ST VINCENT'S HOSPITAL
MELBOURNE

Partnering

TO ACHIEVE SOMETHING GREATER

—

RESEARCH REPORT 2016

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ST VINCENT'S HOSPITAL MELBOURNE, PROVIDING THE HIGHEST STANDARDS OF CARE FOR 124 YEARS

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MESSAGE FROM THE CHIEF EXECUTIVE OFFICER

Medical research underpins our approach to patient care, and since arriving at St Vincent's Hospital Melbourne at the beginning of 2016, the breadth and quality of research I have observed occurring across our campus has been impressive

Our devoted researchers are inspiring, and work to deliver the latest advances in healthcare. In turn, our researchers are inspired by the patients that they see every day, and driven by a desire to improve their quality of life.

Ensuring that our researchers are given every opportunity to provide new hope and new life for patients is what drives our vision for the Aikenhead Centre for Medical Discovery (ACMD). The ACMD will be Australia's first biomedical engineering research hub integrated within a major hospital, bringing together medicine, science, engineering and industry to revolutionise how we approach medical solutions to chronic health problems.

In 2016 we took a major step in making this vision a reality with the opening of BioFab3D, a state-of-the-art bioengineering facility that will fast track discoveries by bringing all key players under one roof for the first time.

In the 21st century, no single institute or hospital or university has the full complement of skills, disciplines and resources to make the big breakthroughs. St Vincent's collaborations across academia, healthcare and industry are the bedrock upon which our successes are built, and the driving force behind the Aikenhead Centre for Medical Discovery.

Adjunct Professor Susan O'Neill
Chief Executive Officer
St Vincent's Hospital Melbourne

MESSAGE FROM THE DIRECTOR OF RESEARCH

Research is at the core of providing excellent care and continuous improvement at St Vincent's Hospital Melbourne. As one of five pillars in the enVision 2025 Strategy for SVHA, research is supported at all levels and driven by our expert clinicians, scientists and researchers all focused on improving care for our community.

The 2016 St Vincent's Research Report is a celebration of advancement and an exploration of ongoing endeavour across a broad range of clinical and scientific areas. This year we celebrate the international collaborations of our premier research teams and the outstanding work that arise from linking like-minded researchers globally.

In 2016, we broadened our commitment to clinical trials and lifted our horizons to grow our national and international connections. We continued to build our links with industry attending national and international conferences in pharma, bioengineering and biotech.

The Aikenhead Centre for Medical Discovery project, led by St Vincent's, aims to speed innovation, translation and commercialisation of medical research, reached a critical milestone with the opening of the BioFab3D facility.

And the annual ACMD Research Week again attracted a record number of posters and presentations, with the program expanded to include a full week of plenary lectures, symposia, and events including the Annual Art Prize and the ACMD Public Lecture.

Finally, the Research Endowment Fund Grants for 2016 distributed a record $962,000 for clinicians and project seed funding. For the first time St Vincent's health Australia Inclusive Health Initiative Grants were included to support research in areas of social justice, reflecting our mission of caring for the poor and vulnerable in our community.

Please join me in congratulating St Vincent's clinicians and researchers,and celebrating another year of enquiry,innovation and advancement in health and medical research at St Vincent's Hospital Melbourne.

I am delighted to present the 2016 St Vincent's Research Report, highlighting the achievements of our dedicated research teams in partnership with collaborators locally,nationally and globally.

Dr Megan Robertson
Director of Research
St Vincent's Hospital Melbourne

RESEARCH AT A GLANCE

46
CONFERRED HDR

112

PHD STUDENTS

72

OTHER HIGHER DEGREE RESEARCH

778

PUBLICATIONS

RESEARCH ENDOWMENT FUNDING (REF)

$962,000

3

BOOKS PUBLISHED

NHMRC AND ARC GRANTS
$7.9M
(JAN-DEC 2016)

RESEARCH INCOME RECEIVED

$115.07M

30
BOOK CHAPTERS PUBLISHED

AMOUNT ACTIVE
$15.8M
(JAN-DEC 2016)

St Vincent's

AND OUR PARTNERS ARE AT THE FOREFRONT OF THE 3D BIOPRINTING REVOLUTION

NEW TECHNOLOGY

AT THE CENTRE OF DISCOVERY

Imagine a future in which joints and limbs damaged through cancer or trauma could be rebuilt.

Where the best surgeons, biomedical engineers, biologists and robotics experts come together with industry under one roof to give patients faced with amputation a fully functioning limb so they can walk, work or hold a loved one again.

The Aikenhead Centre for Medical Discovery (ACMD) will make these dreams a reality. Bringing together basic, translational and clinical research expertise from St Vincent's Hospital, five internationally recognised universities and three renowned medical research institutes in a purpose built centre, the ACMD will drive medical innovation to reduce the burden of chronic disease.

The vision of the ACMD partners is to collaborate in a dedicated hub fusing medicine, engineering, science and industry, bringing health solutions more rapidly to the community and building a leading global industry to further support Australia's burgeoning biotech sector.

The ACMD vision represents more than the building, and collaborations between partners are already producing outstanding results across the St Vincent's campus and at partner institution.

As plans progress to develop the ACMD, we now have the opportunity to bring one of its core components to life with the opening of BioFab3D, Australia's first robotics and biomedical engineering centre embedded within a hospital.

St Vincent's and our partners are at the forefront of the 3D bioprinting revolution. Together, we have built BioFab3D to change the landscape of healthcare as we know it.

Researchers, clinicians, engineers and industry partners are now working alongside each other with a vision to build biological structures such as organs, bones, brain, muscle, nerves and glands: almost anything that requires repair following disease and physical trauma.

