWENTIES YOUNG ALUMNI AWARD

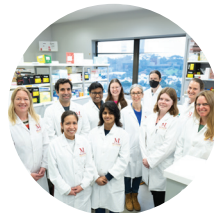
from the University of Otago – Te Whare Wānanga o Ōtākou



DR YASMIN NOURI

WELLINGTON BASIC SCIENCE PHD RESEARCH PRIZE

from the University of Otago – Te Whare Wānanga o Ōtākou



HUGH GREEN CYTOMETRY CENTRE NAMED

CYTEK CENTRE OF RESEARCH EXCELLENCE



DAVID LIN

FELLOW

of Chartered Accountants Australia and New Zealand



NEW ZEALAND DEVELOPED CANCER TREATMENT: ONE STEP CLOSER TO MARKET

RNZ Nine to Noon, 17 May 2023



NEW ZEALAND SCIENTISTS CREATE NEW mRNA-BASED MALARIA VACCINE IN POTENTIAL MAJOR BREAKTHROUGH

Newshub, 21 July 2023



NZ T-CELL THERAPY TRIAL 'STEP CHANGE'

Wairarapa Times Age, 16 August 2023



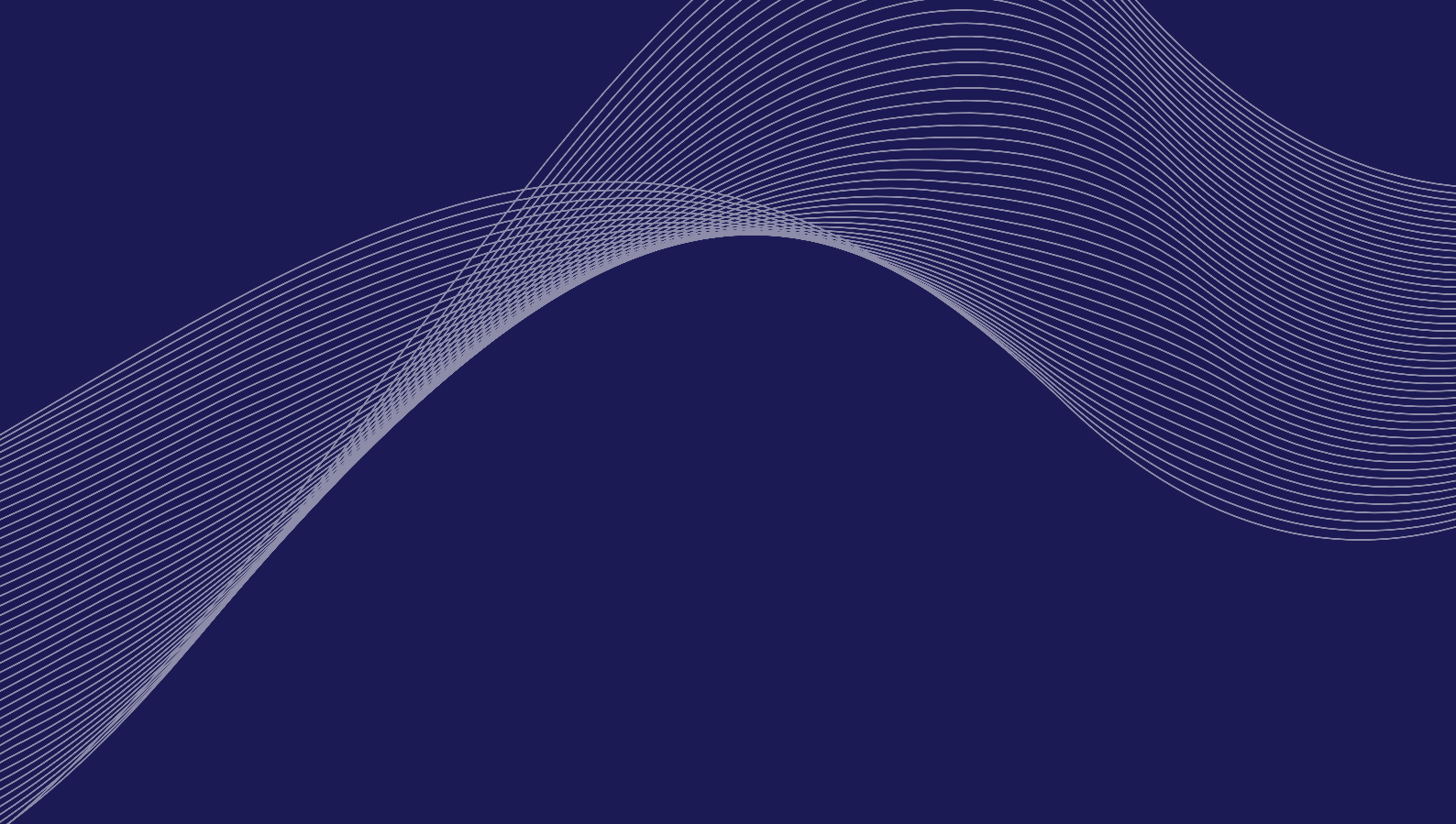
BABRAHAM INSTITUTE TO PARTNER WITH NEW ZEALAND'S MALAGHAN INSTITUTE TO IMPROVE mRNA VACCINES IN OLDER AGE

Cambridge Independent, 2 June 2023



'INFECT AND FORGET': HOOKWORM STUDY SETS GROUNDWORK FOR MEDICATION-FREE MANAGEMENT OF INFLAMMATORY BOWEL DISEASE

NZ Doctor, 19 June 2023



Too many of our loved ones are dying and suffering from diseases we don't know enough about. But we do know the immune system holds the key to prevention, treatment and cures.

Together we can harness the power of the immune system and save lives.



Deeper understanding

We research to understand how to use the immune system to fight disease.



Better treatments

We develop new immunotherapies to more effectively treat disease.



Fairer access

We are committed to taking our research into the community to provide treatment options for all.

The Malaghan Institute is New Zealand's world-class independent biomedical research charity with a focus on breakthrough discoveries in immunology and immunotherapy.

Our journey started more than 50 years ago with a vision to improve the lives of all New Zealanders through advancements in medical research. In 1966, a group of far-sighted New Zealanders set a course for world-class independent medical research to be carried out in Wellington. In 1986, the organisation, then the Wellington Cancer and Medical Research Institute, was renamed the Malaghan Institute of Medical Research in recognition of the generosity of Tip Top founder Len Malaghan and his wife Ann, whose donation of shares from the company seeded the institute.

From benchtop to bedside

Fundamental research meets clinical development at the Malaghan Institute. By bringing together world-class immunological research with clinical expertise, we are uniquely positioned to translate new discoveries into new therapies to prevent, treat and cure disease.

Owned by New Zealand, for all New Zealanders

Our value to New Zealand lies in our independent status as a research organisation, backed by the community. As a registered charity, we are owned by New Zealand, for the benefit of all. Through a range of funding sources, including philanthropic, government and corporate, the Malaghan Institute has developed the capability and expertise to deliver significant health and economic benefits to New Zealand, while retaining the freedom, flexibility and spirit to make breakthrough discoveries.



By conducting fundamental research on the immune system, we create opportunities to discover new therapeutic targets and immunotherapies.



We can apply our discoveries in pre-clinical laboratory models to identify whether they hold potential as new immunotherapies.



The next step is to conduct early-stage clinical studies or trials with collaborators such as doctors and hospitals to determine whether the therapy has a positive impact on participants' health.



