Institute for Mental and Physical Health and Clinical Translation

Annual Report 2022

Medical research to benefit the community





IMPACT acknowledges the Traditional Custodians of the land on which our Deakin University campuses sit: the Wadawurrung people of the Kulin Nation on whose land our Geelong campuses are located, the Wurundjeri people of the Kulin Nation on whose land our Burwood campus is located and the Gunditjmara people on whose land our Warrnambool campus is located.





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Forewords



Alfred Deakin Professor Julie Owens Deputy Vice-Chancellor, Research

In a year when the COVID-19 pandemic continued to present disruptions, researchers at Deakin University's IMPACT remained committed to translating their important biomedical discoveries into practical solutions and applications, from <u>developing new international</u>. guidelines to help diagnose and treat muscle loss in the elderly to <u>breakthroughs in finding new drugs to fight malaria</u>.

We have learnt much about COVID-19 and other infectious diseases since the beginning of the pandemic. This year, IMPACT's Professor Alyssa Barry and Professor Eugene Athan harnessed the collective power of infectious diseases expertise in Geelong to lead the new Centre for Innovation in Infectious Disease and Immunology Research (CIIDIR), an initiative of the Deakin and Barwon Health partnership.

The international reputation of the Institute's researchers continued to grow in 2022, with our Director, Alfred Deakin Professor Michael Berk, and Adjunct Professor Dr Harris Eyre representing Deakin on the global stage at the United Nations General Assembly Science Summit in New York City to discuss the value of 'brain capital' and establish IMPACT as the 'brain capital hub' for Australasia.



Professor Rachel Huxley Executive Dean, Faculty of Health, Deakin University

It's been inspirational to see how the research performance of the Institute for Mental and Physical Health and Clinical Translation has continued to flourish in 2022.

IMPACT continues to cement its position as an international leader in the prevention and management of mental health conditions as evidenced by the award of numerous highly competitive grants, an Alfred Deakin Professorial appointment, fellowships and media and international exposure.

The significant contributions IMPACT is making to global research, by having 5 members make the prestigious 2022 Clarivate Highly Cited Researchers list, is to be celebrated and commended.

Another impressive year for IMPACT, my congratulations to Alfred Deakin Professor Michael Berk and the entire team at IMPACT as their work continues to advance knowledge and improve the health outcomes for the local and global community.



Ms Frances Diver Chief Executive Officer, Barwon Health

Collaboration and research are essential components in delivering care to the community, and this is very much in evidence at Barwon Health.

Over the years we have grown to embed research in what we do, and this has evolved into a culture of inquiry and a commitment to innovate and constantly improve. We are exceptionally privileged to have the collective talent of the IMPACT Institute, which – through research and collaboration – supports our clinicians in delivering the very best care to the community.

The benefits to the health sector of IMPACT's research are far-reaching; it will have a lasting effect on the people we treat locally, and more broadly, globally, through the sharing of the outcomes of the Institute's research.



Message from the Directors



In 2022, IMPACT entered its third year of operations – and it has proved to be another major year. Despite the challenges faced over the course of the COVID-19 pandemic, our teams have shown their determination to tackle some of the most complex mental and physical disorders facing the world today.

We welcomed several new members to our growing institute during the year. We now have a team of more than 300 researchers, students and staff who are working to produce some outstanding research.

It was a pleasure to host our IMPACT Showcase, which took place for the first time in two years due to the pandemic. Our teams were able to finally get together face to face; some members were meeting for the very first time. I felt immensely proud as I listened to a range of presentations that highlighted the diversity of research that is conducted across our seven themes, particularly by the next generation of researchers. This year, we supported 16 students to complete their PhDs – this cohort is the future of medical research at Deakin, and what a promising future it is!

Dr Wolfgang Marx received the prestigious Young Tall Poppy Science Award for his excellence in research and enthusiasm for communicating science beyond the walls of the laboratory.

IMPACT is also now home to five Highly Cited Researchers[™] and 2022 saw the highest number of Deakin researchers on the list since its inception. This recognition is a testament to the quality of our institute members, who are global leaders in their fields.

Please join me in celebrating our successes and looking ahead to what we can accomplish in 2023.



Alfred Deakin Professor Michael Berk Director



Our teams experienced 2022 as IMPACT's most productive year since the Institute was established at the beginning of the pandemic. This year has enabled the bench-to-bedside concept – around which our institute was formed – to flourish within Deakin's School of Medicine.

Researchers were able to return to the laboratories with uninterrupted time spent developing treatments or pursuing cures for some of the world's most disabling physical and mental health conditions. Our clinical trials teams were able to welcome participants into our clinical spaces as part of the quest for much-needed solutions in areas such as drug discovery, the human microbiome and infectious diseases, to name but a few.

We celebrated grant successes across IMPACT this year. Associate Professor Jee Hyun Kim and Dr Roey Elnathan were among Australia's best and brightest mid-career researchers after receiving a combined total of more than \$1.94 million for their projects, which focus on finding solutions to some of science's biggest challenges. Dr Heidi Staudacher received an NHMRC Investigator Grant to explore the Mediterranean diet and its role in improving depressive symptoms.

Over the past 12 months, as we have turned away from our Zoom meetings and returned to regular real-world interactions, I have been reminded of the human side of the Institute's work. Although we never lose sight of the community our research serves, it's been inspirational to read about the genuine impact of our work in this report. As you will discover in these pages, many of our researchers have intriguing personal stories that have led them to investigate areas such as diabetes, bipolar disorder and malaria.

With all this in mind, I look forward to seeing what we can achieve in 2023.

ler Walder

Professor Ken Walder Deputy Director

OUR IMPACT

197 Staff



146 students

12.4k WEBSITE VISITORS impact.deakin.edu.au

187 COLLABORATIONS ACROSS AUSTRALIA AND THE WORLD

40 AWARDS RECEIVED View a complete list <u>here</u>

Collaborations

Every year our researchers work with more than 180 national and international partners from universities, healthcare providers and philanthropic organisations. These collaborations are crucial to driving new discoveries and embedding our research into real community settings.

View all our collaborations here



AUSTRALIA

Queensland	10
New South Wales + ACT	19
Western Australia	5
Tasmania	1
South Australia	2
Victoria	44
Northern Territory	1
Total	82

WORLD

 North America 	26
United Kingdom	17
• Europe	28
• Asia	15
South America	7
New Zealand and Oceania	7
Africa and Middle East	5
Total	105

Key highlights of 2022

It's been another busy 12 months at IMPACT. Below, follow our journey through the year.

MARCH

World Bipolar Day Q&A session

World Bipolar Day is celebrated each year on 30 March, the birthday of Vincent Van Gogh, who is widely believed to have had bipolar disorder. The event is coordinated by the International Bipolar Foundation on behalf of participating organisations across the globe. IMPACT's team hosted a free online Q&A session, which was open to anyone keen to have their question answered either for themselves or someone they care for. The extraordinary panel included lived-experience experts, researchers and clinicians. Watch the recording here.

MAY

IMPACT Showcase

For the first time since the pandemic began, IMPACT members were able to gather to celebrate their work and share knowledge at the annual IMPACT Showcase. Designed to build relationships across our growing Institute, the two-day event, featuring more than 31 presentations and 80 research posters, proved a success.

AUGUST

Introducing the Centre for Innovation in Infectious Disease and Immunology Research (CIIDIR)

A new Geelong-based research centre was created to contribute to global efforts to prevent, control and treat infectious and immune-related diseases, including COVID-19, Buruli ulcer, malaria and asthma. The CIIDIR is led by IMPACT's Professor of Systems Epidemiology of Infection, Alyssa Barry, and Barwon Health Clinical Director of the Public Health and Health Service Partnerships Directorate and Professor of Infectious Diseases, Eugene Athan.





SEPTEMBER

IMPACT joins the United Nations General Assembly in NYC

After years of closed borders and virtual meetings, experts from around the world were finally able to meet face to face in New York City for the Science Summit at the 77th United Nations General Assembly. Director of IMPACT Professor Michael Berk and Adjunct Professor Dr Harris Eyre attended to represent Deakin University on the global stage.

\$1.94m in Future Fellowships grants

September proved a busy month with the announcement of the Australian Research Council's Future Fellowships. IMPACT had success with two projects: a first-of-its-kind exploration of dopamine receptors to better understand development across the lifespan by Associate Professor Jee Hyun Kim, and creating nano-needles to deliver genetic materials into cell interiors by Dr Roey Elnathan. These two are next-gen researchers working to find solutions for some of science's biggest challenges.

