

ACCELERATING DISCOVERIES TO SAVE LIVES



ANNUAL REPORT 2021

ACKNOWLEDGEMENT OF COUNTRY

The Victor Chang Cardiac Research Institute acknowledges Cardiac Research Institute Aboriginal and Torres Strait Islander peoples as the Traditional Custodians of the lands and waters on which we live and work and pay our respects to their Elders past, present and emerging.

We proudly recognise the ongoing spiritual and cultural custodians of the lands where we make our discoveries -

which at the Victor Chang in Darlinghurst is the Gadigal of the Eora Nation and at the main Crawley campus of the University of Western Australia the Whadjuk Noongar people.

At the Victor Chang Cardiac Research Institute, we are committed to improving health outcomes for Aboriginal and Torres Strait Islander peoples.



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ACCELERATING **LIFE-SAVING** DISCOVERIES

that will benefit all

AUSTRALIANS

and deliver

INTERNATIONAL MPACT THE VICTOR CHANG CARDIAC **RESEARCH INSTITUTE IS DEDICATED TO FINDING CURES** FOR CARDIOVASCULAR DISEASE **THROUGH WORLD-CLASS AND CUTTING-EDGE MEDICAL RESEARCH**

> The team at the Institute is working urgently to discover better ways of understanding, diagnosing, treating, and preventing the onset of heart disease and is committed to ensuring its research breakthroughs are translated into advances in clinical care.

Founded in 1994, the Victor Chang Cardiac Research Institute was established in honour of the legendary heart transplant surgeon, Dr Victor Chang AC.

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It now has around 230 scientists, doctors, and staff working together at 23 laboratories across the country

Regarded as Australia's home of heart research, the Institute has earned its place on the global stage as one of the most respected medical research facilities in the world.

This year saw it expand its national footprint by establishing a new heart disease research hub at the University of Western Australia. This will allow researchers and scientists to accelerate life-saving discoveries that will benefit all Australians and deliver international impact.

ctorchang.edu.aı

CHAIRMAN'S MESSAGE

It is with confidence and pride that I can say that under the leadership of Professor Jason Kovacic, the Victor Chang Cardiac Research Institute has continued to successfully navigate the changing landscape caused by COVID-19 and further develop its bold vision for the future.

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a panel of renowned scientists who make up our Scientific Advisory Board. To ensure that the Institute continues to produce the highest quality research, its faculty members and research programs, as well as its infrastructure and support services, are subjected to stringent review every five years. In particular, the Scientific Advisory

Testament to this is the positive

endorsement received from the

Quinguennial Review conducted by

Board endorsed Jason's vision for the future which includes the intention to create a new research and development pipeline. This will actively work to translate our fundamental discoveries to patients in the form of new treatments, medications, and strategies for heart disease that will reach GP surgeries and hospitals on a whole new scale.

Jason's plan for the Institute to expand its traditional base on the east coast

of Australia and establish a national

footprint was also strongly supported.

The launch of the Wesfarmers UWA-

at the University of Western Australia

represents the first stage of the plan to

build a significant VCCRI Cardiovascular

Research Hub in Western Australia.

VCCRI Chair in Cardiovascular Research

Despite the challenges of 2021, our researchers continued their groundbreaking research celebrating numerous scientific achievements and another prolific year of publications.

The 2021 Virtual Sohn Hearts & Minds Investment Leaders Conference was more successful than ever with a record

1.677 people attending to listen to the world's top fund managers come together to share innovative and bold investment ideas in support of Australian medical research.

We are extremely grateful to Hearts & Minds Investment Limited (ASX:HM1) for the transformational revenue it generates for cardiovascular research at the Victor Chang Cardiac Research Institute, and other medical research organisations due to the generosity of all the fund managers involved.

We are forever grateful for the valuable contribution of our Board members and their commitment to the Institute and their vision. In particular, I would like to express my sincere thanks to David Craig, our Deputy Chairman and Chairman of the Finance and Risk Committee. for his dedication to the Institute.

Finally, I am deeply grateful to all of the Institute's wonderful donors, whose support has been unwavering during a very difficult two years. At Australia's home of heart research, we rely on your continued philanthropic support to find ways to prevent and treat cardiovascular disease that is of pandemic proportions and is the number one killer of Australians and people worldwide.

Math

Matthew Grounds AM Chairman

2021 IN NUMBERS



STAFF MEMBERS



WINNING GRANT APPLICATIONS

50,000





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DELIVERING THE FULL IMPACT OF OUR DISCOVERIES

Since the Institute was founded almost three decades ago, our dedicated team of scientists and researchers have been committed to delivering new treatments and cures for heart disease.

Over the last 12 months, we've taken giant strides to ensure our discoveries deliver on their promise faster, and to their maximum clinical potential. It's been a huge year of milestones that have seen the Institute grow in strength, size, and stature.

exciting collaborations with the world's leading MedTech companies, ioined forces with the most remote institutes in Australia to accelerate our discoveries and have expanded our footprint outside of Sydney making us the only national heart disease research institute in Australia.

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We've embarked on new and

cardiovascular research excellence in Western Australia thanks to a partnership with Wesfarmers and the University of Western Australia. In parallel, we opened our second research Laboratory in WA - led by

We've also joined forces to establish the Australian Stroke & Heart Research Accelerator (ASHRA). By working together this first of its kind translational network will accelerate our translational growth strategy and help us deliver new treatments, medications, technologies, and strategies for heart disease.

