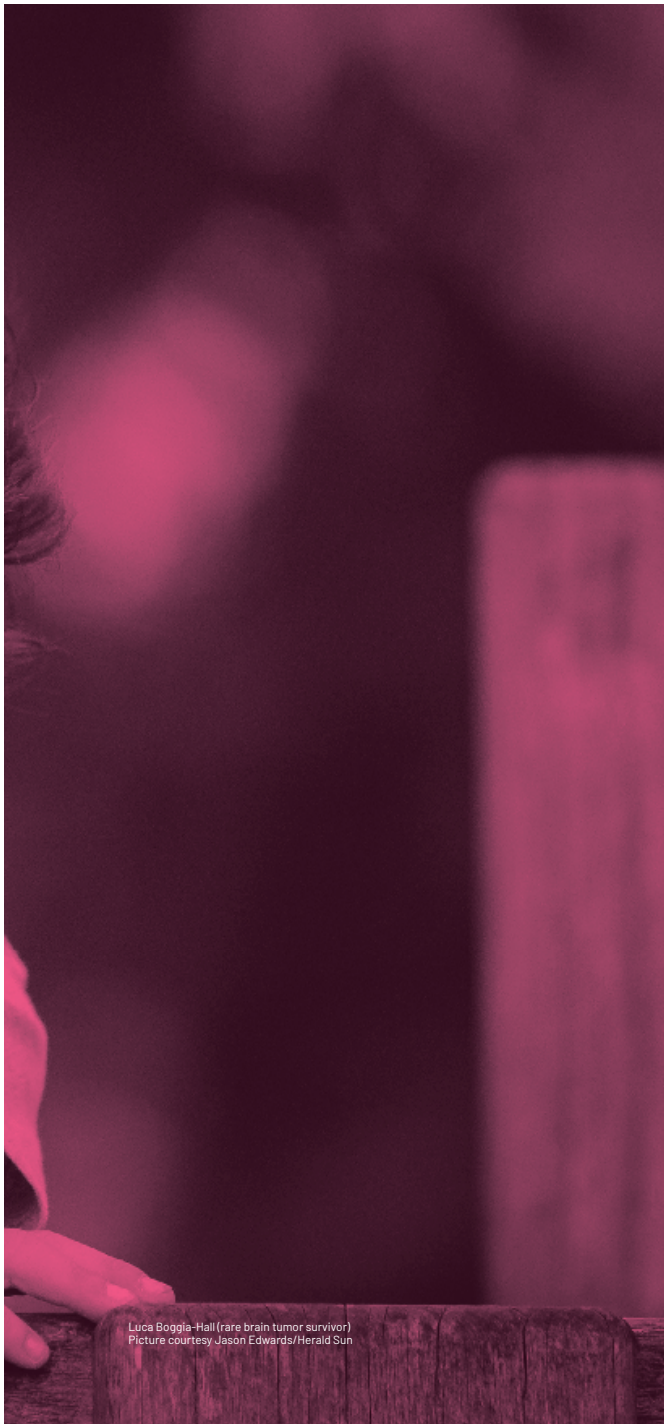
HUDSON
INSTITUTE OF MEDICAL RESEARCH

ANNUAL REPORT 2023



Luca Boggia-Hall (rare brain tumor survivor)
Picture courtesy Jason Edwards/Herald Sun

Cover image: Jessica Clark (rare ovarian cancer survivor) with her daughter Matilda. See page 22 for full story.

About us

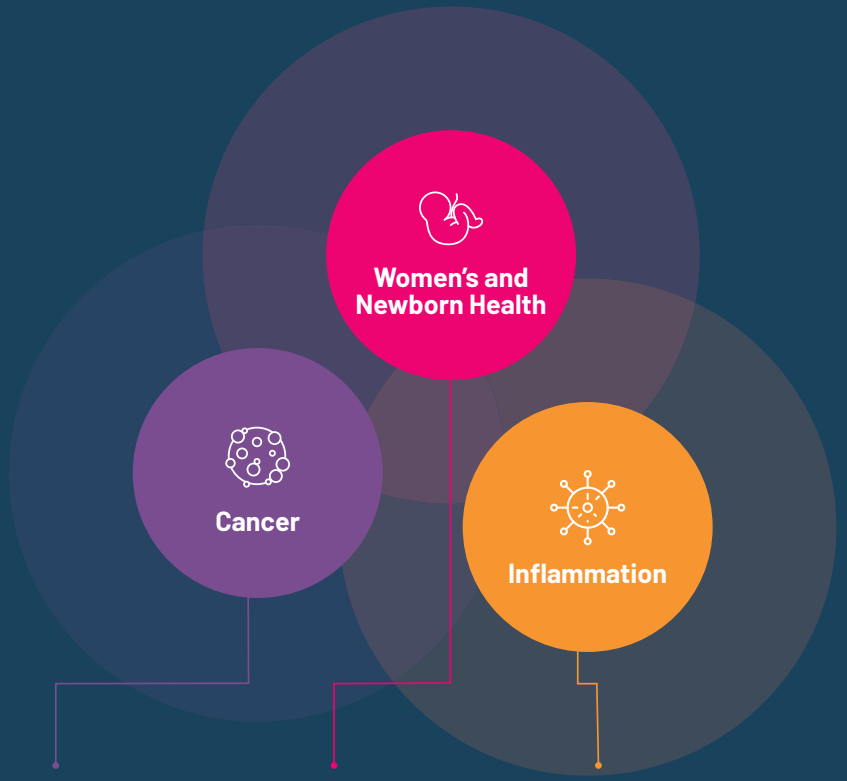
As an independent medical research institute and global bioscience leader, Hudson Institute advances healthcare through groundbreaking, collaborative medical research discoveries and their translation into real-world impact.

Our 430 scientists, clinicians and graduate students come from around the world to pursue one mission – to make medical research discoveries that save and change lives. Located in the Monash Medical Precinct, our scientists work alongside clinical and industry colleagues and use advanced technology platforms to inform their research.

Our expertise spans the complete translation pipeline from patient need and scientific discovery to clinical testing and commercialising new preventative approaches, therapies and devices for patients. Our Institute is named after Professor Bryan Hudson AO, the founding director of Prince Henry's Institute, and inaugural chair of the Department of Medicine at Monash University.

Our research themes

Our research programs deliver in three broad areas of medical need



Using cutting-edge technologies to discover new methods for diagnosing and treating childhood and adult cancers.

Undertaking innovative research to improve outcomes for high-risk babies and to address the unmet medical need of health conditions affecting women.

Uncovering the complex networks that control inflammation to find new ways to diagnose, detect and treat inflammatory and infectious diseases.

Monash Medical Precinct

Hudson Institute is located within a major scientific and medical innovation hub in Melbourne's south-east corridor, in Clayton, Victoria. The Monash Medical Precinct is a medical innovation powerhouse and a focal point for biomedical research translation and healthcare.

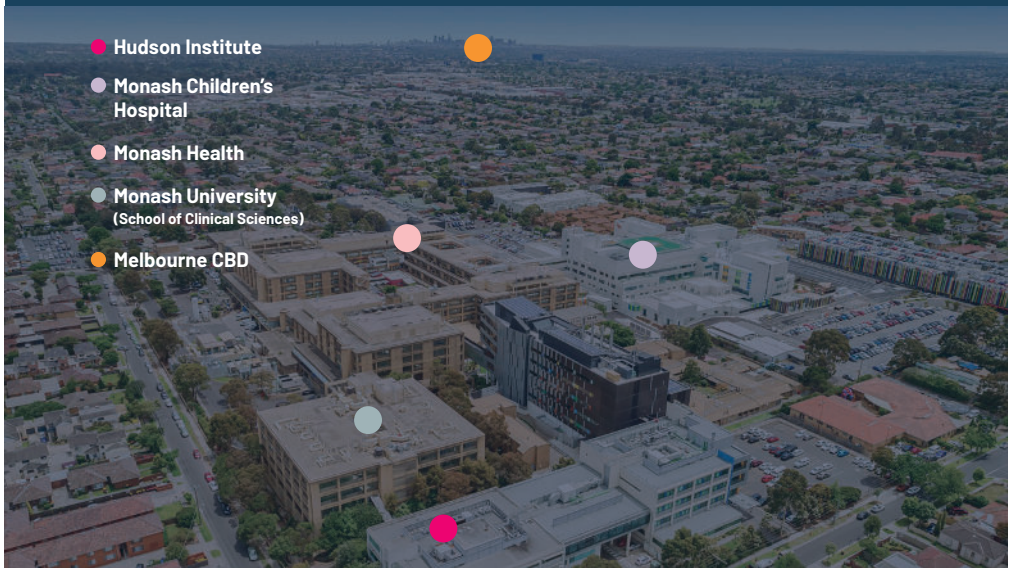
Hudson Institute, together with our founding partners, Monash Health, including the Monash Children's Hospital and Monash University, continue to be global leaders in medical research, healthcare, new technologies and education.

HUDSON INSTITUTE OF MEDICAL RESEARCH

MONASH University

Monash Health

Monash Children's Hospital



Values

Excellence

Integrity and passion underpin our pursuit of scientific knowledge of the highest quality while nurturing the next generation of scientists.

Collaboration

Our collaborative research environment enables scientists to partner with researchers, clinicians, technical experts and consumers to accelerate knowledge gain and real-world impact.

Innovation

We inspire and enable world-class researchers at the frontiers of science and medicine to find new solutions to our greatest health challenges.

Community

We partner with consumers, patients, families and the wider community to learn from their lived experience and focus on impacts that will transform health and people's lives.

At a glance

262 STAFF

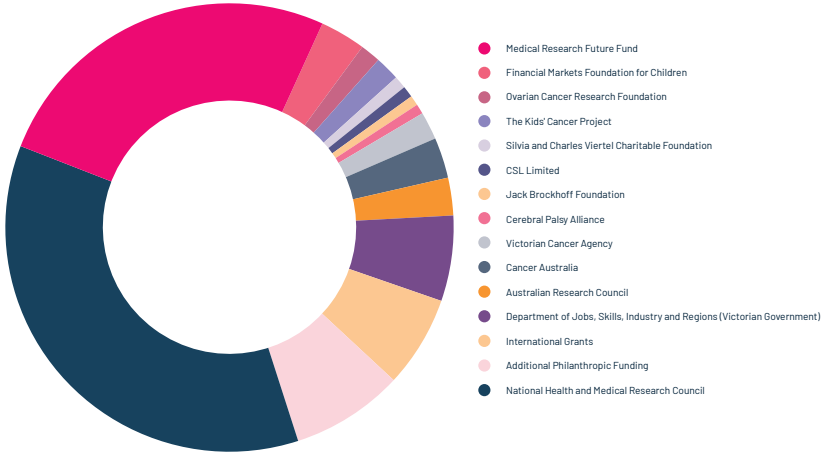
170 STUDENTS

41 RESEARCH GROUPS

280 RESEARCH PUBLICATIONS

Research outputs

Grant funding received in 2023



National Health and Medical Research Council	10,910,815
Medical Research Future Fund	7,875,359
Department of Jobs, Skills, Industry and Regions (Victorian Government)	1,874,750
Financial Markets Foundation for Children	1,000,000
Cancer Australia	890,000
Australian Research Council	826,426
Victorian Cancer Agency	610,959
The Kids' Cancer Project	538,578
Ovarian Cancer Research Foundation	445,574
Silvia and Charles Viertel Charitable Foundation	275,000
CSL Limited	250,000
Jack Brockhoff Foundation	219,977
Cerebral Palsy Alliance	217,178
TOTAL	**25,934,615**
Additional Philanthropic Funding	
Rare Ovarian Cancer Inc	190,000
Robert Connor Dawes Foundation	162,000
National Heart Foundation	146,073
Canteen	143,750
Zero Childhood Cancer Program	142,718
Children's Cancer Foundation	139,316
Cancer Council Victoria	134,619
Additional grant funding	1,413,501
TOTAL	**2,471,977**
International Grants	
Department of Defense (USA)	1,407,523
University of Birmingham	189,876
National Institutes of Health (USA)	130,314
Other International grants	283,373
TOTAL	**2,011,086**
TOTAL GRANT FUNDING	**30,417,678**

Publications

In 2023, Hudson Institute's researchers published extensively in international peer-reviewed journals.

Publication type	2021	2022	2023
Original research articles	188	192	209
Reviews	41	38	50
Editorials and commentaries	26	17	17
Books and book chapters	2	3	4

DIRECTOR & CEO'S REPORT

Professor Elizabeth Hartland

There is a great deal to celebrate from the year and just as much to look forward to in the months and years ahead.

Among our biggest successes in 2023 was the publication in *Nature* of Professor Paul Hertzog's and Dr Nicole Campbell's work on interferon epsilon as a potential immunotherapy treatment for ovarian cancer. This provides hope for a quantum change to survival rates that have not changed in 50 years. We are all looking forward to seeing the team translate their discoveries into urgently needed new treatments for this disease.

Another highlight was the launch of the Childhood Cancer Model Atlas, a world-leading capability led by Professor Ron Firestein that can test thousands of potential treatments against some of the rarest and hardest-to-treat paediatric cancers. As you will read in this report, unprecedented collaboration with hospitals, universities and research institutes around the world has enabled Hudson Institute to become a global focus for this research.

Of course, collaboration is written into our DNA. A great benefit of working where we do is seen in our clinical partnerships with Monash Health. These connections allow us to remain focused on the areas of greatest healthcare need. The recent work of Associate Professor Jun Yang, to establish the National Health and Medical Research Council Primary Aldosteronism Centre of Research Excellence with Professor Peter Fuller here at Hudson Institute, is a wonderful example.

Congratulations also to Professor Firestein, the head of our Childhood Cancer Program, on his elevation to the position of Deputy Director of the Institute, taking over from Professor Hertzog, who has given so much to the Institute and to me since taking up the position in 2014.

After an international search, we were delighted to appoint Professor Seth Masters to head the Centre for Innate Immunity and Infectious Diseases, beginning a new era for our inflammation programs. An expert in genetic disorders that trigger inflammatory diseases, Prof Masters has spent the past 12 years as Head of the Inflammasomes and Autoinflammatory Disease Laboratory at WEHI.

In further recruitments in our Childhood Cancer Program, we welcomed Dr Pouya Faridi as Head of the Translational Antigen Discovery Research Group.

Finally, any researcher will tell you that securing funding is a task that takes up a great deal of their time and requires constant attention. With that in mind, we were thrilled to hear the news in December that three of our scientists were awarded prestigious NHMRC Investigator Grants to continue their outstanding research over the next five years, ensuring much-needed continuity for their important research.

On top of that, in the NHMRC Ideas Grants round, six new research projects were funded, ranging from the use of nanotechnology to treat pelvic organ prolapse, to innovative strategies for stillbirth prevention through to cancer and hypertension.

All these results are vindication of the great work we do and the great people who do it. I thank our scientists for their commitment and dedication, just as I thank you for supporting Hudson Institute.

There are many things to look forward to in the coming year and I hope you will come along with us on this exciting journey.

Professor Elizabeth Hartland
Director and CEO

"As you will read in this report, unprecedented collaboration with hospitals, universities and research institutes around the world has enabled Hudson Institute to become a global focus for this research."

Professor Elizabeth Hartland

Dr Robert Edgar

CHAIR'S REPORT

Dr Robert (Bob) Edgar AM

The end of 2023 finds Hudson Institute in an outstanding position, both from a research and a governance perspective.

Our Board membership remains solid. We were sad to see the retirement of Nigel Garrard and we thank him for his many years of sterling service. His replacement as non-executive director is the Professor the Hon Jill Hennessy, who brings a wealth of experience in the law, the disability sector and, of course, in government, where she was Victoria's attorney-general and minister for health. We welcome her on board and look forward to her contribution.

A significant honour was conferred to one of our number with the award to Professor Warwick Anderson of an Officer in the General Division of the Order of Australia – well-deserved recognition of his many years of service to the medical research sector both here and overseas.