OCTOBER

NHMRC grant success

Alfred Deakin Professor Michael Berk and emerging Alfred Deakin Postdoctoral Research Fellow Dr Heidi Staudacher received a combined total of \$3.9 million to fund their mental health research. Professor Berk's research will support the development of a bench-to-bedside platform for novel therapy development for psychiatric disorders, while Dr Staudacher's program will investigate the Mediterranean diet, its role in improving depressive symptoms, and how it might facilitate these mood effects.

NOVEMBER

MAGNET's first Annual Science Meeting

The Mental Health Australia General Clinical Trials Network (MAGNET) team met with more than 130 researchers, clinicians and experts who convened at Deakin Downtown in Melbourne for MAGNET's Annual Scientific Meeting. The exciting new network is bringing together these experts for the first time as it is Australia's only clinical trial network focused on adult mental health – driving better prevention, diagnosis, treatment and recovery.

NOVEMBER

An ABC TV appearance with Magda

November shaped up to be another big month as Alfred Deakin Professor Felice Jacka joined Magda Szubanski and VicHealth CEO Dr Sandro Demaio on ABC's new series *Magda's Big National Health Check.* Prof. Jacka discussed the important link between our physical and mental health. Missed the episode? Catch up on ABC iview <u>here</u>.

Highly Cited Researchers™ join the top 1%

The Institute's team ended the year with a bang after finding out that five of our researchers appeared on the Clarivate™ Highly Cited Researchers™ list for 2022. The list identifies researchers who have made the most significant contributions to global research in the past decade and includes those who are ranked in the top 1% of research paper citations.

The five IMPACT team members are:

- Alfred Deakin Professor Michael Berk
- Dr Andre Carvalho
- Associate Professor Olivia Dean
- Alfred Deakin Professor
 Felice Jacka OAM
- Professor Alison Yung

Clinical Trials and Interventions

Harnessing community engagement to deliver insights

Over the past 12 months, the TRIALS team has made significant gains in producing high-quality research and contributing to real-world outcomes.

The theme completed the Return to Work Feasibility Study (RESET). The project also involved engaging a group of people with lived experience of stroke to co-design a support module for direct translation into clinical practice.

TRIALS researchers started a trial of mirtazapine for methamphetamine dependence – a world-first pharmacological intervention study.

Theme members celebrated as two Honours students – whose research investigated medication use in methamphetamine dependence and bipolar disorder – successfully completed their degrees. In 2022, researchers continued to create exceptional work as part of their collaborations with Melbourne Neuropsychiatry Centre, and, internationally, with Northwest University and the Karolinska Institute. A collaborative project involving researchers at the University of California Berkeley – working on the hybrid psychosocial intervention BipolarWISE for people with bipolar disorder – also made impressive progress during the year.

The theme saw further expansion of the Community and Research Network, in collaboration with the McIntosh Family Gift and Western Alliance.

Meanwhile, TRIALS was proud to work with the Geelong Music Community Collective to raise more funds for the GMCC Dean McInnes Student Travel Award (which has raised more than \$16,000 to date).

2022 HIGHLIGHTS

Anna Wrobel completes PhD

Rising star Anna Wrobel completed her PhD with the TRIALS theme, with her research focusing on investigating the role of trauma in the treatment of bipolar disorder. She also completed an internship with Barwon Health.

TINA Trial draws media interest

The TINA Trial, a collaborative clinical trial investigating methamphetamine dependence, commenced, and quickly gained media attention across Australia. The trial is designed to see whether mirtazapine, an antidepressant medication, can help people reduce participants' use of methamphetamine

Prestigious award for Olivia Dean

Olivia Dean is a Highly Cited Researcher[™] for 2022. Highly Cited Researchers[™] have demonstrated significant and broad influence reflected in their publication of multiple highly cited papers over the last decade. These highly cited papers rank in the top 1% by citations for a field or fields and publication year in the Web of Science[™]. Of the world's population of scientists and social scientists, Highly Cited Researchers[™] are 1 in 1,000.

Stroke project shows the power of collaboration

The RESET Advisory Group and Network comprises individuals with lived experience of stroke (having had a stroke or caring for someone who has had a stroke) and clinicians interested in better supporting people through the post-stroke return-to-work journey. This group has been instrumental in refining the return-to-work (RTW) approach taken in the TRIALS research project, RESET, and has co-designed a new brief intervention to help stroke survivors at any time during their work journey.

Since 2017, the team has been working on a program of post-stroke RTW research. After joining the Stroke Association of Australia in delivering a face-to-face RTW support service, TRIALS researchers developed, trialled and refined a telehealth version of the service, which they named RESET (Resuming Employment after Stroke – Enhancement through Tele-coordination; funded by IMPACT seed funding and the Stroke Foundation). They recruited participants from Barwon, South-West, Western District and Albury Wodonga health services.

As part of the project, TRIALS engaged an advisory group of people with lived experience (stroke survivors and carers) and clinicians, to help refine an intervention for rural centres.

During those meetings, some key themes emerged, including the need for consistent support, employer education and provision of longer-term (beyond six months) support. There is currently a significant gap in availability of longer-term vocational support following stroke; both within the scientific literature and clinical practice, with most services centring on the early postacute period (three to six months). Given the differing needs (for example, differences in physical and cognitive/mood/fatigue symptoms) of those stroke survivors who attempt to return to work later compared with those who are sufficiently recovered within the shorter post-acute period, it is unlikely that existing interventions could simply be applied to this later time point.

Funded by an IMPACT Seed Grant, in 2022 the RESET Advisory Group worked with the research team to codesign a service approach that would fit the needs of this client group. The researchers also engaged a steering committee of clinicians, researchers, lived experience experts and industry partners (Stroke Foundation, Stroke Association of Victoria, Western Alliance, WorkSafe) to oversee the project and provide recommendations.

The RESET Advisory Group met eight times over the course of this year. Together, the RESET Advisory Group, Steering Committee and research team created a 'work wellbeing' module – a three-session brief intervention that a clinician can use to help a stroke survivor identify potential challenges in the workplace (for example, fatigue, cognitive issues), and strategies to address these when things are going well, not so well and in times of crisis. This module can be delivered and re-delivered at any time during the return to work and longer-term work journey.

In 2023, the researchers will finalise the new RTW service module and seek funding for piloting and evaluation. In addition, the RESET Advisory Group and Steering Committee strongly recommended employer/ workplace knowledge be the focus of the next project. The team has successfully secured IMPACT seed funding to start this project in the coming year, enabling the lived experience Advisory Group to continue to provide valuable input into service development efforts.

OUR YEAR IN NUMBERS

22 Researchers, students and staff

PhD completion

24 Research projects

Collaborators



Mood disorders research driven by compassion



Dr Adam Walker Trisno Family Research Fellow

What area of research do you specialise in?

My research interests predominantly lie in the fields of behavioural neuroscience and biological psychiatry. I specialise in the investigation of biological markers of treatment response in mood disorders (for example, major depression or bipolar disorders).

How long have you been in this field? Did you do anything different before this?

My PhD research (2012–2016) involved using a preclinical model of antidepressant resistance to investigate the (then) novel rapid treatment effects of ketamine, and the potential of lithium as an adjunctive therapy in depression.

Since graduating, I have transitioned into clinical research, joining IMPACT and working to advance biological marker investigations for TRIALS, the Clinical Trials and Interventions theme.

What makes you passionate about this area?

While current gold-standard treatments are certainly useful, for many people experiencing mood disorders (30%–50%), initial treatment will be insufficient. And the likelihood of remission drops with each attempt.

Early on in my PhD, I read William Styron's *Darkness Visible: A Memoir of Madness* (1990). I think that is when it really hit me, just how insidious and intractable depression can be. Though short in length, the book is a heavy read; I felt it afforded readers a little insight into the oppressive sorrow of the dark in depression, and emergence into the light with recovery. Mood disorders are thought to be progressive in nature, especially when not effectively treated. And with so many people experiencing a mood episode each year, it is more important than ever that people get the right help, right out of the gate. If we can identify some indicators (or biomarkers) to help guide treatment, I feel we may be able to improve illness trajectory and reduce the burden of depressive episodes.

What is your current focus?

I am currently focused on examining biological analytes in blood samples of participants of the past adjunctive treatment trials that were led by Associate Professor Olivia Dean and Professor Michael Berk.