A key strength of ASHRA is its partnerships with industry – which is critical to the future of the Institute and something we embraced in 2021. Over the past 12 months:

- We teamed up with VentriClinical to accelerate the development and testing of new heart disease technologies.
- We worked closely with the makers of potentially the world's first durable total artificial heart by conducting critical studies in the run-up to human trials.
- We moved a step closer to developing a new drug that has the potential to prevent the damage done after a heart attack or stroke through research taking place at the Institute and the University of Queensland.
- At the same time we've continued to grow our strong foundations in cardiovascular discovery, and were thrilled to open the new Cellular Bioenergetics Laboratory led by Professor Nigel Turner.

The benefits of this new drive by the Institute are widespread – medical innovations and treatments that will reach patients far sooner, reduced hospitalisations, more local investment and commercialisation of Australian medical breakthroughs and increased domestic and export opportunities.

We can turn the tide of cardiovascular disease by working together to drive translational research that will see real change and lives saved far sooner than we ever thought possible.



Professor Jason Kovacic MBBS, PhD, FRACP, FAHA, FACC, FSCAI, FCSANZ Executive Director

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WE'VE TAKEN GIANT STRIDES TO ENSURE OUR DISCOVERIES DELIVER ON THEIR PROMISE FASTER, AND TO THEIR MAXIMUM **CLINICAL POTENTIAL.**

PROFESSOR JASON KOVACIC

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TRANSLATIONAL RESEARCH

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A WATERSHED MOMENT FOR HEART RESEARCH

The Victor Chang Cardiac Research Institute is committed to ensuring our basic science discoveries move seamlessly from our laboratories into the clinic.

Our research and development 'pipeline' brings our fundamental discoveries through a series of advanced translational stages and then up into pre-clinical studies, before ultimately becoming human trials to evaluate new treatments or new medical devices and from there to widespread clinical use.

It's overseen by our scientists

at the Institute who are working

on exciting and new collaborations

in Australia and overseas that will

accelerate our translational focus

over the coming years.

IMPORTANCE OF TRANSLATIONAL RESEARCH

> As our Executive Director Professor Jason Kovacic explains, this will have a fundamental impact on the Institute "We've always been dedicated to ensuring that our discoveries deliver on their promise, and we've been able to do this with many of our research projects such as our research in heart transplantation.

"To develop a translational pipeline, you need a scientific engine room that is churning out critical discoveries of candidate genes, molecules, cells, and other agents that hold promise as clinical diagnostics or therapeutics for patients.

"Over the last three decades, the Institute has nurtured and grown that engine room into a world-class enterprise. Now we are developing a robust translational pipeline to accelerate those discoveries up to patients."



WORLD-LEADING MEDICAL DEVICES

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The Institute has teamed up with Ventri Clinical to drive new innovative MedTech solutions for heart disease.

Ventri Clinical, Australia's Gateway for Cardiovascular Medtech Innovation, aims to connect and empower businesses, clinicians, and professionals who conduct, contribute to, or support the successful testing and study of cardiovascular medical device innovations.

Ventri Clinical is facilitated by the Australian Cardiovascular Alliance and is also supported by MTPConnect, the Charles Perkins Centre at Sydney University and Hydrix.

"It's incredibly exciting to have joined forces with the Victor Chang Cardiac Research Institute which is unique in Australia in that it has the combined forces of world-class researchers and clinicians, as well as being home to state-of-the-art equipment and cutting-edge technologies through its Innovation Centre," says Ventri Clinical's Anthony Murray.

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BEING PART OF THIS BROAD NETWORK WILL IMPROVE HEALTH OUTCOMES FOR ALL AUSTRALIANS BY ACCELERATING THE DEVELOPMENT AND TESTING OF NEW TECHNOLOGIES.

PROFESSOR JASON KOVACIC

BASIC RESEARCH

Intervention improves patient health

CLINICAL PRACTICE

Discoveries translate to clinical trials

CLINICAL RESEARCH

Administer trial results to real-world settings

TRANSFORMING AUSTRALIA'S GLOBAL COMPETITIVENESS IN HEART DISEASE AND STROKE RESEARCH

The Victor Chang Cardiac Research Institute has joined forces with the country's leading cardiovascular researchers to establish the Australian Stroke and Heart Research Accelerator ("ASHRA") through the MTPConnect Targeted Translation Research Accelerator Scheme and the Medical Research Future Fund (MRFF).

The announcement included a \$10 million commitment from MTPConnect and the MRFF over four years as well as more than \$20 million in partner contributions. The funding will ensure new treatments and innovative digital and MedTech solutions reach patients in Australia and worldwide.

Other partners include Monash University, UNSW Sydney, the University of Sydney, The George Institute for Global Health, the University of Western Australia, Australian National University, Menzies School of Health Research, and the University of Melbourne, as well as key industry involvement.

A portion of the announced funding will be used to work towards key translational projects at the Victor Chang Cardiac Research Institute, including the viability of the world's newest total artificial heart and our partnership with Telstra Health.

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IMPROVING DRUG SAFETY WITH TELSTRA HEALTH

The Institute is working with Telstra Health on a project that could revolutionise the way we screen life-saving drugs for cardiac safety.

Regulatory requirements mandate that all new drugs need to be screened for their potential to cause cardiac arrhythmias. However, while current screening is effective at identifying dangerous drugs, it is viewed as overly stringent and this has meant that the development of many helpful, or even life-saving, drugs have likely been unnecessarily halted.

It's hoped that this research with Telstra Health, which is supported by ASHRA, will improve drug safety and accelerate drug development for a range of disorders.

"Our team is building an end-toend solution for the pharmaceutical industry, combining drug screening, computer simulations of heart cells, and risk prediction algorithms that will increase the safety of drugs going onto the market," says Dr Adam Hill, Head of the Institute's Computational Cardiology Laboratory. To achieve a large-scale rollout of the work, the Institute's team partnered with Telstra Health to use the Telstra DataHub - a technology platform that will support the cloud-based pipeline.