On the commercialisation front, Hudson Institute is increasingly valued as a major partner with industry in the development, testing and production of new treatments. This is evident in partnerships with companies such as Cleo Diagnostics in the development of ovarian cancer testing, a partnership that saw the company successfully listed on the ASX.

The latest round of CUREator grants also demonstrated our partnership credentials – these are delivered by Brandon BioCatalyst and the Medical Research Future Fund to support early-stage research through to proof-of-concept and providing opportunities for commercialisation. This year $2 million was invested in two projects: one for a new ovarian cancer treatment and the other to produce novel exosome therapies with great potential for a range of treatments, including lung, liver and kidney fibrosis.

We have maintained our commercial partnerships with Australian clinical-stage drug development company Noxopharm Ltd through its wholly owned subsidiary, Pharmorage Pty Ltd, which continues to work to make mRNA vaccines more effective and easier to manufacture. We are also working with Adelaide-based biotech company, BiomeBank, which continues to make excellent progress in its mission to accelerate the development and production of microbiome-based therapies. The work of our own Associate Professor Sam Forster is a cornerstone of this project and we are excited to see where it leads.

Another positive reflection of our standing was the appointment of our director, Professor Elizabeth Hartland, as President of the Association of Australian Medical Research Institutes (AAMRI). This is a significant role in which she will advocate on behalf of the entire sector, including the upcoming consultation in developing a national health and medical research strategy to focus on funding the full costs of research as well as supporting early-to-mid-career researchers.

Despite the difficult funding environment in which our sector continues to operate, 2023 proved to be a successful year financially with significant research grants awarded and healthy commercial returns generated. This strong financial position was made even greater thanks to our passionate donors and generous philanthropic bequests. We do expect 2024 to be a fiscally challenging year; however, we will continue to support AAMRI and our representative bodies as they lobby for further support for the research sector, which is so vital for the future health of all Australians.

On behalf of the Board, I look forward to another year of achievement for the Institute in 2024 and many more successes to celebrate.

Dr Robert (Bob) Edgar AM
Chair

"Despite the difficult funding environment in which our sector continues to operate, 2023 proved to be a successful year financially with significant research grants awarded and healthy commercial returns generated."

Research impact

Associate Professor Michael Gantier

OVARIAN CANCER

Published in *Nature*, August 2023

Major study on a little protein, with a big impact for ovarian cancer

Professor Paul Hertzog, Dr Nicole Campbell

Lead Researchers

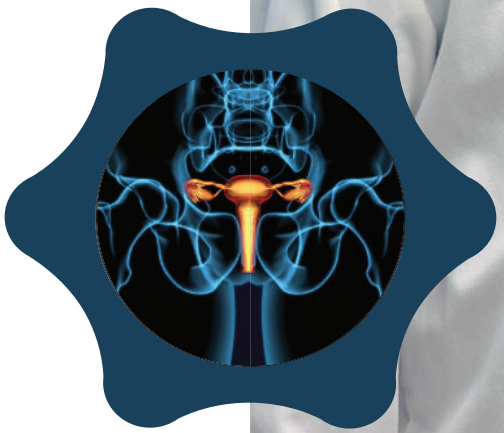
In this seminal study, Professor Paul Hertzog and Dr Nicole Campbell have discovered that the innate immune system produces a potent defence that guards against the metastasis of ovarian cancer.

Collaborators

Peter McCallum Cancer Centre; WEHI; Imperial College of London (UK); Trinity College Dublin, The University of Dublin (Ireland)

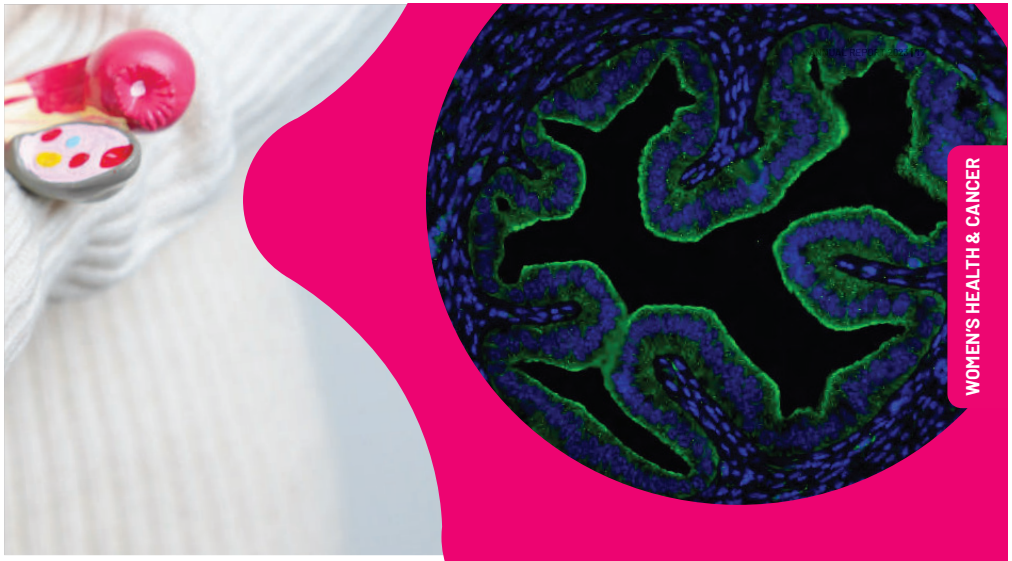
Funders

NHMRC; US Department of Defense



L–R: Professor Paul Hertzog, Dr Nicole Campbell

OVARIAN CANCER



Major study on a little protein, with a big impact for ovarian cancer

Increasingly, cancer treatments focus on harnessing the body's own resources – the innate immune system – but one cancer has proven more elusive than most.

Nearly half of the women diagnosed with ovarian cancer lose their lives within five years and there have been no new effective treatments for more than half a century.

Ovarian cancer survival rates are well below the average for all cancers because

- The disease is often not detected until the advanced stages, when the cancer has metastasised
- Chemotherapy typically becomes ineffective over time.

Metastasis is the ultimate cause of death for most ovarian cancer patients – and where new treatments are desperately needed.

While other cancers have responded to evolving treatments, such as immunotherapy, ovarian cancer remains a formidable foe. New treatments are desperately needed, which makes the work of Professor Paul Hertzog and Dr Nicole Campbell so much more compelling.

Their latest research, published in the esteemed journal, *Nature*, showed that the innate immune system produces a powerful weapon against ovarian cancer – interferon epsilon (IFNε) – a weapon just waiting to be harnessed to deliver an effective immunotherapy treatment option.

"The results of this study were striking. IFNε stops the spread of secondary ovarian cancer by instructing immune cells to target and kill the cancer cells involved," Dr Campbell said.

Multifaceted defence

The discovery is even more encouraging because of the clever, multi-pronged defence that IFNε takes, throwing up at least three 'roadblocks' to ovarian cancer.

"IFNε activates multiple layers of the immune system, and at different stages, to fight tumours. Most cancer treatments work in one way, either to kill the tumour or to activate the anti-tumour immune cells.

"This means that any IFNε-based drugs could act in multiple ways to block tumours," said Dr Campbell.

Hiding in plain sight

The story of IFNε goes back 20 years, to 2004, when it was discovered in Prof Hertzog's lab.

"IFNε is part of a family of proteins called interferons that 'interfere' with invaders like viruses and bacteria. Interferons also kill tumour cells and activate anti-tumour immune responses," Prof Hertzog said.

While interferons were discovered in the 1950s, the discovery of IFNε was relatively recent.

"IFNε had evaded scientists because it behaves very differently to other IFNs," said Prof Hertzog.

1500

Australian women diagnosed annually

Only 46%

of patients survive beyond 5 years

"'Typical' IFNs are produced to fight infection and are found in the blood in large quantities. In comparison, IFNε doesn't increase during infection; it is always present in epithelial cells that line tissues and organs, and it is not detectable in blood.

"In 2009 we discovered that IFNε is produced by epithelial cells that line organs such as the female reproductive tract. These are the type of cells where cancer arises, and in this recent discovery we identified that, in the most common ovarian cancer, these cells have lost the ability to produce IFNε," Prof Hertzog said.

The team, including Dr Zoe Marks and Dr Nollaig Bourke, established that IFNε serves to protect the healthy body against the development of ovarian cancer, meaning it could potentially be used as a new way to fight the disease.

Next steps

The team is now aiming to understand how IFNε modulates the immune response to ovarian cancers, as well as

- How best to deliver it for maximal and safe effect
- How to identify which patients will benefit
- Whether it is best used in combination with other treatments.

In further recognition of this work's significance, 2023 also saw Dr Campbell receive a grant from the US Defense Department to continue this work.

"We are incredibly proud of this discovery and the global scientific recognition. In the next stage we will be exploring opportunities to translate it into patient treatments," Prof Hertzog said.

There is one crucial ingredient required for that to happen: funding. Whether it comes from research grants or a commercial partner, the fact is it will take a serious financial commitment to take this discovery from the laboratory to patients, where it can really make a difference.

"This means that any IFNe-based drugs could act in multiple ways to block tumours."

Dr Nicole Campbell

OVARIAN CANCER

Published in *Cancer – American Cancer Society*, April 2023

Harnessing the power of patient experience in rare ovarian cancer

Associate Professor Simon Chu

Lead Researcher

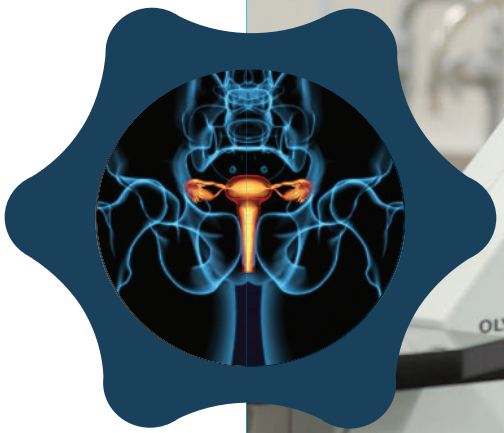
Hormones and cancer expert, Associate Professor Chu, is harnessing the power of patient-reported outcomes to improve rare ovarian cancer diagnosis, detection and treatment

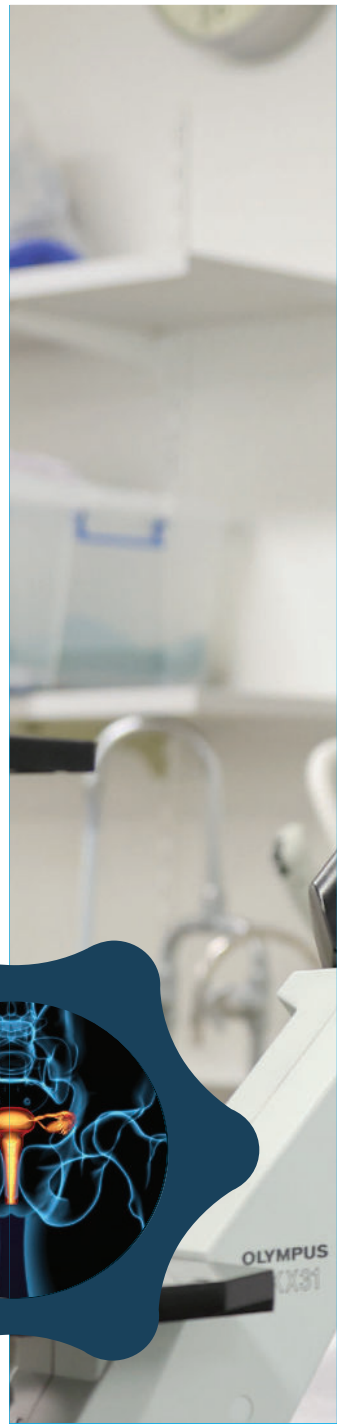
Collaborators

Deakin University; GCT Survivor Sisters; Monash Health; WEHI

Funders

MRFF; ROCinc; GCT Research Foundation (Canada/NZ)





Associate Professor Simon Chu

OVARIAN CANCER

Associate Professor Simon Chu

WOMEN'S HEALTH & CANCER

Harnessing the power of patient experience in rare ovarian cancer

Sometimes help for scientific discoveries comes from the most unassuming places. Especially for rare diseases, the power of community can be the key to making a difference.

For Associate Professor Simon Chu, the problem leading Hudson Institute's research into rare ovarian cancers was getting access to large quantities of real-world data, and the solution came from a surprising place: social media.

GCT Survivor Sisters

While A/Prof Chu continued his search for clues to detecting and treating one of the rare ovarian cancers, Granulosa Cell Tumours (GCT), on the other side of the world a disparate group of women were dealing with the reality of being diagnosed with a disease their doctors knew little about.

Their initiative, in the face of an information vacuum, led to the formation of the Facebook group, GCT Survivor Sisters, with a global membership.

What is GCT?

Granulosa Cell Tumours (GCT) are a rare cancer making up five to eight per cent of malignant ovarian cancers. They can develop at any age, even in children. The condition has a high rate of late recurrence, meaning that even if surgery is effective, women live for years in constant fear that their cancer might return. Around 100 Australian women are diagnosed with GCT each year.

Survivor data informs research

For the Survivor Sisters, A/Prof Chu and his team represented hope and a chance to use their own experiences to increase knowledge of GCT within the patient, medical and research communities.

For the Hudson Institute team, the Survivor Sisters provided a unique information resource: a previously invisible pool of real-world data and, crucially, tumour samples on which to draw in their research.

When the Survivor Sisters went searching for information, the internet led them to Hudson Institute and a collaboration was born.

"Effectively, what this group has done is build a medical database with some amazing information. What's even more special is that they chose to share their database, so we can understand the disease better through survivors' experiences, learning what is important for them as well as provide precious patient tumour samples to help design better treatments," A/Prof Chu said.

5–8%
of ovarian cancer is GCT

100 women
diagnosed annually in Australia

3,000 diagnosed
annually in the US, 4,000 in Europe

1,800 members
of GCT Survivor Sisters Facebook group worldwide

40 - 60 years of age
most common age of diagnosis, but GCT can develop at any age, even in children

"We sometimes feel that we're struggling to get our doctor's attention and that our disease is not taken as seriously as it should be. There are very few clinical trials which include treatments for GCT and hardly any that focus on GCT exclusively. For years we've tried to get a research team to use our data to advance knowledge and understanding of our disease and its treatment. Hudson Institute's team is the first to indicate sincere interest and, from the beginning, it was obvious that they were sincere in their dedication to studying GCT."
Kaye Ackermann, USA
GCT Survivor Sister

A unique collaboration

GCT Survivor Sisters has grown from a handful of women in the USA and UK to more than 1,800 members worldwide, including Australians, as part of the local organisation, ROCinc.

One unexpected result of their collective work is that they are now officially recognised in the scientific literature on this disease, with a seminal publication on the use of patient-reported outcomes appearing in *Cancer*, the main journal of the American Cancer Society, with an editorial written on the research.

"This unique collaboration has meant we are being contacted by women with GCT worldwide who want to donate their tumour tissue to help with our research," A/Prof Chu said.

"They also contribute to our patient-driven research program, where the GCT Survivor Sisters identified a subject that has been of great interest to them, leading to a new study on the efficacy of radiotherapy for this disease."

"Our direct engagement with survivors of this disease serves as a constant source of motivation, driving my ongoing commitment to understanding GCT and exploring improved treatment options. As a leading research group in this disease, the combination of new discoveries and access to state-of-the-art technologies makes this a particularly exciting and fulfilling phase in being involved in this work," A/Prof Chu said.

Next steps

The next major step is to conduct pre-clinical proof-of-concept work for the novel combination therapies that will hopefully lead to clinical trials for those with recurrent GCT.

This unlikely partnership provides a template for incorporating the patient experience into medical research, and a beacon of hope for women who previously felt very much alone.

OVARIAN CANCER

L-R: Jessica Clark (rare ovarian cancer survivor) with her daughter Matilda and husband Ben at home. They also have a son, Louie.

WOMEN'S HEALTH & CANCER

JESS'S STORY

Cancer has a way of changing your priorities

There are cancers, rare cancers and – believe it or not – a sub-category of rare cancers that are even less common.

