ANNUAL REPORT 2020

A community of impact

RAINE MEDICAL RESEARCH FOUNDATION

Contents

Our Partners & Donors

Our thanks go to our generous donors and partners who have contributed to the outstanding research programs supported in 2020. This ongoing support has enabled the stability of our programs throughout a highly uncertain year, where the importance of health and medical research became even more apparent during the COVID-19 pandemic.

BrightSpark Foundation Western Australia
Supporting Research into Child Health

Charter Hall

The University of Western Australia
Cockell Bequest

Healy Medical Research Foundation

The Jon & Caro Stewart Family Foundation

Forrest Research Foundation

Government of Western Australia
Department of Health

Strachan Bequest

KY Wong Family

About the Foundation

The Raine Medical Research Foundation was established in 1957 when Mary Raine decided to leave her wealth to The University of Western Australia. Her motivation was the unexpected death of her husband to cardiovascular disease – she wanted to spare others the devastating heartbreak and helplessness that she felt when doctors couldn't save him. The Foundation has now distributed more than $50 million to support and provide funding for research into seeking, diagnosing and investigating the nature, origin and causes of diseases in human beings, and the prevention, cure, alleviation and combating of such diseases.

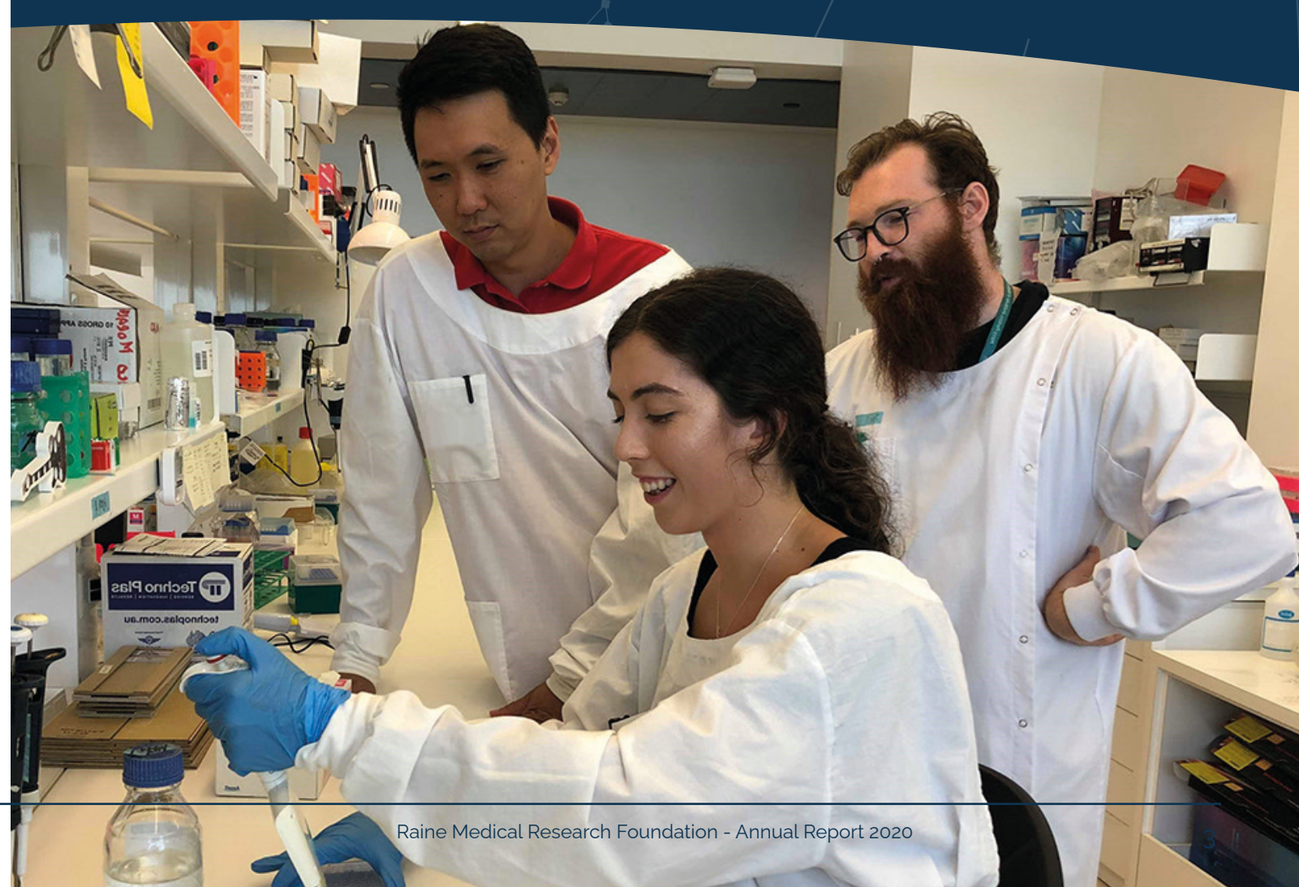
The Foundation prides itself in supporting Western Australian medical researchers, and particularly those looking to establish themselves as leaders in their field. We do this in partnership with like-minded organisations and through application of robust and equitable funding programs and grant review processes. This ensures that we support the very best people and research to achieve long-term health impact for the benefit of the community.

Our programs fall within two main focus areas:

- **Leadership Priming:** Grants and Fellowships for early-career researchers to pursue medical research projects and programs that advance health outcomes and their research careers.
- **Research Collaboration:** Awards and Prizes that facilitate skills transfer, communication, and collaboration across the globe, including bringing leading experts to Western Australia.

We also support other ventures and programs that align with our strategic goals, with established partnership organisations, including:

- **The Raine Study:** A world-leading longitudinal cohort study that enables researchers from around the globe to study health and medical questions throughout the whole life course. We were the first proud funders of this study in 1989 and we continue to provide support as more data is collected over the life course of the cohort participants.