The final stage in the development pipeline is large-scale, longitudinal clinical trials, with the end goal of integration into the existing healthcare system as a new standard of care.

Chairman's report



During the December 2022 Trust Board meeting, I advised trustees that I would be standing down from my position as chairman in December 2023. Having acted on the board prior to and formally from 1990, it is time for me to step aside.

I am pleased that our deputy chair, Sir Paul Collins, will take on the role of chair. Alongside his significant governance experience, Sir Paul has a strong connection with the institute. His father, Mr Tom Collins, an eminent surgeon in Wellington, was a member of the small group of individuals who initiated the concept of an independent health research facility in the city in the 1960s – the facility that would one day become the Malaghan Institute. Then, as chief executive of Brierley Investments in the 1980s, Sir Paul was involved in a rescue package for the institute after the 1987 share market crash.

During my time as chairman, I am proud to have played a part in bringing our current director to the Malaghan Institute. Graham Le Gros and his wife, Franca Ronchese, joined the institute in 1994. Together they have developed a strong team of researchers and brought the focus on immunology to the institute that we see today. They have worked tirelessly to deliver outcomes for a healthier New Zealand, with singular success. Having worked with Graham for some thirty years, I can say he is an outstanding New Zealander. Not only has he contributed to his country and to world knowledge, his ability to do world-recognised research has seen the retention of high-calibre researchers and a succession of high-achieving PhD students.

The institute has had another busy year, completing a vaccine to enhance protection from Covid, which is now ready for human trials. This feat was accomplished by bringing together resources and talent from the University of Otago and Victoria University of Wellington, spearheaded by the Malaghan Institute. Planning for the phase 2 clinical trials of our CAR T-cell therapy has now been committed by trustees, but significant financial effort and strategy will be needed, which will most likely require resources beyond those we have in-house.

Graham and Franca travelled to Europe mid-year, presenting papers to various prestigious conferences and holding

meetings with a number of potential collaborators to enhance our scientific capabilities. Meanwhile, numerous research papers were accepted in influential scientific journals, giving our research teams further international recognition.

During the year we were saddened to lose two trustees: John Beattie, who joined the board with me in 1990, and Dan Williams, a trustee for some 15 years. Both were great contributors.

But the recruitment of new trustees over recent years has ensured the board is well positioned to take the institute into the future. During this time, preparations for succession planning have been discussed, as has the structure of our governance. In early 2023, several sub-groups of the executive committee, along with co-optees, were tasked with looking at our functions on the three- to five-year horizon. These included science priorities, revenues and commercialisation. A report on the governance of the institute was also commissioned.

Sourcing revenue to fund our various science programmes is always challenging. Government sources are understandably restrained, but given our increasing annual expenditures, we are the grateful recipients of significant gifts from donors in the USA, the Hugh Green Foundation and a large bequest, while our own fundraising activities have maintained and grown support across New Zealand.

We are fortunate to have a capable and widely-experienced team of trustees who give their time and experience without remuneration. The management team, led by the director, has also given great dedication to their tasks and to the institute.

To all the researchers, technicians, students and support staff, my congratulations on your success and for exploring the many opportunities ahead.

To all who have supported the institute through your donations, bequests and services, thanks to you all. We could not achieve what we do without you.

I have enjoyed a great journey.

MR GRAHAM MALAGHAN | CHAIRMAN

ONZM, Hon. DSc, FCILT

Director's report



This year's annual report is a significant one. Not only because it marks yet another year of incredible scientific progress across the institute, but because it reports on the last year with our chairman, Graham Malaghan, at the helm.

Graham, whose parents, Len and Ann, were fundamental to the creation of what is now the Malaghan Institute, has served as chairman since 1990. It is no understatement to say his passion and leadership has made an impact on every facet of the Malaghan Institute and has shaped it to the world-class organisation it is today.

Over the last 30 years, Graham and I have built an incredibly strong working relationship with a shared vision for the institute and the need to support independent biomedical research that has real-world impact for New Zealand. We also share a commitment to fostering future science leaders. I believe part of the reason Graham can step back from his position with confidence is thanks to the calibre of people he has helped cultivate at the Malaghan Institute, and seeing some of our long-term goals of translating research for the benefit of the community come to fruition.

Achieving our goal of bringing CAR T-cell therapy to New Zealand patients has not come without enormous pressure on our research teams and support staff. But we are all unanimous that the hard work is justified if we can raise the bar for cancer treatment in New Zealand. I am incredibly proud of our team for meeting challenge after challenge as they forge new ground in this clinical space. There has never been a clinical programme like this before in New Zealand, and its continued success helps pave the way for other life-saving treatments.

We are gearing up for the next phase of our CAR T-cell therapy programme with vigour. My congratulations to General Manager Mike Zablocki, Clinical Director Dr Rob Weinkove and the CAR T-cell team for their fantastic work establishing a scale-up solution for CAR-T cell therapy in New Zealand. Knowing that if we can deliver on this we will have created a cancer therapy that is far cheaper than anywhere else in the world, with features that ensure patients from the regions get access and with a safety profile that looks outstanding, will be a fulfilment for the many patients, donors, researchers,

clinicians and support staff that have given so much to this effort.

We are also on an exciting journey as we embrace RNA technology and the promise it holds for therapeutic development and vaccine security for future pandemics. On the back of her ongoing leadership role with Vaccine Alliance Aotearoa New Zealand, Professor Kjesten Wiig has been key in developing the Malaghan's own RNA capability and in mobilising researchers and stakeholders across New Zealand for the Government's RNA Development Platform, of which she is interim co-director.

Research from Professor Ian Hermans and Professor Gavin Painter from the Ferrier Research Institute is harnessing this very technology, with their mRNA-based vaccine for malaria, developed in collaboration with the Peter Doherty Institute for Infection and Immunity in Australia, stimulating protective immunity in preclinical models.

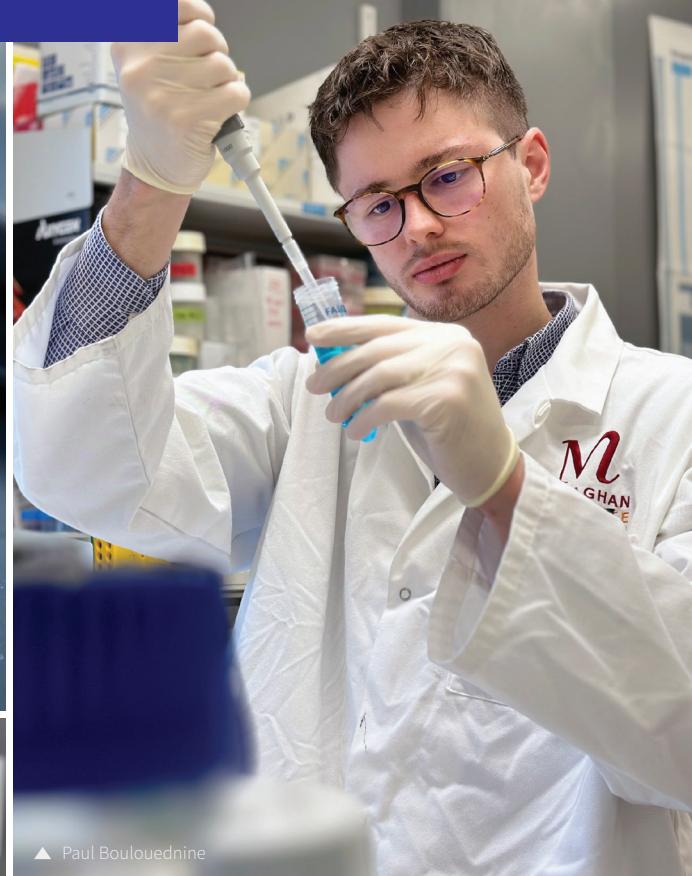
In the allergic and inflammatory disease space, Professor Franca Ronchese and her team continue to make significant progress in determining the origins of allergic skin disease, while Dr Tom Mules, Mali Camberis and Dr Olivier Gasser are doing great research in gut health.