Russel Duncan, Telstra Health Chief Technology Officer, says: "It has been great to be involved in supporting the Institute in bringing together research, technology, and health care, consistent with Telstra Health's purpose of improving lives through digitallyenabled care for our community."

Another key partner in the project so far is the company Nanion Technologies, which builds the screening platform central to the proposed solution.

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Cardiar Research Institute

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OUR TEAM IS BUILDING A SOLUTION FOR THE PHARMACEUTICAL INDUSTRY, COMBINING DRUG SCREENING, COMPUTER SIMULATIONS, AND RISK PREDICTION ALGORITHMS THAT WILL INCREASE THE SAFETY OF DRUGS GOING ONTO THE MARKET

DR ADAM HILL

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ARTIFICIAL HEARTS

HEART FAILURE AFFECTS OVER 23 MILLION PEOPLE WORLDWIDE EVERY YEAR AND A PROPORTION OF PATIENTS WILL EVENTUALLY REQUIRE A HEART TRANSPLANT.

The Institute's Professor Chris Hayward is playing a pivotal role in the development of what is expected to be the world's first durable artificial heart, which could transform the field of heart transplantation.



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HEART

ONLY 6,000 DONOR HEARTS WORLDWIDE ARE AVAILABLE EACH YEAR, A VERY SMALL NUMBER WHEN COMPARED TO THE OVERWHELMING NEED

The BiVACOR total artificial heart can replace the function of the failing heart. It's smaller, more powerful, more responsive, and more durable than existing devices on the market.

It's designed to be implanted in place of a human heart to support patients with end-stage biventricular heart failure (both sides of the heart not working adequately).

The pump has several unique features:

- ▶ The motor is magnetically suspended within the device, which reduces wear and tear, minimises effects on blood cells, and enhances durability.
- > The motor has a dual impeller design that supports both the left and right sides of the pump – this reduces potential points of failure.
- Finally despite continuous flow technology, the motor can mimic the pulsatile heart by increasing or decreasing the pump speed to create a pulse wave.

Whilst initial trials will focus on patients who require a bridging device to transplant, it's been designed to provide more than 10 years of support and it's hoped it will replace the need for donor heart transplantation for many patients around the world.



THE INSTITUTE'S **PIVOTAL ROLE**

A team at the Victor Chang Cardiac Research Institute and St Vincent's Hospital, Sydney – led by the Institute's Professor Hayward – is preparing this incredible device for its first human trials.

They are trialling it on a mock circulatory loop – a machine that mimics the human cardiovascular system where they can adjust the parameters of the system to mimic all sorts of cardiovascular states including heart failure and see how the pump affects the rest of the vascular system.

The team is also placing the device in 3D models of the human chest to see how much pressure it exerts on the back of the chest wall

Professor Hayward is working closely with BiVACOR'S Australian founder, Dr Daniel Timms, and is part of a worldwide collaboration working on this project.

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Top left and top right: The BiVACOR heart Bottom: Prof Chris Hayward and Dr Sam Emmanuel

HOPE FOR THE FUTURE

Julie Ovens knows that one day in the future she may need a new heart.

The mother of two from Sydney had assumed she'd go on the heart transplant waiting list.

But the development of the world's first durable artificial heart has got her imagining a very different scenario. One that fills her with hope, rather than dread.

"I never thought anything like this was possible. The thought of having a healthy and reliable heart when I need it, is just incredible," says Julie.

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JULIE IS NO STRANGER TO HEART SURGERY

She was diagnosed with congenital heart failure aged just 12 months and underwent open-heart surgery twice as a child; the first to repair a large hole in the atrium wall of her heart and five years later to repair the mitral valve.

She later had the mitral valve repaired again after giving birth to her second child – a healthy baby boy.

Since then, she's suffered several strokes, cardiac arrest, and a mechanical valve replacement.

Julie explains: "There is every possibility I will need a transplant in the future. Whilst this research is still being studied and trials are yet to start, the fact this technology is out there gives me hope".

healthy is just

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I'M CERTAINLY NOT AFRAID OF HAVING AN ARTIFICIAL HEART IF IT WILL ENSURE I LIVE A LONG LIFE AND ENJOY EVERY MINUTE WITH MY HUSBAND, CHILDREN, AND GRANDCHILDREN.

JULIE OVENS

EXPANDING INTO WESTERN AUSTRALIA

DELIVERING NATIONAL IMPACT

2021 was a momentous year for the Victor Chang Cardiac Research Institute with the establishment of a new heart disease research hub at the University of Western Australia.

With established laboratories across the country, it cemented the Institute's position as Australia's only national

Professor Jason Kovacic, Executive Director of the Institute, says: "Founded in 1994, our Institute has grown to become Australia's Home of Heart Research. However, until recently the majority of our scientists were based in Sydney

"The Victor Chang Cardiac Research Institute has become a national organisation. We look forward to growing this national footprint and our national impact in the years ahead."

A new collaboration between the Institute, The University of Western Australia, and Wesfarmers saw the opening of WA's first dedicated centre of heart research.

biggest killer.

It will allow Professor Livia Hool, the Institute's Faculty Head and UWA academic, to set up a preclinical Chair in cardiovascular disease discovery at UWA to advance groundbreaking projects, leading to earlier diagnosis, prevention, treatments, and future scientific breakthroughs.

"

PROFESSOR LIVIA HOOL

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Centre: Prof Livia Hool

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A NEW CHAIR OF CARDIOVASCULAR

The Wesfarmers, UWA-VCCRI Chair in Cardiovascular Research will focus on delivering new research and treatments to tackle Australia's

Wesfarmers Managing Director Rob Scott says: "We are very pleased that our commitment to endow a new Chair in cardiovascular research will help improve people's lives and their health outcomes."