However, when Jessica Clark was diagnosed with a Juvenile Granulosa Cell Tumour (jGCT), those distinctions were not important; she had ovarian cancer ... at the age of just 21.

GCTs account for five to seven per cent of malignant ovarian cancers and the juvenile form (which can develop at any age) is a tiny fraction of that figure.

The oldest Australian diagnosed with jGCT is in her 70s. The youngest was just 11 months old.

After diagnosis, Jessica's priorities immediately shifted: "Suddenly, there were much more important things, like my health, having a family, having a partner who cared ... living. A career was at the very back of my mind. My life got flipped, and what I wanted became very different."

Thanks to her connection with the GCT Survivor Sisters, Jessica found Associate Professor Simon Chu and Hudson Institute, giving her hope to carry alongside the knowledge that her type of cancer has a high recurrence rate.

Jessica's diagnosis was in 2016. She is now a 28-year-old married mother of two and her priorities include being a fierce campaigner for ovarian cancer awareness, not to mention more funding for research.

"Please, for me, for my daughter, for my mother, for your sister, for your daughter, for your wife. We have to give energy, time, money, talk about this ovarian cancer, so that the reality for women diagnosed with it is changed," said Jessica.

"Please, for me, for my daughter, for my mother, for your sister, for your daughter, for your wife. We have to give energy, time, money, talk about this ovarian cancer, so that the reality for women diagnosed with it is changed."

Jessica Clark

PELVIC ORGAN PROLAPSE

21st century science tackling an age-old problem

Dr Shayanti Mukherjee

Lead Researcher

With a PhD in nanostructured biomaterials, Dr Mukherjee is using a multidisciplinary approach to address pelvic floor disorders and childbirth injuries.

Collaborators

Australian National Fabrication Facility; Monash Health; Monash University

Funders

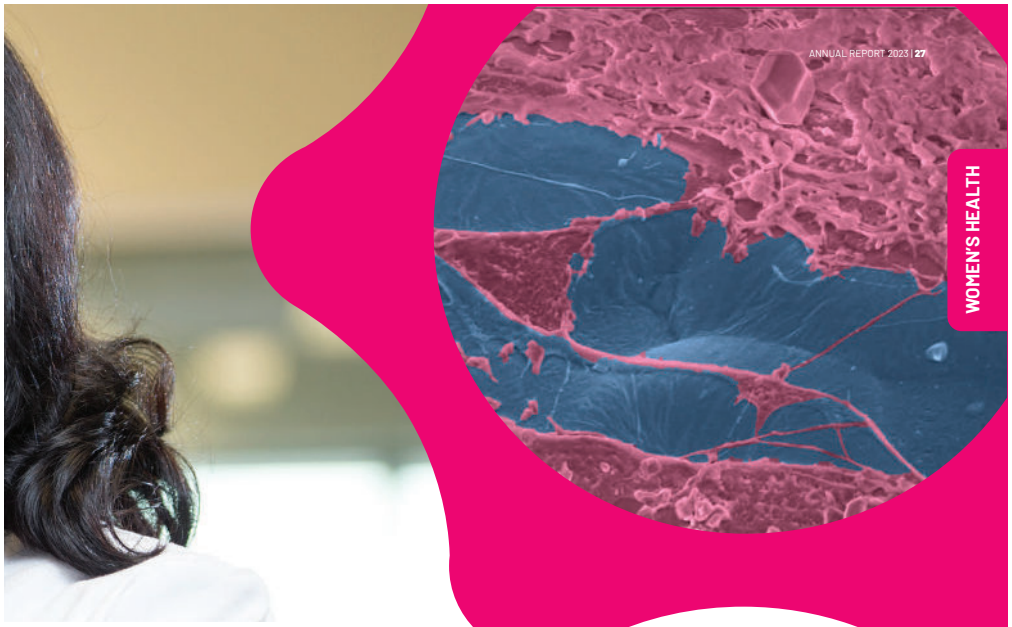
MTPConnect; NHMRC; Rebecca L Cooper Foundation; VMRAF

Dr Shayanti Mukherjee

PELVIC ORGAN PROLAPSE

Dr Shayanti Mukherjee

WOMEN'S HEALTH



21st century science tackling an age-old problem

It's the most common medical condition you've never spoken about.

A condition affecting 40 per cent of all women, to varying degrees.

A condition that costs the Australian healthcare system $200 million each year.

A condition that can leave sufferers with drastically reduced quality of life – unable to run, play with or even lift their kids – and STILL it is rarely, if ever, spoken about in public forums.

Pelvic Organ Prolapse (POP) is as old as motherhood itself and is crying out for contemporary solutions.

Dr Shayanti Mukherjee, Head of Hudson Institute's Translational Tissue Engineering lab, specialises in innovative cell-based therapies for pelvic floor disorders and birth trauma injuries.

"There is no adequate treatment for POP and no treatment that can prevent its onset following a vaginal birth injury," said Dr Mukherjee. "So, women suffer in silence for years to decades, with new solutions desperately needed to improve their quality of life."

Dr Mukherjee brings a unique 21st century skillset and a fierce determination to this challenge, with a PhD in nanostructured biomaterials and a commitment to advancing women's health utilising biomedical engineering.

"A defining moment in my career was learning that my materials engineering and nanotechnology background could change the lives of women," she said.

Her research merges multiple disciplines to understand how chronic pelvic floor disorders manifest after childbirth injury and she applies her knowledge to develop novel cell-based tissue-engineered therapies for pelvic reconstruction to advance maternal urogynaecological health.

"My vision is to break this impasse for women by introducing new paradigms in pelvic reconstruction that will reduce suffering due to birth injury," said Dr Mukherjee.

Personalised POP treatments

Dr Mukherjee's research uses a woman's own stem cells to create a 3D-printed degradable mesh, promising to avoid the complications that have plagued previous synthetic non-degradable meshes.

The aim is a simple one – a one-step safe and effective surgical treatment for POP, providing hope for millions of women worldwide.

"By integrating cutting-edge techniques like electrospinning and 3D printing of materials and cells, I aim to revolutionise maternal urogynaecological health, offering transformative solutions and improving the wellbeing of women affected by this prevalent issue."

"This research has the potential to revolutionise therapies for pelvic floor regeneration and enable personalised medicine for women," she said

Early prevention of POP

Dr Mukherjee's research is as much about prevention as a cure. She is also developing an understanding of how chronic pelvic floor disorders develop after a childbirth injury and improving awareness of birth injuries among obstetricians and midwives.

"We have discovered that early therapy, given soon after childbirth, can heal signs of birth injury and prevent prolapse later in life, giving hope that women will not have to suffer in silence for years," she said.

A remarkable year

Dr Mukherjee describes her achievements in 2023 as significant – not just scientific milestones but a beacon of hope for herself, her team and all women. Among the highlights were the granting of nearly $4 million in research funding for her POP research, including a Victorian Medical Research Acceleration Fund Grant, an NHMRC Ideas Grant and a Rebecca L Cooper Foundation Fellowship. Dr Mukherjee also gained valuable industry experience with pharmaceutical and biotechnology company, Moderna, during a six-month full-time fellowship with the company.

"Without this funding, we could not take this research further. Taking it further means bringing these new techniques from the lab, through pre-clinical trials and eventually into the clinic, potentially benefitting millions of women," she said.

Transforming women's health

"By advancing innovative cell-based therapies, we are on the brink of transforming the landscape of maternal urogynaecological health, promising a brighter and healthier future for women across the globe," said Dr Mukherjee.

"It represents a leap towards a future where groundbreaking research transforms healthcare, ensuring better lives and equitable wellbeing for our community."

"Women suffer in silence for years to decades, with new solutions desperately needed to improve their quality of life."

Dr Shayanti Mukherjee

1 in 4 women

globally live with POP

1 in 2 women

over 50 years of age globally live with POP

$200m annually

cost to Australian healthcare system

SALLY'S STORY

Going public about pelvic organ prolapse (POP)

It takes courage to speak about your experiences with POP and a special kind of courage to put your face and your name to this very personal condition.

Sally Maconochie has that kind of courage and more - and, ironically, she has the silence of previous generations to thank.

Three years after giving birth, this once fit and active woman found herself recovering from vaginal repair surgery that had an 80 per cent chance of failure when her mother told her that she had a prolapse and so did her grandmother.

No-one in her family had ever mentioned prolapse and, despite all her research on how best to prepare for childbirth, she had never encountered any information about the risk of POP, let alone how to avoid it.

"POP impacts an enormous number of women around the world," Sally said. "The critical thing is that nobody talks about it. I want to see real solutions before, during and after childbirth. That's why I am talking about it to anybody who will listen!"

Following her surgery Sally reached a low point, realising she would never be as physically able as she was before childbirth – that she might never be able to dance, run or walk with her little boy.

"I was so angry that nobody had told me all the ways I could have helped to prevent prolapse and birth injury – I was facing a life of immobility that could have been prevented."

Out of her anger and desperation Sally chose to do something positive – she is now Hudson Institute's first POP Advocate.

"I want to spread the word about prevention and I'm working to raise funds for research, in the hope that one day no other women will find themselves in this position."

Sally Maconochie

CHILDHOOD CANCER

Published in *Cancer Cell*, March 2023

Cancer detectives embrace open-source AI solution

Professor Ron Firestein, Dr Paul Daniel, Dr Claire Sun

Collaborators

Nearly 50 collaborations with cancer research institutes, universities and academic medical centres around the globe, including Monash University; QIMR Berghofer Medical Research Institute; Sydney Children's Hospital UNSW; University of Newcastle; Bambino Gesù Children's Hospital (Italy); Children's Brain Tumour Network (USA); Duke-NUS Medical School (Singapore); Hopp Children's Cancer Centre (Germany); Johns Hopkins University (USA); KK Women's and Children's Hospital (Singapore); McGill University (Canada); Stanford University (USA); The Children's Hospital of Philadelphia (USA); The Hospital for Sick Children (Canada); The Institute of Cancer Research (UK); University of California San Francisco (USA), University of Lübeck (Germany)

Funders

ALCCRF; Children's Cancer Foundation; MRFF; MyRoom; NHMRC; Robert Connor Dawes Foundation; VCA

L-R: Dr Paul Daniel, Dr Claire Sun, Professor Ron Firestein

CHILDHOOD CANCER

Cancer detectives embrace open-source AI solution

The old saying goes that a problem shared is a problem halved. In the world of cancer research, there are few problems bigger than paediatric solid and central nervous system (CNS) tumours.

These tumours are the number-one cause of childhood cancer-related deaths.

Exacerbating this problem, the pharmaceutical industry puts little emphasis on developing new drug treatments for kids' cancers, due to their relatively small numbers compared to adult varieties.

As a comparison, the US Food and Drug Administration (FDA) approved more than 500 adult cancer drugs in the last four decades, but only 12 for childhood cancers, and none for brain or CNS cancers in kids.

"Paediatric cancers are unique from adult cancers, so we don't necessarily expect the same drug that works in adult cancers to work in children," said Dr Paul Daniel.

Hudson Institute cancer specialists, leaders of the Victorian Paediatric Cancer Consortium (VPCC) Precision Medicine Program, realised that the more this problem is shared, the greater the chances of success.

A global solution

Faced with such a monumental challenge, Hudson Institute's Centre for Cancer Research, headed by Professor Ron Firestein, decided to share the burden, bringing highly competitive institutions together in pursuit of a common goal: to accelerate the search for new treatments and cures.

Together, they created the Childhood Cancer Model Atlas (CCMA), a highly sophisticated paediatric cancer hub offering an open-source bank of childhood cancer tumour tissue samples complemented by advanced artificial intelligence (AI) data-mining tools.

With the world's largest collection of high-risk paediatric cancer cell lines consolidated in one location, hospitals worldwide now collaborate by sharing tumour tissue samples with Hudson Institute researchers. These researchers utilise the samples for comprehensive testing against a wide array of cancer drugs.

That means researchers working anywhere in the world on childhood cancers can have their potential treatments tested then analysed using the latest AI techniques, with the results available for every paediatric oncologist and childhood cancer researcher worldwide.

The story of the CCMA featured in the esteemed journal, *Cancer Cell*, marking a milestone in paediatric cancer research and embedding Hudson Institute as a global leader in the field.

AI and data is key

This work goes way beyond the testing of tissue samples. Dr Claire Sun is a bioinformatician, whose job involves compiling, collating and condensing huge amounts of data, as the team performs hundreds of tests on each tumour type.

"Having models [samples] of various childhood cancers is the only way that we can study the disease and understand how it develops, what makes it grow and ultimately what treatments can be used to fight it off and hopefully cure it," Dr Sun said.

Worldwide impact for children with cancer

"Drs Sun, Daniel and Prof Firestein have addressed the urgent need to develop a childhood cancer cell line resource to identify the vulnerabilities of specific cancers towards improving targeted therapies for paediatric solid and central nervous system tumours. Their work also provides important insights into new targets of clinical relevance for paediatric-focused cancer drug development."

Professor David Eisenstat, Head of the Children's Cancer Centre at Melbourne's Royal Children's Hospital and Group Leader, Neuro-Oncology, Murdoch Children's Research Institute

"Understanding the vulnerabilities of paediatric tumours is essential to help identify new therapeutic approaches. This work is a 'tour de force' that includes the largest collection of brain tumour models, generating a resource that will be invaluable to researchers across the world."

Dr Mimi Bandopadhayay, Assistant Professor of Paediatrics, Harvard Medical School

Next steps

Traditional clinical trials often focus on single-agent treatments, but the team recognises the transformative potential of combining multiple drugs concurrently, so their next steps involve leveraging the power of combination therapies for improved paediatric cancer outcomes.

This approach, illustrated through collaboration with the ongoing international phase II clinical trial, CONNECT2109, presents an opportunity for rapid translation of research discoveries to improve outcomes for children with cancer.

"We're like detectives, creating models that copy how tumours act, looking at all the tiny details and figuring out what could work best. The CCMA is like a treasure trove for researchers and clinicians all over the world, helping us work together to find better ways to help these brave kids," said Prof Firestein.

The CCMA is the outcome of seven years of support and more than $7 million in funding from the Children's Cancer Foundation. The CCMA also benefited from the support of the Australian Government's Medical Research Future Fund and the Robert Connor Dawes Foundation.

1 in 5 children
will not survive

Most survivors
suffer long-term disability from the treatments

#1 cause
of death for Australian children

12 cancer drugs
approved for children in last 40 years vs 500 approved for adults

Pippa Rea, diagnosed with a cancerous tumour in the brainstem

VIRGINIA'S STORY

Childhood brain cancer: building hope

Pippa Rea was just nine years old when she was diagnosed with a diffuse intrinsic pontine glioma (DIPG), a cancerous tumour in the brainstem.

Surgery was too dangerous, so she underwent simultaneous chemotherapy and radiotherapy, which suppressed the tumour for 14 months until it grew again. The tumour eventually took Pippa's life 21 months after diagnosis.

Her mother, Virginia, donated the tumour post-mortem for tissue samples, which provided DNA, RNA and a live cell line.

"We never thought of the tumour as part of Pippa and, naturally, wanted it removed. Understanding that the cell line has now become a spider's web connecting research labs around the world gives us a sense of closure with the tumour and provides us with a positive impact. We will always be advocates for the importance of post-mortem donation but hope that one day we won't have to be," said Virginia.

"Understanding that the cell line has now become a spider's web connecting research labs around the world gives us a sense of closure with the tumour and provides us with a positive impact."

Virginia Rea, mother of Pippa Rea

MONIQUE'S STORY

Childhood brain cancer: building hope

Luca Boggia went from being an active three-year-old to needing extensive brain surgery in a matter of weeks, due to what turned out to be an extremely rare cancerous tumour. Eleven rounds of chemotherapy and 33 consecutive days of radiotherapy later, he was on his way back to health.

Luca has just had his ninth birthday and his mother Monique Boggia says he's thriving. She's thankful for the opportunity to donate her son's tumour tissue and hopeful that the next family who finds itself in the same position has an easier time of it.