I also acknowledge one of our original Malaghan Institute Fellows, Professor Mike Berridge, who received a Doctor of Science from Victoria University of Wellington last September. We are all proud of what he has achieved as a scientist over an illustrious career.

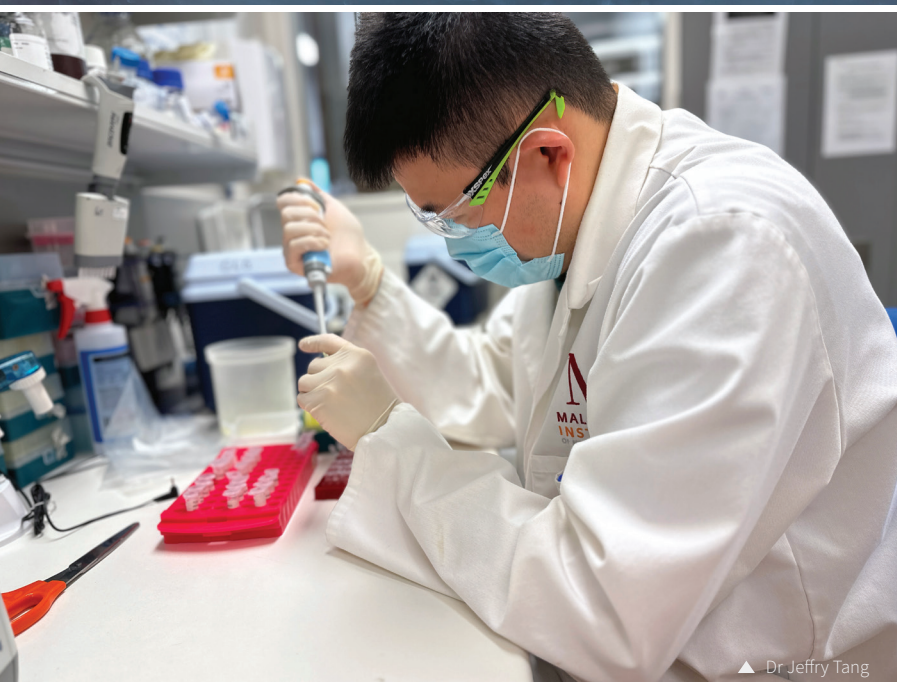
We are privileged to have among us scientists of this calibre, but we cannot and do not work in isolation. It is why we are such strong proponents of Wellington Science City and its promise to build capability in New Zealand's research, science and innovation system through investing in co-location and collaboration.

The Malaghan Institute is ambitious because its supporters are ambitious. Thank you to our many donors, advocates and partners for driving us forward.

PROFESSOR GRAHAM LE GROS | DIRECTOR
CNZM, FRSNZ, FRCPA (Hon), BSc, Dip Immunol, MPHIL, PhD



▲ Paul Boulouednine



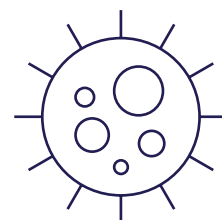
▲ Dr Jeffrey Tang



▲ Dr Georgia Carson

CANCER

Finding better ways to assist the immune system to recognise, prevent and eliminate cancer cells is a core area of research at the Malaghan Institute. Through both fundamental and clinical research, we are changing the face of cancer treatment in New Zealand.



CAR T-CELL THERAPY: REPROGRAMMING A PATIENT'S OWN IMMUNE CELLS TO FIGHT CANCER

CAR T-cell therapy not only has the potential to bring hope to the 21,000 New Zealanders living with blood cancer, it has wider implications for how we treat all kinds of cancer and deliver individualised medicine.

When we launched our CAR T-cell programme in 2016, working on a new CAR T-cell therapy for people with B-cell non-Hodgkin lymphoma, our hope was to develop

a treatment that was safer and more effective than those currently available overseas, that was accessible to all who needed it. Today, as we finalise our phase 1 ENABLE trial and plan for a phase 2 trial in 2024, we are working towards CAR T-cell therapy becoming a standard of care in New Zealand hospitals.

ENABLE trial establishes effective dose range and expands

New Zealand's first CAR T-cell clinical trial, ENABLE, hit a significant milestone in January 2023, treating the 21st and final patient in the dose escalation cohort of this phase 1 trial.

"Safety and efficacy data from the dose escalation cohort has allowed us to determine an optimal dose range for our CAR T-cell therapy," says Clinical Director Dr Rob Weinkove. "We've observed an excellent safety profile, and an encouraging response rate, consistent with commercial CAR T-cell therapies. Preliminary phase 1 trial results have been presented at international meetings, and we anticipate submitting the phase 1 trial results for publication later in 2023."

"These improvements are key to our planned phase 2 trial in 2024 and for future routine care."



The phase 1 trial has now been expanded based on the optimal dose range to incorporate a series of manufacturing and clinical improvements. We expect to complete enrolment to the dose expansion cohort by the end of 2023.

"With this dose expansion cohort we're adopting automated closed-system manufacturing of the CAR T-cells and are embedding outpatient management. These improvements are key to our planned phase 2 trial in 2024 and for future routine care, as it will be simpler, cheaper and faster to manufacture patients' CAR T-cells, and easier for hospitals to deliver the therapy."

Automated manufacturing to scale up CAR T-cell therapy

In a shift that is key to scaling up CAR T-cell therapy in New Zealand, in July 2023 the Malaghan Institute and our partners at BioOra moved to a new automated process for clinical production of patient CAR T-cells.

"This isn't just a process change, this is a step change. It's about democratising a cutting-edge cancer therapy that New Zealanders deserve to have access to, and reducing inequities in cancer outcomes," says Prof Graham Le Gros.

Dr Rob Weinkove says moving manufacture from a time-intensive manual process to an automated one will allow the team to manufacture CAR T-cells more consistently and at scale.