Chair's Report

In a year of great uncertainty, the Raine Medical Research Foundation has held steadfast to its mission to support world-class health research conducted right here in Western Australia. The impact of COVID-19 has further highlighted the need for increased medical research support, as well as the positive impact that health and medical research offers for community wellbeing. This has been a major focus for the Raine Foundation in 2020, in continuing to offer funding for critical health and medical research, as well as guiding the development of a strategic plan that aims to increase support across broad health research areas and all career levels. Our commitment to increasing support for early-career researchers will also continue as we grow.

As the new Chair of the Raine and Healy Research Committees, I would firstly like to congratulate and thank Professor Robyn Owens for her outstanding contribution as the previous Chair, and for leading the Foundation honourably over the past eight years. The Foundation has a strong reputation and history in Western Australia for supporting the early careers of some of our most outstanding researchers, and I am honoured to have the opportunity to build on this strategic vision going forward.

We are acutely aware that national medical research funding success rates have continued to decline in Western Australia and that there is increasing demand on local sources of funding. Our first priority is to grow the Foundation, so that we can retain and attract medical research talent and build research strength in the State. We will also focus on raising community awareness of the outstanding achievements of our over 500 Raine alumni by evaluating and communicating research outcomes and impact that have been enabled over the last 60 years through Raine Foundation funding.

We give thanks to our partners and donors who have provided support throughout 2020 – together we have been able to achieve much more than we could have ever hoped to achieve without such generous support and input. Our major partners and supporters in 2020 were the WA Department of Health, the University of Western Australia, the BrightSpark Foundation, the Jon and Caro Stewart Family Foundation, the Charter Hall Group, the Forrest Research Foundation, and the Wong Family. We are incredibly grateful for their continued support.

I would also like to acknowledge the many researchers and other volunteers (both past and present) for their generosity of time and knowledge to the activities of the Raine Foundation, including the members of the Raine and Healy Research Committees, the Finance & Strategic Advisory Committee, and our Research Advisory Committees. I extend my personal thanks for their hard work and dedication to supporting the very best research for the benefit of those in our community.

Lastly, I would like to extend deepest sympathy to the Quinlan family on the passing of Professor Michael Quinlan AO. Michael was an esteemed member of the Raine Research Committee for 21 years who will be remembered for his outstanding service to the Foundation, for his commitment to uphold the vision of Mary Raine, and for his dedication to the advancement of medical research in Western Australia.

Here's to a happy and healthy 2021, where we will likely see health and medical researchers featured on a world stage, continuing their tireless efforts to solve the greatest health problems we face today. We, as a Foundation, will continue to support them to achieve the very best research outcomes for the Western Australian community.

Professor Amit Chakma
Raine Research Committee Chair

Director's Report

The year 2020 will be remembered as a year of great change and challenge across the world, and a turning point in the awareness of the importance of advances in medical research.

The need for increased resources in the hospital system, lockdowns affecting research progress, and restrictions to travel, has forced change in the way researchers conduct and collaborate in research. This has also resulted in changes in the way the Raine Foundation supports our researchers, including adaption of our programs to ensure that research progress continues, and a wider range of collaborative research activities are supported going forward. Unfortunately, new funding for our Visiting Professor Awards program which supports travel of international research leaders to Western Australia has been put on hold until global travel restrictions are lifted. But all of our other programs have been modified where possible to ensure continued support and progress towards solving major health and medical research questions that impact on our community.

In 2020, the Raine Foundation continued program funding across two main focus areas; Leadership Priming and Research Collaboration. We distributed $2 million towards Western Australian research, including 47 ongoing research grants, fellowships, awards and prizes, resulting in 70 research articles being published in 2020. We also continued our long-standing support for the Raine Study, a longitudinal study of close to 3,000 pregnant women which was established in 1989 after initial support from the Raine Foundation.

Close to $2.2 million was awarded across our major funding programs to new research projects to commence in 2021. This includes projects in the areas of child health, mental health, cardiovascular disease, emergency medicine, neurology, cancer, neuromuscular disorders, ophthalmology, infectious disease, and allergy.

- **Raine Priming Grants:** Awarded to early-career scientists who are leading high quality research projects and are progressing towards an independent research career. Five grants were awarded to commence in 2021, with a total funding allocation of $791,830.

- **Clinician Research Fellowships:** This program was established through a partnership with the WA Department of Health and aims to support high achieving clinicians, allied health professionals and nurses, to lead a program of research that will advance medical research outcomes and translation in the clinical setting. Three fellowships were awarded to commence in 2021, with a total funding allocation of $1,056,941.18.

- **Research Collaboration Awards:** These Awards aim to encourage medical researchers in Western Australia to establish and develop national and international collaborative research activities. Seven Awards were granted across three different partnership categories, spanning early career researchers, child health and mental health, with a total funding allocation of $169,642.

- **Publication Prizes:** These Prizes are awarded for the best published research by an early-career researcher and facilitate conference attendance and research collaboration. Five Awards were granted across three partnership categories, with a total funding allocation of $21,650.

Looking forward, we will continue to support early career researchers. But through future growth of the Foundation, we will be developing new pathways and programs which will support the wider research community in building research strength and health impact. We will also focus on communicating the research we have supported to-date and the important health outcomes that have been achieved due to our funding support.

Finally, I would like to thank all of our committee members and reviewers who volunteer their time for the greater good of WA research and the advancement of medical research outcomes for the wider community. The work that they do in research and administration is immense, but they know how important it is to ensure that the best research is supported in a fair and robust way to maximise opportunity for long-term impact. This is something that we take great pride in and is testament to the many world-leading researchers we have supported over the last 60 years in this State. I look forward to a year of growth and change in 2021.