Funding for the ACMD is now over 50% secured. Early in 2015, the Victorian State Government confirmed their support for the development allocating $60M in the annual budget towards the build of the new facility to be located on the corner of Nicholson Street and Victoria Parade in Fitzroy on the edge of the Melbourne CBD.

St Vincent's has an established track record in health and medical research and clinical trials and our clinicians and clinician researchers will inform basic research with expert clinical insights, identification of unmet patient needs and also translate research findings to patients to drive improvements in clinical outcomes to bring the ACMD vision to reality.

WHAT IS BIOFAB3D

BioFab3D is a state-of-the-art facility that is accelerating biomedical advancements by bringing all key players together under the one roof. More than just a laboratory, this purpose-built space fosters interaction and meaningful collaborations with the very clinicians who work directly with patients.

Researchers and clinicians are exploring the real-time development and production of replacement body parts, which can be surgically implanted into patients. Our vision is that this will eventually lead to real-time printing of 3D implants, while a patient is in surgery.

Exploring

THE REAL-TIME DEVELOPMENT AND PRODUCTION OF REPLACEMENT BODY PARTS

RESEARCH DIRECTORATE REPORT 2016

For 124 years, St Vincent's Hospital Melbourne has been providing the highest standards of care driven by our concern for others, especially those in need.

In addition to diagnosing, treating and caring for patients across the entire health spectrum, St Vincent's is a world-leading clinical research hospital.

The work of the Research Directorate is led by the Director of Research, Dr Megan Robertson.

BUSINESS DEVELOPMENT

Both the state and federal governments have initiatives to increase clinical trial activity in Australia to give patients access to the latest innovations in care and to build sustainable jobs.

The Research Directorate team are actively engaged in promoting St Vincent's Hospital Melbourne's research capabilities both locally and internationally.

In 2016, we joined State government trade missions to BIO2016 in San Francisco (Biotech and Pharmaceuticals) and AdvaMed in Minneapolis and Boston (Medtech), presented at International BioFest in Melbourne and hosted several international groups for inbound trade missions.

Working with other clinical trial service providers and trial sites, we are promoting a coordinated sector in Victoria that can provide a fast, efficient and competitive path for clinical trials for both therapeutics and medical devices.

Unique advantages for conducting clinical trials in Victoria include:

- Generous Research and Development tax credits up to 43% for all research activity including clinical trials
- Fast regulatory pathways for clinical trial therapeutics through the TGA CTN scheme
- National Mutual Acceptance for ethical review, so that clinical trials only need to be considered by a single ethics committee in Australia (excluding WA and NT)
- Fast ethical review processing with final response within 30 days of committee meeting through our innovative Research Valet® Service

RESEARCH VALET® SERVICE

Our unique Research Valet® Service, launched in 2015, is now recognised as a sector leader across Australia and has resulted in a disruptive change in clinical trial start-up and management.

The Research Valet® Service led by Dr Wade Kruger provides expert rapid document preparation for ethical review, submission and liaison throughout the review process for clinical trials Phase 1–4.

The key feature of the service is close communication between sponsors / researchers and the Valet team at all steps of the process, eliminating unnecessary delays and ensuring final response from the ethics committee within 30 days of the committee meeting.

Introduced in 2015 due to industry demand, the Research Valet® Service now offers ongoing regulatory management throughout the life of your trial.

We have site alliances with QuintilesIMS, Parexel, INC Research, Eli Lilly and Astra Zeneca and work widely with sponsors, local and global CROs and biotech start-ups.

Right: Dr Wade Kruger, Clinical Trials Business Development Manager

Our unique Research Valet® Service, launched in 2015, is now recognised as a sector leader across Australia.

St Vincent's
IS A WORLD-LEADING CLINICAL RESEARCH HOSPITAL

BIOMEDICAL RESEARCH VICTORIA

BioMedical Research Victoria (BMV) is the peak body that unites health and medical researchers across Victoria, linking researchers from universities, academic hospitals, medical research institutes, CSIRO and other research organisations. BMV aims to ensure that Victoria is a global leader in health and medical research innovation, to improve health and to create wealth for all Victorians.

As a member of this vibrant community, we participate in the Hospital Research Directors Forum and the Hospital Research Managers Subcommittee, and Dr Megan Robertson chairs the Scientific Advisory Council and sits on the BMV Board.

NHMRC CLINICAL TRIAL INITIATIVES

The Research Governance Unit participated in the Good Practice Pilot project led by the NHMRC Clinical Trials Section in 2015 and 2016.

Brenda Ly was appointed as our Clinical Trials Liaison Officer for the project and she monitors clinical trial start-up times from initial feasibility enquiry through to study start-up and first participant enrolment. This has enabled us to benchmark our performance with national practice and to optimise our timeline from feasibility to first patient recruited for sponsored clinical trials.

In late 2016, the NHMRC established the Clinical Trials Ready Development Committee with representatives from organisations and groups involved in clinical trials across Australia. Chaired by our Director of Research, Dr Megan Robertson, the CTR Development Committee aims to establish a process to promote clinical trial sites in Australia, capturing their various capabilities for easy access by trial sponsors.

Right: Brenda Ly, Clinical Trials Liaison Officer
Below: Dr Tam Nguyen, Executive Officer for Research

RESEARCH INTEGRITY – AN INTERNATIONAL ISSUE

Maintaining research integrity and excellence are essential to the continuing successful growth of health and medical research globally, but recent widely reported issues of misconduct have reduced the public confidence in research reliability. Research integrity and excellence are shared individual and institutional responsibilities.

At St Vincent's Hospital Melbourne we have a proactive approach to research integrity, providing online free GCP training, introductory lectures to students and staff, and regular continuing professional development sessions for all research staff.