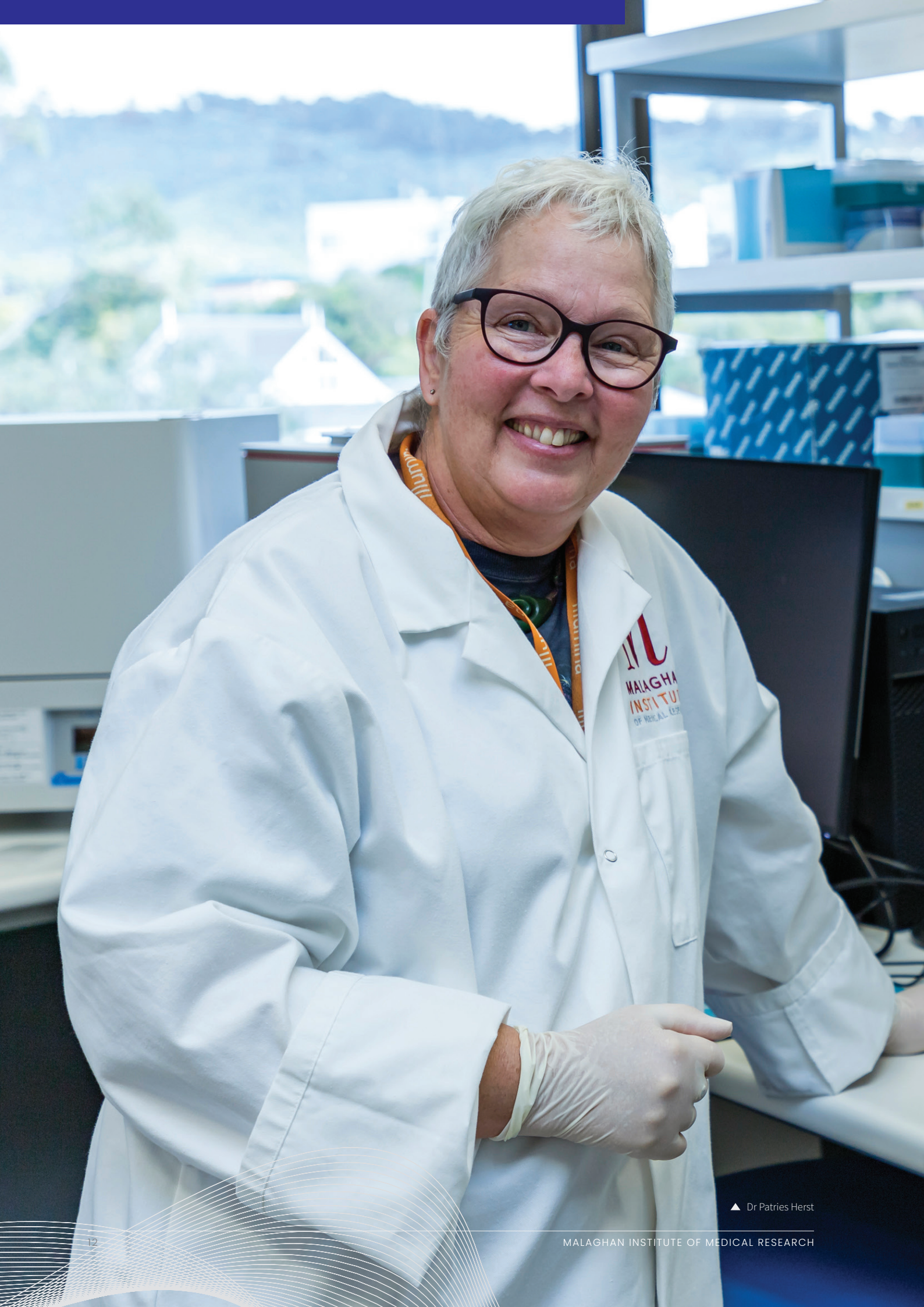
"It's about democratising a cutting-edge cancer therapy that New Zealanders deserve to have access to, and reducing inequities in cancer outcomes."



Until recently, the Malaghan Institute manufactured patients' CAR T-cells manually, a time-intensive process requiring over 40 hours of skilled operator time inside a specialised clean room for each patient's dose.

Working with BioOra – a new company formed between the Malaghan Institute and Bridgewest Ventures in 2021 – this process has now been largely automated, with the manufacture of patient CAR T-cells taking place in Lonza's Cocoon Cell Therapy Manufacturing Platform.

"Automating the manufacture provides significant advantages, including increased throughput and lower costs, while maintaining quality. This is critical to enable us to treat more patients – within our clinical trial programme at first and, we hope, as a future standard of care," says Dr Weinkove.



▲ Dr Patries Herst

RESEARCH HIGHLIGHTS



Lung cancer immunotherapy collaboration tackling health inequities in Aotearoa

A collaboration between the Auckland Cancer Society Research Centre at Waipapa Taumata Rau – University of Auckland and the Malaghan Institute is addressing New Zealand's leading cause of cancer death by improving immunotherapies that target lung cancer. Funded by the Health Research Council of New Zealand and the Maurice Wilkins Centre for Molecular Biodiscovery, the collaboration aims to create new immunotherapeutic tools or stimulants that boost the effectiveness of existing anti-cancer immunotherapies, improving overall patient response rates to this disease.



Research to improve efficacy and application of CAR T-cells

Our CAR T-cell research programme continues to progress several projects aimed at improving CAR T-cell technology, its safety and efficacy, and its potential to be applied to other kinds of cancers. In December 2022, a provisional patent was filed for a new discovery using a surface protein tag as a molecular tracker and safety switch for cell therapies. We continue to carry out in vivo studies to evaluate its efficacy and safety.



RE-TELL: telling the patient side of CAR T-cell cancer therapy

Giving a voice to New Zealand patients undergoing CAR T-cell therapy is important to identify ways to improve patient care and CAR T-cell delivery, and ensure it is accessible to all New Zealanders. Run in collaboration with Francis Health, now Deloitte, and Janssen, the RE-TELL study helped paint a picture of the patient side of CAR T-cell therapy so that the clinical team can optimise quality of care and address any real or perceived barriers to accessing this treatment.



International deal for Kiwi cancer therapy biotech

Wellington Zhaotai Therapies, a joint venture between the Malaghan Institute and Hunan Zhaotai Medical Group, entered a multimillion-dollar commercial deal with leading international pharmaceutical company Dr. Reddy's Laboratories Ltd in April 2023 for an exclusive licence to its unique CAR T-cell technology in India. The agreement gives Dr. Reddy's exclusive licence to trial and commercialise the construct in India, but also signifies a strategic partnership that could potentially extend to other countries and other cell therapies.