Dr Amanda Cleaver
Director

Raine Priming Grants

Building the next generation of research leaders

This program supports early-career researchers to develop research independence and leadership, while building their skills and track record so that they are competitive for national and international funding programs.

Grants awarded in 2020

50 applications

13 shortlisted

5 successful (10%)

$856,636 awarded

Dr Nicola Bondonno
(Raine/Robson Fellow)
School of Medical and Health Sciences, Edith Cowan University
Is the source of dietary nitrate a determinant of its impact on cancer risk?
$10,000 – Travel Award

Dr Julie Ji
(Raine/BrightSpark/Cockell Fellow)
School of Psychological Science The University of Western Australia
Predicting self-injurious behaviour in young people – a novel cognitive approach
$227,542

Dr Christian Pflueger
Centre for Medical Research, The University of Western Australia
Advancing epigenome editing to understand hepatocellular carcinoma progression
$234,806

Dr Rhonda Taylor
Harry Perkins Institute of Medical Research/ The University of Western Australia
Mapping muscle gene enhancers: An approach to improving genetic diagnosis for neuromuscular disorders
$224,806

Dr Flavia Di Pietro
School of Pharmacy and Biomedical Sciences, Curtin University
Why does pain spread? An investigation of inhibition in the human brain
$ 160,000

RAINE MEDICAL RESEARCH FOUNDATION

BrightSpark FOUNDATION WESTERN AUSTRALIA
Supporting Research into Child Health

THE UNIVERSITY OF WESTERN AUSTRALIA
COCKELL BEQUEST

One Health: A new paradigm for studying evolution and transmission in *Clostridium difficile*

Using genomic techniques to better understand infectious diseases

Dr Daniel Knight is a NHMRC Fellow with the School of Medical, Molecular and Forensic Sciences at Murdoch University and an Adjunct Research Fellow at the School of Biomedical Sciences at UWA. He received a Raine Priming Grant in 2019 for his project investigating the genetic factors driving the transmission of *Clostridium difficile* in humans and animals.

Clostridium difficile infection (CDI) causes life-threatening diarrhoea and is the leading healthcare-related gastrointestinal infection in the developed world. The prevention and control of CDI are essential, yet the factors driving CDI transmission outside of the hospital setting are poorly understood.

Dr Knight's research proposes a novel paradigm that CDI has a zoonotic aetiology, with livestock and the environment playing a critical, yet still underappreciated, role in *C. difficile* transmission to humans.

Throughout his Raine Priming Grant project, Dr Knight took a unique "One Health" approach to investigate the genetic factors driving the evolution and transmission of *C. difficile* in humans, animals and their overlapping environments.

The key outcomes of the project include:

- The establishment of Australia's first longitudinal and nationwide surveillance study on CDI molecular epidemiology and *C. difficile* antimicrobial resistance (AMR).
- Paradigm changing insights into the cryptic transmission chains and genetic factors (such as AMR) that influence the transmission of *C. difficile* in animals and humans in Australia and internationally.
- Additionally, using a world-leading collection of more than 12,000 *C. difficile* genomes his team are in the process of characterising a novel CRISPR-based high-resolution typing tool, that may be used to improve CDI tracking and outbreak investigations.

The findings of this Raine Priming Grant project has led to eight publications, one of which won the **2020 Raine Research Prize** for best scientific publication by a Western-Australian based early career researcher. He has also given five invited talks and eight poster presentations at local, national, and international conferences throughout the course of this grant.

Dr Knight remarked that the award of this Raine Priming Grant has undoubtedly accelerated his research career, in particular allowing him to build a research team, secure further funding, develop new international collaborations and establish himself as an emerging international leader in the field of CDI research.

Also, in recognition of early-career research excellence and distinguished contribution to Microbiology research in Australia, Dr Knight was awarded the **2020 Jim Pittard Early Career Award** from the Australian Society for Microbiology (ASM), the first Western Australian recipient of this prestigious award.

In the next year, Dr Knight and his team will be focusing on several projects investigating aspects of *Clostridium difficile* taxonomy, equine CDI and vaccine design.

RAINE PRIMING GRANT

Dr Daniel Knight

School of Medical, Molecular and Forensic Sciences

Murdoch University

$199,950
2019 – 2020

Examining environmental risk factors for asthma in Western Australia

Seeking to predict and improve outcomes for WA kids with asthma

RAINE PRIMING GRANT

Dr Rachel Foong

School of Physiotherapy and Exercise Science

Curtin University

$93,397
2018 – 2020

Dr Rachel Foong is a Research Fellow at the Telethon Kids Institute and holds an adjunct position at Curtin University. She received a Raine Priming Grant in 2018 for her project that seeks to identify environmental factors that increase asthma risk in Western Australia, in efforts to improve lung health and environmental management plans.

Asthma affects over two million Australians and is the most common chronic lung disease of childhood. In Western Australia, the prevalence of asthma in children is currently 8.7%, being the most common reason for hospitalisation in children aged 1-14 years, impacting on school attendance and quality of life of affected children. The causes of asthma, however, remain unknown. Previous studies have indicated that early life environmental exposures may increase asthma risk. This project examines the impact of multiple early-life environmental exposures in birth cohort studies in Perth and Europe to identify risk factors that may contribute to asthma.

Dr Foong's findings demonstrated that parental asthma and maternal smoking contributed to low lung function and asthma development in children in WA. When examining the role of environmental risk factors, such as air pollution, early-life day-care attendance, pet exposure and the presence of plastic metabolites including bisphenol A and phthalates during pregnancy, it was observed that day-care attendance in the first three years of life contributes to wheeze in children, but there were no long-term risks for asthma, allergies, or low lung function throughout childhood and into adolescence. Plastic exposure in pregnancy was, however, associated with lower lung function in children and teenagers, but was not associated with asthma.