Dr Tam Nguyen, Executive Officer for Research, was an invited speaker at the inaugural Asia Pacific Rim Research Integrity Network meeting in San Diego and will be attending the 2017 meeting in Hong Kong.

In 2016, a monthly research audit program was implemented as part of the institution requirement to monitor research and a proactive channel of communications between the researchers and Research Directorate staff. In addition, Dr Tam Nguyen and Ms Melanie Asquith have completed the University of Melbourne Research Integrity Advisor (RIA) training program and have been appointed as RIAs for St Vincent's Hospital Melbourne.

Maintaining

RESEARCH INTEGRITY AND EXCELLENCE ARE ESSENTIAL TO THE CONTINUING SUCCESSFUL GROWTH OF HEALTH AND MEDICAL RESEARCH

PROVIDING FREE TRAINING AND EDUCATION

IN RESEARCH PRACTICE AND INTEGRITY

ACMD RESEARCH WEEK 2016 – PROMOTING RESEARCH COLLABORATIONS

Once again, ACMD Research Week in August was a wonderful celebration of the important research work done in collaboration across the ACMD Partners led by St Vincent's.

ACMD Research Week was launched by the Hon Frank McGuire, Parliamentary Secretary for Medical Research, with an address from former St Vincent's researcher and Chief Medical Officer of Australia appointee Professor Brendan Murphy.

Invited speakers included Professor Doug Hilton AO, Director of Walter Eliza Hall Institute (WEHI) and Distinguished Professor Peter Hunter, Director of the Auckland Bioengineering Institute.

Workshops on grant writing and research integrity and a symposium on the latest in targeted and immune therapies plus molecular diagnostics were well attended.

The highlight of the week was the second ACMD Public Lecture "Why Sport, Not Science – the lamentable lack of sex appeal of science and what to do about it" featuring Simon McKeon AO, Chancellor of Monash University, Prof David Vaux, Deputy Director of WEHI, Professor Sharon Lewin, Director of the Doherty Institute, Professor Hans Westerbeek from Victoria University, Alex Riewoldt, Amanda Gome, and local comedian Rod Quantock.

TJ MARTIN MEDAL

Dr Brian Liddicoat

The role of ADAR1 in haematopoiesis and leukaemia

ACMD GLOBAL VISION SERIES

Our ACMD Global Vision series aims to bring industry and researchers together to learn from local and international leaders in an intimate forum.

In 2016 we hosted Dr Tom Insel from Verily Health, former head of the NIH Mental Health in USA and Distinguished Professor Peter Hunter, the founding Director of Auckland Bioengineering Institute at select breakfast sessions for ACMD partners and industry.

In a new initiative, Kathy Connell (Director of New Ventures, ANZ, J&J), Michelle Gallaher (Director, the Social Science) and Prof Peter Hunter combined in our first Global Vision panel to discuss commercialisation and confidentiality in today's competitive biotech market.

Our ACMD Global Vision series aims to bring industry and researchers together to learn from local and international leaders in an intimate forum.

RESEARCH ENDOWMENT FUND GRANTS – RESEARCH SUPPORT FROM SVHM

The annual St Vincent's Research Endowment Fund (REF) grants provide funding for clinician researchers and seed funding for campus-based research projects.

REF grants are a tangible indication of support for research throughout the organisation and across the campus, and the funds help to build important collaborations around specific projects with direct clinical relevance.

In 2016, we awarded **$962,000** in grants to support our researchers in their work across a wide spectrum of clinical areas and disciplines.

For the first time, the grants included a specific category for research aimed at the mission of St Vincent's to help the poor and vulnerable. The Inclusive Health Innovation Fund grants address important research questions in one of 5 vulnerable groups: the homeless, prisoners, Aboriginal or Torres Strait Islanders, those affected by alcohol and drugs, or those with mental illness.

Left: Professor Richard MacIsaac,
Chair of the ACMD Research Week Committee

'WE NEED TO HAVE THAT DISCIPLINE INSIDE THE SCIENTIFIC COMMUNITY TO TAKE SERIOUSLY THE TASK OF ENGAGING WITH THE PUBLIC'

Simon McKeon AO
Chancellor of
Monash University

INCLUSIVE HEALTH INNOVATION GRANTS COVERED RESEARCH AIMED AT

5

VULNERABLE GROUPS IN SOCIETY

$962,000

IN RESEARCH ENDOWMENT FUND GRANTS AWARDED TO SUPPORT RESEARCHERS

'SCIENTISTS HAVE TRANSFORMED THE WAY WE LIVE AND THEY SAVE LIVES ON AN UNPRECEDENTED SCALE. WE JUST HAVE A MAJOR IMAGE AND PR PROBLEM'

Professor Sharon Lewin
Director of The Peter Doherty
Institute for Infection
and Immunity

AWARDS

Congratulations to our St Vincent's and partner researchers who have been recognised for contributions to their research field in the past 12 months.

ADDICTION MEDICINE

Dr Jon Cook
Australasian Chapter of Addiction Medicine (AChAM) Research Project Prize

ANAESTHESIA

Dr Jeff Reddy
ACORN Excellence in Perioperative Nursing Team Award, St Vincent's Health Australia Thermal Care Collaborative

CARDIOLOGY

Dr Elizabeth Paratz
Best Presentation; Pulmonary Hypertension Society of Australia and New Zealand Conference 2016

ENDOCRINOLOGY

Dr Dilshani Jayawardene
JDRF Travel Grant
ADS/ADEA President's Young Investigator Award

GASTROENTEROLOGY

Prof Michael Kamm
Joseph Sung Lecturer, Chinese University of Hong Kong

Prof Michael Kamm
Distinguished Scholar, Chinese University of Hong Kong

Prof Michael Kamm
Joanna and David B. Sachar M.D. International Award in Inflammatory Bowel Disease, Icahn School of Medicine, Mount Sinai Hospital, New York, USA.