As well as the support from Wesfarmers, the Institute was also excited to announce another partner in its expansion across the country.

Just weeks after the establishment of this new Chair, Woodside Energy came on board to further invest in this collaborative project.

THIS INCREDIBLE SUPPORT **FROM WESFARMERS AND** WOODSIDE WILL ALLOW US TO **TRANSFORM THE FACE OF HEART RESEARCH IN WESTERN AUSTRALIA.** THIS WILL DELIVER SCIENTIFIC **BREAKTHROUGHS THAT WILL BENEFIT PEOPLE THE WORLD OVER.**

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DISCOVERING WHAT DRIVES **HEART DISEASE**

Our new Laboratory Head Dr Lee Nedkoff brings an entirely new set of skills to the Victor Chang Cardiac Research Institute.

Dr Nedkoff is an epidemiologist a scientist who analyses data to discover what is driving heart disease in different communities.

Dr Nedkoff joins our growing heart research centre based at The University of Western Australia, working alongside the Institute's Professor Livia Hool.

Dr Nedkoff says: "In order to tackle heart disease, you need to demonstrate the true scale of the problem. You would think with heart disease we would already have this data out there, but not all of it is accurate or robust, and there are many gaps."

Dr Nedkoff will focus on three main areas:

- ▶ The burden of coronary heart disease and how rates appear to be increasing.
- Exploring how having heart disease contributes to your risk of stroke.
- ► Dr Nedkoff is part of a team of investigators who are studying rheumatic heart disease (RHD). which can cause atrial fibrillation. heart failure, and stroke. First Nations peoples aged under 45 years old are 64 times more likely to suffer from RHD than non-Aboriginal people in Australia.

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WE NEED TO BREAK DOWN WHAT'S HAPPENING ACROSS **DIFFERENT AGE GROUPS, DIFFERENT LOCATIONS, BY GENDER, AND BY CULTURAL** BACKGROUND.

DR LEE NEDKOFF

FINDING A CURE FOR THE SILENT KILLER

Five years ago, Ben Beale a father of five and much-loved husband, son and brother, passed away from a heart attack.

Ben was just 47 years old and unaware he was suffering from atherosclerosis, which is known as the 'silent killer' because there are often no apparent symptoms.

His wife Sarah Beale says: "Ben was at the peak of his fitness and health and had no idea he was suffering from a disease which takes far too many lives.



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The Beale family knows all too well the importance of establishing a centre of research excellence in Western Australia.

"Scientists at the Victor Chang Cardiac Research Institute are beginning to unravel what causes atherosclerosis and we hope that in the future we will be able to prevent other families going through such unnecessary heartache."

Our scientists have identified critical pathways that are key in driving the build-up of plaque that leads to the hardening of the arteries.

This world-first research has the potential to pave the way for new treatments that would effectively 'deactivate' this pathway before it can cause devastating damage like a heart attack.

Professor Livia Hool, who heads the Institute's research centre in WA. says: "The aim is to stop this disease from occurring in the first place. That would be transformative in the treatment of heart disease."

LATEST BREAKTHROUGHS

MEDICAL ADVANCES IN HEART RESEARCH ARE BEING FAST-TRACKED IN THE INNOVATION CENTRE AT THE VICTOR CHANG CARDIAC RESEARCH INSTITUTE.

Featuring world-best technology and expertise, the Innovation Centre is focused on translating scientific discoveries into new treatments and diagnostic tools that ultimately improve patient health.

And with millions of people dying from cardiovascular disease every year, finding cures has never been more urgent.

That's why in 2021 the Innovation Centre further expanded its research programs across its seven facilities, forming new collaborations with industry leaders, commercial stakeholders, and of course principal Australian scientists.

Top: Dr Kathryn Wolhuter using a mass spectrometer Right: Dr Wolhuter VICTOR CHANG CARDIAC RESEARCH INSTITUTE INNOVATION CENTRE

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ACCELERATING **DISCOVERIES**

Technology in the Innovation Centre is playing a central role in propelling a world-first breakthrough led by Professor Jason Kovacic to the next level.

Professor Kovacic and his team pinpointed the genes most likely to trigger a heart attack and also found the most important gene for vascular disease that's potentially ever been discovered.

The gene, called PHACTR1, can lead to atherosclerosis. stroke, fibromuscular dysplasia, spontaneous coronary artery dissection, hypertension, and migraine headache.

Lauded by scientists globally, Professor Kovacic was presented with the Agilent Thought Leader Award for his influential work.

> This vital discovery has also formed the groundwork for a new study currently underway in the Innovation Centre.

Under the expert guidance of Professor Kovacic, rising star Dr Kathryn Wolhuter will now analyse how this gene impacts the way a cell functions. Dr Wolhuter will use a highly specialised instrument called a mass spectrometer to measure the exact size and weight of thousands of molecules in a matter of minutes.

Left to right: Dr Christine Lucas, Dr Nicole Bryce, Dr Kathryn Wolhuter and Prof Jason Kovacic Bottom: Agilent Technologies mass spectrometer The results are expected to pave the way for a whole new field of targeted therapies and treatments for those at risk of vascular disease.

To take this project to the next level, Agilent Technologies will embed a new proteomics machine in the Innovation Centre. to examine how proteins in the body are influenced by PHACTR1 signalling.

It's cutting-edge research that will enable Dr Wolhuter to develop a complete picture of this complex gene and gain an understanding of how the whole system interacts within our body to cause disease. This broad, comprehensive approach, known as multi-omics, is critical to achieving precision medicine.