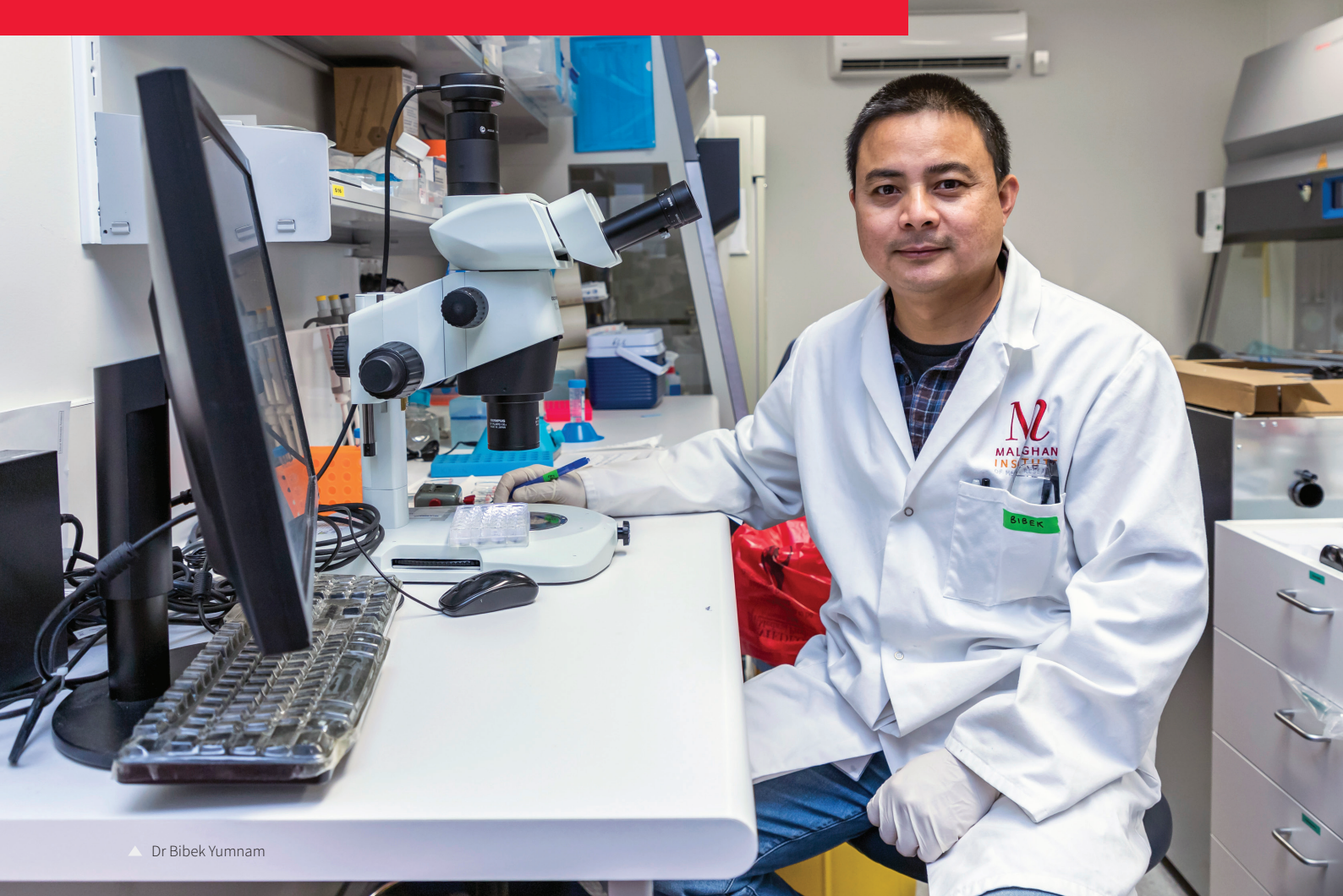
PhD student receives Māori Cancer Researcher Award

Malaghan PhD student Danielle Sword was one of two Māori cancer researchers awarded funding by Te Kāhui Matepukupuku o Aotearoa (Cancer Society of New Zealand) and Hei Āhuru Mōwai (Māori Cancer Research Leadership Aotearoa) to help address health inequities. Danielle, who is undertaking her University of Otago PhD within the Malaghan Institute's CAR T-cell programme, is looking into improving the mechanisms of CAR T-cells in the laboratory and investigating te ao Māori perspectives on CAR T-cell therapy from patients, their whānau and the researcher.



Professor Mike Berridge receives higher doctorate

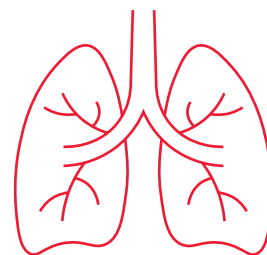
Professor Mike Berridge, whose research career ranges from plant biology to cancer metabolism, was awarded a Doctor of Science from Te Herenga Waka – Victoria University of Wellington at its December 2022 graduation. This higher doctorate recognises more than 45 years of ground-breaking research by Prof Berridge, who is one of the founding scientists of the Malaghan Institute.



▲ Dr Bibek Yumnam

ALLERGIC & INFLAMMATORY DISEASE

The science behind why the immune system can trigger allergic and inflammatory disease is changing rapidly as advancements in technology allow scientists to dive deeper into immune cells than ever before. At the Malaghan Institute we are breaking new ground as we apply our findings from fundamental research in clinical studies. The ultimate goal of our allergic and inflammatory disease research is to find ways to prevent these diseases from occurring in the first place.



CLINICAL STUDY INVESTIGATING IMMUNE CELLS IN THE SKIN

The skin is often the first point of contact for the immune system to interact with our external environment. The immune cells that live in our skin have a crucial role in keeping us safe by identifying what's safe and what's harmful. For those living with allergic or inflammatory conditions, the immune cells in the skin are thought to contribute to the development of these conditions, but the genetic and environmental triggers that cause this are relatively unknown.

"The divide between individual healthy immune cells and allergic immune cells is narrower than previously thought."



New research by the Ronchese Laboratory is investigating whether their previous findings that specific immune cells in the skin act as the 'trigger' for a wide range of allergic diseases can carry over into human studies. Working with clinical immunologist Dr Maia Brewerton, the team is investigating the composition and function of immune cells found naturally in the skin for both healthy individuals and those living with

allergic disease in order to gain a deeper understanding of what drives this phenomenon.

"The aim of this project is to study the impact of immune responses on a specific type of immune cells called type 2 innate lymphoid cells, in both mouse and human skin," says Malaghan Research Fellow Dr Sotaro Ochiai. "Under normal conditions, these cells produce a chemical signal called interleukin-13. Our recent research has shown that this plays a crucial role in the development of pro-allergic skin dendritic cells."

Key to the success of this novel clinical study is investigating the immune cells in 'healthy' populations, not just in those with allergic disease.

"In addition to understanding immune cells of allergic people, in this study we're really trying to establish a baseline understanding of immune cells in the skin of healthy individuals," says Professor Franca Ronchese. "Our research has shown that the divide between individual healthy immune cells and allergic immune cells is narrower than previously thought, so we need to take a wider look at the whole family of immune cells that live in the skin."

HOOKWORM AS A 'MEDICATION-FREE' MANAGEMENT FOR INFLAMMATORY BOWEL DISEASE

Published in *Inflammatory Bowel Diseases*, results from a year-long feasibility study of participants living with ulcerative colitis found that hookworm could offer a medication-free alternative for patients to manage their disease.

"This pilot study is the first controlled evidence in the use of hookworm as a therapy in ulcerative colitis," says Malaghan Institute clinician and gastroenterologist Dr Tom Mules, who led the study alongside Rutherford Clinic gastroenterologist Dr Stephen Inns. "Our study has shown that this kind of therapy is well-tolerated, safe and feasible to take into a full-scale trial.

"One of the key findings was that a single dose of hookworm can reside in the body for several years, if not longer," says Dr Mules. "This means that if hookworm is effective at preventing disease flares, you can get infected with hookworm and potentially no longer have to daily medicate. 'Infect and forget'. The worms just sit there in the background and do their thing. I think that's where the power of this therapy lies."

Throughout the trial, patients who were in remission from ulcerative colitis were infected with a controlled dose of

hookworm larvae or given a placebo. They were followed up regularly over a 12 month period and provided regular feedback on any changes to their gut health or discomfort. Samples were collected throughout the year-long infection to test a range of scientific parameters such as gut inflammation, microbiome and immune cell composition.

"The worms just sit there in the background and do their thing. I think that's where the power of this therapy lies."



"We deliberately chose to target patients with ulcerative colitis in remission," says Dr Mules. "We believe that the effect of hookworm may not be strong enough to push someone from an active disease state into disease remission. However, once they are in remission, hookworm could keep them there, prevent them from having disease flares, and reduce the need to take medication, such as steroids, which suppress the immune system and have adverse effects."