Dr Sudarhsan Paramosthy
Travel Award, American Gastroenterology Association, Digestive Diseases Week, 2016 (San Diego)

Dr Sudarhsan Paramosthy
Young Investigator Award, Gastroenterology Society of Australia (GESA), Australian Gastro Week, 2016 (Adelaide): Multi-donor Faecal Microbiota Transplantation (FMT) for Ulcerative Colitis - A Randomised Controlled Trial

Dr Sudarhsan Paramosthy
National Scholar Award (Australia), United European Gastroenterology Week (Amsterdam): Faecal Microbiota Transplantation (FMT) in Ulcerative Colitis is Associated with Specific Bacterial Changes

Dr Zina Valaydon
Young Investigator Award, Asia Pacific Association for the Study of the Liver (APASL), Annual Meeting, 2016 (Tokyo)

Dr Zina Valaydon
Young Investigator Award (finalist), Gastroenterology Society of Australia (GESA), Australian Gastro Week, 2016 (Adelaide): Type 1 interferon mediates early viral clearance in HBeAg negative variants of hepatitis B

Dr Zina Valaydon
Travel Award, Australasian Society for HIV, Viral Hepatitis and Sexual Health Medicine, Viral Hepatitis Meeting, 2016 (Gold Coast)

Dr Matthew Choy – Poster of Distinction
American Gastroenterology Association, Digestive Diseases Week, 2016 (San Diego): Comparison of accelerated infliximab induction vs standard induction treatment in acute severe ulcerative colitis.

Dr Emily Wright – Ferring IBD Clinician
Establishment Award, Gastroenterology Society of Australia (GESA)

IMMUNOLOGY

Prof Peter Cowan
2016 Ian McKenzie Prize for Outstanding Contribution in Transplantation, The Transplantation Society of Australia and New Zealand (TSANZ)

Mentee-Mentor Award, The Transplantation Society (TTS) and TSANZ

Dr Doreen Fang
TSANZ Young Investigator Award

Mentee-Mentor Award, The Transplantation Society (TTS) and TSANZ

Dr Anjan Bongoni
Mentee-Mentor Award, The Transplantation Society (TTS) and TSANZ

Ms Evelyn Salvaris
2016 Kidney Health Australia Prize for Laboratory Research

Dr Bo Lu
Mentee-Mentor Award, The Transplantation Society (TTS) and TSANZ

MENTAL HEALTH

Dr Melissa Petrakis
The Tom Trauer Evaluation and Research Award

Dr Andrea Phillipou
The Society for Biological Psychiatry International Early Career Travel Fellowship

NEPHROLOGY

Dr Doreen Fang
(Joint Nephrology and Immunology Research Centre) Transplantation Society of Australia and New Zealand Young Investigator Award – Annual Scientific Meeting 2016

NEUROSCIENCE

Sanders LM, Tan M, Cook MJ, D'Souza WJ
Best Poster Award – Asia Pacific Stroke Conference, Gold Coast, Australia 2016: Increase risk of Stroke in Patients with Epilepsy: analysis of the Tasmanian Epilepsy Register

ONCOLOGY

Dr Christopher Hart
Best of the Best Poster Award for translational research, COSA annual scientific meeting (Gold Coast)

RESEARCH DIRECTORATE

Dr Tam Nguyen
VCCC Scholarship to complete Graduate Certificate in Consumer and Community Engagement

Asia and Pacific Rim Research Integrity Network Travel Grant

RHEUMATOLOGY

Dr Mandana Nikpour
NHMRC Career Development Fellowship (2017-2020)

Dr Shereen Oon
Australian Rheumatology Association Victorian Fellowship (2017)

Dr Laura Ross
MOVE PhD Scholarship (2017-2019)

Dr Kathleen Morrisroe
Best podium abstract presentation prize, Pulmonary Hypertension Society of Australia and New Zealand

SURGERY

Prof Peter Choong
NHMRC 2016 Award for Centre for Research Excellence in total Joint Replacement

Congratulations

TO OUR ST VINCENT'S AND PARTNER RESEARCHERS

FORESIGHT PAYING

DIVIDENDS FOR JOINT REPLACEMENT

'To make ourselves competitive on the world stage, we have to hold hands with experts from outside our region. International collaboration brings expertise to a group, and builds our capacity to undertake research. I strongly believe that to be the case.'

To say that Peter Choong is a long-term thinker would be something of an understatement. Almost two decades ago, he recognised the need for longitudinal data on outcomes and patient satisfaction from joint replacement surgery and established the St Vincent's Melbourne Arthroplasty Registry. Together with Associate Professor Michelle Dowsey, he has developed this research registry into the only one of its kind in Australia, and one of only a handful in the world. But that foresight and commitment is delivering dividends now.

Prof Choong, the Chair of Surgery at St Vincent's Hospital Melbourne, is the lead researcher in a major international project, recently awarded CRE status (Centre for Research Excellence), and given a major funding boost to bring colleagues from around the globe onboard. The study of Total Joint Replacement Outcomes focuses on optimising the outcomes of equity, cost effectiveness and appropriate selection of patients for the procedure, and the database gives them an invaluable baseline.

'Over the next 15 years, about two million joint replacements are going to be done in Australia, at a cost that will be greater than $50 billion,' Prof Choong said.

'But this CRE is not just about the impact of our research in Melbourne, or even Australia; we believe this CRE will have a global impact.'

Prof Choong, and colleague A/Prof Dowsey, together scoped the research proposal more than five years ago, and in the intervening years, identified and approached the various experts they needed, to ensure the study would be as comprehensive as possible.