Through a collaboration with Professor Sophie Erhardt and Dr Lilly Schwieler of Karolinska Institute in Sweden, we now have some great data – which I am eager to finish analysing – on a handful of peripheral tryptophan metabolites in plasma samples from more than 400 clinical trial participants who were currently experiencing a depressive episode.

What does an average work week look like?

I feel this is a bit of a common answer in research – but things can vary a lot week to week. I might be sending a bunch of emails, writing a grant application, advising on a student project, analysing data, presenting at a conference, writing up a manuscript, or providing edits, or completing peer review.

I am not really a wet-lab scientist, nor am I a trial clinician (although I do have some experience in these areas). I try to fill the niche space between the two and rely on the brilliance of collaborators and colleagues around me to help achieve our research goals. IMPACT is a great place for this.



What has driven you to research in this area?

I did not really set out to be a researcher. When I was finishing high school, I wanted to be a physiotherapist; during my undergraduate studies, perhaps a psychologist? But as I grew to understand myself a little better, I realised that a clinical job was not for me. In school, I was always the kid in class with questions. I get curious. And I find myself drawn to understanding more about these kinds of phenomena. I chose a double major in neuroscience and psychology in my undergraduate studies at The University of Melbourne. Passing up an offer of honours in neuroscience at Melbourne, I opted to complete my fourth year at Deakin University, in psychology, which included a student project investigating treatment resistance in depression. After our project was completed, my then-supervisor, Dr Susannah Tye, suggested research (and a PhD) might be a good option for me – and the rest is history.

Tell us about some of your career highlights.

Concurrent with my PhD, I was fortunate enough to complete a year-long research traineeship in the Mayo Clinic's Department of Psychiatry and Psychology in Minnesota with Dr Tye (now at Queensland Brain Institute). Other highlights include joining IMPACT in 2017 and being appointed the Deakin University Trisno Family Research Fellow in 2019 and 2021. This fellowship is co-funded by the philanthropic Trisno Family Gift, Deakin University, and an NHMRC Centre of Research Excellence. It is designed to support research investigating new biologically based treatments for psychiatric disorders. Another was being named an associate investigator on the Mental Health Australia General Clinical Trial Network (MAGNET).

What was your career highlight in 2022?

For me, it was working on an invited opinion piece with A/Prof. Dean titled <u>'Current approaches to precision</u> <u>medicine in psychiatry: Are we just spinning our wheels?'</u> This was published in *European Neuropsychopharmacology*.

Where next?

For me, 2023 marks 10 years since I began my journey in research. The coming year is about getting more of our results out there, while working with our wonderful collaborators: Dr Zoe Liu and Professor Ken Walder in the IMPACT Psychiatric Biomarkers Discovery Group, Dr Dhama Eratne and Professor Dennis Velakoulis in the MiND Study, and Dr Schwieler and Prof. Erhardt at Karolinska.

2023

Theme researchers will be trialling DepressionASSIST, BipolarASSIST and BipolarWISE, and are looking forward to getting feedback from participants. This will help the team to update these psychosocial programs to make sure they are useful to the people who access them.

The theme will keep building on lived-experience engagement via the Community and Research Network (CARN), and working with Deakin's Community Research Engagement Network (CREN), and Change to Improve Mental Health (CHIME). RESEARCH THEMES

Food and Mood

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New academy expands centre's global reach

This year saw the welcome return of more in-person events for the Food & Mood Centre.

Staff and students were back working from the office, attending face-to-face meetings and workshops, and travelling nationally and internationally for conferences and collaborations. Another exciting development was the return of students from overseas, with the first two international PhD students since 2019 joining the centre.

Easing COVID restrictions throughout 2022 also meant the Food & Mood Centre was able to resume several of its research projects with vigour. Five studies were actively recruiting and underway (including the HARMON-E signature trial, led by Professor Adrienne O'Neil via the MAGNET Network) and another five were in the throes of data analysis. Alongside this, the centre launched its new education and translation arm, the Food & Mood Academy, and also convened the inaugural meeting of the Global burden of disease Lifestyle And mental Disorders (GLAD) Taskforce in Milan with more than 80 in attendance. GLAD is investigating the contribution of lifestyle risk factors to common mental disorders globally, by sex and over time. The Food & Mood Centre continued to grow its team over the year – in both number and composition. Now comprising more than 50 staff and student members, the centre created several innovative positions to ensure its continued excellence in conducting and implementing its research. This included the employment of a dedicated clinical trial manager, as well as lived experience and diversity and inclusion officers.

In 2022, the centre's very own Alfred Deakin Professor Felice Jacka appeared in the ABC's <u>Magda's Big National</u> <u>Health Check</u>, a three-part TV show following Magda Szubanski as she uncovered some of the major health challenges facing Australians.

2022 HIGHLIGHTS

Awards prove a boost for 'Mood'

There were awards and honours aplenty for Food & Mood Centre team members. The title of Alfred Deakin Professor was awarded to Felice Jacka. Dr Wolf Marx was honoured with a Victorian Young Tall Poppy Science Award. Dr Tayla John received a Highly Commended Finalist Award at the Victorian Public Healthcare Awards. Four team members – Drs Samantha Dawson, Heidi Staudacher and Jess Davis, and Amelia McGuiness – were recognised with IMPACT Institute excellence awards. Dr Staudacher was also awarded an NHMRC Investigator Grant.

Fresh approach to education lures global learners

The Food & Mood Academy was launched. Led by the centre's education and training leader, Dr Tetyana Rocks, the academy is the centre's dedicated education and translation arm, providing formal accredited education and training for clinicians.

A 'world first' in depression care

Led by the Food & Mood Centre's Professor Adrienne O'Neil and Dr Wolf Marx, the world's first clinical guidelines for the use of lifestyle-based mental health care in major depressive disorder were <u>published</u>.

Mental health research distilled into helpful guidelines

Dr Wolf Marx and Professor Adrienne O'Neil chaired and led an international research taskforce to develop the first ever international clinical guidelines for lifestyle-based mental health care for major depressive disorder.

Major depressive disorder (MDD) is a leading cause of global disability and one of the primary causes of disease burden worldwide. About 4.7% of people worldwide experience depression in any 12-month period. The prevalence of MDD is consistent across high-, middle- and low-income countries, demonstrating the global burden of this disease.

Representing three years of work, Dr Marx (lead author) and Prof. O'Neil (co-chair and senior author) partnered with the World Federation of Societies for Biological Psychiatry and the Australasian Society of Lifestyle Medicine to lead an international research taskforce to develop clinical practice guidelines to provide clinicians with up-to-date, evidence-based information on the management of MDD using nine lifestyle-based approaches:

- Physical activity and exercise, including the importance of improving aerobic and resistance training while reducing sedentary behaviours
- 2. Relaxation techniques, such as guided breathing exercises
- 3. Re-engaging people with employment or volunteering
- 4. Adequate sleep
- 5. Mindfulness-based therapies
- 6. Healthy diet
- 7. Quitting smoking
- 8. Addressing feelings of loneliness and improving social connection
- 9. Interaction with nature (green and blue spaces).

The guidelines are designed to support the application of 'lifestyle-based mental health care' in any country or setting and provide evidence that they can make a positive difference to mental health. The recommendations and implementation considerations are important as a means of expanding treatment options given the increasing incidence of depression globally and the overstretched mental health workforce.

Based on a synthesis of current scientific evidence, the guidelines were rigorously evaluated using a systematic grading system that determined the strength of recommendations. They were published in *The World Journal of Biological Psychiatry*.

A series of consumer resources were developed to accompany the guidelines to help those living with MDD understand the latest evidence on lifestyle-based care for the disorder.

The guidelines and resources for practitioners are available on the Food & Mood Centre's website.

The guidelines attracted media interest across Australia, appearing in the *Geelong Advertiser, Cairns Post, NT News, Mercury, Townsville Bulletin* and *The Daily Telegraph*, Prof. O'Neil was interviewed by ABC Radio, and Dr Marx was interviewed by Joy Drive Radio about the recommendations. In the future, the international taskforce plans to produce similar clinical guidelines for lifestyle-based mental health care in the treatment of other mental disorders.

OUR YEAR IN NUMBERS

55 Researchers, students and staff

5 PhD completions

10 Research projects

92 Articles published

RESEARCHER SPOTLIGHT

Excited by the potential of a cutting-edge field



Dr Wolfgang Marx Senior Research Fellow and Head of the Nutraceutical Research stream at the Food & Mood Centre

What area of research do you specialise in?