RESEARCH HIGHLIGHTS



Healthy volunteer hookworm study wrapped up

Our study to understand the effects of hookworm on a healthy individual's immune system, gut bacteria composition and gut function came to a close in July 2023, with the final participants completing their observation period. The study, pre-published in *MedRxiv*, found that the low dose of hookworm was safe and well-tolerated. The study also found immune-linked metabolic pathway changes, laying the groundwork for further investigations into the effect of hookworm on metabolism.



Discovery offers clues on what causes immune cells to drive allergic disease

A study by the Le Gros Laboratory has uncovered genetic clues that help explain how certain immune cells can cause allergic disease. The paper, published in *Immunology and Cell Biology*, brings us one step closer to preventing the cellular mechanisms that drive the development of allergic and inflammatory diseases by targeting the specific immune cells that trigger them.



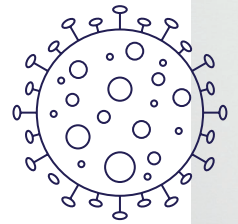
Investigating the impact of dietary fibre on infant health

Funded by the High-Value Nutrition – Ko Ngā Kai Whai Painga National Science Challenge, the SUN (Seeding throUgh FeediNg) study is investigating whether introducing dietary fibre to babies as they first start to eat solids can promote good gut and immune health. The study involves researchers from the University of Auckland, AgResearch, Plant & Food Research, Massey University's Riddet Institute, the University of Otago and the Malaghan Institute.



▲ Dr Yasmin Nouri

INFECTIOUS DISEASE



We're applying cutting-edge research and technology to better understand how the immune system navigates and protects us from the constant presence of infectious organisms. Armed with this knowledge, we're working on developing safe, effective and long-lasting vaccines to tackle infectious diseases, old and new.

KIWI-MADE COVID-19 BOOSTER VACCINE OFFERS 100% PROTECTION IN PRECLINICAL STUDY

A preclinical study evaluating a Kiwi-made Covid-19 vaccine – Kiwi Vax – has shown its unique formulation induces a safe and highly effective immune response to SARS-CoV-2 variants of concern, making it a promising booster vaccine candidate.

The study shows that Kiwi Vax, developed by Vaccine Alliance Aotearoa New Zealand – Ohu Kaupare Huaketo (VAANZ) as part of the Government's Covid-19 vaccine strategy, is highly immunogenic, robustly expressed and has a strong stability profile. The vaccine was independently tested at the National Institutes of Health in the United States and at the University of Melbourne.

"These findings not only show that we have developed a promising booster vaccine candidate, but that we have the expertise, capability and experience within New Zealand to make our own vaccines – something that stands us in good stead for future pandemics," says the Malaghan Institute's Professor Kjesten Wiig, Executive Director of VAANZ.

Dr Lisa Connor, head of VAANZ's Vaccine Evaluation team says their subunit vaccine combines two different parts of the spike protein – the receptor-binding domain and the N-terminal domain. These specific regions have been identified to contain 'hot-spots' that trigger potent immune responses against the critical areas of the SARS-CoV-2 virus required for infection.

"Kiwi Vax has a unique set of attributes – its clean design does not attract extraneous immune responses, and it is designed to be specific to the virus. It elicits a broad antibody and T-cell response to all variants of concern, including Omicron, providing complete protection against disease and preventing the virus from replicating in mice that were exposed to it.

"We have the expertise, capability and experience within New Zealand to make our own vaccines."



"The immune response generated by the vaccine is also very durable and long-lasting, and results to date indicate that Kiwi Vax is stable at refrigerator temperature for several months and at room temperature for at least one month. These are important advantages over current vaccines," says Dr Connor.

"This year saw a big milestone in passing our 'good laboratory practice' toxicology study with flying colours, which has given us the confidence to take the vaccine into clinical testing," says Prof Wiig.

A phase 1 safety trial of Kiwi Vax is planned for 2024 in a study involving 50 healthy adult participants. Positive results from the trial will give the team the ability to engage with international companies to further develop the vaccine.



▲ Dr Rebecca McKenzie

HARNESSING mRNA TECHNOLOGY TO DEVELOP A POWERFUL MALARIA VACCINE

A new mRNA vaccine targeting immune cells in the liver could be the key to tackling malaria, a disease that causes over half a million deaths each year, according to the World Health Organization, yet has no effective long-lasting vaccine.

Trans-Tasman research collaborators from the Malaghan Institute and Victoria University of Wellington's Ferrier Research Institute in New Zealand, and the Peter Doherty Institute for Infection and Immunity in Australia, have developed an mRNA-based vaccine that can effectively target and stimulate protective immune cell responses against the malaria-causing parasite *Plasmodium* in preclinical models.

"It's an exciting area to work in and I feel privileged to be working with Professor Ian Hermans and the rest of the team on this at the Malaghan Institute," says Dr Mitch Ganley, who co-authored the research. "There are great immunologists here and the technical expertise in flow cytometry is fundamental. What we're doing is quite different to most people in the malaria field and the RNA vaccine field more broadly, so having the support from the institute and technical teams, I believe is having a global impact."

The focus of the collaborative research investigating a novel target for malaria was originally on peptide-based vaccines. However, in 2018, the team shifted their approach and

started investigating RNA-based vaccines – a decision that, so far, seems to have paid off with the recent success of RNA technology in vaccine development.

"While our successful peptide-based vaccines targeting malaria only contain small protein fragments of a malaria protein, mRNA vaccines encode an entire malaria protein," says the University of Melbourne's Dr Lauren Holz, Research Officer at the Doherty Institute and co-author of the paper.

"What we're doing is quite different to most people in the malaria field and the RNA vaccine field more broadly..."



"This is a real strength because it means we can generate a broader and hopefully more protective immune response."

To pack an extra protective punch, the mRNA vaccine has been combined with an adjuvant – originally developed at the Malaghan and Ferrier Institutes for cancer immunotherapies – which targets and stimulates liver-specific immune cells. This additional ingredient helps localise the RNA vaccine response to the liver, a key site in preventing the parasite from developing and maturing in the body.



▲ Dr Jordan Minnell

RESEARCH HIGHLIGHTS



Research suggests hookworm could offer protection from severe Covid symptoms

Prior infection by a parasitic hookworm has been shown to protect mice from severe SARS-CoV-2 disease, offering a potential explanation as to why certain human populations seemed to fare better during the height of the Covid-19 pandemic. In a collaboration between the National Institutes of Health in the United States and the Malaghan Institute, the research found that mice infected with hookworm were less likely to develop severe Covid symptoms and recovered from infection much more quickly than their counterparts, even after the worms were cleared from the body.