Study partners include Jasvindar Singh, Professor of Rheumatology and Medicine at University of Alabama, Dr Michael Kattan, from the Cleveland Clinic in the US, an expert in quantitative health sciences, Dr Kieran O'Sullivan, expert academic physiotherapist in Limerick, Ireland, and Emeritus Professor Stefan Lohmander, Professor of Orthopaedic Research, Lund University Sweden, just to name a few. Locally, research participants come from universities, hospitals and research institutes in Melbourne, Perth, Adelaide, Queensland and New South Wales.

'We're bringing the best of the best from around the nation and the world, to create the best prospect of a good result for our patients.

'Our hope is that through this study, we will reduce complications, improve cost effectiveness, and really enhance the outcomes of people having joint replacement,' says Prof Choong.

'This research is about patient related outcomes' Prof Choong says, observing that the Total Joint Replacement Outcomes research is looking at four main elements:

1. Expectations: what are the patient and the surgeon's expectations, and are they aligned?
2. Decision-making: what are the drivers of decision-making. Why do patients decide they need to have surgery? And what drives the surgeons? And if you gave the surgeon the right information, would they do the surgery?
3. Alternatives: what are the available alternatives to surgery?
4. Effectiveness: to ensure the surgery is as cost effective as possible and as minimally complicating for the patient

The CRE on Total Joint Replacement Outcomes is just one of multiple research projects Prof Choong is currently engaged in.

'Almost every project of ours has a collaborator of national or international significance,' says Prof Choong, 'The more important ones have the bigger proportion of collaborators.'

Our hope is that through this study, we will reduce complications, improve cost effectiveness, and really enhance the outcomes of people having joint replacement.

2 MILLION

JOINT REPLACEMENTS WILL BE DONE IN AUSTRALIA OVER THE NEXT 15 YEARS

TOTAL JOINT REPLACEMENT COST WILL BE GREATER THAN

$50 BILLION

GUT MICROBIOTA

THE NEW AMAZON

With 30 years of clinical research experience, St Vincent's Gastroenterologist Professor Michael Kamm has long been at the forefront of gastroenterology research, making many discoveries into inflammatory bowel diseases.

But Prof Kamm is as excited as a fresh faced PhD student when talking about the next frontier in gastroenterological research, the incredibly complex gut microbiota.

'We are but a minority of ourselves,' Prof Kamm says. 'The gut microbiota, made up of viruses, bacteria and fungi that live in our digestive system, constitute about 90% of the cells in our body.'

Researchers have known the gut microbiota exits for many years, but haven't had the ability to explore it. Thanks to improvements in technology, Prof Kamm and his international team of collaborators are studying the gut microbiota more closely.

'Exploring the gut bacteria is a whole new horizon. It might be the most interesting development in any part of medicine at the moment. Having been neglected for so long, it is now akin to an undiscovered organ. It is like the Amazon of the human body.'

'Research and developments in this area are paradigm changing. Traditionally treatment for inflammatory bowel disease has involved immune suppressing drugs. Unfortunately they can adversely suppress the immune system in other unwanted ways as well, increasing the risk of infection and cancer.'

'We are now discovering that we can manipulate the microbiota and change the ecosystem that exists with our gastro intestinal tract.'

Prof Kamm recently led a clinical trial, named the 'FOCUS' study, looking at faecal microbiota transplantation (FMT) for patients with active ulcerative colitis, a condition that inflames the bowel. This trial, conducted in the three eastern Australian states, had very positive results, showing that more than half of all patients responded to the treatment. This study has been published recently in one of the world's leading clinical journals, the Lancet.

'These were patients who had disease that was resistant to many established drug therapies,' Prof Kamm explains. 'This really nails it and proves that it is an effective therapy and should be part of the offering for patients with active ulcerative colitis resistant to standard therapies.'

Prof Kamm and his team are now collaborating with scientists at Mt Sinai Hospital in New York to pinpoint which bacteria are important.

They have also begun collaborating with international companies with expertise in faecal transplant, to streamline and simplify what is an otherwise cumbersome process.

We now think that diet and the resulting changes in the gut microbiota probably play a big part in conditions like type 2 diabetes and non-alcoholic fatty liver disease.

'At the moment FMT involves collecting samples and extensive screening of donors and patients. It is not really practical for every day clinical use. We hope to progress to using capsules that can deliver the benefits of FMT in a much easier way.'

Research in this area has also revealed that gut bacteria may be responsible for a number of other diseases that have become very common in a short space of time.

'We now think that diet and the resulting changes in the gut microbiota probably play a big part in conditions like type 2 diabetes and non-alcoholic fatty liver disease.'

If you want to figure out the cause of a condition, a great place to look is where it is changing. Prof Kamm has been involved in epidemiological studies in 13 countries in South East Asia looking at inflammatory bowel disease.

'Inflammatory bowel disease was unheard of in Asia 30 years ago, now a third of all gastroenterology inpatients in China have these conditions. In a short time China will have more patients than the western world.'

By looking at the changing patterns of disease and comparing it to patients in Australia, it may be possible to determine what in the environment may be producing these changes.

'Our hypothesis is that changes in the bacteria in the gut in the Chinese population has led to the emergence of these diseases. What is making the bacteria change?'