My research focuses on the role of nutraceutical and bioactive compounds in our mental and brain health. To investigate this, I run quite a broad research program across clinical trials, animal models, epidemiology, meta-analyses and umbrella reviews, and guideline development.

What does an average work week look like?

One of the great things about a research career is that it is filled with new opportunities, new collaborations with interesting people, and things to learn. This makes my weeks quite varied. I meet weekly with the Food & Mood team as well as my own research team to discuss new projects and progress. There are usually meetings throughout the week with ongoing collaborations, mentors and mentees, and clinical trial teams. There is often media interest in my work, which means possible newsprint or radio interviews. One of my favourite aspects of research is writing and so I also try to carve out big blocks that are set aside for writing each week.

What has driven you to research in this area?

I have always been interested in how food can affect our health. While nutrition is well understood to be important to physical health, the role of diet in mental health has not traditionally received such attention. To be in this field when we are only just now beginning to understand how it might affect our mental health is an exciting opportunity to do meaningful research. I think the translatability of nutritional psychiatry is particularly powerful because novel findings can often be readily translated into an individual's life.

Tell us about some of your career highlights.

In 2011, I received a small research scholarship during my clinical masters. It was a six-week program in which I wrote my first research paper. This experience completely captivated my interest and was the catalyst for promptly applying for a PhD. When I finished my PhD, I knew I wanted to continue my research career but was unsure what the next step was. However, one cold-call email and a random coffee with Professor Felice Jacka set the scene for me to come work at the Food & Mood Centre, where I have had the chance to work with some of the world leaders in mental health and work on interesting, meaningful projects.

A highlight among these projects was the opportunity to, along with Professor Adrienne O'Neil, lead the development of the first international clinical guidelines on lifestyle-based mental health care.

What was your career highlight in 2022?

Receiving an NHMRC Investigator Grant and the Young Tall Poppy Award in 2022 was a significant milestone in my research career and the culmination of several research projects that informed our understanding of how dietary interventions can affect mental health.

Where next?

We now have epidemiological and clinical trial data supporting the use of dietary interventions in mental health. Yet key evidence gaps need to be addressed to improve treatment efficacy and the translation of these therapies into routine clinical practice. My research aims to develop a greater understanding of how diet might affect depression, identify who is most receptive to treatment response, and ensure that clinicians are using best practice to inform clinical care.

2023

The coming year will see the Food & Mood Centre progress exciting international collaborations, including with colleagues from the Institute for Space Health at NASA, the World Economic Forum, and the Zoe Health Study at King's College London.

Several highly anticipated clinical trials will be completed in 2023. This includes the large international BeNEFIT trial, testing the efficacy of a digital education program for depression.

The centre also expects to have findings ready for publication and dissemination from various projects, including a study (led by Dr Wolf Marx) exploring the possible impact of fermented dairy on measures of brain function and neurochemistry.

Infection, Immunity and Cancer

Collaboration leads to innovation

Having faced the challenges of COVID-19 over the past couple of years, in 2022 it was wonderful to have researchers back in the lab conducting discovery-based research that will ultimately aid the diagnosis, treatment and prevention of infectious diseases and cancer.

This year saw the creation of a new initiative of the Deakin University and Barwon Health partnership: the Centre for Innovation in Infectious Disease and Immunology Research (CIIDIR). This centre is leveraging the capabilities of the Infection, Immunity and Cancer (IIC)-theme members to strengthen existing connections and build new links with internal and external partners so that innovative research can be conducted to find novel ways to prevent, control and treat infectious diseases that are relevant to our region.



2022 HIGHLIGHTS

Centre taps into network's expertise

The CIIDIR, an important and timely initiative of Barwon Health and Deakin University, was established to unify infectious disease, microbiome and immunology expertise into a vibrant network of researchers working collectively to reduce the burden of infectious and immune-mediated disease in the community.

Honour for Professor Tania de Koning-Ward

Professor Tania de Koning-Ward was awarded the Bancroft-Mackerras Medal by the Australian Society of Parasitology, which recognises outstanding contributions of its members to the science of parasitology. The medal was presented at the annual ASP meeting, which was held in Cairns.

Rising star Rebecca Edgar wins two awards

Postdocs and students in the IIC theme continued to excel and the following researchers won awards: PhD student Rebecca Edgar was awarded best oral presentation at the Victorian Infection and Immunity Meeting, culminating in an invitation to give this presentation at the 2023 Lorne Infection and Immunity Conference. She also won an IMPACT Best Publication Award. PhD student Rifka Fayaz won the People's Choice Award at the School of Medicine's Three Minute Thesis (3MT) competition. Faiza Basheer received the Professor Marjorie Dunlop Grant this year for the best faculty HAtCH grant application by an early-career researcher.

New hub of research excellence harnesses collective capabilities

The Centre for Innovation in Infectious Disease and Immunology Research (CIIDIR), an initiative of the Deakin University and Barwon Health partnership, was established in 2022 to build on strengths in human infectious disease, microbiome and immunology research, linking to a national network to enhance the response to emerging and existing infectious disease threats locally and globally.

In 2020, initiatives such as the Deakin–Barwon Health COVID-19 Research Taskforce highlighted the collective power of infectious diseases expertise in Geelong. Several high-profile researchers, clinicians and public health practitioners rapidly mobilised to establish a COVID-19 Observational Cohort Study and develop transdisciplinary research projects. Together, they amassed more than \$1 million in external funding for COVID-19 research.

During the same period, IMPACT and Barwon Health increased capacity in microbiome and immunology research, and saw an opportunity to capitalise on the population health and laboratory capacity at the Health, Education and Research Building (HERB) in Geelong to further strengthen these areas and complement nutrition and mental health research in the building.

The partnership also saw an urgent need to link these previously disparate areas of research. CIIDIR was created to capitalise on new opportunities in these areas by bringing together infectious disease, microbiome and immunology expertise across the University and Barwon Health.

Led by IIC researchers Alyssa Barry and Eugene Athan, the centre will foster cross-disciplinary collaboration to conduct innovative, locally relevant and internationally important research that will enhance the prevention, control and treatment of infectious and immunemediated diseases. CIIDIR also aims to build links with external partners as a hub of research excellence. Through research in key areas, CIIDIR will build translational platforms for clinical practice innovation and public health policy.

The centre's activities will be structured into four research pillars – molecular microbiology, immunity and inflammation, population health and biology, and clinical and public health research – that span the discovery-to-translation pipeline, which aims to produce real outcomes for human health.

The molecular microbiology pillar will focus on fundamental research on host-pathogen and medical device interactions to decipher biological pathways that are critical for infection and inflammation.

Activities in immunity and inflammation will prioritise basic and translational research on immunity and inflammation, and microbial diversity (pathogens and microbiome), to inform vaccine and biomarker development and therapeutic interventions.

The population health and biology pillar will encompass epidemiology and surveillance to understand patterns of disease and disease transmission in human populations, and development of innovative approaches for surveillance.

The fourth pillar, clinical and public health research, will comprise clinical studies of infectious disease and immune disorders, and implementation and operational research on public health interventions.

OUR YEAR IN NUMBERS

87 Researchers, students and staff

3 PhD completions

Research streams



RESEARCHER SPOTLIGHT

Gaining ground in the 'never-ending battle with viruses'



Professor John Stambas Professor of Viral Immunology

What area of research do you specialise in?

The Stambas laboratory is focused on understanding the role of host proteins in immune responses targeting influenza virus. We currently have commercially available interventions (vaccines and antivirals) that only target the virus itself making them susceptible to changes in the virus genome.

This requires reformulation of vaccines on an annual basis and detailed surveillance to ensure antivirals remain effective. Over the past decade, our group has shown that host proteins can influence pathogenesis and impact the overall burden of disease.

Tell us a little about your career background.

I have been working in the field of viral immunology for the past 20 years and received my postdoctoral training in the laboratory of Nobel Laureate Peter Doherty (2002–2009; St Jude Children's Research Hospital in Memphis, Tennessee, and the Department of Microbiology and Immunology at the University of Melbourne).

What fascinates you about viral immunology?