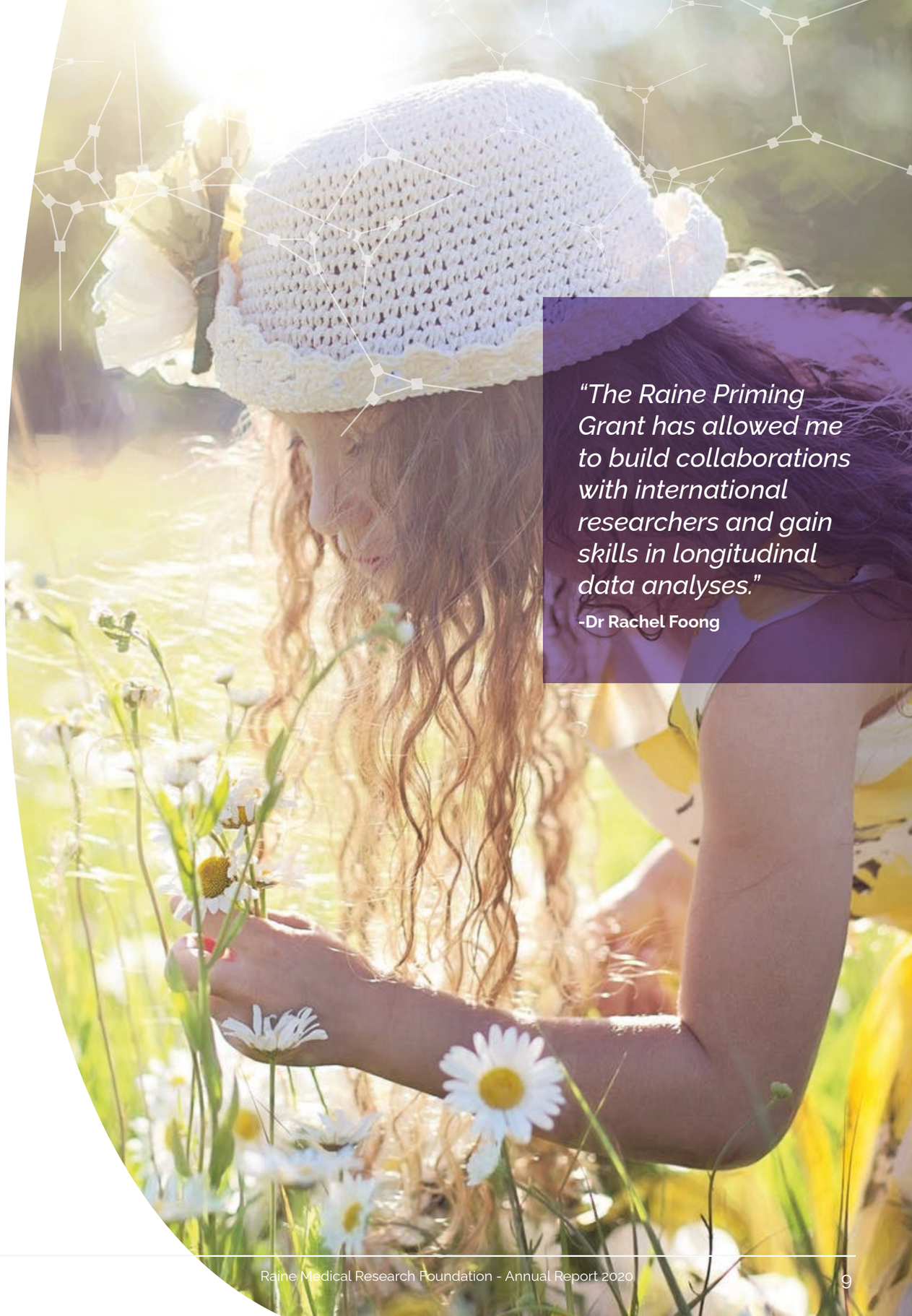
Air pollution levels are low in WA compared to international standards and no association was observed with asthma and allergies. Cat or dog ownership also did not appear to increase the odds of asthma, or reduce lung function in childhood.

The rates of asthma in children and their parents was found to be higher in Perth compared to the European cohorts studied. In addition, the use of asthma management plans was found to be low, with less than half of asthmatics using them. Such findings have highlighted the importance of identifying factors that contribute to asthma development as well as promoting written action plans to support management of asthma for families.

This Raine Priming Grant has led to two joint publications with European collaborators, several manuscripts in preparation, and Dr Foong is now co-supervising a PhD student on a project aiming to predict asthma using machine learning.

Dr Foong is part of the recently launched Walyan Respiratory Research Centre, which is a partnership between Telethon Kids Insitute, Perth Children's Hospital Foundation and Perth Children's Hospital.

Since being awarded a Raine Priming Grant in 2018, Dr Foong has been successful in receiving a NHMRC Early Career Fellowship to continue her important work into the contributors to asthma development in childhood. Indeed Dr Foong's future research will seek to use new methodology, including machine learning, to develop a predictive tool for asthma. She is also aiming to engage with the Asthma Foundation of WA to identify means to improve on the use of asthma management plans in families living in Perth.



"The Raine Priming Grant has allowed me to build collaborations with international researchers and gain skills in longitudinal data analyses."

-Dr Rachel Foong

Clinician Research Fellowships

Enabling clinicians to improve health care through medical research

This program enables clinicians, nurses and allied health professionals to establish a research career while still maintaining their clinical role, seeking to broaden their impact on Western Australian health outcomes and support rapid research translation into clinical practice.