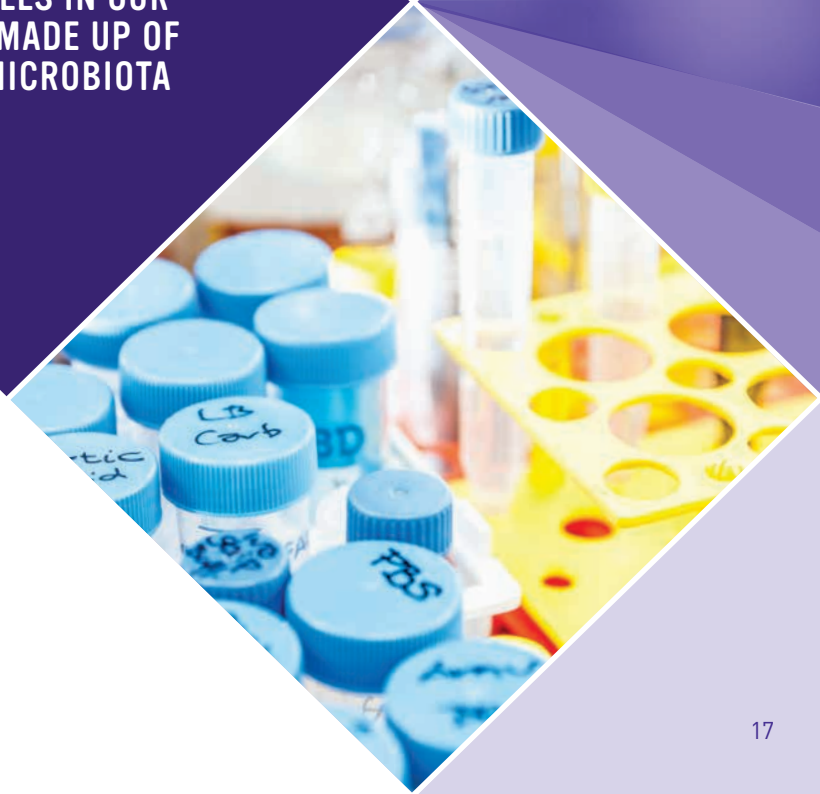
'One theory we have is that it may not be diet itself but dietary additives in prepared foods. An increase in manufactured foods in Asian diets. These foods contain a range of additives, such as emulsifiers, that may directly alter the gut microbiota.'

GUT BACTERIA

MAY BE RESPONSIBLE FOR A NUMBER OF DISEASES

90%

OF THE CELLS IN OUR BODY ARE MADE UP OF THE GUT MICROBIOTA



REVOLUTIONISING THE WAY WE TREAT NEUROLOGICAL CONDITIONS

For Natalie Kallelea, every day was a struggle. Suffering from severe epilepsy, Natalie spent many years incapacitated from multiple daily seizures.

But thanks to a world-first procedure led by Director of Neurology Prof Mark Cook, Natalie now has a chance at a normal life.

In December, Prof Cook and his team implanted a pump in Natalie's stomach that sends medication through a tiny tube directly into the brain. It is the first time that medication has been delivered in this way. The procedure itself is very well established, however the procedure is an example of using existing technology for novel solutions for which Prof Cook is becoming renowned.

'We are usually using catheters to drain rather than inject,' Prof Cook says. 'What's new about this is we are delivering a drug directly to the brain, which has never been done before.

This procedure marks the culmination of five years of work between Prof Cook and Medtronic, a medical device company based in Seattle. The two partners have developed a remarkable relationship, continuously looking for solutions that match Medtronic's technology with clinical objectives.

So far, three patients have undergone the procedure. Although it is early days, preliminary results are encouraging that the new drug delivery system can control epileptic seizures.

'The procedure has had a dramatic effect on Natalie, it's been surprising how effective it has been,' Prof Cook says. 'The side effects are manageable and we are all ecstatic with how things have gone.'

The next step for Prof Cook and his team will be to look at delivering different types of drugs in this manner.

'Some medications aren't available in a form that patients can take as a tablet, but may work very well for epilepsy, so if we can give them directly to the brain, it will give us another range of drugs to treat severe epilepsy,' Prof Cook says.

Prof Cook is also excited about a future project that is the result of constant collaboration between device companies and clinicians.

'Our team had the great idea to stimulate the brain to see how far away a seizure may be, so we can deliver treatment before a seizure happens, rather than as it is happening We didn't have the hardware to develop that idea, but Medtronic did, without an apparent use.

Professor Cook and his team implanted a pump in Natalie's stomach that sends medication through a tiny tube directly into the brain.

'We got together and have developed a system that monitors the brain continuously and can detect a seizure, then send an electronic response to that specific part of the brain to stop that seizure from happening.'

Prof Cook believes that St Vincent's provides unique advantages for international companies looking to collaborate on clinical trials.

'St Vincent's is different to a lot of American centres,' Prof Cook explains. 'Where they might deal with very specific groups of patients exclusively, we deal with all levels of complexity, treating patients from diagnosis to complex surgeries. There aren't many places that have that range of exposure.'

'We are lucky in that we have excellent clinical processes in the hospital, the ability of staff, the infrastructure that's available, the patients who we service, we see people who have very difficult epilepsy, there are few other options for them and they are very enthusiastic about being involved with new clinical trials.'

Ultimately, the importance of collaboration for his team cannot be overemphasised and these discoveries could never have been made without first building the trust of collaborative partners.

'You need a very strong element of trust from people who have put many years of their life into medical research. Ultimately they need to know you well, your skills, background, what your facility can do.'

'We do things well in Melbourne, and punch above our weight. But as a small place in the big scheme of things we do need to get out and meet people, share ideas, publish and show that we are really determined to be leaders in research.'

5 YEARS

OF WORK AND RESEARCH

3 PATIENTS

HAVE UNDERGONE THE NEW PROCEDURE

MOST PATIENTS ARE ALIVE AND WELL AFTER

3 YEARS

ST VINCENT'S IS NOW A

PHASE 1

SITE FOR NEW BLOOD CANCER TREATMENT

'GAME-CHANGING' CLINICAL TRIAL LEADS TO FURTHER DISCOVERIES

Clinical researchers Associate Professor Con Tam and Dr Hang Quach have built a reputation as leaders in the field of haematology, and their contributions to clinical knowledge with their own discoveries have pharmaceutical companies taking notice.