Viral immunology is an extremely interesting field. We are in a never-ending battle with viruses, trying constantly to stay ahead of the game to minimise their impact on the human population. We are currently focused on the extracellular matrix and its constituents (the supporting structure surrounding cells) and what role it plays in determining the outcomes of respiratory virus infection. This is a very new field and we are global leaders in this research area, especially in the context of the ADAMTS family of extracellular matrix enzymes. The ADAMTS enzymes were previously not associated with viral immunity.

What led you to study immunology?

As a very young child I was fascinated by science, trying to understand how and why things work. My local GP was an inspiration, which led to an interest in biology at high school and a degree in science at university. I completed an honours year and a PhD in the field of immunology in which I carefully characterised immune responses against bacteria and viruses, driven by a desire to develop novel intervention strategies to minimise the impact of infection on the human population.

Career highlights

- 4 CIA NHMRC grants
- 1 CIA CR Roper Fellowship (University of Melbourne)
- 1 CIA American Association of Immunologists Careers in Immunology Fellowship
- 1 Australian and New Zealand Society for Immunology Gordan Ada Senior Travel Award
- 6 American Association of Immunologists Travel Awards
- 6 PhD student completions
- 7 Honours completions

What was your career highlight in 2022?

In 2022, I was CIA on an IMPACT SEED grant, and I supported one student to complete their honours degree.

Where next?

Now that we know the ADAMTS extracellular matrix enzymes contribute to the immune response to influenza virus infection, we are looking at developing and optimising interventions that can be translated into the clinic.

2023

CIIDIR aims to be an excellent, collaborative and community-focused hub with a strong brand. Current and future projects include launching the website in early 2023, developing a five-year strategy, strengthening and establishing collaborations internally and externally, setting up a genomics research and training facility, recruiting PhD students and applying to seed grant programs for major funding opportunities.



Mental Health Disorders and Neuroscience

The second

Clinical triallists' gathering sparks growth

This year, the Mental Health Disorders and Neuroscience theme built upon its success and momentum from 2021.

Theme members continued to navigate a world transformed by the COVID-19 pandemic – with hybrid working arrangements, including working from home and conducting research over Zoom or Teams, part of the new normal. Nonetheless, it was encouraging to see Level 3 of the Health and Education Research Building (HERB) become busier, as new research projects began and existing projects that had been stalled by COVID resumed.

The Mental Health Australia General Clinical Trial Network (MAGNET) continues to grow. The first annual MAGNET Scientific Meeting was held in November at Deakin Downtown and attracted clinical triallists and other stakeholders, including those with lived experience, from across the country. MAGNET's eagerly awaited website with an array of resources for clinical triallists is set to be launched in early 2023. The Web of Science Group ranked the researchers who have made the most significant contributions to global research in the past decade.

Of the 337 Australian researchers featured on the list, Professors Michael Berk and Alison Yung of the Mental Health Disorders and Neuroscience theme were among the five IMPACT staff named as 2022 Clarivate Highly Cited Researchers™ appearing in the top 1% of research paper citations.

These achievements highlight the resilience and hard work of all staff within the Mental Health and Neuroscience theme.

2022 HIGHLIGHTS

Alison Yung takes on non-profit role

Professor and theme lead Alison Yung was named President of the Early Intervention in Mental Health Association (IEPA), a non-profit international network for individuals involved in the study and treatment of the early phases of mental health disorders.

Novel therapy project awarded \$3.2m grant

Professor Michael Berk was granted \$3.2 million in funding via an NHMRC Investigator Grant. The grant will support the creation of a bench-to-bedside platform for novel therapy development for psychiatric disorders, including depression, bipolar disorder and schizophrenia.

Luba Sominsky to lead JPND research

Dr Luba Sominsky was named a Chief Investigator on an NH/MRC–European Union Joint Program on Neurodegenerative Disease (JPND) Research. The project was given \$2.5 million in funding, with \$250,000 awarded to Deakin. The aim of the project titled 'Effects of early stress on lipid mediators and inflammation for early detection of neurodegeneration' is to find easily measurable early biomarkers for neurodegeneration and cognitive dysfunction in neurodegenerative diseases.

Unlocking the vast potential of data sharing

Enabling data sharing for completed clinical trials has the potential to greatly impact the lives of community members and research participants in a number of ways. One key way is by improving the efficiency and effectiveness of future clinical trials, which can ultimately lead to the development of better treatments and therapies for various health conditions.

For example, let's consider a completed clinical trial that investigated a new drug for a rare disease. If the data from this trial are shared with other researchers and clinicians, they may be able to build upon the existing knowledge and potentially identify new uses for the drug or new avenues for research. This could lead to more targeted and effective treatments for the disease, ultimately improving the quality of life for patients who suffer from it.

In addition, enabling data sharing for completed clinical trials can also help to prevent redundant or unnecessary research. If researchers can access information about past trials and their results, they can better understand what has already been done and what still needs to be explored.

Finally, making data from completed clinical trials more accessible to the broader research community can also increase transparency and accountability in the research process. This can help to build trust and confidence among research participants and the broader community, which can lead to more participation in clinical trials.

The HeSANDA initiative has already shifted the culture and attitudes towards the sharing of data and has helped push the open science framework to the forefront of clinical triallists' minds. Reusing health data will accelerate research and innovation, as well as improving the wellbeing of people in Australia and across the world. Recognising this gap, the Australian Research Data Commons (ARDC) launched the Health Studies Australian National Data Asset (HeSANDA) initiative.

The main goal of the HeSANDA initiative is to enable the creation of a national health data asset that supports sharing and reuse of health research data. The HeSANDA Mental Health Node is one of the nine 'nodes' supported nationally by the ARDC. The Mental Health Node in collaboration with the Secure Health Data and Biosample platform (SHeBa) aims to maximise the outputs and impact of already collected health research data. This is possible because SHeBa is a state-of-the-art platform for discovering, combining, accessing and analysing data, and bio samples collected by health services.

In recent years, there has been a growing recognition that sharing data and research findings more openly can accelerate scientific progress, reduce duplication of effort, and enhance the reproducibility and reliability of research findings. This trend has been particularly pronounced in the field of clinical research, where there is a strong imperative to develop new treatments and therapies for a wide range of health conditions.

However, a number of challenges have hindered progress in this area. One is the lack of standardisation and consistency in the way clinical trial data are collected, organised and reported. This can make it difficult for researchers to compare and analyse data from different trials.

In response to these challenges, there have been efforts to develop standards for clinical trial data sharing and metadata management. For example, the Clinical Data Interchange Standards Consortium (CDISC) has developed a set of standards for clinical trial data, including metadata, that aims to improve interoperability and facilitate data sharing.

OUR YEAR IN NUMBERS

49 Researchers, students and staff

140+ Publications

186 Collaborators

\$5m+ Grant funding



Aviation vision expertise leads to fascinating collaborations



Dr Amanda Douglass Senior Lecturer in Optometry and Vision Science

What area of research do you specialise in?

I finished Optometry at The University of Melbourne in 2008 and then started clinical practice in Geelong. During my years in full-time practice, I became interested in aviation vision and undertook the training to become a CASA-credentialled optometrist. In 2012 I reduced my clinical hours and commenced my postgraduate research in eye movements in frontotemporal dementia.

The PhD was invaluable for teaching me skills in eye movements that I have been able to apply both to my clinical work with eye movement patients, such as nystagmus patients, and to research. I have also published a few broader clinical papers ranging from dry eye to workforce demographics. After finishing the PhD in 2016 I started as a research assistant collaborating with the Defence Science and Technology Group (DSTG) to look at how eye movements and other physiological measurements change with the optical misalignment of night vision goggles when flying.

In 2017 I joined Deakin in a lecturing role and have continued collaborating with DSTG on a number of defence-relevant occupational vision questions such as: 'What is the effect of laser eye protection on colour vision?' and 'Is helicopter pilot performance significantly affected by wearing progressive lenses rather than bifocal lenses?' Eye movements have been a wonderful tool for examining attentional pattern changes in these questions, but I have also been able to use my other clinical skills in occupational optometry in this collaboration.

What makes you passionate about this area?

I am passionate about this work because I can see the operational relevance; it is not abstract. The research questions are informed by 'boots on the ground' personnel. I work with an amazing interdisciplinary team with backgrounds in physics, engineering, occupational medicine, psychology and vision science, and I get to work directly with the ADF pilots as well as the defence stakeholders making purchasing and policy decisions, ensuring that this research isn't purely theoretical but makes an impact.

What is your current focus?