"I'd hope that through the work of the surgeons and researchers, the next family gets a clearer picture of the available treatments and what can be done," said Monique.

"I'd hope that through the work of the surgeons and researchers, the next family gets a clearer picture of the available treatments and what can be done."

Monique Boggia, mother of Luca Boggia

Luca Boggia-Hall (rare brain tumour survivor)

LUNG CANCER

Published in *Journal of Experimental and Clinical Cancer Research*, April 2023
Published in *Cell Reports*, September 2023

Defeating lung cancer: the power of technology and research

Associate Professor Dan Gough

Lead Researcher

Associate Professor Gough, a biochemist and cancer biologist, examines the interaction between lung tumours and the immune system, as well as alterations within tumours, to inform a new generation of cancer treatments.

Collaborators

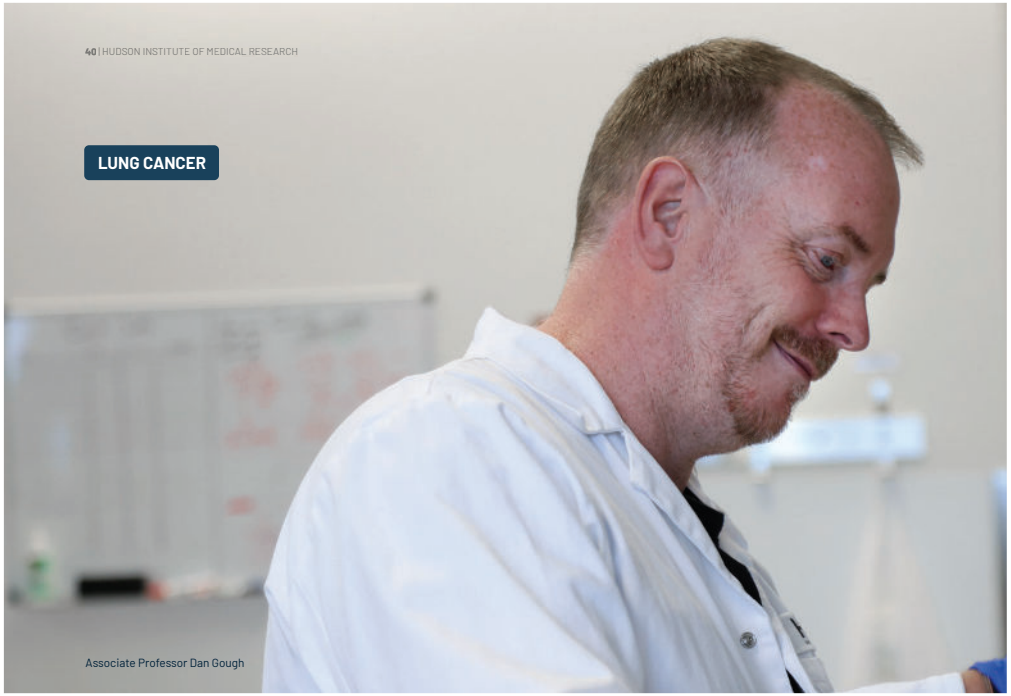
Garvan Institute; Monash Biomedicine Discovery Institute; Monash Institute of Pharmaceutical Sciences; Western Sydney University; CNRS (France); New York University (USA); University of Toronto (Canada)

Funders

Peninsula and South East Oncology; Victorian Cancer Agency

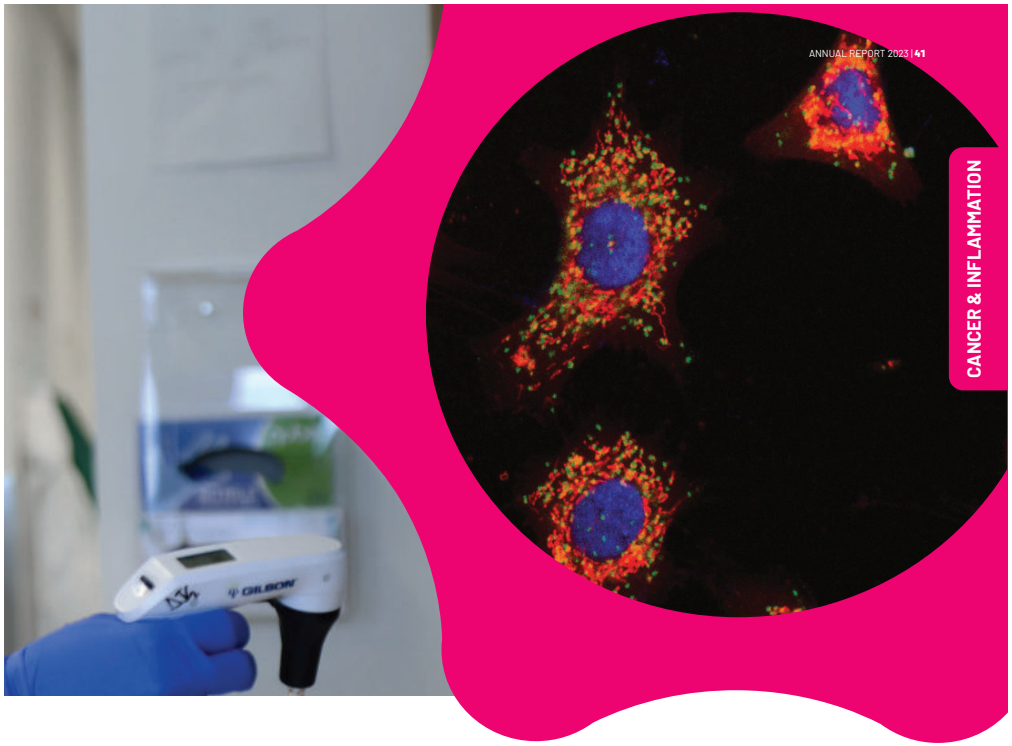
Associate Professor Dan Gough

LUNG CANCER



Associate Professor Dan Gough

CANCER & INFLAMMATION



Defeating lung cancer: the power of technology and research

Motivation is not hard to come by in Associate Professor Dan Gough's line of work – he is reminded every time he's asked what he does for a living.

"When I tell them that I am a cancer researcher it inevitably leads to a conversation about how they have been touched by cancer and how important the work is," A/Prof Gough stated.

The disease A/Prof Gough is working to defeat is the most lethal cancer worldwide: lung cancer.

With his team in Hudson Institute's Centre for Cancer Research, he has developed sophisticated models of lung cancer which allow them to model disease progression and observe response to current treatments in patients.

These models can also allow the team to test new drugs that will

- Be effective treatments on their own
- Improve the response to current care
- Reduce metastatic spread.

Uniting fundamental science and technology

A major focus is to improve on a new class of immunotherapy drugs which empower the patient's own immune system to kill their tumour.

But sometimes it's the nuts and bolts of cancer development and growth that can have the most impact.

"I have spent 20 years building better model systems and knowledge about tumour formation," A/Prof Gough said.

"Scientists now have access to new technologies which, when combined with these models, enable the team to ask critical questions about tumour interaction with the other cells in the tissue that it is forming in."

Why chemotherapy stops working

A/Prof Gough's work was recognised on several fronts throughout 2023, from fundamental discovery research into how tumour cells change the way they generate the energy required for growth (*Cell Reports*) to large drug-screening studies in lung cancer in the *Journal of Experimental and Clinical Cancer Research (JECCR)* and paediatric cancers *(Cancer Cell)*.

The publication in *JECCR* identified why lung cancer stops responding to the most commonly used frontline chemotherapy – platinum. Importantly, the team identified a drug that restored platinum sensitivity, ultimately doubling the lifespan in a preclinical lung cancer model.

It is this type of fundamental research – that so often goes unnoticed – which identifies potential targets for cancer treatment and ultimately forms the basis of the next wave of cancer treatments.

"These insights will be critical to refining the new generation of cancer treatments."

Associate Professor Dan Gough

Next steps

The next step for Hudson Institute's lung cancer specialists is to leverage the preclinical models they have developed and embrace new technologies to understand how to achieve better outcomes for lung cancer patients.

The future is full of exciting possibilities in this field and as A/Prof Gough knows, all the motivation he needs is never far away.

"Applying our understanding of fundamental biological systems to the complex setting of tumour growth is essential to identify new treatments," said A/Prof Gough.

Every minute	Most lethal	1 in 10 men	1 in 3 women
one Australian dies from lung cancer	cancer worldwide	with lung cancer have no smoking history	with lung cancer have no smoking history

STOMACH CANCER

Published in *Nature Communications*, June 2023

A fire in the belly: more to be done in stomach cancer research

Professor Richard Ferrero

Lead Researcher

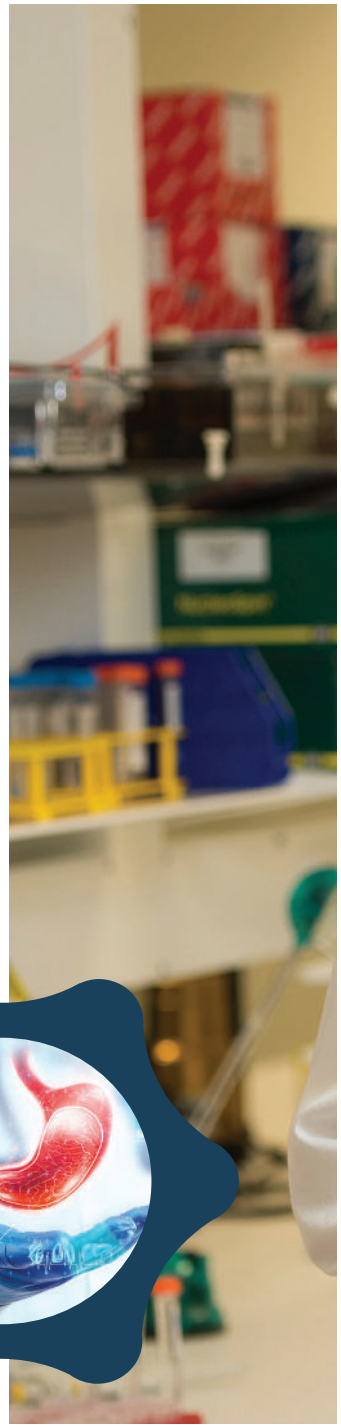
Professor Richard Ferrero studies how inflammation causes stomach cancer and the role of a bacterium in this process.

Collaborators

Monash University; WEHI; Boston Children's Hospital (USA); Cell Signaling Technology (USA); Duke-NUS Medical School (Singapore); Genome Institute of Singapore (Singapore); Karolinska Institute (Sweden); National Cancer Centre Singapore (Singapore); Singapore General Hospital (Singapore); Shanghai Jiao Tong University (China); SingHealth Duke-NUS Blood Cancer Centre (Singapore); University of Hohenheim (Germany); University of Toronto (Canada); Zhejiang University (China)

Funders

ARC; Can Too Foundation; DAAD; German Academic Exchange Service; NHMRC; US Department of Defense

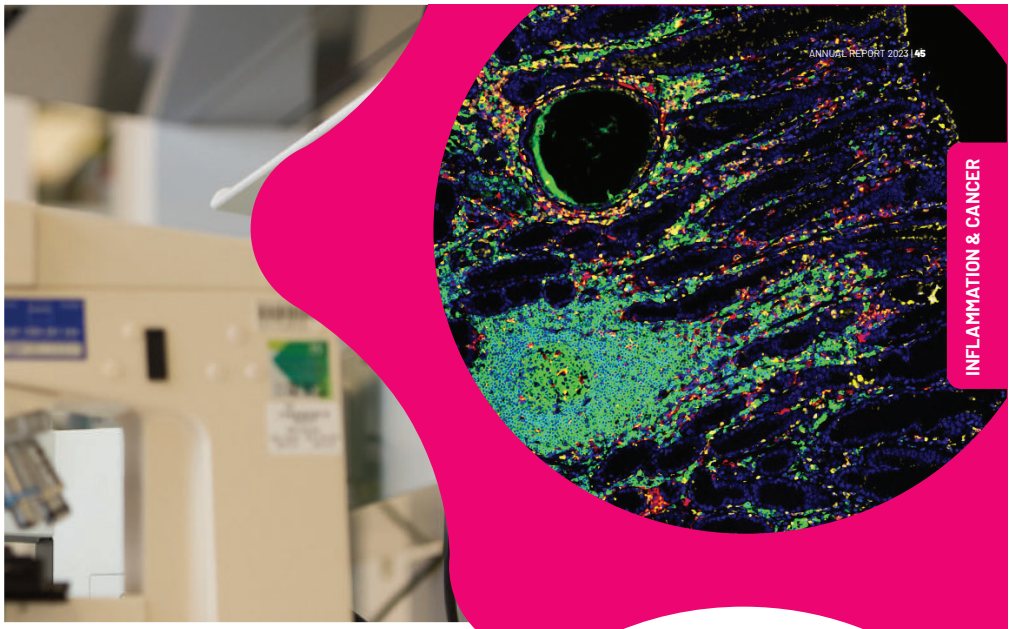


Professor Richard Ferrero

STOMACH CANCER

Professor Richard Ferrero

INFLAMMATION & CANCER



A fire in the belly: more to be done in stomach cancer research

Some science stories have entered into folklore, such as the researcher who infected himself with a particular bacterium in order to prove that it, not stress, was the cause of stomach inflammation and ulcers.

That research won the Western Australia-based gastroenterologist, Professor Barry Marshall, and his pathologist colleague, Dr Robin Warren, a Nobel Prize and boosted awareness of the damage Helicobacter pylori (*H. pylori*) causes to gut health.

Inflammation and stomach cancer

In the years since, it has been firmly established that *H. pylori* infection can also play a central role in the development of stomach cancer.

That is where Hudson Institute's Professor Richard Ferrero comes in. He has spent decades increasing the understanding of how inflammation can cause stomach cancer and the role of *H. pylori* in this process.

But with cases of *H. pylori* infection and stomach cancer decreasing in Western countries, and the availability of antibiotics that can treat the infection, he is sometimes asked, "Why bother studying the bacterium?"

"While fewer people are suffering from *H. pylori* infection and dying of stomach cancer, there is still a major gap in some populations. Many Indigenous peoples around the world, including in Australia, continue to suffer from *H. pylori* infection and, like others, have increasing rates of stomach cancer. Throughout Asia, stomach cancer remains the second leading cause of death due to malignancy," said Prof Ferrero.

Perseverance pays

Prof Ferrero said his lab's current research focuses on two main areas:

"The first concerns nano-sized 'blebs' (vesicles) that are released by bacteria and encounter cells in the body. We are studying how vesicles can alter the normal functions of these host cells and how they can be harnessed as vaccines to protect against stomach cancer caused by *H. pylori*."

When Prof Ferrero first presented his work in this area at an international conference, a senior colleague asked with a smirk: "Do you really believe that these vesicles exist?".

Since then, research on bacterial extracellular vesicles has exploded, with the importance of vesicles in bacterial infection now accepted dogma in the field.

"A second theme is focused on a rare type of lymphoma that develops in the stomach of some people with *H. pylori* infection. We are characterising the molecular pathways involved in the development of this lymphoma to be able to better predict those likely to develop the most severe forms of this cancer and develop new therapeutic targets," Prof Ferrero said.

Closing the gap for patients

Prof Ferrero's 2023 highlights included a publication in the prestigious journal, *Nature Communications*, and an NHMRC Ideas grant worth more than $1 million over four years to examine how 'blebs' alter host cell functions, leading to cancer. This research will describe a new mechanism by which bacteria can cause cancer.

Despite the fact that up to half of the world's population is infected with *H. pylori* and that stomach cancer remains a major cause of death in many parts of the world, funding for this cancer is much lower than for many other types of malignancy.

It's something that keeps the fire in Prof Ferrero's belly burning.

"Through a greater understanding of *H. pylori* infection, we are identifying molecular targets that can be used for better diagnosis, new therapies and preventative treatments, such as vaccines, against the diseases caused by this bacterium," Prof Ferrero said.