Fellowships awarded in 2020

11 applications

3 shortlisted
3 successful (27%)

$1,056,941 awarded

Ms Jessica Nolan

Department of Physiotherapy, Osborne Park Hospital

Determining best-practice rehabilitation for lateropulsion after stroke

$228,817

Dr Stephen MacDonald

Emergency Department, Royal Perth Hospital

Improving survival from sepsis: A translational research platform for the future

$ 405,800

Dr Mon Ohn

Department of Respiratory and Sleep Medicine, Perth Children's Hospital

NIGHTOWL – Safety and quality in adenotonsillectomy for childhood obstructive sleep apnoea

$422,315

RAINE MEDICAL RESEARCH FOUNDATION

Government of **Western Australia**
Department of **Health**

CLINICIAN RESEARCH FELLOWSHIP

Dr Warren Pavey

Fiona Stanley Hospital

$204,932
2018 – 2020

Supercooled storage for extended preservation of hearts – A pilot study in a rodent model

Heart research has never been "cooler" – efforts to improve organ preservation procedures for better heart transplant outcomes

Dr Warren Pavey is a Specialist Anaesthetist with the Department of Anaesthesia and Pain Medicine at Fiona Stanley Hospital.

He was awarded a Clinician Research Fellowship in 2018 to develop novel methods to better preserve and assess hearts to be transplanted.

Organ, and specifically heart shortages are a global problem and the number of patients awaiting transplant is increasing. There have been a number of strategies proposed to improve heart transplantation procedures to reduce the waiting list. The ability to store hearts for longer than the current limit of six hours would improve organ sharing and improve successful matching with a suitable recipient. In addition, extended preservation of hearts for organ transplantation could result in fewer wasted organs due to lack of suitable local recipients, as well as reduced need for prospective recipients to remain within short travel times of transplant centres.

In this study, Dr Pavey successfully developed a sheep model that delivered gas into the arteries of the heart to preserve it after having stopped beating in the donor animal. He and his research team also demonstrated that a state-of-the art type of ultrasound known as shear wave elastography can demonstrate changes in stiffness to assess the health of hearts outside of the body.

The research findings of this Fellowship fall within the preclinical realm in an animal model of intervention. Future research seeks to translate these findings to humans in efforts to advance clinical practice and improve patient outcomes.

Dr Pavey acknowledged the impact of the Clinician Research Fellowship in assisting the growth of his research and laboratory, develop collaborations with other disciplines, as well as support junior clinicians who have joined their research laboratory in Western Australia.

Dr Pavey has been successful in receiving a grant from the Australian and New Zealand College of Anaesthetists to continue this important work in optimising organ preservation for improved transplantation outcomes for patients. Dr Pavey is also in his second year of a PhD investigating novel gas perfusion of hearts as a preservation strategy, continuing the work of the Clinician Research Fellowship.

Diagnostic genomics applications for short stature

Addressing the challenges of diagnostic genomics applications for short stature

CLINICIAN RESEARCH FELLOWSHIP

Dr Dimitar Azmanov

Department of Diagnostic Genomics, PathWest

$190,650 2018-2021

Dr Dimitar Azmanov is a Genetic Pathologist with the Department of Diagnostic Genomics at PathWest Laboratory Medicine WA.

He was awarded a Clinician Research Fellowship in 2018 to develop a streamlined diagnostic and management process for patients with genetically determined short stature.

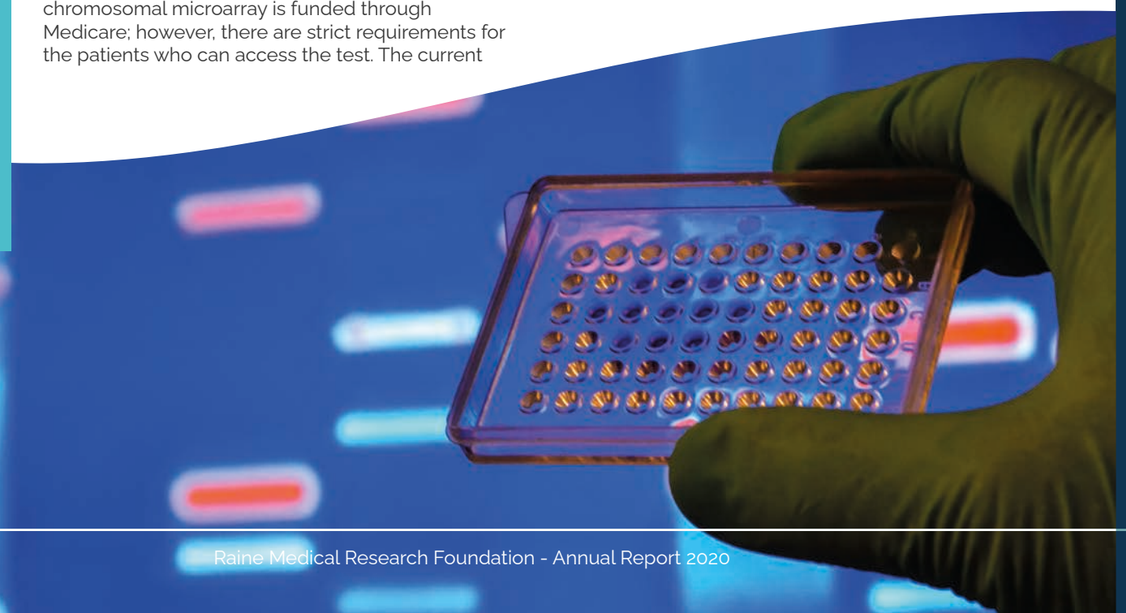
Genetic testing has been revolutionised with the introduction of contemporary technological and research advances, yet further work needs to be done towards integrating genomics into standard clinical care. Genetic/genomic assessment can enhance patient care for children with endocrine disorders. For example, the Australian Growth Hormone Programme uses tailored treatment for patients with short stature if there is a proven genetic component; however, current tests can identify only 5% of the known genetic causes. This project aims to introduce efficient and comprehensive diagnostic tests and associated professional guidelines for management of patients with genetically determined short stature.