My current focus is on working to provide experimentalbased evidence for visual display symbology to optimise human visual performance in operationally relevant scenarios. This work is important as in some contexts, an extra couple of seconds to detect a symbol and make a change in flight can have a very big effect on outcomes.

What does an average work week look like?

My average work week varies. There is usually some time spent seeing clinical patients, some teaching and some time spent in a dark lab with night vision devices, new technology for measuring different aspects of vision, or simulations. Depending on where we are up to in the different projects, I also make field trips to different parts of Australia to work with pilots and different helicopter systems.



What has driven you to research in this area?

From my early days as a full-time practising optometrist, I have been interested in vision in aviation. For me, using the skills I gained in my research training in an occupational context was a natural fit. The collaboration across different projects is an excellent application of my skills and has provided interesting research questions where the results have an impact both on the aviation medicine field and on defence stakeholders.

Tell us about some of your career highlights.

One of my big career highlights thus far has been receiving an international grant from the Office of Naval Research Global. This grant has allowed me and the team to investigate laser eye protection and colour vision, but has also opened up opportunities to collaborate with defence researchers in the United States.

The other notable highlight was being a co-author for the 2019 Joseph Haley Writing Award on the paper 'Changes in physiological parameters induced by optical misalignment in night vision binocular devices'. This award is presented to the best paper published each year on the subject of rotary-wing aviation medicine and is sponsored by the US army flight surgeons group at the Aerospace Medical Association.

What was your career highlight in 2022?

My highlight in 2022 was securing a multi-year collaborative agreement with DSTG to investigate visual display symbology until 2025. The support for this research is incredibly encouraging and demonstrates the value of what we are investigating.

Where next?

My research focus for 2023 is on building the foundations for the visual display work. This will mean a lot of time in a dark lab, but it should be very interesting.

2023

The Mental Health Disorders and Neuroscience theme will continue to pursue and meet the IMPACT Institute's goals of improving the mental and physical health of the community by collaborating with researchers within the Institute, with Barwon Health, and with the CHIME initiative to conduct clinically relevant research.

Molecular Medicine

RESEARCH THEMES

Translating research strengths into opportunity

The Molecular Medicine theme seeks to understand and improve the treatment of many of the most common chronic diseases affecting populations across all ages.

Our key research areas include early-life origins of immune disorders, metabolism and metabolic disorders, musculoskeletal health, and vision and eye health.

This year delivered numerous successes on our path towards fulfilling the theme's overall aim. Professor Richard Page completed important work on improving surgical outcomes for patients that resulted in highimpact publications in *The Lancet* and *JAMA*. Professor James Armitage has established strong relationships with companies developing novel eye-care treatments that will see new clinical trials in this space begin at Deakin.

The theme also achieved significant milestones in the translation of its work, with spin-out companies Prevatex, Imitex and Ambetex meeting crucial capitalraising and IP protection goals.

2022 HIGHLIGHTS

Progress towards better surgical outcomes

MRFF funding to support work in improving surgical outcomes for patients. This project will investigate whether intensive hospital physiotherapy for patients with hip fractures reduces the length of hospital stay and patient recovery.

Environmental links uncovered

Identification of environmental factors associated with childhood developmental disorders and chronic diseases. These include the association between secondhand smoke exposure and attention deficit/hyperactivity disorder (ADHD) and prenatal and perinatal inflammation and emotional and behavioural problems.

Medical education now a core focus

Incorporation of medical education research into theme's research streams. One example of a current research program is determining whether incorporation of 'lived-experience' health monitoring into medical student curriculum enhances patient management and outcomes.

Delivering a clearer view of children's eye health

How does our early-life environment affect the way our eyes and visual system develop? A collaboration with the Barwon Infant Study group is helping us better understand the eye health of children in the Geelong region.

The Barwon Infant Study (BIS) is a birth cohort study running in Geelong since 2010 and led by Professor Peter Vuillermin from Barwon Health and Professor Anne-Louise Ponsonby from the Florey Department of Neuroscience and Mental Health. The team runs out of the Child Health Research Unit at Barwon Health and works in collaboration with the Murdoch Children's Research Institute and Deakin University.

There are over 1000 children involved in BIS who are now nearing the end of their primary school years and the research team has been assessing their cardiovascular, immune, respiratory and neurodevelopmental health for more than 12 years.

In 2022, for the first time, Professor James Armitage's group, which is focused on understanding the vision system in health and disease, started a collaboration to incorporate a vision study within BIS. Prof. Armitage leads the Developmental and Adult Determinants of Ocular and Systemic Health group at IMPACT.



The team of researchers is measuring refractive status, ocular biometry, binocular vision status and the structure of retinal neurons and microvasculature in children from the BIS cohort to try to understand how early-life factors and current cardiovascular and neurodevelopmental status may be associated with ocular health or disease.

By understanding the factors associated with good ocular health and the onset of conditions such as myopia (shortsightedness), the group hopes to be able to predict which children might benefit most from interventions to control the development of this condition.

The group also hopes to find biomarkers within the eye that may be useful for predicting other conditions, for example neurodevelopmental or cardiovascular disorders. Because the eye is the only place in the body where researchers can visualise neurons and microvasculature entirely non-invasively, it is a window to neuronal and microvascular structure and function throughout the body.

The team also has a major opportunity to better understand how early-life factors might impact the development of eye conditions. The BIS participants are at the perfect age to establish a baseline for the development of myopia, which may occur over the coming years. Currently, they are asking participants if they can measure their refractive error, binocular vision status, eye size and retinal structure at a point just before researchers might expect myopia to develop. The researchers are hopeful they can continue to follow these participants in future BIS visits.

OUR YEAR IN NUMBERS

64 Researchers, students and staff

10 PhD completions

7 Research groups

80 Publications

Family connection inspires dedicated focus on diabetes



Associate Professor Kathryn Aston-Mourney Associate Professor in Human Biology

What area of research do you specialise in?

Diabetes - specifically the islet beta-cell.

How long have you been in this field?

I've been in this field for 20 years.

What makes you passionate about this area?

Diabetes is complex and fascinating. There is always something new to learn and there is still so much for us to work out. It is an incredibly common disease, so any new treatments and innovations can help a huge number of people. Diabetes is also one of the biggest diseases; it increases the risks of everything from cardiovascular disease, depression and impaired wound healing to cancer. So, outcomes from diabetes research not only have the potential to help in the area of diabetes but also can have a massive impact on a wide range of diseases and conditions. This is why I think that targeting diabetes is probably one of the best ways to influence the overall health and wellbeing of our population.

What is your current focus?

I'm currently working on repurposing existing drugs to prevent or slow the development of diabetes. I'm also collaborating with other researchers from different disciplines to generate new mechanisms for drug delivery and enhance the outcomes of current treatments such as islet transplants.

What does an average work week look like?

My average week (unfortunately) doesn't have a lot of time dedicated to research. Most of my time is spent in my role as Faculty of Health HDR Director where I oversee and develop the HDR programs and candidates in the faculty. I also spend some time teaching MD students (as topic coordinator for the Human Biology Block) or students in other degrees.

My research time has a large focus on the supervision and mentoring of my HDR students as well as developing research projects and collaborations and writing grants and papers. My favourite times are when an animal project is running, and I get to spend some time in the lab and give my surgery skills a workout.

What has driven you to research in this area?

I have been interested in the diabetes field since childhood when my grandmother was diagnosed with type 2 diabetes. Apparently, I announced to her when I was 13 years old: 'I am going to find a cure for you, Gran.' Well, that hasn't happened, but hopefully the field is on its way to finding one.

I was fortunate enough to undertake my honours and PhD at the University of Melbourne and the Royal Melbourne and Austin hospitals under the supervision of an extremely enthusiastic and supportive supervisor, Sof Andrikopoulos. This cemented my plans to be a diabetes researcher and showed me the importance of training and mentoring the next generations of researchers.



My focus on the beta-cell stems from the central role of beta-cell failure in diabetes. It is the core common defect of all diabetes.

Tell us about some of your career highlights.

My top highlights from the past have been the awards. One standout was being awarded the Pincus Taft Young Investigator Award from the Australian Diabetes Society. This is the key award given by this society at the Australasian Diabetes Congress each year. I'm also very excited to now be on the other end – getting to judge this award and choose from a selection of the most promising young investigators in the field.

I've also been fortunate to be awarded several other young investigator awards, two prestigious postdoctoral fellowship awards and, more recently, leadership awards.

These days my favourite highlights are the completions, awards and careers of my honours and PhD graduands. I think seeing them succeed and excel in their chosen fields is the true measure of my success.