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DR KATHRYN WOLHUTER

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THESE TINY LITTLE FISH **SHARE OVER 70% OF HUMAN GENES WHICH HAS THE POTENTIAL TO LEAD TO NEW DRUG DEVELOPMENTS.**

Victor Chang

DR KAZU KIKUCHI



A critical new gene has been discovered that could help repair damaged heart muscle after a heart attack.

heart muscle in these fish.

published in *Science* revealed by a critical gene called Klf1.

HOW THE GENE WORKS

The gene makes remaining uninjured heart muscle cells more immature and changes their metabolic wiring. This allows them to divide and make new cells. When the gene is removed, the zebrafish heart loses its ability to repair itself after an injury such as a heart attack, which pinpoints it as a crucial self-healing tool.

Top: Dr Kazu Kikuchi Bottom: Prof Bob Graham talking to the media about the discovery

UNCOVERING A SECRET **SWITCH**

Researchers at the Institute identified a genetic switch in zebrafish that turns on cells allowing them to divide and multiply after a heart attack, resulting in the complete regeneration and healing of damaged

It's already known that zebrafish can heal their hearts, but research for the first time the role played

Dr Kazu Kikuchi, who led this worldfirst research whilst at the Institute, says: "We identified a secret switch that allows heart muscle cells to divide and multiply after the heart is injured. It kicks in when needed and turns off when the heart is fully healed. In humans where damaged and scarred heart muscle cannot replace itself, this could be transformative.'

NEXT STEPS

The next steps are to undertake further research into the gene's function to see if it may also act as a switch in human hearts and improve the ability to pump blood around the body.

The discovery was made in collaboration with the Garvan Institute of Medical Research.

SAVING LIVES WITH DEADLY SPIDER VENOM

A potentially life-saving treatment for heart attack victims has been discovered from a very unlikely source – the venom of one of the world's deadliest spiders.

It's hoped the research being led by the Institute's Professor Peter Macdonald and a team at the University of Queensland will help prevent the damage caused by a heart attack, and will also extend the life of donor hearts used for organ transplants.

Professor Macdonald says this incredible result published in *Circulation* had been decades in the making: "This could not only help the hundreds of thousands of people who have a heart attack every year around the world, but this could also increase the number of hearts available for transplant by 30%."

HOW IT WORKS

The new therapy works by stopping a 'death signal' being sent from the heart in the wake of an attack.

After a heart attack, blood flow to the heart is reduced, resulting in a lack of oxygen to the heart muscle. The lack of oxygen causes the cell environment to become acidic, which combines to send a message for heart cells to die.

But scientists have discovered that a peptide derived from the spider venom can block the death message in the cells and protect the heart from further damage.

NEXT STEPS

The drug has been tested on beating heart cells and is already showing promise in early preclinical studies that are currently underway.

It is anticipated that first-in-human safety trials could start as early as 2023.

This phase one clinical trial will test the dosage range and identify any side effects on a small group of people before moving on to larger clinical trials.



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FOR PEOPLE WHO ARE LITERALLY ON DEATH'S DOOR, THIS COULD BE LIFE CHANGING.

PROFESSOR PETER MACDONALD

BREAKTHROUGH FOR 'RARE' DISEASE

KEY GENES IDENTIFIED FOR VASCULAR DISEASE THAT MAY AFFECT ONE IN 20 WOMEN

The Institute's Professor Jason Kovacic was part of a global team that identified the key genetic drivers of fibromuscular dysplasia (FMD) - a vascular disease that in severe cases can cause heart attack, kidney complications, stroke, and aneurysm.

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> Now these key genes have been identified, it's hoped it will lead to opportunities for better diagnosis and new treatments for a disease thought to affect up to one in 20 women.

> "Now that we finally know the scale of this disease and have identified the key genes, we are hopefully one step closer to being able to better manage, diagnose and find a cure for FMD," says Professor Kovacic.

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WHILST MOST WOMEN WHO **CARRY THIS DISEASE WON'T EVER DISPLAY A SYMPTOM OTHERS EXPERIENCE SIGNIFICANT PROBLEMS FROM FMD SUCH** AS STROKE, HEADACHE, HIGH **BLOOD PRESSURE OR TINNITUS.**

PROFESSOR JASON KOVACIC

KEY FINDINGS

- ▶ Scientists from Australia, the US, and Europe conducted the largest ever study of FMD and compared data from more than 1,500 patients with FMD and around 7,000 people without the disease.
- This led to the identification of five important genes responsible for causing FMD that was published in the journal Nature Communications.

The work was a collaboration between the Victor Chang Cardiac Research Institute. Icahn School of Medicine at Mount Sinai in New York and other international collaborators including in Michigan and Paris.

NEXT STEPS

The Institute's team is already undertaking state-of-the-art studies at the cellular level to understand how the key genes cause FMD and other vascular diseases.





to find a diagnosis.

from FMD

she says.

Chris's battle to get a diagnosis began in her 20s when she started to experience high blood pressure, vertigo and headaches. A normal blood pressure reading was 180/110 but at times hers reached 250/150.

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CHRIS SHAW

ATEST BREAKTHROUGHS

LIVING WITH FMD

I LOST MY KIDNEY FROM A DISEASE **ONCE CONSIDERED RARE**

Chris Shaw lived with sky-high blood pressure for years unable

The mother of two from Geelong eventually went on to lose a kidney

"If I had been treated for FMD at the start of my illness, there is every chance I would still have my kidney and a whole host of other medical conditions could have been avoided." Chris recalls: "Eventually I was seen by a specialist who finally worked out what was happening. It was such a relief to finally have answers.

"But by then my right kidney was already damaged because the main artery to it was 95% blocked. They just couldn't save it."