Using a genetic analysis technique known as multiple parallel sequencing (MPS), Dr Azmanov demonstrated higher efficacy for detecting underlying abnormality of unexplained prenatal and postnatal growth problems at 19%, which is nearly four times higher than the identification rate of current techniques.

Currently, another available genomic technology, chromosomal microarray is funded through Medicare; however, there are strict requirements for the patients who can access the test. The current project confirmed the limited utility of chromosomal microarray in the context of isolated short stature. In turn, the main advancement facilitated by this project is through the introduction of MPS for the investigation of patients with suspected genetically determined short stature. In addition, access to MPS is available through the public health system, which provides equity for all WA patients.

Immediate benefit from this Clinician Research Fellowship project is gained through individualised patient therapy, minimised cost of multiple ongoing investigations, and improved social and genetic counselling support to help inform reproductive decisions in the extended family. Indeed, this research project has re-shaped the patient care for paediatric endocrine patients with suspected major underlying genetic aetiology. Multidisciplinary team (MDT) meetings have been established between the Department of Endocrinology and Diabetes, Perth Children's Hospital, Genetic Services of Western Australia, and Department of Diagnostic Genomics, PathWest. The MDT meetings have become a forum for discussion of complex cases, interpretation of challenging/unexpected diagnostic genomics results, and integrated care of patients with short stature in WA.

Dr Azmanov's research has sparked local, national and international collaborations, two published articles with a further three under review, and a successful grant application through the PathWest Innovation scheme to continue his research into translational pathways of diagnostic genomics for developmental disorders.



Research Collaboration Awards

Connecting emerging and established research leaders across the globe

This program facilitates the development of new collaborations and projects with national and international partners, supporting skill development and knowledge transfer.

Awards allocated in 2020

23 applications

7 successful (30%)

$169,942 awarded

Dr Lauren Blekkenhorst
Healy Research Collaboration Award
Edith Cowan University with Erasmus University, The Netherlands, and Deakin University, VIC
Dietary nitrate intake and its associations with cardiometabolic, cognitive and mental health
$29,832

Dr Alexander Tang
Healy Research Collaboration Award
The University of Western Australia with the University of Otago, New Zealand
Developing novel treatments for stroke
$22,987

Dr Zachary Howard
Cockell Research Collaboration Award
The University of Western Australia with The University of Newcastle, NSW, and Australian National University, ACT
Uncovering the causes of perceptual inference deficits in patients with schizophrenia
$16,500

Professor Penelope Hasking
Cockell Research Collaboration Award
Curtin University with Stanford University, USA
The role of emotion regulation in mental illness
$20,427

Dr Cele Richardson
Charter Hall / Cockell Research Collaboration Award
The University of Western Australia with Flinders University, SA, and University of Reading, UK
Bright light therapy to improve sleep and mental health outcomes for young people with depression
$20,600

Dr Jess Reynolds
BrightSpark Research Collaboration Award
Telethon Kids Institute, The University of Western Australia with Garvan Institute of Medical Research, NSW
Challenging the core autism phenotype – investigating motor impairments in children on the autism spectrum using whole genome sequencing
$30,000

Dr Lieke van den Elsen
BrightSpark Research Collaboration Award
The University of Western Australia with South Australian Health and Medical Research Institute, Adelaide
Does lack of colostrum feeding in neonates lead to impaired growth and immune development, and enhanced disease susceptibility in later life
$29,296

BrightSpark Foundation Western Australia – Supporting Research into Child Health

The University of Western Australia – Cockell Bequest

Healy Medical Research Foundation

Charter Hall

BRIGHTSPARK RESEARCH COLLABORATION AWARD

Dr Diana Tan

School of Psychological Science, The University of Western Australia

In collaboration with the University of Cambridge, UK

$7,600
2019-2020

Investigating biological markers of autism using longitudinal cohort studies in the UK and Australia

Facial features as a potential biomarker to assist early identification and intervention of autism

Dr Diana Tan is a Research Associate in the School of Psychological Science at The University of Western Australia.

Dr Tan's research examines early markers of autism, in seeking to better understand factors that impact the development of autism.

Autism currently affects 1 in 100 children in Australia, and is diagnosed three times more frequently in boys than in girls. Although the current evidence suggests that very early intervention improves long-term psychosocial well-being and cognitive outcomes for children on the autism spectrum, the condition is not typically diagnosed until four years of age. This highlights the importance of establishing early markers of autism in identifying infants with an increased probability of developing autism, to assist early intervention and support.

Dr Tan's research consisted of two potential early markers of autism: facial features and a group of hormone-disrupting chemicals (phthalates and BPA) commonly found in many consumer products, such as food packaging and detergents. Working with a group at The University of Cambridge, Dr Tan gained access to data from a unique pregnancy cohort in the UK, to compare with Raine Study cohort data here in Western Australia.

Their findings across both sets of data provided evidence that higher levels of testosterone during pregnancy are associated with more masculinised facial structures in later life, which in turn was found to be associated with autism. The final analyses for the work on hormone-disrupting chemicals are nearly completed, with the findings to be published.

This Research Collaboration Award has led to two manuscripts in preparation, conference presentations, and ongoing collaborations with UK researchers, including Dr Tan being named as an Associate Investigator on a grant through the British Academy.

"As an Early Career Researcher in Australia, the award funded by the Raine Medical Research Foundation and the BrightSpark Foundation has given me an opportunity to visit and form valuable links with colleagues from the University of Cambridge. I was also invited to give a symposium to showcase world class research that was conducted in Western Australia. Interesting and insightful discussions and conversations arose from this symposium which have, in turn, developed my thinking as a researcher. Beyond Cambridge, I have established relationships with other researchers from Norwich, Newcastle and St Andrews, all of which have given me new perspectives and inspirations in conceptualizing the next steps for my research."