What was your career highlight in 2022?

My highlight in 2022 was a successful promotion to Associate Professor!

Where next?

The focus for 2023 is growth, starting new HDR students and pushing forward collaborations with my outstanding colleagues. The two main project foci are: developing an injectable islet transplant hydrogel for the treatment of diabetes – with Richard Williams and Karen Dwyer; and determining the effects of maternal metformin treatment during pregnancy and lactation on the offspring's metabolic health – with Leni Rivera and Bryony McNeil. I also plan to continue with research into medical teaching to determine how we can best train our future doctors to be ready and person-centred practitioners.

2023

Theme members will strengthen collaboration within the Molecular Medicine theme, as well as identifying synergies with other IMPACT themes and external partners to better translate researchers' work and positively impact patients. Their clinical work is being directly translated into clinical practice by clinician-researchers, while biological research with translational links is being spun out into biotechnology companies that will continue to develop innovative products to enhance patient outcomes.

Novel Treatment Discovery

Developing ambitious trials and potential applications

In 2022, research programs in the Novel Treatment Discovery theme resumed at full capacity, with access to laboratories and face-to-face contact with participants restored. There was more activity in the labs and offices, and theme members were able to re-establish contact with colleagues.

Progress was excellent across the theme's endeavours. At the Laboratory of Aptamer Theranostics, led by Dr Sarah Shigdar, researchers have been developing aptamers to act as targeted delivery agents for the eradication of cancer cells that spread to or originate in the brain. This was a big year as the team embarked on a journey to spin out a company from Deakin and start the process of developing clinical trial protocols. Increased access also enabled Novel Treatment Discovery researchers to complete recruitment for the NHMRCfunded CHROMIC trial in chronic fatigue syndrome and start the trial's stem cell component. During 2023 the Stem Cell Laboratory will complete a wet laboratory drug screen for drugs that can be repurposed to treat bipolar disorder and generate new cell lines for the study.

2022 HIGHLIGHTS

Philanthropic support for bipolar disorder research

The bipolar disorder stem cell program of research led by Dr Bruna Panizzutti Parry secured \$280,000 in philanthropic funding from the US-based Milken Foundation. The project hopes to identify and characterise drugs formerly used to treat othe diseases that are useful for treating bipolar disorder.

Government scheme backs Sarah Shigdar's innovative work

Dr Sarah Shigdar received a federal government Innovation Connections grant which provides researchers with funding to develop and implement a new idea with commercial potential.

Aptamer lab in the limelight

The theme's research on aptamers featured in an article on <u>LabOnline</u> saying that, 'The prognosis for breast cancer patients diagnosed with brain metastases is poor, with survival time measured merely in months. This can largely be attributed to the limited treatment options capable of reaching the tumour as a result of the highly restrictive blood–brain barrier (BBB).'

Synergy underpins drug repurposing project

People with bipolar disorder spend most of their time in the depressive phase of the illness, and there are currently no treatments available that are widely effective. Commonly used antidepressants do not work for bipolar depression, indicating novel therapies targeting entirely new mechanisms are needed.

The Novel Treatment team used a unique stem cell-derived model system combined with gene expression signature technology to identify trimetazidine as a drug that could be repurposed to treat bipolar depression.

Trimetazidine is commonly used to treat angina, a type of chest pain caused by reduced blood flow to the heart. The drug is commonly used in Europe and Asia and has a well-established safety profile.

Researchers know that bipolar depression is associated with increased inflammation and disrupted cell metabolism to result in reduced energy. Trimetazidine is an anti-inflammatory drug that improves metabolism and normalises energy production when it is impaired. Therefore, the drug may be beneficial in reducing symptoms of bipolar depression and improving the lives of patients.

The team has joined forces both within IMPACT and across the world to bring the research to life. In collaboration with IMPACT's Associate Professor Jee Hyun Kim and Professor Brian Harvey from North-West University in South Africa, the researchers were able to show the antidepressant-like effects of trimetazidine in two animal models. The team then worked with Professor Michael Berk to successfully apply for funding from the Stanley Medical Research Institute in the United States. This support has enabled the group to establish the TIDE (trimetazidine in bipolar depression) Trial to conduct a multi-site global clinical trial to test the efficacy of trimetazidine in treating bipolar depression. The study aims to test if trimetazidine (70mg a day over 8 weeks), in addition to usual treatment, helps to reduce symptoms of bipolar depression and improve general quality of life.

The project is an excellent example of IMPACT's bench-to-bedside process and the synergy of its multidisciplinary approach.

The trial will begin recruitment in the first half of 2023, and results will be revealed in three years.

OUR YEAR IN NUMBERS

43 Researchers, students and staff

2 PhD completions

9 Research streams and projects

80 Publications

Committed to turning findings into actions in mental health care



Dr Bruna Panizzutti Parry Research Fellow (Stem Cells)

What area of research do you specialise in?

As part of the Novel Treatment Discovery team at IMPACT, my research is focused on finding new treatment options for diseases like bipolar disorder, chronic fatigue and schizophrenia. To do so, we use a stem-cell derived in vitro model that recreates key brain cells in a dish, a 'genetic fingerprint' that differentiates diseased and healthy cells, and a compound library with more than 1000 off-patent drugs with known safety profiles.

How long have you been in this field? Did you do anything different before this?

I have been working in mental health research for over 13 years. I've been working with stem-cell derived models since 2017, and with the drug discovery team since 2020 when I joined IMPACT.

What makes you passionate about this area?

I'm passionate about the everyday lab work, planning, designing and running experiments and the amazing things we get to do. And how every little piece of the puzzle helps to mount the big picture, which translates into real benefits for the people suffering with these disorders.

What does an average work week look like?

My work week usually is divided between laboratory work and writing/administrative work. For example, this week is heavily skewed to writing – including working on my grant application – but I always keep a few hours a week to dedicate to the laboratory work that I love and have so much fun with.

What has driven you to research in this area?

I always knew I wanted to be a scientist like my aunt, so during my first semester at university in Brazil I started an internship at a research laboratory that focused on understanding the molecular mechanisms underpinning bipolar disorder. The mental health aspect of my research was kind of a stroke of luck as I started in a laboratory with amazing colleagues who were passionate about it and willing to share their knowledge. With time and experience, especially once I started having contact with the research participants, I decided to stay in the field and focus on the translational work I do now.

After the internship I did my honours and PhD at the same laboratory. During my PhD, I had the opportunity to come to Australia as a visitor working with Professors Ken Walder and Michael Berk. The experience of doing research in Australia was wonderful and changed my life. After a year in Australia, I went back to Brazil, finished my PhD (2016) and decided I would move to Australia to stay with my partner.



On arriving back in Australia in 2017 I worked in hospitality for a while until I landed a research assistant position at MCRI working on stem-cell models. It was this opportunity that gave me the qualifications to later apply for a job with Prof. Walder at IMPACT. And today I lead the BD Stem project, which focuses on discovering new treatments for bipolar disorder.

Tell us about some of your career highlights.

There are so many highlights, and everyone seems to focus on grants and awards, and I'm still working towards those like everyone else. But running my first ELISA in the lab, achieving my first 'first-author' publication, my overseas experience in Australia (when I met my partner), making the decision to leave a secure position and family and friends in Brazil to move across the world, experiencing different jobs within and outside of the academic career were the things that really shaped the way I work today and my everyday decision to continue working in research, even when the noes are much more frequent than the yeses. Maybe this will change when I get one of my grant applications funded, but until then I will continue celebrating the beautiful images my research produces (above), the experiments that work and the amazing people I collaborate with. The goal is to translate our findings into actions that will help people with mental health disorders.

What was your career highlight in 2022?

The big highlight of my career in 2022 was when after some really hard work to create 'brains in a dish' we successfully did it!

Where next?

The next step is the drug discovery part, where we get to test how different drugs affect our little 'brains in a dish' and find out which ones have the potential to improve the lives of people with bipolar disorder.

2023

In 2023, the Novel Treatment Discovery theme plans to continue to support multidisciplinary teams to tackle society's most pressing health problems. Researchers in the theme will continue to focus on their major studies including analysing the exciting findings from their CHROMIC trial on chronic fatigue syndrome, so keep an eye out for these announcements! The team will also commence international recruitment for another important project, the TIDE Trial.