20–50% people
in Western countries have *H. pylori*

80% people
in developing countries have *H. pylori*

Fifth most
common cancer worldwide

700,000 deaths
annually worldwide

"Many Indigenous peoples around the world, including in Australia, continue to suffer from *H. pylori* infection and, like others, have increasing rates of stomach cancer."

Professor Richard Ferrero

Published in *EMBO reports*, October, 2023

Understanding inflammation: a matter of life and (cell) death

Associate Professor Kate Lawlor

Lead Researcher

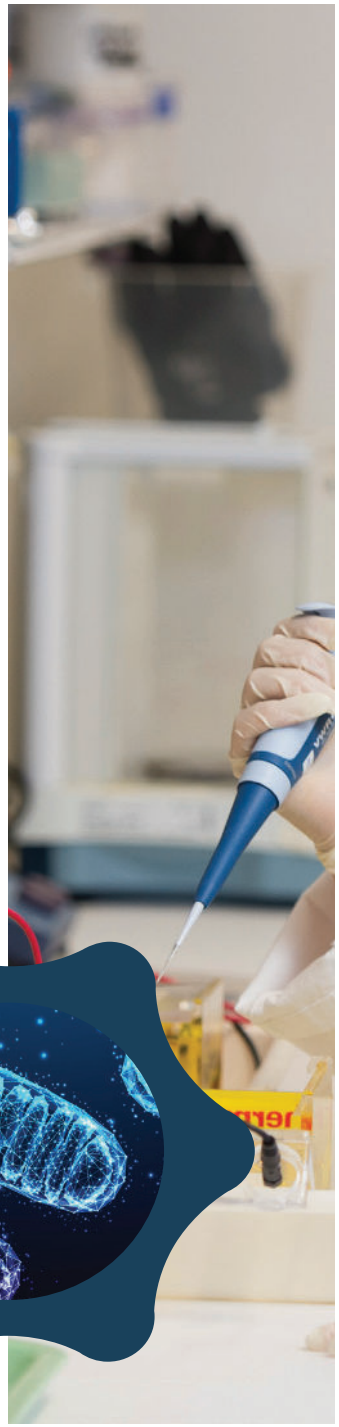
An immunologist, Associate Professor Lawlor studies how cell death impacts immune responses in inflammatory and infectious diseases. Her work impacts antimicrobial resistance, cancer, sepsis, rheumatoid arthritis and type 2 diabetes.

Collaborators

Monash University; Doherty Institute; WEHI

Funders

ARC (Future Fellowship);
NHMRC Ideas Grant



Associate Professor Kate Lawlor

Associate Professor Kate Lawlor

INFLAMMATION

Understanding inflammation: a matter of life and (cell) death

"Life is pleasant. Death is peaceful. It's the transition that's troublesome."
Isaac Asimov, American author and Professor of Biochemistry.

Associate Professor Kate Lawlor knows better than most that it is not death itself but how and when it happens that is most significant.

A/Prof Lawlor leads the Cell Death and Inflammatory Signalling Group that investigates the intricate links between cell death and inflammation and how these processes impact various inflammatory and infectious diseases.

She knows that when it comes to cell death – an essential and inevitable process - too much or too little is a problem: both are bad for your health.

Diseases linked to cell death

When cell death goes wrong, such as cells failing to die or dying at the wrong time, it can lead to many diseases including cancer, autoimmune diseases and neurodegenerative disorders, such as Alzheimer's and Parkinson's.

Cell death also regulates the body's inflammatory response to infection and, when in excess, can drive both acute and chronic inflammatory conditions, such as sepsis, rheumatoid arthritis and type 2 diabetes.

How is cell death linked to better health?

A/Prof Lawlor explains that cell death is the removal of dead cells from the body to maintain healthy tissues and organs:

"It occurs in two ways, through natural controlled cell death (apoptosis), or through accidental cell death (necrosis) due to an injury or infection which can cause inflammation.

"My team aims to understand how cell death regulates innate inflammatory responses, where innate immune cells act as the first line of defence against microbial infections and tissue injury.

"By understanding how cell death signalling coordinates inflammatory responses and tissue repair, we believe that we can selectively target cell death regulatory molecules to promote better health outcomes in a wide range of disorders.

"While activating cell death can be good in infection, too much cell death can drive tissue damaging inflammation, known as sepsis. Likewise, we have shown that elevated cell death directly triggers inflammation in acute and chronic inflammatory diseases, so my lab is trying to discover molecules that limit cell death and diminish inflammation," she said.

"I enjoy that in my area of fundamental cell death research I get to dissect complex molecular pathways using innovative new technologies. But I am more excited by the fact that my findings have the potential to uncover new therapeutic targets that can be translated into the clinic to treat inflammatory disorders, infections and even cancer."

Associate Professor Kate Lawlor

Uncovering clues for therapeutics

2023 saw significant progress in this field, with research published in *Cell Death & Disease* and *EMBO Reports* that uncovered essential cell death regulatory molecules that dictate when specific innate immune cells die during normal ageing and to select bacterial infections.

These achievements led the group to receive funding from the ARC to explore new areas of innate immune cell regulation.

For A/Prof Lawlor, this work brings multiple benefits:

"I enjoy that in my area of fundamental cell death research I get to dissect complex molecular pathways using innovative new technologies. But I am more excited by the fact that my findings have the potential to uncover new therapeutic targets that can be translated into the clinic to treat inflammatory disorders, infections and even cancer.

"Beyond this, my Research Group Head role has allowed me to inspire the next generation of medical researchers to have successful careers in both academia and industry.

"It's a career that aims to deliver better treatments and incredible science, in a research area promising huge benefits for us all," she said.

PRIMARY ALDOSTERONISM

Setting a new PACE for hypertension

Professor Peter Fuller, Associate Professor Jun Yang

Lead Researchers

Professor Peter Fuller and Associate Professor Jun Yang are clinician-researchers working at Hudson Institute and Monash Health. They are improving the diagnosis and treatment of the number-one risk factor for death, high blood pressure (hypertension). Their focus is on primary aldosteronism (PA), a common, potentially curable but under-diagnosed form of hypertension.

Collaborators

Primary Aldosteronism Centre of Research Excellence (PACE) is a large collaborative initiative led by Hudson Institute, involving Barwon Health; Baker Heart and Diabetes Institute; Curtin University; Menzies School of Health; Monash Health; Monash University; University of Queensland; University of Western Australia

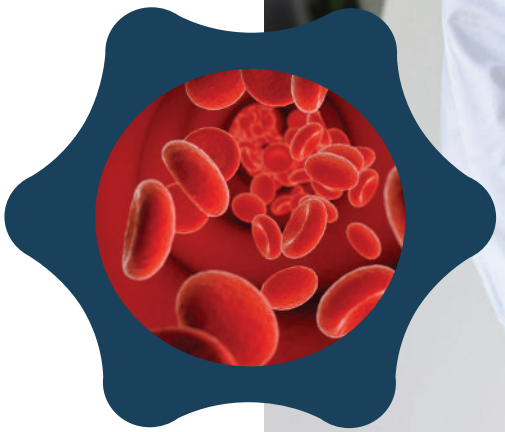
Funders

MRFF; NHMRC

Clinical trial

CONSEP trial

CONn Syndrome (primary aldosteronism) screening and Evaluation in Primary care (CONSEP).



L-R: Professor Peter Fuller, Associate Professor Jun Yang

PRIMARY ALDOSTERONISM

Associate Professor Jun Yang with patient David

HORMONE DISORDERS

Setting a new PACE for hypertension

Some quick mathematics paints a disturbing picture

- Six million Australians – one in three adults – have hypertension
- For 10 per cent of those, the cause is a hormonal condition called primary aldosteronism (PA)
- Only one percent of people with hypertension are tested for PA.

For Associate Professor Jun Yang, this issue is personal as well as professional. An endocrinologist and a researcher, soon after A/Prof Yang started researching PA, she found that not just one, but both of her parents had the condition, which explained their inability to keep their blood pressure under control.

"What I love about PA is that it is easily detected (with the correct blood test) and has effective treatment or even a cure," A/Prof Yang said.

"It is just there, right under our noses, and yet it is often missed. If we can systematically improve its diagnosis in the whole population, we may be able to prevent many unnecessary heart attacks, strokes and kidney failure."

With her mentor, Professor Peter Fuller, who is Head of Endocrinology at Monash Health and leads Hudson Institute's Centre for Endocrinology and Metabolism, A/Prof Yang successfully applied for an NHMRC Centre of Research Excellence Award in 2023. This allowed the establishment of the Primary Aldosteronism Centre of Research Excellence (PACE), bringing together world-class researchers from Hudson Institute, Monash Health, Monash University, University of Queensland Diamantina Institute, Baker Heart and Diabetes Institute, Curtin University, University of Western Australia and Menzies School of Health.

"The aim of PACE is to coordinate PA research and develop integrated strategies to enable the medical profession – from general practitioners to major hospitals – to better understand, identify and treat this condition," Prof Fuller said.

The establishment of PACE was one of many highlights in this field throughout 2023.

A/Prof Yang's group also received a Clinical Trials Activity Grant from the Medical Research Future Fund (MRFF) for the CONSEP (Conn Syndrome Evaluation in Primary Care) trial to be conducted in GP clinics across Victoria, South Australia and Tasmania. CONSEP aims to increase the effectiveness of PA detection by testing a new intervention based on educational outreach and electronic clinical decision support.

Reflecting on PACE's prominence in the PA research community, 2023 also saw the publication of novel research discoveries from the team, including

- PA affects up to 14 per cent of hypertensive patients
- It is cost effective to screen for PA from the onset of hypertension rather than waiting for resistant hypertension to develop
- Oral contraceptives can cause a false-positive PA screening test result
- PA screening tests can vary within individuals and should be measured at least twice to be certain
- Abnormal screening tests for PA are common in both First Nations peoples and non-Indigenous people based in Darwin.

With PA identified as a major health concern in Australia, not to mention an estimated 1.13 billion PA cases worldwide, it's an area of research that can change lives, and Hudson Institute is leading the way.

"As a clinician, I do research because I want to answer clinical questions and address challenges beyond the consultation room. While I love being a clinician and helping patients, being able to work on problems identified in the clinic, find solutions and change clinical practice on a larger scale is extremely rewarding."

Associate Professor Jun Yang

6M Australians
affected

10% with
hypertension have primary aldosteronism

Only 1%
screened for primary aldosteronism

1 in 3 adults
in Australia affected

1.13 billion
people affected worldwide

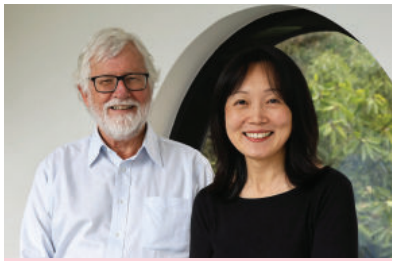
1 in 4 adults
affected worldwide

Research excellence

National and international funding bodies award research fellowships and grants through a highly competitive process, where expert panels assess and rank applications on scientific merit, innovation and track record.

A successful grant proposal demonstrates how highly a researcher's work is regarded by their peers. However, competition for available grant funding is high and limited budgets mean only a small percentage of applications progress through to scientific discovery projects. Congratulations to the 2023 recipients.

Top 2023 grants and fellowships awarded



Associate Professor Jun Yang and Professor Peter Fuller

NHMRC Centres for Research Excellence
Medical Research Future Fund, Clinical Trials Activity Grant

Research area: hypertension, primary aldosteronism

Professor Elizabeth Hartland and Dr Kitty McCaffrey

Human Frontiers Science Program

Research area: RNA, pathogens

Dr Stacey Ellery

NHRMC Investigator Grant

Research area: perinatal brain injury

Professor Ron Firestein

NHRMC Investigator Grant

Research area: precision medicine, genomics, cancer

Professor Stuart Hooper

NHRMC Investigator Grant

Research area: transition to birth

Dr Courtney McDonald

Medical Research Future Fund, Early to Mid-Career Researchers Grant

Research area: preterm babies, cell therapy, brain injury, expanded umbilical cord blood, cerebral palsy

Associate Professor Jason Cain

NHMRC Ideas Grant

Research area: lung adenocarcinoma

Professor Peter Fuller

NHRMC Ideas Grant

Research area: blood pressure, heart attack

Associate Professor Kate Lawlor

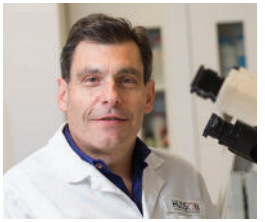
ARC Discovery Grant

Research area: cell death

Dr Miranda Davies-Tuck

NHMRC Ideas Grant

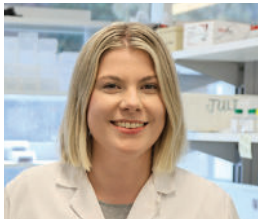
Research area: stillbirth prevention



Professor Richard Ferrero

NHMRC Ideas Grant

Research area: cancer, stomach cancer, H. pylori



Dr Nicole Campbell

US Department of Defense

Research area: ovarian cancer

Professor Vincent Harley

NHMRC Ideas Grant

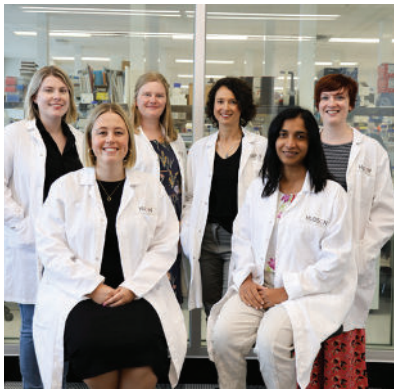
Research area: disorders of sexual development

Dr Shayanti Mukherjee

NHRMC Ideas Grant

Research area: pelvic organ prolapse

Professor Claudia Nold, Co-chair, Research Committee



2023 Emerging leaders | Back row L-R: Dr Nicole Campbell, Dr Emily Gulliver, Dr Caroline Skene, Dr Sarah Moody. Front row L-R: Dr Harriet Fitzgerald, Dr Rukmali Wijayarathna

Collaboration generates innovation

Innovation Seed Funding Awards

The Innovation Seed Funding Awards support innovative blue-sky thinking between researchers from different fields to solve healthcare challenges.

In a constrained funding environment, where many promising projects do not receive funding, the Awards encourage innovative thinking by supporting collaborating researchers from different fields and career levels to gather critical baseline data for new ideas. That data is integral to providing a pathway to secure sustainable funding.

In 2023, two new awards for researchers in the field of pediatric cancer were announced in addition to the current Senior and Postdoctoral Researcher Awards.

"The Innovation Seed Funding Awards are an opportunity to think more creatively and develop new, or strengthen existing, collaborations across disciplines with the aim of producing critical data for either grant funding or a manuscript for publication."

Professor Claudia Nold, Co-chair, Research Committee

Emerging leaders

The Emerging Leaders Program empowers high-achieving early-career researchers annually to reach their full potential in becoming independent researchers and future leaders in their fields.

Established by the Career Development Committee in 2019, and awarded after a competitive application process, the leadership training and mentoring program

- Prepares awardees for managing an independent research group
- Provides the tools to navigate a research career
- Develops confidence to innovate and create change.

Awardees are also tasked with helping others by sharing their new knowledge for the benefit of other early-career researchers.

"Careers in academic medical research are incredibly difficult to sustain, which means that talented young scientists are too often lost to other career pathways. The Emerging Leaders Program provides the awardees with practical tools and advice to future-proof their career, ensuring they reach their potential as future leaders."

Associate Professor Michael Gantier, Co-chair, Career Development Committee

Dr Emily Camm

Dr Fiona Cousins and her students

veski STEM program

Senior Research Scientist, Dr Emily Camm, was awarded a position in the prestigious Victorian Endowment for Science, Knowledge and Innovation (veski) inspiring women STEM sidebyside leadership program.

With women continuing to be under-represented at leadership levels across Australia, the leadership program empowers women in STEM with the skills, networks and mindset to extend and achieve their career goals.