A/Prof Tam and Dr Quach are key members of an international program that developed a new class of anti-cancer drug that has literally given a new lease of life for patients with what would previously be considered terminal blood cancer.

'A number of blood cancers, including non-hodgkin's lymphoma and chronic lymphocytic leukaemia (CLL), have origins in B-cells,' A/Prof Tam says. 'There is a protein named BTK that plays a crucial role in B-cell development, and studies in a class of drugs called BTK inhibitors have begun targeting these cells in adults.'

A/Prof Tam and Dr Quach became involved in the study of the first drug in this field, Ibrutinib, in 2012, after seeing a phase one trial presented at an international conference.

'What struck us was how effective Ibrutinib was,' A/Prof Tam says. 'In attempting to find the toxic dose of the drug, it became apparent that there wasn't one. What was even more remarkable was that at anything apart from the lowest dose, all patients responded and the cancer shrunk away.'

Patients that required transfusions no longer needed them and went back to work. Patients who had been given three to six months to live all of a sudden had a much brighter outlook.

'We thought "wow, this is a gamechanger", we need to get involved. We approached the company, Pharmacyclics, and said we have many needy Australian patients and we would love to make this drug accessible for clinical trials in Australia.'

'We were invited to join the phase three study which compared Ibrutinib with an antibody, which was then the best standard of care in patients with advanced CLL. The response rate for the drug was ten times higher than that of the antibody and patients were three times more likely to survive.'

The results of this study were published in the New England Journal of Medicine. According to A/Prof Tam, there has seldom been a clinical trial so one-sided in medicine.

The team has since been involved with studies comparing Ibrutinib to the best standard of care in older patients who were not fit for chemotherapy. After overwhelming results proving its efficacy, Ibrutinib is now licenced in Europe, US and Australia.

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GAME-CHANGING

A/Prof Tam and Dr Quach were Australia's biggest recruiters to these studies. Three years later most of these patients are alive and working, after previously been given dismal outlooks.

The team also made a number of observations on side-effects which has led to further discoveries. A major side effect of Ibrutinib is bleeding, and the team found that this was because the drug inhibits platelets. In fact, BTK inhibitors may turn out to be quite effective cardiovascular drugs. The team also made discoveries on another complication caused by the drug, an arrhythmia of the heart called atrial fibrillation.'Working with researchers right here in Melbourne, we were able to make new discoveries, and published three papers in Blood and Leukemia, the top ranked journal in Haematology.'

In 2013, the team began working with BeiGene Pharma, a company based in China, who had developed a second generation Ibrutinib drug. 'BeiGene Pharma approached us due to our demonstrated expertise in BTK and our previous discoveries.'

St Vincent's is a now a phase one site, along with Peter MacCallum Cancer Centre and Royal Melbourne Hospital, with A/Prof Tam acting as Principal Investigator overseeing the trial program which extends across US and Asia.

'Australia is a much sought after destination for clinical trials. We have highly trained medical staff and strong collaboration with lab and clinic staff. For example, we may never have found out about the bleeding side-effects of Ibrutinib if not for a close relationship between clinicians and lab researchers.

'In America, that would be impossible, because platelets have a very short shelf-life. You only have an hour to test these samples and in institutions like the big American Cancer Centres, you'd be lucky if the samples could get to the pathology lab within three hours.'

Left: Dr Hang Quach
Right: Associate Professor Con Tam

REDUCING THE RISK OF

COGNITIVE DECLINE POST-SURGERY

Following surgery, older patients often report being unable to think clearly, which in the long run may affect their ability to live independently.

Although the vast majority will recover and return to normal, 10 to 15 per cent of older people will experience a measureable degree of cognitive impairment even 12 months after surgery.

Associate Professor Brendan Silbert and Associate Professor Lis Evered from the St Vincent's Department of Anaesthesia are working with leading scientists in Sweden to uncover more about this phenomenon and ensure that Australia's ageing population is not adversely affected by anaesthetics in surgery.

'Surgery is very common and its occurrence is growing year upon year,' A/Prof Silbert says. 'One in three people over the age of 65 will have an operation every year.

A/Prof Silbert has been involved in Alzheimer's research for many years, after beginning his career as a cardiac surgery anaesthetist.

'I began researching the link between anaesthesia in surgery and cognitive decline after seeing many patients who were not the same after cardiac surgery,' says A/Prof Silbert. 'We started testing cognitive function before and after cardiac surgery, which led us to test people undergoing other types of surgery.'

'We found that even in non-cardiac surgery, 20 per cent of people had changes in cognition after surgery and these changes started to overlap with dementia in the community at large.'

St Vincent's has made a number of discoveries in this area, with A/Prof Evered leading a world renowned project looking at cognitive and functional decline in patients in the short and long term.

'We followed a group of patients for seven and a half years after cardiac surgery and found that there was a prevalence of dementia that is really much greater than we would have expected in that age group of people,' A/Prof Evered says.

Anaesthesia offers a unique opportunity for research in this area, as the patient is in hospital, and St Vincent's ability to extract cerebral spinal fluid for analysis together with commitment to patient follow-up means the team has become extremely sought after for collaboration across the globe.

The team has been working with a leading scientist in Sweden who analyses cerebral spinal fluid samples, looking for biomarkers that indicate the presence of Alzheimer's.

'After taking cerebral spinal fluid samples from patients during the peri-operative period, we have been sending these samples to Sweden,' A/Prof Silbert says. 'Testing of this fluid has shown that for patients who had the proteins indicating Alzheimer's, their cognition declined more than others following anaesthesia during surgery.'