Population Health

A big year for major bone studies

This year was a particularly busy one for the Population Health theme. It saw the launch of the 25-year follow-up for women in the Geelong Osteoporosis Study (GOS), while NETFIT, a study of musculoskeletal injuries in young female netball players, was restarted.

Theme staff progressed work on several grantfunded endeavours including an NHMRC project on antipsychotics and bone (using human bone cell models, zebrafish models and epidemiological data) and an NHMRC Investigator Grant project focused on mental health, associated treatments and physical health. Researchers also made headway on two Amgen competitive industry projects: one focusing on how people with fracture experience medicine (HOPE-Med study); the other testing the clinical utility of a new technology, known as impact microindentation (IMI), to determine bone's resistance to fracture. Work also continued on gestational diabetes and offspring bone health in childhood (supported by the Norman Beischer Medical Research Foundation). Meanwhile, three Alfred Deakin Postdoctoral Research Fellowships were underway, investigating early-life exposures and child bone health; health literacy, medication beliefs and fracture; and the intersection between sarcopenia and cognition.

In 2022, the Population Health theme celebrated two HDR completions – one on skeletal muscle health during critical illness and the other on methods for identifying bone fragility – as two new PhD projects – on attention deficit hyperactivity disorder (ADHD) and on musculoskeletal healthy ageing – commenced. During the year, students' work progressed on another 14 HDR undertakings, covering a wide range of topics including: mental and physical health and cognitive performance; musculoskeletal health, cognition and common mental disorders; the microbiome in health and disease; multi-omic analyses to identify blood biomarkers for poor cognition; new diagnostic criteria for diabetes and pre-diabetes; health literacy and cardiovascular disease progression; antipsychotics and bone; serotonin and bone; suboptimal medicine regimes; and paternal determinants of offspring and maternal health.

2022 HIGHLIGHTS

Recognition for theme members' dedication

Research Fellow Natalie Hyde was honoured with a prestigious ANZB/MS Philip Sambrook Award and a highly commended award at the Griffith University Discovery Award for early-career researchers; PhD student Emma West was recognised with the Geoff and Betty Betts Mental Health Award (Rotary Geelong); and honours student Rina Barhoum received a School of Medicine Award for Improvement and Publication Writing.

Data gathering, assessments resume

The Population Health theme recommenced face-to-face data collection once COVID-19 restrictions were eased at Barwon Health and participants could again be assessed on site.

Study innovation to add clarity on cognition

Researchers introduced neurological assessments into the Geelong Osteoporosis Study that involved the use of functional near-infrared spectroscopy (fNIRS) to measure changes in blood flow in the brain during dual physical and mental tasks – to help identify people with cognitive frailty.

Skeletal muscle expertise shapes clinical guidelines

Sarcopenia refers to age-associated deterioration of skeletal muscle. It is characterised by low muscle strength, mass and physical performance. It affects balance and gait, increases falls risk, hospitalisations and length of stay, and interferes with a person's capacity to perform essential everyday activities.

As part of the battery of clinical assessments performed by the Geelong Osteoporosis Study (GOS) since its inception in the early 1990s, participants' lean mass (a proxy measure for skeletal muscle mass) has been measured serially using dual energy X-ray absorptiometry (DXA). More recently, Population Health researchers have introduced imaging from peripheral quantitative computed tomography (pOCT) and measures of muscle strength, walking speed and balance, providing objective measures for muscle mass, strength and performance.

Sarcopenia was recognised as a disease state in 2016 and included in the *International Classification of Diseases – 10th Revision (ICD-10)*. However, recognition in clinical practice has been slow because currently, worldwide, there is no consensus for an operational definition of sarcopenia.

Theme researchers' prevalence estimates for sarcopenia in older Australians – based on different national and international criteria – show a wide range (0.3%–13.7% for women and 0.6%–32.8% for men), highlighting the need for consistency in definitions.

In a recent set of diagnostic guidelines from a European working group on sarcopenia, normative data from the GOS were chosen as the reference for identifying low lean mass. IMPACT researchers also participated in a taskforce for the Australian and New Zealand Society for Sarcopenia and Frailty Research (ANZSSFR) to establish guidelines for diagnosing sarcopenia in Australia and New Zealand that are consistent with the expert opinions and preferences of health professionals and consumers. Theme researchers have also shown that people with depressive symptoms score more poorly in tests of muscle strength and walking speed. The implication is that mental health should be considered when performing these tests to diagnose sarcopenia.

Muscle wasting occurs in patients of intensive care units (ICU), but it is not clear if these patients have poorer muscle health before admission, or if muscle health is fully restored during recovery. The theme's data show that pre-ICU muscle status may not predict development of critical illness, but greater lean mass on admission is associated with better survival after critical illness. Further, ICU patients gain lean mass in the year after ICU discharge, but do not reach the level of matched population-based peers and, moreover, the patients tend to gain more body fat. Pre-habilitation with targeted exercise and nutrition strategies is thus recommended for people about to undergo elective surgery.

In terms of outcomes, the team showed that low lean mass is associated with early mortality and that reductions in the lean-to-fat ratio result in sarcopenic obesity, a condition that increases falls risk and is detrimental to wellbeing.

This body of work contributes to the evidence base that will reduce current confusion in clinical practice regarding sarcopenia, provide potential targets for intervention and improve uptake of recommendations for diagnosis, prevention and management of sarcopenia.

OUR YEAR IN NUMBERS

1. 61

37 Researchers, students and staff

2 HDR completions

9 Current grants

54 Publications

Community engagement makes for rewarding research



Dr Kara Anderson Associate Research Fellow

What area of research do you specialise in?

I'm a postdoctoral researcher at the Epi-Centre for Healthy Ageing, specialising in bone health, specifically new technologies for measuring bone structure and identifying bone fragility.

How long have you been in this field?

I've been working in this area since the start of my honours year, right through my PhD and have continued in my current position as an associate research fellow with the Geelong Osteoporosis Study.

What makes you passionate about this area?

There's something really rewarding for me working in a translational space, where our research involves engaging directly with the community. I enjoy looking at the big picture of issues and seeing how the smaller components come together in a functional way, and epidemiological research fits this bill perfectly for me.

What does an average work week look like?

In an average work week, I meet with our study participants, asking them questions about their health and lifestyle. I also undertake clinical measurements including images of their bones using specialised technology such as dual energy X-ray absorptiometry (DXA) and peripheral quantitative computed tomography (pQCT), in conjunction with a new technique known as bone impact microindentation. I might also clean data, perform statistical analyses, prepare manuscripts or review participant medical records, such as X-ray reports for potential fractures, and assist research students and other research team members to reach our common goals.

What has driven you to research in this area?

I was originally drawn to bone health research after completing a forensic science degree. I had a personal interest in bone and bone measures in that space, but it's a difficult field to break into and I was excited to see what other opportunities related to bone might be out there. By chance I became aware of the extensive Geelong Osteoporosis Study and bone in the context of healthy ageing, and consequently I've really enjoyed deep-diving into the field.

What was your career highlight in 2022?

In 2022, I graduated with my PhD, finally completing what felt like a decade of my life (but was really only four years). This enabled me to apply for grants, work hard on data collection in my current role, contribute to five publications and take on new responsibilities as part of the group including taking on a supervisory role for students. In mid-2022, when COVID-19 restrictions were eased at Barwon Health, I was given the opportunity to prepare equipment and roster the research team for launching the 25-year follow-up assessment phase of the Geelong Osteoporosis Study.

During the year, I also received the Faculty of Health Publication Award for my PhD and an IMPACT Award for best PhD completion.

Where next?

In 2023, I'm excited to expand my support for students in a supervisory role, see more study participants and finish publishing work arising from my PhD thesis. I plan to explore new topics in the field of musculoskeletal research, and be proactive in disseminating my research to the scientific community and translating findings into clinical practice.

2023

Theme members will continue the ongoing program of research. New work will focus on body composition, cardiometabolic and mental health; epigenetics of mental health; and the burden of personality disorder. The coming months will also bring the launch of the longitudinal phase of the Bipolar, Health and Lifestyle study and of the pilot extension of the Geelong Osteoporosis Study: Looking into the Next Generation (GOS-LINGs) cohort. Researchers are also developing a physical activity screener suitable for digital integration into electronic medical records in primary practice and will deliver a new interactive online tool for osteoporosis education and prevention.

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in linkedin.com/company/impactdeakintwitter.com/IMPACTDeakin

E: impact@deakin.edu.au

W: impact.deakin.edu.au