Chris is incredibly excited by the new FMD research taking place at the Institute. "It would be fantastic if more women are diagnosed early so they can be properly treated and managed and don't have to endure what happened to me," she says.

OTHER ARTERIES IN MY BODY ARE ALSO AFFECTED NOW AND I HAVE HAD MANY MINI ANEURYSMS. THEY USED TO BE ABLE TO GO IN AND **REPAIR THE DAMAGE BUT NOW MY** ARTERIES ARE SO FRAIL THEY ONLY **OPERATE WHEN IT'S CRITICAL.**

TEAM HIGHLIGHTS

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It's fair to say 2021 was a big year for Professor Diane Fatkin. It began with a major team effort, involving the University of Michigan, developing a gigantic genomic catalogue a rich resource for research into genetic causes of human disease.

The catalogue contains over 50,000+ genomes covering a broad spectrum of genetic variation in diverse human populations. That's billions upon billions of pieces of genetic information in the one resource. Results of this work was published in the prestigious Nature journal.

Next up was news of a \$1 million grant from the Heart Foundation awarded to a multicentre team led by Professor Fatkin. This research will investigate the role genetics play in the risk and treatment of atrial fibrillation (AF), a major public health problem that places one in three individuals at risk of developing it in their lifetime.

Professor Fatkin says: "This will really allow us to do in-depth genetic analyses on our patients, and we already have a large cohort of those available. This will enable us to do these genetic analyses for the first time in Australia, so it really is a major new initiative.

"Our data will define high-risk patient subsets and have direct implications for the screening and clinical management of family members."

The 2020 Predictive Modelling Grant was awarded to Professor Fatkin to investigate the role of genetics for risk stratification in AF.

A MILLION DOLLAR GRANT, FULBRIGHT SCHOLARSHIP AND A NATURE PUBLICATION

Finally, Professor Fatkin was awarded a Fulbright Scholarship.

Now that COVID-19 travel restrictions have relaxed, she hopes to undertake a sabbatical study visit to the Seidman Laboratory at Harvard Medical School in Boston to gain experience in cutting-edge techniques for studying heart function, which will provide insights into the causes of genetic heart disease.



MEET OUR NEWEST RECRUITS

2021 witnessed the arrival of two new clinical faculty and a new laboratory head.

As an Institute which is committed to gender equity, we are pleased to welcome both Dr Nikki Bart and Associate Professor Kavitha Muthiah – cardiologists at St Vincent's Hospital, Sydney.

It's also vital because research shows there is gender inequality in the outcomes of female patients presenting with cardiac conditions and we can help address this issue by training emerging female cardiology leaders.

Also bringing a different and fresh perspective is Professor Nigel Turner who is a world-leader in metabolic diseases and joins us from UNSW.

IMPROVING LIVES FOR PATIENTS WITH END-STAGE HEART DISEASE

It is seeing patients who are at death's door that drives Associate Professor Kavitha Muthiah's research into heart failure.

The Institute's new clinical faculty appointee is determined to improve the lives of people who are waiting for a heart transplant and being kept alive with the support of a mechanical heart pump.

"I am passionate about advanced heart failure and transplant because you can make a huge difference. These patients are often knocking on death's door before they get their implant, and it is such a rewarding experience to see them on the other side," Associate Professor Muthiah says.

Whilst these devices, which are also known as left ventricular assist devices, are lifesaving for those with end-stage heart failure they can also cause devastating side effects.

Associate Professor Muthiah, says: "What I have been trying to understand is how the

Top: Prof Nigel Turner Middle: Dr Nikki Bart Left: A/Prof Kavitha Muthiah

body changes when this life-saving pump is implanted. One of the things I am studying is how the pump affects blood vessel formation.

ON A MISSION TO HALT THE RISING TIDE **OF OBESITY-RELATED METABOLIC DISEASES**

The Institute's new faculty head Professor Nigel Turner is a worldleader in the field of cellular bioenergetics - the process in which cells take up nutrients from our diet or that are derived from processes within the body.

"We want to find out if there are various points in these metabolic pathways where we could intervene, that might prevent diseases occurring or at least slow disease progression."

Professor Turner spent eight years with the Garvan Institute of Medical Research in the diabetes and obesity program, before moving onto UNSW where he led a team attempting to develop a new drug to burn off excess calories.

In addition to continuing this project targeting fuel metabolism, Professor Turner is also working on a project that will develop new drugs that prevent the accumulation of specific types of toxic lipid molecules.

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"My research at the Institute will focus on how we can mitigate any adverse events. I hope it will lead to a precision medicine approach in these patients."

"We're interested in understanding how these metabolic pathways can change and the role they play in metabolic diseases. We've more recently started moving into the cardiometabolic space," says Professor Turner, who is head of the Institute's new Cellular Bioenergetics Laboratory.

Professor Turner plans to utilise the Institute's cutting-edge Innovation Centre for many of his projects.

A ONE-STOP-SHOP TO TREAT THE RARE DISEASE **AMYLOIDOSIS**

A diagnosis of amyloidosis used to be something to fear as it was often found far too late.

But new clinical faculty head Dr Nikki Bart says developments in the field are transforming its treatment. She hopes her research at the Institute and St Vincent's Hospital, Sydney, will further improve outcomes for patients affected by this rare disease, that occurs when an abnormal protein called amyloid builds up.

"Amyloidosis is a devastating multisystem disorder that frequently involves the heart. Untreated, the prognosis is extremely poor. Recently, disease-specific therapy has become available, opening up new opportunities to dramatically improve patient outcomes through early diagnosis and treatment," says Dr Bart.

Dr Bart's work was given a huge boost after she and Professor Diane Fatkin were successful in their bid for an International Society of Amyloidosis Pfizer fellowship, which allowed for the appointment of the inaugural Amyloid Fellow.