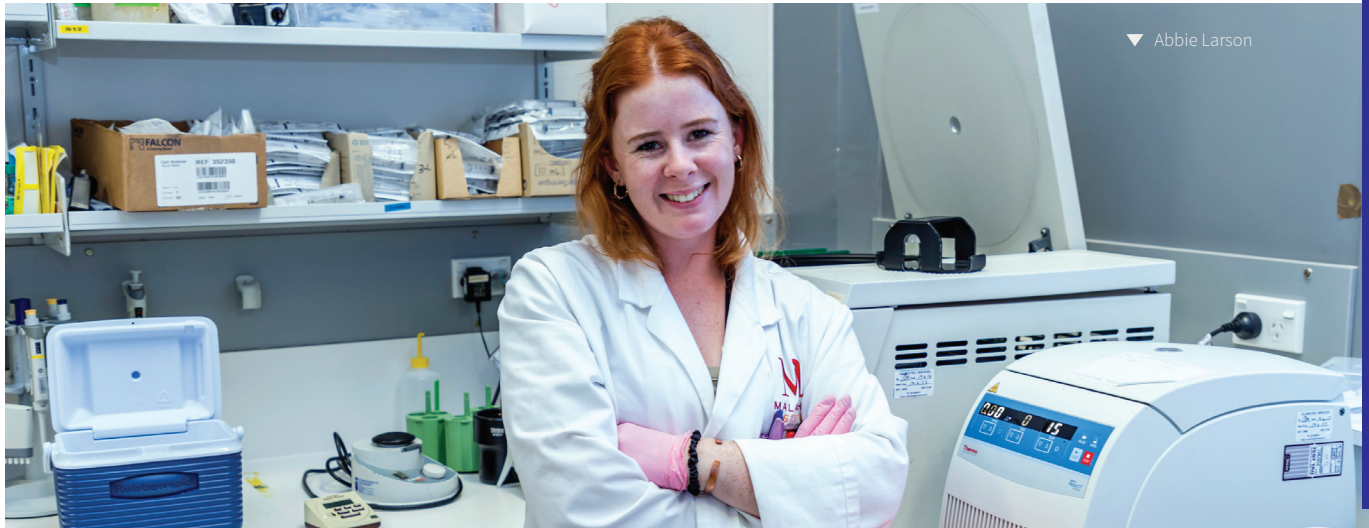
Clinical study shows booster needed to protect against Omicron

A clinical study investigating immune responses to the Pfizer-BioNTech vaccine in New Zealanders has demonstrated the importance of a booster vaccination for immunity to SARS-CoV-2 Omicron variant infections. The Ka Mātau, Ka Ora study, undertaken by VAANZ, shows that a first booster dose significantly improves the ability of vaccine-induced immune responses to neutralise viral variants, including Omicron, across all demographic groups, following a period of waning immunity after a second dose.



Designing vaccines that target immune cells in the mucosa

Research from the Malaghan Institute's vaccine evaluation team, published in *Cell Reports*, has identified that MAIT-cells, a type of immune cell found in mucosal tissues, are a promising target for future vaccines, with the potential to create stronger, more protective immune responses against pathogens at the site of infection.



▼ Abbie Larson



International collaboration to crack the code on the ageing immune system

A collaboration between the Malaghan Institute and Cambridge's Babraham Institute has been strengthened with an International Partnering Award from the United Kingdom's Biotechnology and Biological Sciences Research Council to research the ageing immune system. Bringing together unique expertise from both organisations, the project aims to develop and test mRNA vaccines designed to counteract the age-related decline in the quality of the immune response.



New funding will boost RNA research into vaccines and other healthcare treatments

Government investment in an RNA Development Platform is set to further advance this revolutionary field in New Zealand and build on capability developed by the Malaghan Institute as part of VAANZ. The platform is hosted by Victoria University of Wellington and the University of Auckland, supported by the Malaghan Institute and the University of Otago. Professor Kjesten Wiig of the Malaghan Institute and Professor John Fraser of the University of Auckland are interim co-directors of the platform.



Developing a robust mRNA testing platform

The Hermans Laboratory has been developing a platform to standardise and test new mRNA vaccines at the Malaghan Institute. By establishing and refining the process of making mRNA, the platform aims to be positioned to be used across a number of disease areas in the near future.

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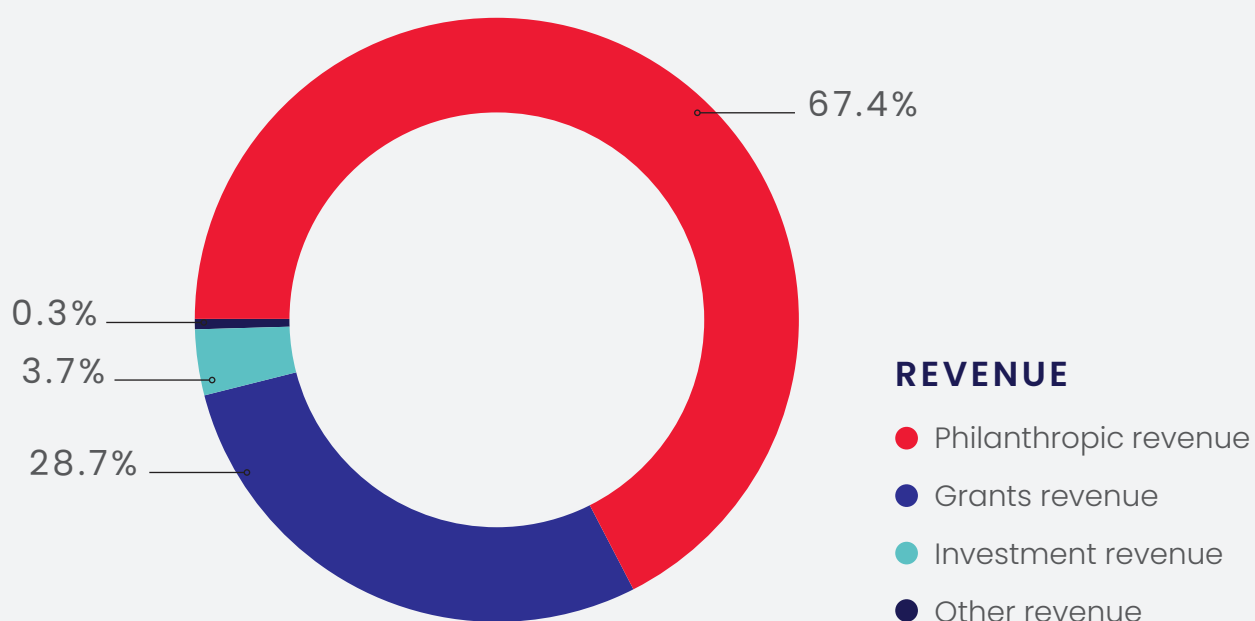
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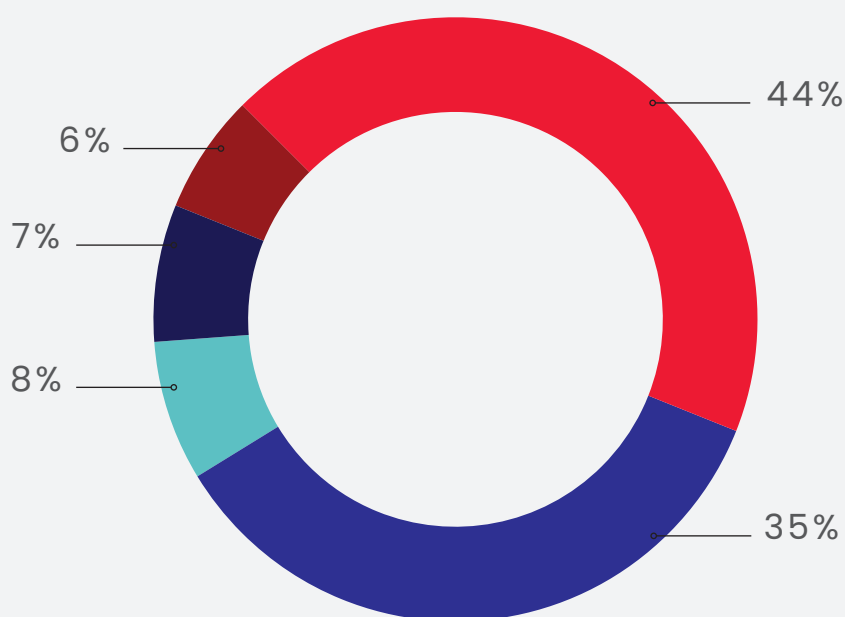
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Financial Performance