The collaboration is a perfect match, as anaesthetists can take the samples, Scientists can perform the analysis, and researchers can follow up with patients to correlate the results.

'We are one of the only groups who have this model of cognitive decline associated with anaesthesia in surgery,' A/Prof Evered says. 'We can maintain follow up of patients better than other places in the world, three months after and 12 months after surgery.'

The project involves research assistants visiting patients' homes on multiple occasions and giving them tests to determine their cognitive function, made possible by an NHMRC-ARC Dementia Research Development Fellowship.

Their work has led to a number of discoveries into Alzheimer's and cognitive function following surgery, but the team will continue to attempt to shed more light on the underlying cause.

'Anaesthesia and surgery go hand in hand, but historically people have picked on anaesthesia, as it affects the brain. This is probably a very simplistic answer and it's more likely to be a combination of the two that causes stress within the body and leads to cognitive decline,' A/Prof Silbert says.

'There's something about this group of patients that means they are more susceptible to getting dementia. What we don't know yet if the anaesthesia and surgery has contributed to that,' A/Prof Evered says. 'Are we just observing a decline that they were already going to experience or is something happening in the peri-operative period that is either initiated or exaggerated in vulnerable patients?'

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1 IN 3

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10-15%

OF OLDER PEOPLE WILL EXPERIENCE COGNITIVE IMPAIRMENT EVEN 12 MONTHS AFTER SURGERY

Left: Associate Professor Brendan Silbert
Right: Associate Professor Lis Evered

IMMUNOTHERAPY
IS NOW STANDARD CARE IN MELANOMA TREATMENT

Across the board
WE ARE LEARNING MORE ABOUT THE INDIVIDUAL CHARACTERISTICS OF LUNG CANCER AT A CELLULAR LEVEL, WHICH IN TURN IS HELPING TO GUIDE TREATMENT

IMMUNOTHERAPY THE NEXT FRONTIER IN CANCER TREATMENT

As Director of Oncology and Cancer Services at St Vincent's Hospital Melbourne, Associate Professor Sue-Anne McLachlan leads a team of hard working and compassionate oncologists striving for new breakthroughs in cancer treatment.

A/Prof McLachlan is working closely with oncologist Dr Melissa Moore recruiting for a number of international trials looking at the next frontier in cancer treatment, immunotherapy.

'Immunotherapy is the latest and greatest in cancer therapy,' A/Prof McLachlan says. 'Cancers have very clever ways of telling the body's immune system to go away, ignore me. New drugs used in immunotherapy tell the immune system to overcome cancer's tricks to evade the immune system.'

Immunotherapy is now part of standard care in melanoma treatment, and A/Prof McLachlan and Dr Moore are leading the charge on looking at a wider range of cancer types. The team is working with a clinical trials group in Canada and with cancer researchers across the globe to use immunotherapy in early stage lung cancer for the first time.

'In initial research, which has come really quickly, immunotherapy has been tried in an advanced cancer setting, where cancer has spread to other parts of the body,' A/Prof McLachlan says. 'Now we have mounting evidence that it is helpful in a number of situations.'

Studies are now moving into early stage cancer, in situations where the cancer has been surgically removed. While in many cases the cancer will come back, the team is trying to use immunotherapy to kill off the cancer before it returns. The advantage about immunotherapy that has them most excited is that the side-effects are generally not as severe as chemotherapy and can be tolerated by patients.

'Whereas chemotherapy is toxic against cancer cells and has a range of side-effects because of that, immunotherapy allows the body's immune system to recognise cancer as foreign and attack the cancer cells,' A/Prof McLachlan says. 'Tantalisingly, we are seeing patients live for some years with cancers that would otherwise have a survival rate of months.'

The next step is combining immune therapy with a different mechanism of action, such as combining immunotherapy with chemotherapy, or combining it with radiation therapy.

'We are recruiting patients to a number of studies, including eight patients that had newly diagnosed metastatic or advanced lung cancer and they were randomised to either chemotherapy, immunotherapy, or chemotherapy plus immune therapy. Some of those patients are responding very well.'

Left: Dr Melissa Moore
Right: Associate Professor Sue-Anne McLachlan

IMMUNOTHERAPY

St Vincent's is a major centre of thoracic surgery in Victoria and the lung cancer research group on campus is a very active group, punching above its weight on the world stage. A/Prof McLachlan believes this is due to the relationships the research group has built with collaborators over a number of years. 'It's about building trust, building a relationship, and building a reputation.'

Cancer trials are becoming more and more selective and applicable to only very small groups, as more is discovered about cancer, and the research group has become very collaborative, sharing patients for trials and endeavouring to find the best options for patients.

'Lung Cancer isn't just one cancer, it's many different cancers at a molecular level,' Dr Moore says. 'It isn't possible to have all of the patients you need to fill clinical trial spots at your centre, so there is a need to collaborate, to reach out to other centres doing niche trials.

'Across the board we are learning more about the individual characteristics of lung cancer at a cellular level, which in turn is helping to guide treatment. We are getting to the point now where we are working out, once they become resistant to a particular kind of treatment, what process is driving that resistance and what treatment can we give to target that resistance. It's a very exciting time for cancer research.'

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ST VINCENT'S ACKNOWLEDGES

the traditional owners of this land, the Wurundjeri people and all the members of the Kulin nations.

We pay our respects to their Elders, past and present. St Vincent's is Victoria's largest metropolitan provider of Aboriginal and Torres Strait Islander healthcare. We continue to develop our relationship with the Koori community and are proud to be acknowledged as a centre of excellence in healthcare for Indigenous Australians.