Through a collaboration with St Vincent's Hospital, Sydney where she works as a cardiologist, Dr Bart, and new fellow Dr Natasha Gorrie will be looking at a genetic first approach to the treatment of amyloid heart disease.

Dr Bart has also established a new state-of-the-art amyloidosis clinic at St Vincent's Hospital which provides patients with access to experts in cardiology, hematology, neurology, and genetics.

EXECUTIVE **DIRECTOR'S AWARD 2021**

TWO WORTHY WINNERS HAVE BEEN PRESENTED WITH THIS YEAR'S EXECUTIVE **DIRECTOR'S AWARD.**

The accolade is handpicked by the Institute's Executive Director, **Professor Jason Kovacic, to recognise** staff who have demonstrated outstanding, consistent leadership that positively fosters engagement, inspires their peers and exemplifies the core values of the Institute.

For the first time this year, the award celebrates not only the achievements and significant contribution of an Operations team member, but it also honours one of our distinguished scientists with a Nobel Prize acknowledgment.

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JENNYFER NGUYEN

Senior Digital Marketing Manager, Jennyfer Nguyen has played a critical role in elevating the Institute's profile since she joined the team in 2020.

Jennyfer's extensive experience has helped revolutionise the Institute's digital platforms, boosting engagement and, vitally, raising overall awareness of heart disease.

Jennyfer is also the co-chair of the Institute's Social Club and a valued advisor to our Diversity Committee.

"

THE NOBEL PRIZE IS **MORE THAN JUST A PRIZE; IT DISTINGUISHES THOSE WHO HAVE GRANTED THE GREATEST BENEFIT TO HUMANKIND**

EXECUTIVE DIRECTOR PROFESSOR JASON KOVACIC

Professor Boris Martinac, has been recognised for his pivotal role in the 2021 Nobel Prize for Physiology or Medicine, which was jointly awarded to Professors David Julius and Ardem Patapoutian for their research into how our bodies sense touch.

The Nobel Prize Assembly specifically highlighted Professor Martinac for his ground-breaking work 30 years ago, proving the existence of mechanosensitive channels. This foundational discovery paved the way for the most recent breakthrough.

Leading the Mechanobiology Laboratory, Professor Martinac has also been recognised for his longstanding commitment and contribution to the Institute over the past decade.

PROFESSOR BORIS MARTINAC

FUNDING SUCCESSES, SCHOLARSHIPS & ACCOLADES

FUNDING SUCCESSES

Professors Boris Martinac, Livia Hool and Michael Feneley were awarded a \$1.2 million NHMRC Ideas Grant to further the understanding of heart hypertrophy.

A \$6 million Genomics Health Futures Mission grant was awarded to the Australian Functional Genomics Network, co-chaired by Professor **Sally Dunwoodie**.

Four NHMRC Investigator Grants were awarded. **Professor Dunwoodie** and **Associate Professor Emily Wong** will drive genetic and epigenomics research into congenital heart disease, **Professor Richard Harvey** will investigate new horizons in cardiac fibrosis, whilst **Professor Bob Graham** will lead research into the regeneration of damaged heart muscles.

Professors Bob Graham, Andrew Jabbour, Peter Macdonald, and Dr Kavitha Muthiah were part of a successful Stem Cell Therapies Mission Grant which will investigate a new therapy for no-option end-stage heart failure.

Professor Richard Harvey was also part of a team awarded a Stem Cell Therapies Mission Grant to investigate if bioengineered heart tissue from pluripotent stem cells can treat congenital heart disease.

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Dr Renjing Liu and Professor Diane Fatkin were both awarded funding from The Baxter Charitable Foundation. This will allow Dr Liu to expand her work into atherosclerosis and Professor Fatkin for research into atrial fibrillation. **Dr Charles Cox** obtained a grant from the Medical Advances Without Animals Trust.

Dr Mayooran Namasivayam received funding from the Clive and Vera Ramaciotti Foundation to investigate aortic stenosis.

AWARDS AND SCHOLARSHIPS

Dr Celine Santiago, Dr Monique Bax, and Dr Jeanette Villanueva were awarded NSW Cardiovascular Research Network Professional Development Awards.

Dr Yashutosh Joshi and Dr Lucy McGrath-Cadell were awarded National Heart Foundation PhD scholarships. Dr McGrath-Cadell was also awarded an NHMRC Postgraduate Scholarship.

Dr Sarah Scheuer took home the Game Changer Award at the ACvA Excellence in Cardiovascular Research Awards.



Cardiac Re



























PROF BORIS MARTIINAC









ART OF THE HEART

Everyday our scientists capture fascinating microscopic images of the hidden world around us, in their search to discover ways to treat and prevent heart disease.

The peer-reviewed Art of the Heart scientific art competition is a chance to showcase the abundance of talent and enormous technical skill at the Institute.

These complex artworks plunge

you inside the amazing process of

stem cells or open a window into how our genes are switched on and off.

have inspired some of the greatest shifts in how we think about life on our planet. Today they continue to transform the way our scientists see the world, understand our hearts, and fight cardiovascular disease. how blood cells are transformed into

Throughout history, micro images











OUR 2021 WINNERS ARE

- Best Scientific Image Monique Bax – 'Phoenix'
- Joint Runners-Up Dr Bob Lee and Dr Meghna Sobti – 'Visualising Blood Re-perfusion' and 'Access Denied'
- Best Technical Image Senior Research Assistant Ella Martin – 'The Heart Speaks Volumes'
- Best Artistic Image Dr Monique Bax – 'Phoenix'
- People's Choice Award Dr Monique Bax – 'Have a Heart'



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FUNDRAISING

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It documents the incredible journey Ollie has undergone since being born with a badly damaged heart, including open-heart surgery when he was just a few weeks old.