EXPENSES

- People costs
- Research expenses
- Other costs
- Facilities costs
- Depreciation



FINANCIAL PERFORMANCE

For the year ended 31 July 2023

	2023	2022
Revenue		
Grants revenue	11,265,978	14,667,206
Philanthropic revenue*	26,478,779	8,635,354
Investment revenue	1,437,276	-251,627
Other revenue	131,871	256,886
	39,313,903	23,307,819
Expenses		
Depreciation	1,660,881	1,428,436
Facilities costs	1,907,850	1,831,445
Lab costs	9,130,708	7,527,785
Other costs	1,947,571	980,182
People costs	11,302,231	9,549,561
	25,949,241	21,317,409
Surplus / (Deficit)	13,364,663	1,990,409
Share of surplus/(deficit) of associates	-	-200,000
Total comprehensive revenue and expenses	13,364,663	1,790,409

FINANCIAL POSITION

As at 31 July 2023

	2023	2022
	Consolidated	Consolidated
Assets		
Current assets	35,734,315	28,107,530
Non-current assets	12,777,274	12,288,444
	48,511,589	40,395,974
Liabilities		
Current liabilities	8,413,068	13,662,115
	8,413,068	13,662,115
Net assets	40,098,521	26,733,859

*This year we received a significant bequest which is committed to future cancer research. Without this bequest we would have had a small operating loss.

Thank you

Thank you to everyone who has supported the Malaghan Institute. As a charitable organisation, we are owned by New Zealand for the benefit of all, which is why your support means so much to us.

We would like to acknowledge our Friends groups and individuals in the community who have supported us through sharing their stories, helping raise awareness of the Malaghan Institute and highlighting the importance of life-saving medical research in New Zealand.

A SPECIAL THANK YOU TO:

Aotearoa Gaming Trust

Betty Stoker Charitable Trust by Public Trust

BEA Trust (Bill & Eileen Allan Family Trust)

Colin Williamson Charitable Trust

David Levene Foundation

The Dines Family Charitable Trust

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Rex & Betty Coker Foundation

The Thompson Family Foundation Inc

Tonks Family Foundation Limited

Walker & Hall Trust

Walter and Rana Norwood Charitable Trust

Warren & Anne Plimmer Foundation

Te Whare Wānanga o Ōtākou – The University of Otago

Farewell to Dan Williams and John Beattie

We were deeply saddened to lose two stewards of the Malaghan Institute in 2023.



DAN WILLIAMS

Distinguished Trustee Dan Williams died at home in Plimmerton on 14 April 2023. Dan served on the Malaghan Institute's trust board from 2005 and chaired the board's audit and risk committee and investment committee until his retirement in 2020. He was recognised as a distinguished trustee in 2021.

As partner at accounting firm Deloitte and its predecessors for half a century, Dan was a strong leader for our finance team and adviser to trustees, ably shepherding the institute through many years of growth.

Malaghan Institute Head of Finance David Lin says Dan's thoughtful insights and careful stewardship of our resources helped the institute remain financially stable and continue important work in medical research.

"Dan's commitment to our mission went far beyond his financial expertise, however. He was a tireless advocate for our cause and devoted countless hours to the institute. His passion for our work was infectious, and he inspired everyone around him to give their best."



JOHN BEATTIE

Trustee of more than 30 years John Beattie died peacefully on 22 April 2023, surrounded by his family.

As an executive of Brierley Investments Limited, John was integral in helping resuscitate the Malaghan Institute following the stock market crash in 1987, helping pull together a rescue package designed to financially underpin the institute and widen its support in the community. As part of this, Brierley Investments made a commitment to sponsor the institute for five years, but did so for many more.

John played significant roles within the board and as a director for related commercial entities, including Wellington Zhaotai Therapies Limited, set up to advance CAR T and other cell therapies.

"John was totally passionate about creating better opportunities in healthcare through research. Despite his long tenure, he could always be relied upon for creative and fresh thinking and for grasping any opportunity for the institute that arose. His energy and commitment will be sorely missed," says Malaghan Institute General Manager Mike Zablocki.

Trust Board

The Malaghan Institute trust board provides governance to the organisation, representing a balance of commercial and scientific expertise. The principal functions and operations of the board, and its various sub-committees, are to provide guidance and direction for the institute's key strategic and operational goals.



GRAHAM MALAGHAN
| CHAIRMAN

ONZM, Hon. DSc (VUW), FCILT



SIR PAUL COLLINS
| DEPUTY CHAIR

KNZM, BCA, ACA



PROFESSOR GRAHAM LE GROS | DIRECTOR

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



JOHN BEATTIE
(TO APRIL 2023)

LLB, MAICD (VUW)



TIM BENNETT

MBA, BCom



DR MAIA BREWERTON

MB ChB, FRACP, FRCPA



PROFESSOR PARRY GUILFORD

MSc (Otago), PhD (CU), FRSNZ



PROFESSOR DAVE HARPER

BA (Hons) (Otago), MA, PhD
(Cant)



DR DIANNE C MCCARTHY

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



TONY MOSSMAN

BBS, DipBusStud, CA, CMinstD



NICOLA SLADDEN

LLB (Well), MPH (BU)



DR MICHELLE SULLIVAN

BSc (Hons) Otago, PhD (Massey)

Te Urungi Māori

Te Urungi: the steering paddle of the waka which supports the work of the kaihoe by guiding the course.

Te Urungi Māori is an integral yet independent group at the Malaghan Institute, providing advice to the leadership team, with an overall approach of equitable health outcomes for Māori as a result of our research and clinical activity. The advisory group also provides guidance on engagement with and implementation of the articles of Te Tiriti o Waitangi and Vision Mātauranga.



DR CLIVE ASPIN

Ngāti Maru, Ngāti Whanaunga,
Ngāti Tamaterā
PhD (Otago), MA (Well), BA, DipELT,
Dip Tchg



DR AMOHIA BOULTON

Ngāti Ranginui, Ngāi te Rangi,
Ngāti Pukenga, Ngāti Mutunga,
Te Ātiawa o Te Waka-a-Māui
PhD (Massey), MA (Applied), BA
(Hons), BA



DR MAIA BREWERTON

Ngāti Porou, Ngāti Kahungunu
MB ChB, FRACP, FRCPA



DR RUAKERE HOND

Taranaki, Ngāti Ruanui, Te
Whānau-ā-Apanui
PhD (Massey), MMS
(Awanuiarangi)



DR WILLY-JOHN MARTIN

Ngāti Wai, Ngāti Whātua, Ngāti
Tamaterā, Ngāti Porou
PhD (Well), MSc, BSc



LEIGH POTTER

Ngāti Porou, Ngāti
Kahungunu, Rongomaiwahine,
Rongowhakaata
PGDipHSc, NDMDI

**Tūramarama ki whēuriuri,
Māramarama ki whēkerekere
Ka ahoaho ki whea? Hei anei!
Koia**

**All darkness given light
Things unknown can be understood
The light can be found where? It is here!
It is**

Our karakia, 'E Ara' (Rise Up) was written and gifted to us by Dr Ruakere Hond.
The full version is at www.malaghan.org.nz/about-us



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