The 2023 program was designed exclusively for a cohort of competitively selected mid-career women from across academia, industry, government and the not-for-profit sector who are aspiring to secure a senior leadership position.

Dr Camm, who has previously been a Science and Technology Australia STEM Ambassador, believes this opportunity will support her in achieving her career objectives.

Her long-term goal is to identify how conditions during early life – such as placental insufficiency, fetal growth restriction and maternal under-nutrition or over-nutrition – can alter child neurodevelopmental outomes and the protective effects of antioxidant and mitochondrial-targeted therapies.

Dr Camm's career so far has seen her complete a PhD at Monash University before postdoctoral studies overseas, including four years lecturing at Cambridge University.

"Engaging with the experienced veski mentors and industry experts, and a cohort of STEM leaders, will refine my leadership style, expand my professional network and further ignite my passion for advocating for gender equality and diversity within the STEM workforce."

Dr Emily Camm

Young Women in Science Program

Girls have overtaken boys in science participation at school. However, at university and in workplaces, it's a different story.

For many school students, a career in STEM can seem unattainable. But when they see someone who looks like them and has achieved success in these fields, it can give them the confidence to pursue their passion.

The Hudson Institute Young Women in Science Program connects 12 female Year 10 science students from local schools with leading Hudson Institute female scientists and their groups for a one-week immersive laboratory experience.

Dr Fiona Cousins, who co-ordinates the week, said there is clear evidence that having a STEM role model can greatly influence a student's decision to pursue STEM subjects at school and as a career.

"The unexpected benefit in 2023 was seeing students bond to form their own science support network. I hope that continues as they pursue their careers."

Dr Fiona Cousins, Young Women in Science Coordinator

New Research Group Heads

Hudson Institute's Research Group Heads lead their team's scientific investigation, mentor students and contribute significantly to Institute leadership. Each has also established themselves nationally and internationally in their fields of research. In 2023 three scientists were promoted to Research Group Heads, recognising their record of scientific discovery and leadership.

Dr Maree Bilandzic

Finding answers for ovarian cancer

Ovarian cancer has the highest mortality of any gynaecological cancer, with more than 90 per cent of patients developing recurrent and chemotherapy-resistant disease.

Molecular biologist Dr Bilandzic is researching new ways to treat ovarian cancer. Her group's recent discoveries that suggest targeting a specialised subset of leader cells will offer a powerful new paradigm to treat late-stage, resistant and recurrent ovarian cancer.

In 2023 Dr Bilandzic was awarded funding from Australia's national biotechnology incubator CUREator Program to develop a new way to treat ovarian cancer by directly targeting chemotherapy-resistant cancer cells. The grant, delivered by Brandon BioCatalyst and the MRFF, supports early-stage health and medical research and innovation in Australia through to proof-of-concept and beyond.

A minute with Dr Maree Bilandzic

Unlike other cancers, ovarian cancer cases are increasing. There are no treatments that achieve long-term remission, and primary care has remained largely unchanged, with new drugs that work on other cancers only making marginal impact on ovarian cancer outcomes.

My goal is to pioneer new anti-cancer medicines by understanding the molecular events and cell interactions responsible for ovarian cancer metastasis and chemoresistance.

I love science because we are always expanding on what we know, and I get to work with people whose passion is to make the world a better place for ovarian cancer patients and their families.

I knew I wanted to be a scientist when I realised there was a vocation that was fun and that could help humanity.

Dr Stacey Ellery

Creatine | healthy pregnancy, healthy baby

Every year 800,000 neonatal deaths and three million stillbirths occur globally because of placental insufficiency and hypoxia.

Pregnancy physiologist Dr Ellery studies cellular energy relationships and is pioneering the investigation of creatine, an energy metabolite, in reproduction, pregnancy and newborn health. Her team investigates creatine supplementation as a treatment to address poor reproductive and pregnancy outcomes, such as perinatal brain injury.

In 2023 Dr Ellery received an NHMRC Investigator Grant that will allow her to translate her studies. In addition, her paper published in the journal *Biology of Reproduction* showed that the human endometrium synthesises creatine, especially at the time of embryo implantation, and that it is altered in women experiencing infertility.

A minute with Dr Stacey Ellery

Creatine has the potential to become a standard dietary supplement used to improve pregnancy outcomes, much like the introduction of folate to reduce neural tube deficits.

As a treatment, creatine could cross geographic and socio-economic boundaries, helping millions in their quest to become parents.

I study how the uterus, placenta, fetus and newborn make and use energy, especially when oxygen and nutrient supplies are low. My team and I then target these processes with the aim of helping to produce healthy pregnancies and healthy babies.

What I love about creatine and energy metabolism is that it's linked to all reproductive processes, good and bad. By targeting these mechanisms with simple strategies like the use of nutritional supplements we can improve reproductive outcomes.

I knew I wanted to be a scientist when I asked my high school biology teacher a million questions in every lesson.

Dr Courtney McDonald

Giving preterm babies the best start

Half of all extremely preterm babies – born at under 28 weeks – will have a developmental delay at school age due to brain injury.

As a stem cell biologist, Courtney McDonald's research is focused on giving preterm babies the best possible start in life. She is developing cutting-edge stem cell therapies to reduce brain inflammation (neuroinflammation) and injuries that cause conditions like cerebral palsy.

In 2023 Dr McDonald received a Medical Research Future Fund (MRFF) Early to Mid-Career Researcher Grant and a Cerebral Palsy Grant to progress her research. Her team also started three clinical trials at Monash Health and a phase 1 clinical trial (CORD SAFE) that is based on her preclinical research over the last 10 years.

A minute with Dr Courtney McDonald

My research has uncovered how cell therapies reduce brain injury and how to optimise cell therapies for clinical translation by determining the best cell type, timing and dose.

There are limited treatments that can prevent brain injury and there are no therapies that can repair the brain once it has been damaged.

Sometimes the brain is clever enough to rewire itself, even if there's a big hole. Understanding why this rewiring happens in some patients and not in others could have a big impact on how we tackle brain injury.

Stem cells from umbilical cord blood can reduce and prevent brain injury when given soon after birth to babies most likely to develop a brain injury. My team and I are looking at the best way to enhance the efficacy of these cells and develop methods to make enough cells for clinical use.

My biggest achievement in 2023 was that I survived the first year of having identical twin girls.

Commercialisation

Commercialisation funding from national and state government helps bridge the gap between where research discovery funding ends and commercial investment begins. The funding of the groundbreaking projects listed below demonstrates their importance in addressing the most signification health issues affecting our population.

"These projects show huge potential, not just from a scientific perspective, but as real-world treatments that will make a genuine difference, potentially to millions of people worldwide."
Rob Merriel, Chief Commercialisation Officer

Professor Vincent Harley

mRNA Victoria Research Acceleration Fund Program

Research area: Parkinson's disease

Dr Jim Vadolas

mRNA Victoria Research Acceleration Fund Program

Research area: myelodysplastic syndromes

Associate Professor Michelle Tate

Victorian Medical Research Acceleration Fund

Research area: influenza

Dr Shayanti Mukherjee

Victorian Medical Research Acceleration Fund

Research area: pelvic organ prolapse

Associate Professor Rebecca Lim

CUREator

Research area: exosome therapies, regenerative medicine

Research area: non-alcoholic steatohepatitis

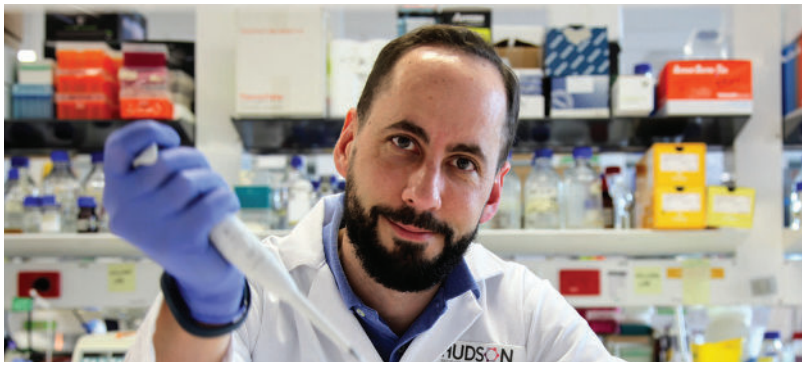
Dr Maree Bilandzic, Dr Andrew Stephens

CUREator

Research area: ovarian cancer

Published in *Nature Communications*, September 2023

Cancer drug proves effective against COVID inflammation



Associate Professor Michael Gantier

Uncontrolled inflammation is responsible for half of all deaths worldwide – it underpins hundreds of chronic conditions, with COVID-19 being a recent global addition to the list.

While COVID-19 may have retreated from the headlines, new strains ensure that its impact remains and the search for new treatments is as urgent as ever.

In 2023, a team led by Associate Professor Michael Gantier established that idronoxil – a drug originally designed to treat cancers – could reduce the dangerous inflammation that occurs in response to COVID-19.

Their research was published in the leading journal, *Nature Communications*, and forms a cornerstone of the partnership between Hudson Institute and Noxopharm Ltd.

A/Prof Gantier and his team of academic and industry collaborators are now developing idronoxil derivatives with enhanced anti-inflammatory activities, leveraging funding from the Victorian COVID-19 Research Fund.

"COVID-19 showed that our hospitals were ill-prepared for an influx of patients with respiratory distress, and more drugs are clearly needed to prevent this from happening again."
A/Prof Michael Gantier

Collaborators include the Australian National University, Monash University, the University of Technology, Centenary Institute and the University of New South Wales.

Their preclinical research, conducted in parallel with an early clinical trial on moderate SARS-CoV-2 patients in 2021, demonstrated that idronoxil was safe.

Next steps

The next step is to further develop idronoxil or its potential derivatives to help treat viral-induced lung hyperinflammation driven by emerging viruses – delivering the remedies that were so desperately needed during the pandemic.

Collaborators | ANU; Centenary Institute; Monash University; St Vincent's Institute of Medical Research; University of Adelaide; University of Technology Sydney; UNSW; Francis Crick Institute (United Kingdom)

Industry Noxopharm Limited

Funders Victorian Government, COVID-19 Treatment Research Fund

COVID-19
still contributing to higher Australian death rates

Nearly 7 million
people have died globally

24,000+
people have died in Australia

Early ovarian cancer detection

L-R: Dr Andrew Stephens and Richard Ullman (CLEO Diagnostics), pictured at Hudson Institute

Some of the greatest advances in modern medicine have come from the ability to screen for serious illnesses, including cancers, and catch them early.

Many of the factors which make ovarian cancer such a devastating disease could be minimised with early detection

- The symptoms are often vague and easily confused with other conditions
- Currently the only sure way to diagnose ovarian cancer is through invasive surgery
- In most cases, diagnostic surgery shows no cancer present
- Around 70 per cent of diagnoses are made in the later stages, when the cancer has spread
- The five-year survival rate is less than 50 per cent – even lower with later diagnosis.

Over 10 years of research at Hudson Institute, largely funded by the Ovarian Cancer Research Foundation (OCRF), Dr Andrew Stephens identified the potential of CXCL10 as a biomarker for use as an accurate diagnostic.

Cleo Diagnostics Ltd saw the potential and is now developing that same biomarker into a range of simple blood tests

1. Triage test – to reduce unnecessary surgeries
2. Recurrence test – identifying whether a cancer is recurring following treatment
3. Screening test – to identify early-stage ovarian cancer.

In August 2023 Cleo successfully launched on the Australian Stock Exchange (ASX: COV), raising $12 million to advance the development of these tests, which they hope to begin launching on the US, Australian and European markets within the next one-three years.

"Through ongoing community support, the OCRF is proud to have nurtured this research from the lab bench through to the commercialisation phase. We are excited to see where Cleo takes it from here."

Robin Penty, Ovarian Cancer Research Foundation CEO

Published in *The Journal of Infectious Diseases*, December 2023

New flu treatment helps the body to help itself

L-R: Dr Lauren Ely, Dr Chris Harpur, A/Prof Michelle Tate, Dr Alison West, Dr Andrew Gearing

The body's response to viruses like influenza can sometimes be more damaging than the virus itself.

New flu strains emerge each year, and when the natural inflammatory response gets out of control it can cause enormous damage to the lungs, with very few treatment options available.

Associate Professor Michelle Tate, working with Melbourne-based Lateral Pharma Pty Ltd, is investigating the next generation of treatments that control the body's response rather than targeting the virus itself.

Their work, published in *The Journal of Infectious Diseases and Clinical & Translational Immunology* and supported by the Victoria Medical Research Acceleration Fund (VMRAF), centres on a novel influenza therapy which limits damaging inflammation and promotes recovery from severe infection.

"We urgently need new drugs for influenza and respiratory viruses. These results support the potential for a treatment that will help patients with severe respiratory disease."

Associate Professor Michelle Tate

A/Prof Tate says the drug mimics a natural protein found in the body and protects lung cells from damage and cell death:

"We're aiming to limit damaging inflammation caused by the influenza virus and its ability to replicate in the lung. The search is always on for treatments that fine-tune the inflammatory response, to strike a balance between inflammation which can be protective or damaging."

This work has the potential to deliver a powerful new weapon in the currently limited arsenal of treatments not just for flu but also for a wide range of serious respiratory conditions, including, potentially, the next pandemic. All these conditions reduce healthspan – the length of time a person is not affected by chronic debilitating diseases.

Collaborators Lateral Pharma Pty Ltd

Funders Victoria Medical Research Acceleration Fund (VMRAF)

252,296
flu cases, up 12% on 2022

3,696 people
hospitalised, up 101% on 2022

376 flu deaths
up 22% on 2022

Thank you to our supporters

We are grateful for the gifts received from individuals, trusts, foundations and organisations during the year.We also acknowledge the support of the Victorian State Government and the Australian Government.

Funding bodies

Australian Research Council

Bethlehem Griffiths Research Foundation

Cabrini Foundation

Cancer Australia

Cancer Council Victoria

Canteen

CASS Foundation

Cell Care Australia

Cerebral Palsy Alliance

Children's Cancer Foundation

Children's Cancer Institute

Children's Tumour Foundation

CSL Limited

Department of Defense (USA)

Endocrine Society of Australia

Financial Markets Foundation for Children

Granulosa Cell Tumour Research Foundation

Harold Mitchell Foundation

Human Frontier Science Program

Inner Wheel Foundation

Jack Brockhoff Foundation

Johnson & Johnson (USA)

Leukaemia Foundation

Loftus-Hills Fund and Renshaw Fund of Lord Mayor's Charitable Foundation

Magee-Womens Research Institute and Foundation

Monash IVF

Medical Research Future Fund

National Health and Medical Research Council

National Heart Foundation

National Institutes of Health (USA)

Ovarian Cancer Research Foundation

Rare Ovarian Cancer Inc

Red Nose Australia

Robert Connor Dawes Foundation

Silence Therapeutics

Snowdome Foundation

The Kids' Cancer Project

The Sylvia and Charles Viertel Charitable Foundation

University of Birmingham (in partnership with CCF)

Victorian Cancer Agency

Victorian Government, Department of Jobs, Skills, Industry and Regions

Victorian Government, Operational Infrastructure Support Scheme

Zero Childhood Cancer Program

Major donors

Estate of Judith Anne Gardiner

Estate of William Gordon Angus

The Lettisier Foundation as Trustees for the Evans Family Foundation

Elliot Gautsch Postgraduate Scholarship, Miette Skiller Scholarship Sub-Fund, Australian Communities Foundation

Mrs Patricia McCallum

Professor Henry Burger AO

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The Phoebe Jones and Jacob Jones Trusts

Estate of Winifred Gould

Mr Thomas and Mrs Patricia Chick

Professor Lois Salamonsen

Mrs Kathleen Johnston

Dr Miriam Faine and Mr Greg Shalit

Estate of Nancye Rae Durham

Mr Nigel Garrard

Stummer Studio Dance School

S&D Hain Foundation

Lifestyle Communities, Officer, Victoria

Lifestyle Communities, Officer, Victoria, Social Committee

Mrs Jill D'Arcy

The Piers K Fowler Scholarship Fund

Mr Neville Marriott

Dr Robert (Bob) Edgar AM

Mrs Leigh Bartelt

Trusts and Foundations

Hudson Institute is grateful for the ongoing support of our generous trusts and foundations who form part of our wider community, helping to connect our Institute and scientists with patients who inform our research.