-Dr Diana Tan

HEALY RESEARCH COLLABORATION AWARD

Dr Lee Nedkoff

School of Population and Global Health, The University of Western Australia

In collaboration with the University of Auckland (New Zealand)

$15,972
2019-2020

Extending the potential of linked health data for international studies of cardiovascular disease: An Australia/New Zealand collaboration

Developing health coding analyses in efforts to track and improve outcomes for patients with cardiovascular disease

Dr Lee Nedkoff is a Research Fellow and cardiovascular epidemiologist in the School of Population and Global Health at The University of Western Australia.

Dr Nedkoff's research seeks to understand the epidemiology of cardiovascular disease to support effective implementation of prevention and disease management programs in Australia.

Cardiovascular disease is the leading cause of death in both Australia and New Zealand. While efforts to reduce major risk factors such as smoking, high cholesterol and blood pressure have led to substantial declines in cardiovascular mortality, the challenge remains to identify specific targets where further gains can be made, which can then inform clinical practice and health policy.

This Healy Research Collaboration Award supported a collaboration between Dr Nedkoff and epidemiologists at the University of Auckland in New Zealand. Collaborative activities have included travel (where possible, given the impact of COVID-19) and online meetings to progress their research program. Together, they have investigated methodologies for defining rates of early deaths following heart attacks in both Australia and New Zealand. They observed that approximately half of deaths from heart attack occur in people who have not been admited to hospital, indicating that current methods for measuring these events need refining.

Linked electronic health data is a pragmatic means of investigating cardiovascular disease burden, whereby integrated electronic records assist health monitoring and interventions. The linked health data system in WA has been at the forefront nationally, with linked state-wide data since the mid 1990's. In New Zealand, the presence of a unique personal health identifier allows for nation-wide linkage of health datasets, resulting in there being a wider availability of linked datasets than in Australia. Through this collaboration, Dr Nedkoff was able to compare administrative cardiovascular coding practices between Australia and New Zealand, and test a New Zealand developed cardiovascular risk score on Australian data.

Since completing this Research Collaboration Award, Dr Nedkoff has been successful in receiving a National Heart Foundation Future Leader Fellowship, a four year program of support that will assist her to build on the work of this Collaboration Award, to further develop this new coding algorithm for monitoring heart attacks and cardiovascular disease in Australia. Dr Nedkoff is currently working with the Australian Institute of Health and Welfare in sharing her research findings, to inform national monitoring practices of heart attacks and strokes in Australia in efforts to improve outcomes for patients with cardiovascular disease.

The Raine Study

The Raine Medical Research Foundation awarded a major research grant in 1989 for the establishment of the West Australian Pregnancy Cohort Study. It was later named "The Raine Study" to acknowledge the original grant from the Raine Foundation and its founder Mary Raine. The Raine Medical Research Foundation continues to provide funding support for the Raine Study, 30 years on.

The Raine Study aimed to develop a long-term cohort to research the role that early life events (from the womb onwards) had on later life. From 1989 to 1991, 2,900 pregnant women (Generation 1) volunteered to be part of the study. Since the Raine Study was established, the children (Generation 2) have been followed up at regular intervals providing an increasingly rich source of data for local, national and international research. Their families are also part of the study, with their grandparents (Generation 0) and children (Generation 3) now also involved in the study. **The Raine Study is one of the largest prospective cohorts of pregnancy, childhood, adolescence, and adulthood to be carried out anywhere in the world.**

Highlights For 2020

3.1mil
was successfully secured in competitive grant and fellowship funding

125
new data access and biosample requests were submitted to the Raine Study

69
new project applications were submitted utilising Raine Study data

49
peer-reviewed papers were published, bringing the total to 599 published papers using Raine Study data since the commencement of the Raine Study

Professor Peter Eastwood
Professor Romola Bucks

The Raine Study welcomed a new Director, Professor Romola Bucks, and new Scientific Director, Associate Professor Rebecca Glauert. The outgoing Director, Professor Peter Eastwood, and Scientific Director, Professor Leon Straker, led many commendable operational and scientific achievements over the past eight years, and we wish them well with their future endeavours.

Dr Samantha Lee
Dr Amanda Cleaver

The Raine Foundation awarded two prizes for the most outstanding presentations by early-career researchers at the 2020 Raine Study Annual Scientific Meeting. They were awarded to Dr Samantha Lee (Lions Eye Institute) for presentation of her research into the causes of choroidal (optic disc) thickness in young adults, and to Dr Chau Jillian Thien Tay (Monash University) who spoke about updated diagnostic criteria for polycystic ovary syndrome based on Raine Study data.

2020 Raine Annual Awards Ceremony

Each year we celebrate the achievements of our past and present awardees at our breakfast awards ceremony. We were honoured to welcome distinguished guests and alumni, including our guest speaker, Professor John Newnham AO, who spoke eloquently to a highly engaged audience about the origins of the Raine Study, his research findings, and history of the Raine Medical Research Foundation.

Professor Simon Biggs, Professor Amit Chakma, Professor Lyn Beazley, Professor John Newnham

Professor Brigitte Tampin, Dr Jess Nolan, Associate Professor Erin Godecke

Mr Jon Stewart, Dr Amanda Cleaver, Mrs Carolyn Stewart, Mr Geoff Anderson

Dr Christian Pflueger and Dr Rhonda Taylor

Dr Bennie Ng, Dr Jess Reynolds, Dr Jess Nolan

Professor Robyn Owens and Professor John Newnham

Professor Nigel Laing and Professor Romola Bucks

Our People

All members of our Research and Advisory Committees are volunteers. We thank our members for their generosity in ensuring that we support the very best medical research in Western Australia. We also thank the many national and international researchers who have given their time to review applications. We are incredibly grateful to have the benefit of their expertise.

Advisory Committees

Our Advisory Committees report to the Research Committee bi-annually.