Ollie is now a happy five-year-old and has just started school, but four babies die of congenital heart disease every week in Australia.

the cause is unknown.

The Institute's scientists are hoping to change that. Professor Sally Dunwoodie has found a genetic cause for various



THE LITTLE **BOY WITH THE BIGGEST SMILE**

Ollie is a true Aussie battler who makes everyone's heart melt.

We were incredibly grateful when his parents Kellie and Paul Taylor let us share this beautiful scrapbook of his life for our Christmas Appeal.

In approximately 80% of these cases,

heart birth defects and crucially, a possible way to prevent some cases.

Professor Dunwoodie and her team found a deficiency in a vital molecule, known as NAD, prevents a baby's organs from developing correctly in the womb.

They are now trying to identify the proportion of women who might be low in NAD levels and would potentially benefit from increasing their vitamin B3 intake. The next step is to develop a diagnostic test to measure NAD levels to identify those women who are at greatest risk.

SOHN HEARTS & MINDS INVESTMENT **LEADERS CONFERENCE**

A record 1,667 people attended the Sohn Hearts & Minds Investment Leaders Conference in 2021. Once again, the virtual conference provided an opportunity to engage with a global audience with the largest number of attendees viewing from Australia, the USA, the UK, Singapore, Switzerland, and New Zealand.

Hosted for the third time by comedian To date, the conference has raised and mathematician Adam Spencer, the conference delivered investors exclusive medical research organisations. In content. Many of the carefully curated international thought leaders rarely speak in public, let alone reveal their stock ideas.

In 2021 attendees were treated to a much-anticipated Q & A session with legendary investor Charlie Munger, Vice-Chairman of Berkshire Hathaway Inc (under Warren E. Buffett) by Dr Mark Nelson, Chairman, and Co-Founder of Caledonia.

Other notable and highly relevant international speakers in today's environment included:

- ▶ Professor Robert Langer, MIT Langer Lab, and Co-Founder of Moderna COVID-19 vaccine
- ► Lawrence Gozlan, Chief Investment Officer and Founder of Scientia Capital, a specialized global fund focused exclusively on Life Sciences.

Integral to the success of the conference is the ongoing support of our major partners; Commonwealth Bank, Paul Ramsay Foundation, the Ainsworth Foundation, and the Sohn Conference Foundation.

more than \$30 million for numerous 2021, the beneficiaries included our own Victor Chang Cardiac Research Institute, Menzies Institute for Medical Research, Shake It Up Australia Fund, Brain Cancer Collective, and Financial Markets Children's Foundation.

The Institute together with the medical research sector is hugely grateful to the Sohn Hearts & Minds Investment Leaders Conference for its ongoing commitment to supporting Australian medical research.

The audience also heard from the Institute's Dr Alastair Stewart who is helping to deliver new anti-viral treatments for COVID-19.

TO DATE:

120 SPEAKERS

180 PARTNERSHIPS

5900 ATTENDEES

+\$30M DONATION



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CHARLIE MUNGER Berkshire Hathaway (USA)

DR MARK NELSON Caledonia Investments

CHARITY STEER BRINGS EASTER CHEER

The Schute Bell Badgery Lumby charity steer auction at the Sydney Royal Easter Show once again raised much-needed funds for the Institute.

The auction has raised more than \$400,000 since 1998 and helps deliver life-changing breakthroughs for families affected by heart disease.

This year 12-year-old Memphis Jackson, who was born with hypoplastic left heart syndrome, was the guest of honour at the auction. Memphis, who has had four open-heart surgeries, attended the auction with his family and was able to get up close to the animal of the hour, Chumps.

The steer was bought for \$32,000 for the 13th year in a row by cattle farmer Paul Ferry.

A huge thanks to Mr Ferry, the Schute Bell team, and St Stanislaus College, Bathurst for prepping the steer.

TOTAL RAISED: \$32,000

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Top: Memphis and his brother Cayless Bottom: The St Stanislaus College show team

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FINANCIALS AND ACKNOWLEDGEMENTS

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FINANCIALS

FOR THE YEAR ENDED 31 DECEMBER	2021	2020
	\$	\$
INCOME		
Research Grants	\$15,237,277	\$12,602,720
Innovation Centre Grant	\$1,677,460	\$1,677,460
Donations and Fundraising	\$11,912,419	\$7,404,102
Investment and Other income	\$1,183,838	\$951,971
Total income	\$30,010,994	\$22,636,253
EXPENSES		
Research expenses	\$17,674,435	\$17,690,494
Administration expenses	\$7,119,494	\$7,024,754
Fundraising expenses	\$2,108,279	\$1,944,661
Total Expenses	\$26,902,208	\$26,659,909
OPERATING SURPLUS/(DEFICIT)	\$3,108,786	(\$4,023,656)
NON OPERATING INCOME/(EXPENSES)		
Gain on revaluation financial assets	\$2,644,362	\$613,747
Net Surplus/(Deficit) before Government Subsidies	\$5,753,148	(\$3,409,909)
Government Subsidies	\$36,906	\$ 3,757,534
Net Surplus for the year	\$5,790,054	\$347,625

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Comparative figures have been adjusted to conform with changes in presentation for the current year.

The above is an extract from the 2021 audited Financial Statements. The extract does not include the information normally included in the financial statement. Accordingly, this extract is to be read in conjunction

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For more about our organisational structure visit: victorchang.edu.au/about-us/our-structure

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victorchang.edu.au

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SUPPORTERS AND ACKNOWLEDGEMENTS

The Victor Chang Cardiac Research Institute would like to thank every one of its supporters. Our research would not be possible without your incredible generosity.

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