We would particularly like to thank the following organisations for their contributions to our work in 2023.

Robert Connor Dawes (RCD) Foundation

During a year in which our children's cancer work has gone to another level, it behoves us to reflect on the contributions the RCD Foundation has made to our research. Since its inception in memory of Connor Dawes, a special 18-year-old who succumbed to brain cancer in 2013, the Foundation has worked tirelessly to advance paediatric brain cancer research, and Hudson Institute has been fortunate to be recognised as a leader in the field with significant funding for our paediatric brain cancer research.

Inner Wheel Foundation

The use of umbilical cord blood cell therapies to prevent and minimise perinatal brain injury to very premature babies is a particular passion of the Inner Wheel Australia, and the work of Dr Tayla Penny is a wonderful example of what can be achieved with this kind of support. Nationally over $3.5 million has been raised by Inner Wheel Australia for this great cause. These funds help to keep our researchers at the forefront of this life-changing work.

CASS Foundation

The CASS Foundation is a private philanthropic organisation that supports Victorian medicine and science research projects that have the potential to lead to improved treatment and practice. As a long-time supporter of Hudson Institute's work, the Foundation has contributed to projects ranging from cancers and contraceptives to pelvic organ prolapse and endometriosis. In an environment in which research funding is crucial to success, we deeply appreciate the continued support that the CASS Foundation provides.

The Kids' Cancer Project

The tagline of the Kids' Cancer Project says it all: Survival starts with science. With a deep understanding of the importance of discovery research, translation and beyond, this charity makes a vital contribution to our work in this area, providing six grants in 2023 alone. Without their tireless efforts and donors' support we would have fewer opportunities to make a real positive difference to the lives of children with cancer and their families.

Stomach cancer advocate and supporter

Philanthropy can be sparked in many ways; for Delva Walker it began after her own brushes with cancer and a subsequent thirst for knowledge about the disease, its causes and possible cures.

"In 2010, I had a radical gastrectomy for stomach cancer," she said. "It was successful surgery, and I didn't have to have chemo or radiation."

"In Hudson Institute's newsletter I saw that Professor Richard Ferrero was researching gastric cancer, so I wrote to him and he replied."

As a passionate advocate for medical research, 92-year-old Delva can often be heard asking: "Why isn't there more funding for stomach cancer research?"

What flowed from that initial contact gave Delva an insight into Prof Ferrero's remarkable work and gave the researcher and his lab a passionate advocate and supporter.

She continues to support Hudson Institute's research with donations and advocacy, all aiming to see more advancements made in stomach cancer research. She also does no harm to her standing among our researchers by occasional contributions of her magnificent homemade orange marmalade!

More than 13 years after becoming a stomach cancer survivor, Delva Walker is an inspiration, for her positivity and attitude of taking each day as it comes.

She continues to inspire the scientists working to develop new treatments for gastric cancers; after all, she is living proof of how valuable it can be to save a life.

L-R: Professor Richard Ferrero, stomach cancer survivor, advocate and supporter Delva Walker and Dr Caroline Skene

L-R: Preterm baby and NEC researchers Professor Marcel Nold, Dr Ina Rudloff, Professor Claudia Nold and CEO of the Norman Beischer Foundation, Andrew Brookes

Right image: Baby Charlie fighting necrotising enterocolitis (NEC) in hospital

Beischer Foundation sticks its 'NEC' out

Any new parent will tell you how overwhelming it can feel to suddenly be caring for a fragile new life.

Now imagine that this life came into the world before it was ready – the fragility is magnified and with it the number of unknowns and things that can go wrong.

Hudson Institute and Monash University are a global leaders in research investigating the conditions that can affect preterm babies, with Professors Claudia Nold and Marcel Nold at the forefront.

One of their primary areas of research is necrotising enterocolitis (NEC), a disease of the premature gut and the most common cause of death due to gastrointestinal health issues in infants.

NEC triggers massive inflammation, causing parts of the small and/or large intestines to die. Widespread infection and multi-organ failure often ensue. It is a looming spectre that strikes unpredictably in preterm babies.

Charlie's story

Sophie and Nathan Streeter had never heard of the disease until it struck their baby boy Charlie just eight weeks after his premature birth.

Three days and two surgeries later, Charlie passed away in his parents' arms.

Through their devastation, this young couple determined to do whatever they could to create positive change; they reached out to Hudson Institute's resident experts, hoping to create the two things they needed when they encountered NEC.

The first was information – providing the resources parents need in the hours and days after a diagnosis of NEC – to fill the exasperating vacuum that currently exists.

The second was more research – to fill another vacuum, namely the absence of safe and effective treatments for this devastating disease.

Sophie and Nathan were also kind enough to allow Hudson Institute to tell their story as part of the 2023 fundraising appeal. Their story has touched the hearts of everyone who's watched it.

Achieving more together

Elsewhere, at the same time, the Norman Beischer Foundation had a similar aim and the funds to help it happen.

Chief Executive Officer Andrew Brookes said the Beischer Foundation was keen to support research into NEC.

"The Foundation wants to stop families, such as the Streeters, and their babies being devastated by being hit by NEC," Mr Brookes said.

"This disease generally occurs out of the blue and the ability to predict who will get it is limited.

"The Foundation was impressed by the expertise of Professors Claudia Nold and Marcel Nold around NEC and believes that they are ideally positioned to help address this devastating condition," said Mr Brookes.

The Beischer Foundation donation of $70,000 to NEC research will go a long way towards pursuing new treatments and giving new hope to parents like Sophie and Nathan.

Scientists in the community

During the year, scientists and students joined in a range of activities, giving back to the community.

Public forum – Conversations Around Difficult Births

A free public forum held in October, Conversations Around Difficult Births, featured discussions about stillbirth, birth asphyxia and birth trauma, as well as the role of research in future patient care. The forum also showcased the ways that fundamental science can be applied clinically to improve health outcomes for women and babies. Facilitated by the Hon Jill Hennessy, the panel included Associate Professor Ryan Hodges (Monash Health), Amy Dawes (Australian Birth Trauma Association), PhD student Kirstin Tindal, and Hudson Institute newborn health researchers, Professor Graeme Polglase, Dr Miranda Davies-Tuck and Dr Stacey Ellery. Directors Maree Davenport and Monica Forlano.

May Measurement Month

The global program May Measurement Month raises awareness of high blood pressure as the primary cause of preventable death worldwide. This year Associate Professor Jun Yang led a team of scientists, clinicians and research students who measured people's blood pressure at M-City, Clayton. For some, this was the first time they had had their blood pressure checked.

White Shirt Campaign

Ovarian cancer researcher Dr Maree Bilandzic again joined the Witchery White Shirt Campaign as an ambassador to raise funds and awareness for the Ovarian Cancer Research Foundation. During the campaign, Dr Bilandzic joined several events and was a member of the speaking panel event at the Sydney Opera house.

Million Dollar Lunch

Researchers and staff volunteered for the Children's Cancer Foundation Million Dollar Lunch, held at Crown Palladium in August. The $2.9 million raised will further support game-changing children's cancer research, including projects underway at Hudson Institute.

Day of Immunology

Discovery tours provide a unique opportunity for the community to go behind the scenes and find out more about medical research and talk to scientists about their work. A free public tour was offered by inflammation and infectious diseases scientists as part of Victoria's Day of Immunology in April.

Inspiring science

Hudson Institute PhD students have been busy nurturing the next generation of young scientists. Brittany Vining and Janelle Ryan joined in a pen pal program where they exchanged letters with Grade 6 students, sharing their love of science and inspiring the next generation of Australian researchers. Janelle also led a Potions Science Class at her daughter's childcare centre, delighting budding scientists with Troll Snot (a Newtonian fluid), Fountain of Fury (Mentos and Coke) and writing secret messages (lemon juice).

Connor's Run

On Sunday 10 September, cancer scientists and their families took part in Connor's Run, the annual major fundraiser for the Robert Connor Dawes Foundation. The team of 20 enjoyed a 9.6 km walk/run and raised more than $2,600 to contribute to the total of almost $1.8 million to support the brave, incredible kids fighting brain cancer and the science helping them.

In memory

Leane Flynn

The Hudson Institute community was devastated by the loss of Leane Flynn on 5 September. Leane was a tireless and dedicated ambassador for ovarian cancer research who showed incredible strength, hope and spirit.

After her ovarian cancer diagnosis in 2017, aged 49, Leane became a fierce advocate, spreading the message that ovarian cancer needed research and funding to change the outlook for women like her. She generously shared her time and personal story to raise awareness and funds.

Our thoughts continue to be with Leane's loved ones and her extended Ovarian Cancer Research Foundation family. We were honoured to have had her support.

L–R: Dr Maree Bilandzic, Leane Flynn

Peta Murphy MP

We were also deeply saddened by the passing of Peta Murphy MP following her long battle with breast cancer. We were delighted to welcome Peta to Hudson Institute on multiple occasions and are in awe of the legacy she leaves behind.

Peta was first diagnosed in 2011 and in 2019 she received the news that the cancer returned, shortly before being sworn in as a Member of the House of Representatives. Through her personal battle with cancer, Peta used her position in parliament to advocate for better treatment, more healthcare services and cancer awareness.

Peta was a unique and strong human who cared and advocated for her community. We extend our deepest condolences to her family, friends and colleagues.

L–R: Lucinda Nolan, the Hon Clare O'Neil MP, Dr Maree Bilandzic, Dr Andrew Stephens, Professor Elizabeth Hartland, Peta Murphy MP

Ya-yanha Daborra

In 2023 Hudson Institute commissioned an artwork by Yorta Yorta brother and sister, Luke and Siena Tieri, of Aboriginal company, Bayadherra. Titled Ya-yanha Daborra, meaning 'to go along a pathway', the unveiling of the work coincided with the Institute registering with Reconciliation Australia and commencing development of a Reconciliation Action Plan.

Ya-yanha Daborra (To go along a pathway)

Central section

The three large central yarning circles represent respectful and meaningful relationships between the Institute, Aboriginal and Torres Strait Islander communities and our research and community partners.

The linking purple pathways represent the sharing of cultural knowledge, understanding and commitment to reconciliation.

The four smaller yarning circles represent the reconciliation journey: Reflect, Innovate, Stretch and Elevate – the four Institute values.

Framing elements

Orange lines depict the patient's healthcare journey and the green alongside is associated with Country and healing.

The surrounding elements represent Country.

Blue dots depict water, acknowledging the healing properties of water and the importance of physical, emotional and spiritual wellbeing.

Green dots depict the land.

Pink dots depict bush tucker.

Blended circles represent native plants.

These elements acknowledge the lands of Traditional Custodians and bush medicines that were derived from Country. The spiritual connection to Country and the ways Country provides for community as part of culture and healing.

Having a great science mentor like Suzie shows younger scientists a roadmap of what is possible in the field and in life. Suzie shows what it looks like to lead with compassion while maintaining high standards of research.
Arya Jithoo

Suzie is a leader who prioritises creating a space that is encouraging and supportive. She celebrates the successes of all her staff and students and is empathetic and supportive during challenging times.
Beth Piscopo

Suzie always makes me feel like a valued member of the team; she fosters an environment where students can comfortably share ideas and grow as scientists.
Charmaine Rock

Having a mentor like Suzie allows me to grow as a scientist. I am continuously learning and improving with her feedback and unwavering support.
Tegan White

Professor Suzanne Miller with her PhD students

Fostering future leaders

In 2023 Professor Suzanne Miller was awarded the Monash University, Medicine, Nursing and Health Sciences, Dean's Award for Excellence - Postgraduate Research Supervision. In addition to being a world leader in the field of fetal and neonatal physiology and brain injury, Prof Miller is a leader of people; as head of The Ritchie Centre she oversees more than 150 research staff and students, including fetal physiologists, immunologists, stem cell biologists, neonatologists, paediatricians, obstetricians, gynaecologists and radiologists.

In the past five years, Prof Miller has supervised 13 postgraduate students who came from around the world to undertake biomedical and clinical research. Her greatest motivation is seeing an individual grow and then thrive once their studies are finished.

Prof Miller shares insights on mentoring and bringing out the best in her students.

Recognising individuality is critically important – As a supervisor my role is to get to know each student and how they work best. We all have our strengths and weaknesses in science and in life, and my role as a supervisor is to harness and extend my students' strengths while acknowledging and improving areas of weakness.

My research approach has always been one of collegiality and acknowledging that we achieve more as a team. This is important in our field, in which we use fundamental science techniques and see problems through a translational lens. With this approach, students gain multidisciplinary knowledge, learning to look at a problem from several angles and to independently tailor their studies.

Being a biomedical scientist builds resilience - In research there are plenty of days that do not go to plan, so as a supervisor it's essential to acknowledge this and instil a belief that resilience is necessary in science and as a broader life skill for the future.

An important expectation as a supervisor is to develop students' independence as researchers and individuals. I strongly encourage self-direction, providing the framework within which students can plan their experiments and outcomes, which is a critical step in the learning process of independent research.

I undertook formal training in mental health awareness and first aid as I recognised that many students were struggling with their mental health, particularly coming back to onsite study after COVID-19. Talking about our mental health is now part of routine self-care and I am confident that it has given me better awareness as a supervisor and mentor to talk about and address problems early.

Australia has a reputation for excellence in biomedical research, particularly in the field of fetal and neonatal research, for which we are world leaders. Thanks to our great relationships with clinical partners, Monash Health and Monash Children's Hospital, and academic partner, Monash University, we attract outstanding students who are highly skilled and sought after across the world.

My greatest motivation is watching an individual grow – It's incredibly rewarding to watch PhD students give presentations that demonstrate increasing confidence in their work, results and interpretation. To watch them go on to thrive post PhD is both gratifying and comforting - to know medical research is in the hands of future leaders in science and discovery.

My role as a supervisor recently came full circle as I was lucky enough to co-supervise PhD student, Dr Madison Paton, who finished in 2018. After graduating, Dr Paton went on to secure the role of Senior Research Fellow at the Cerebral Palsy Alliance and recently became a Fulbright Scholar, which is an outstanding achievement.

Graduates of 2023

Congratulations to our postgraduate and honours students who graduated in 2023.

Doctor of Philosophy

Dr Elham Ahmadzadeh

The impact of fetal growth restriction on cardiorespiratory centres in the brainstem

Supervisors: Prof Suzanne Miller, Dr Beth Allison, Prof Graeme Polglase, Dr Vanesa Stojanovska

Dr Sumaiah Al Asmari

An investigation of the engagement of cGAS-STING signalling upon DNA damage in cancer cells

Supervisors: A/Prof Michael Gantier, Prof Bryan Williams

Dr Saleh Hussain Almasabi

Investigating integrin-linked kinase as a therapeutic target in colorectal cancer

Supervisors: Prof Bryan Williams, Dr Afsar Ahmed

Dr Alex Bell

The neurovascular unit in fetal growth restriction

Supervisors: Prof Suzanne Miller, A/Prof Atul Malhotra, Dr Tamara Yawno

Dr Sneha Biniwale

Regulation and functions of macrophages in the adult mouse testis

Supervisors: Prof Mark Hedger, Prof Andreas Meinhardt, Prof Kate Loveland, Dr Sudhanshu Bhushan

Dr Abby (Yee Shen) Choo

Measuring total inhibin by mass spectrometry analysis as a detection method for ovarian cancer

Supervisors: A/Prof Simon Chu, A/Prof Peter Temple-Smith

Dr Ingrid Dudink

Fetal growth restriction and brain connectivity: Can lactoferrin restore the deficits?