FINANCE & STRATEGIC ADVISORY COMMITTEE	APPOINTMENTS & REMUNERATION COMMITTEE	RAINE PRIMING GRANTS ADVISORY COMMITTEE	CLINICIAN RESEARCH FELLOWSHIPS ADVISORY COMMITTEE	AWARDS & PRIZES ADVISORY COMMITTEE
Mr Garry Prendiville (Chair)	Professor Robyn Owens (Chair, Outgoing)	Associate Professor Steven Mutsaers (Chair)	Ms Jodie Hegarty (Chair)	Professor Robyn Owens (Chair, Outgoing)
Mr Geoff Anderson	Professor Tim Colmer (Chair, Incumbent)	Dr Amanda Cleaver	Professor Garry Allison	Professor Andrew Page (Chair, Incumbent)
Mr Tony Barber	Professor David Joyce	Professor Elizabeth Davis	Dr Aron Chakera	Dr Amanda Cleaver
Dr Amanda Cleaver	Mr Garry Prendiville	Dr Archa Fox	Dr Amanda Cleaver	Dr Andrew Currie
Mr Graham Dowland		Professor Shane Patman	Professor David Joyce	Associate Professor Elin Gray
Mr Peter Smith		Professor Phil Stumbles	Professor Merrilee Needham	Professor Gerard Hoyne
Mr Andrew Thompson		Professor Valerie Verhasselt	Professor Anne Williams	Professor David Joyce
		Dr Lisa Wood		Professor Anna Nowak

Raine Management Team

Dr Amanda Cleaver
Director

Ms Nicole Feast
Senior Research Grants Officer

Ms Victoria Stead-Wynne
Senior Research Communications Officer

Research Commitee

The Raine Medical Research Foundation and the Healy Medical Research Foundation are governed in accordance with their Deeds of Trust. This includes the composition of the Research Committee.

Professor Robyn Owens
Chair (Outgoing)
Deputy Vice-Chancellor (Research), The University of Western Australia

Mr Peter Smith
Fellow of the Royal Australasian College of Surgeons

Professor Amit Chakma
Chair (Incumbent)
Vice-Chancellor, The University of Western Australia

Professor Aron Chakera
Fellow of the Royal Australasian College of Physicians

Dr Bennie Ng
General Practitioner
Australian Medical Association WA Branch Representative

Professor Jeff Hamdorf
Professor of Surgery
The University of Western Australia

Professor David Joyce
Professor of Medicine
The University of Western Australia

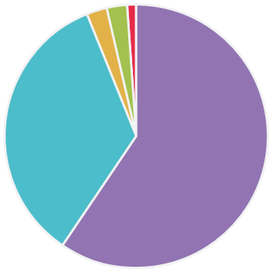
Mr Garry Prendiville
Financial Consultant
Research Committee Nominee

Professor Valerie Verhasselt
Professor of Biochemistry
The University of Western Australia

Financial Reports

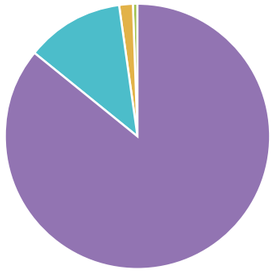
Raine Medical Research Foundation
Financial Summary as at 31st December 2020

2020 Income



- 59.6% - Investment Income
- 35.4% - Partnerships
- 2.5% - Management Fees
- 2.4% - Other Income
- 0.1% - Donations & Bequests

2020 Expenses



- 86.2% - Medical Research Funding
- 12% - Employment
- 1.6% - Administration
- 0.1% - Depreciation

NB. Both Partnerships income and the Medical Research Funding expense reflect the consolidated position of the Raine Medical Research Foundation and its associates.

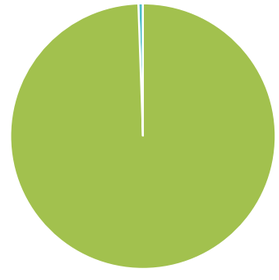
Investment Balances

Investments	2020	2019
Corpus	32,318,350	32,000,028
Research Committee Capital	12,310,064	10,895,044
Research Committee Operations	276,990	234,483
Donations & Bequests	172,030	190,610
Total Pool Investment	**45,077,434**	**43,320,165**
Other Investments - Market Value		
24/95 Monash Avenue (Hollywood)	482,850	482,850
Dexus Property Group (DEXUS) Holdings	2,122,520	2,641,860
Dexus Property Group (DEXUS) Imputation Credit (Accrual)	4,411	4,757
Total Other Investments - Market Value	**2,609,781**	**3,129,467**
Total Assets	**47,687,215**	**46,449,631**
Liabilities		
Provision for leave	33,718	26,882
Total Liabilities	**33,718**	**26,882**
Total Net Assets	**47,653,497**	**46,422,749**

NB. The Raine Financial Summary is extracted from the full financial statements. The full financial statements of the Raine Medical Research Foundation can be obtained from the Director upon request.

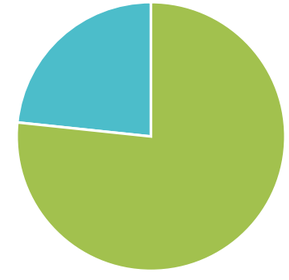
Healy Medical Research Foundation
Financial Summary as at 31st December 2020

2020 Income



- 99.8% - Investment Income
- 0.2% - Other Income

2020 Expenses



- 76.8% - Medical Research Funding
- 23.2% - Management Fee

Investment Balances

Investments	2020	2019
Corpus	1,993,790	1,980,461
Research Committee Operations	169,091	104,666
Total Pool Investment	**2,162,881**	**2,085,127**
Total Net Assets	**2,162,881**	**2,085,127**

NB. The Healy Financial Summary is an extract of the full financial statements. The full financial statements of the Healy Medical Research Foundation can be obtained from the Director upon request.

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RAINE
MEDICAL RESEARCH FOUNDATION