Supervisors: Prof Suzanne Miller, Dr Beth Allison, Dr Amy Sutherland

Dr Vik Eng

The physiological role of RIPK1/3 in mucosal immunity against Citrobacter rodentium infection

Supervisors: A/Prof Jaclyn Pearson, Prof Elizabeth Hartland

Dr Dasun Fernando

The therapeutic targeting of paediatric high-grade gliomas

Supervisors: Prof Bryan Williams, Dr Asfar Ahmed, Dr Paul Daniel

Dr Rasa Islam

Re-engineering the function of natural killer cell receptors via CRISPR/Cas9: A new approach for 'off-the-shelf' immunotherapy

Supervisors: Prof Alan Trounson, Dr Nicholas Boyd, Prof Richard Boyd, Dr Vera Evtimov, Dr Runzhe Shu

Dr Rashidul Islam

T-cell subsets in the human testis and their potential role in testicular germ cell tumours

Supervisors: Prof Katherine Loveland, Dr Daniela Fietz, Prof Mark Hedger, Prof HC Schuppe

Dr Monica Kanki

Mineralocorticoid regulation of cardiac and renal circadian clocks in biology and disease

Supervisors: Prof Morag Young, Prof Timothy Cole, Prof Peter Fuller

Dr Sara Khan

Investigating the molecular and clinical landscape of embryonal brain tumours

Supervisors: A/Prof Jason Cain, A/Prof Elizabeth Algar, Dr Peter Downie, Prof Annie Huang

Dr Hoang My Le

Bacterial extracellular vesicles and their associated toxins

Supervisors: Prof Richard Ferrero, Dr Le Ying

Dr Renata Libianto

Primary aldosteronism: Prevalence, clinical features and biomarkers

Supervisors: Prof Peter Fuller, A/Prof Jun Yang, Prof Morag Young

Dr Ruby Oberin

The role of maternal epigenetic inheritance in offspring growth and bone development

Supervisors: A/Prof Patrick Western, Prof Natalie Sims

Dr Sarah Parackal

Identification of targetable pathway dependencies in diffuse midline glioma

Supervisors: A/Prof Jason Cain, Prof Ron Firestein

Dr Emily Pryor

Optimising lung aeration at birth

Supervisors: Prof Stuart Hooper, Dr Douglas Blank, Dr Marcus Kitchen

Dr Motahhareh Tourchi Roudsari

A functional genomics approach to identify new therapeutic targets in DIPG

Supervisors: Prof Ron Firestein, A/Prof Jason Cain

Dr Madeleine Smith

Translating neural stem cell therapy for perinatal brain injury

Supervisors: Dr Courtney McDonald, A/Prof Michael Fahey, Dr Megan Finch-Edmondson, Dr Madison Paton

Dr Hsin Yee Tee

Modulation of α-globin gene expression: Applications for β-thalassaemia treatment

Supervisors: Dr Jim Vadolas, Dr George Grigoriadis

Dr Alice West

The role of inflammasome-associated innate immune receptors in gastric cancer

Supervisors: Prof Brendan Jenkins, A/Prof Ashley Mansell

Dr Penelope Whiley

The roles of activin A and Ipo5 in spermatogonial stem cell biology

Supervisors: Prof Kate Loveland, A/Prof Robin Hobbs, Dr Peter Stanton

Dr Zileena Zahir

Characterisation of RNA binding properties and functions of high mobility group A1 proteins in pluripotent stem cells

Supervisors: Dr Minna-Liisa Anko, A/Prof Chen Davidovich, Dr Madara Ratnadiwakara

Dr Danxi Zhu

The role of mediator kinases in intestinal homeostasis and colorectal cancer

Supervisors: Prof Ron Firestein, Dr Marius Dannappel

Master of Biotechnology

Miss Nivedhitha Selvakumar

Master of Biomedical and Health Sciences

Miss Srividya Babu
Mr Hongyu Chen
Ms Yee Farn Goh
Ms Samia Khan
Mr Yang (Henry) Lin
Ms Jiayuan Wang

Bachelor of Biomedical Science (Honours)

Ms Rayann Andrade
Ms Abby Boppana
Ms Chloe James
Ms Lacey Klompmaker
Ms Ashley Maher
Ms Mira Menyen
Mr Isaac Naqash
Mr Jordan Tan
Ms Sheryl Teo
Ms Emma Vandenberg
Ms Taylah Williams

Bachelor of Medical Science (Honours)

Ms Hannah Davey
Mr Lachland Evenden
Ms Yuqi He
Ms Amanda Nguyen
Ms Lucina Pezzimenti
Ms Zoe Poulos
Mr Bill Wang
Ms Emily Whalen

Bachelor of Science (Honours)

Ms Emily Brennan
Mr Liam Chase
Ms Chloe Edwards-Lee
Ms Muna Farah
Ms Sofia Green
Ms Katherine Hansford
Ms Zoe Johnson
Ms Celine Keifer
Ms Lethicia Low
Mr Anthony Nisi
Ms Sarah Nolan
Ms Gabrielle Pulsoni

Students at a glance

170
STUDENTS
129 PHD
10 MASTERS
31 HONOURS

63
POSTGRADUATE AND HONOURS STUDENTS COMPLETED IN 2023

Board of directors

The directors of Hudson Institute of Medical Research Board, 31 December 2023

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BEcon (Hons), PhD (Ohio State)

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BComm
Chair, Investment Committee

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MBBS, PhD, FRACP, FAHMS

PROFESSOR WARWICK ANDERSON AO
PhD, FAAHMS, Hon LLD, DUniv, DHealth

MR GEORGE OU
MBA, CPA

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Investment Committee

Mr Andrew Leyden (Chair), Mr Robert Merriel and Mr Alan Lahiff (Secretary)

Intellectual Property and Commercialisation Committee

Ms Zita Peach (Chair), Dr Andrew Gearing, Dr Alastair Hick, Dr Chris Smith, Dr Tony Eglezos, Mr Robert Merriel (Secretary), Professor Elizabeth Hartland, Professor Claudia Nold, Professor the Hon Jill Hennessy, Ms Carmela Monger (Business Development Manager) and Mr Ryan Huang

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MBA, FCAANZ
Chair, Finance and Audit Committee

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COMPANY SECRETARY
BA, Grad Dip (Psych), Grad Dip (Accounting), CPA

PROFESSOR THE HON JILL HENNESSY
GAICD, BA, LLB, LLM

MS ZITA PEACH
BSc, FAICD, FAMI
Chair, Intellectual Property and Commercialisation Committee

PROFESSOR KIM CORNISH
BS (Hons), PhD (London)

Organisation structure

COMMITTEES
Career Development Committee
Culture and Engagement Committee
Early Career Researcher Committee
Education and Training Committee
Equity and Diversity Committee
Ethics Committee
Hudson Institute Student Society
OHSE Committee
Research Committee
Seminar Committee

BOARD OF DIRECTORS

BOARD SUBCOMMITTEES
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Investment Committee Intellectual Property and Commercialisation Committee

Director and CEO
Professor Elizabeth Hartland

CENTRE HEADS

Centre for Cancer Research
Professor Ron Firestein

Centre for Endocrinology and Metabolism
Professor Peter Fuller

Centre for Innate Immunity and Infectious Diseases
Professor Brendan Jenkins
January – June 2023

Interim Head
Professor Richard Ferrero
July 2023 – January 2024

Professor Seth Masters from February 2024

Centre for Reproductive Health
Associate Professor Patrick Western

The Ritchie Centre
Professor Suzanne Miller

EXECUTIVE

Deputy Director
Professor Ron Firestein

Chief Financial Officer
Chief Commercialisation Officer
Company Secretary
Mr Rob Merrial

Finance
Commercialisation and IP
Research Office
Research Integrity
People and Culture

Chief Operating Officer
Dr Joseph Pereira

OHSE
Logistics and Technical Services
Platforms
Purchasing
Bioresources

Head of Fundraising and Communications
Mr Garry Tanner

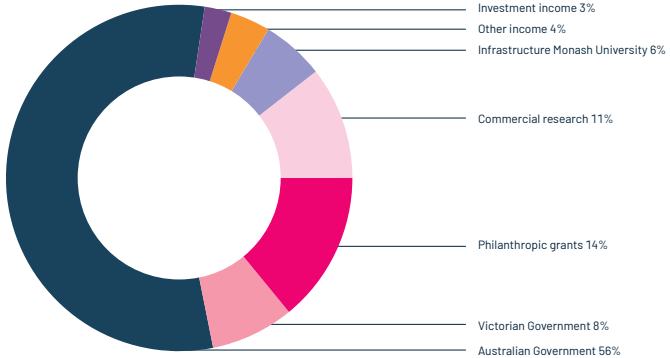
Fundraising
Communications

Executive Officer
Ms Ann Scott

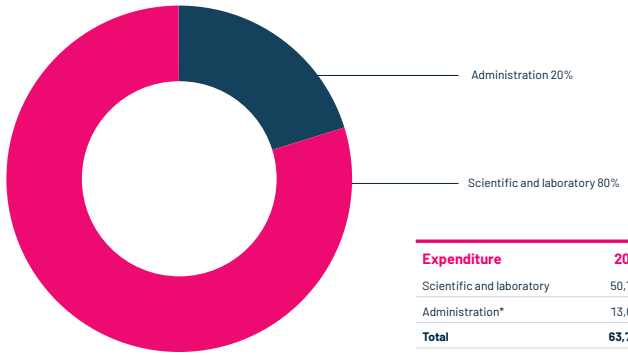
Strategy

SCIENTIFIC SUPPORT GROUP

Financial snapshot



Revenue	2023 ($)	2022($)	2021 ($)
Australian Government	35,713,656	35,242,311	35,831,133
Philanthropic grants	9,068,854	7,691,335	7,975,494
Commercial research	6,766,122	5,495,120	5,539,265
Victorian Government	5,005,385	4,120,398	3,844,981
Infrastructure Monash University	3,768,022	3,061,489	3,702,044
Other income	2,407,019	1,806,907	1,283,901
Investment income	1,610,565	901,892	701,942
Total	**64,339,623**	**58,319,452**	**58,878,760**

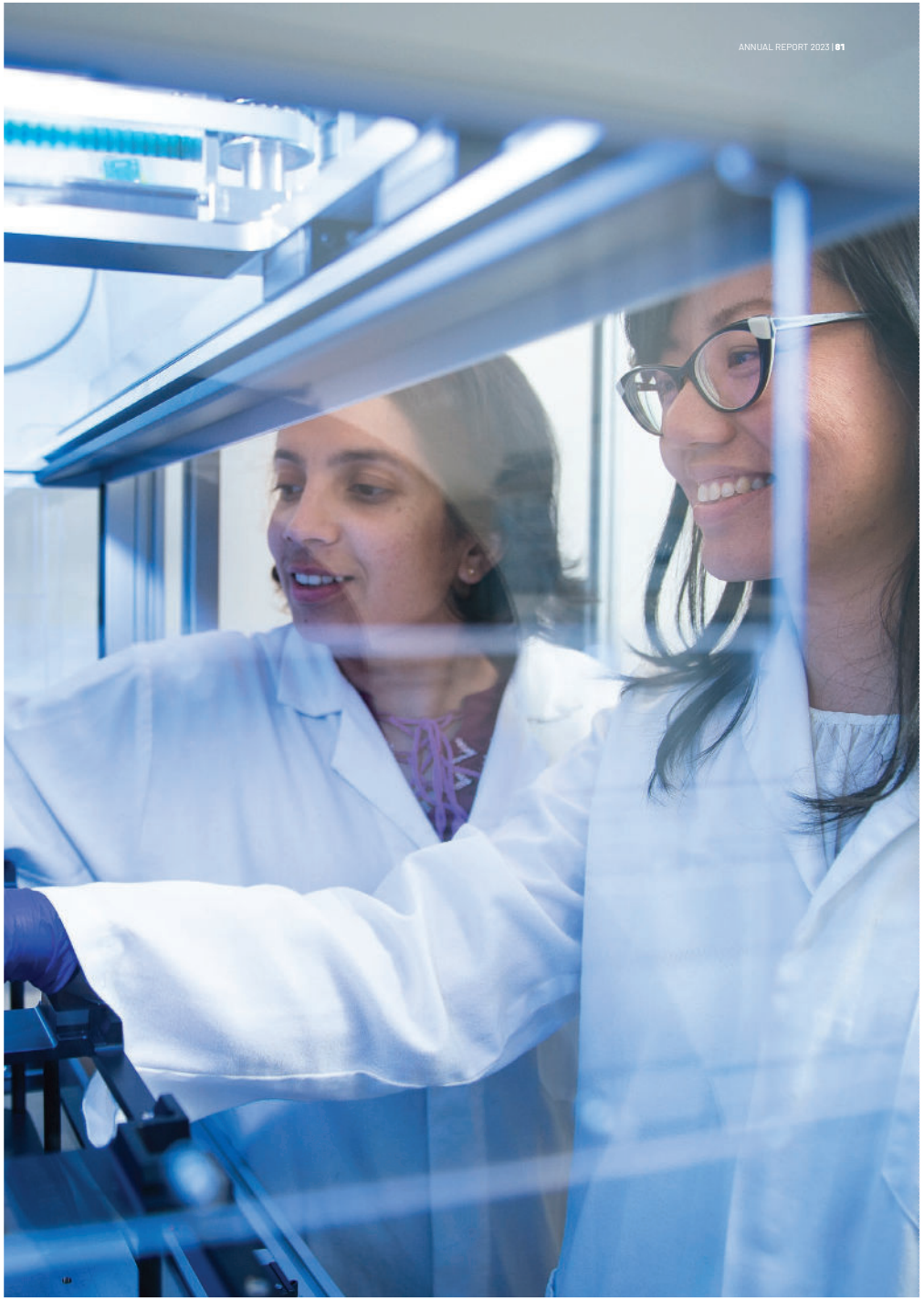


Expenditure	2023 ($)	2022 ($)	2021 ($)
Scientific and laboratory	50,744,064	45,664,647	46,558,691
Administration*	13,001,178	11,534,862	11,465,389
Total	**63,745,242**	**57,199,509**	**58,024,080**

*Administration expenses include: special projects; salaries of administrative and scientific support staff; fundraising; communications; rent, utilities and buildings; information systems; professional services; legal patents and commercialisation; finance; and insurances.

Glossary

AAMRI	Association of Australian Medical Research Institutes
AI	artificial intelligence
ALCCRF	Australian Lions Childhood Cancer Research Foundation
AMR	antimicrobial resistance
ARC	Australian Research Council
CCF	Children's Cancer Foundation
CCMA	Childhood Cancer Model Atlas
CiiiD	Centre for Innate Immunity and Infectious Diseases
CNRS	French National Centre for Scientific Research
CNS	central nervous system
CONSEP	Conn Syndrome Evaluation in Primary Care
DIPG	diffuse intrinsic pontine glioma
FDA	Food and Drug Administration (USA)
GCT	granulosa cell tumour
IFN	interferon
IFNε	interferon epsilon
jGCT	juvenile granulosa cell tumour
MRFF	Medical Research Future Fund
mVRAF Program	mRNA Victoria Research Acceleration Fund program
MDS	myelodysplastic syndromes
NEC	necrotising enterocolitis
NHMRC	National Health and Medical Research Council
OCRF	Ovarian Cancer Research Foundation
PA	primary aldosteronism
PACE	Primary Aldosteronism Centre of Research Excellence
POP	pelvic organ prolapse
RAP	Reconciliation Action Plan
RCD Foundation	Robert Connor Dawes Foundation
ROC Inc	(Rare Ovarian Cancer) Incorporated
VCA	Victorian Cancer Agency
veski	Victorian Endowment for Science, Knowledge and Innovation
VMRAF	Victoria Medical Research Acceleration Fund
VPCC	Victorian Paediatric Cancer Consortium
WEHI	Walter and Eliza Hall Institute



HUDSON
INSTITUTE OF MEDICAL RESEARCH

t: +61 3 8572 2700
e: info@hudson.org.au
w: hudson.org.au
ABN 48 132 025 024

27-31 Wright Street
Clayton VIC 3168
Australia