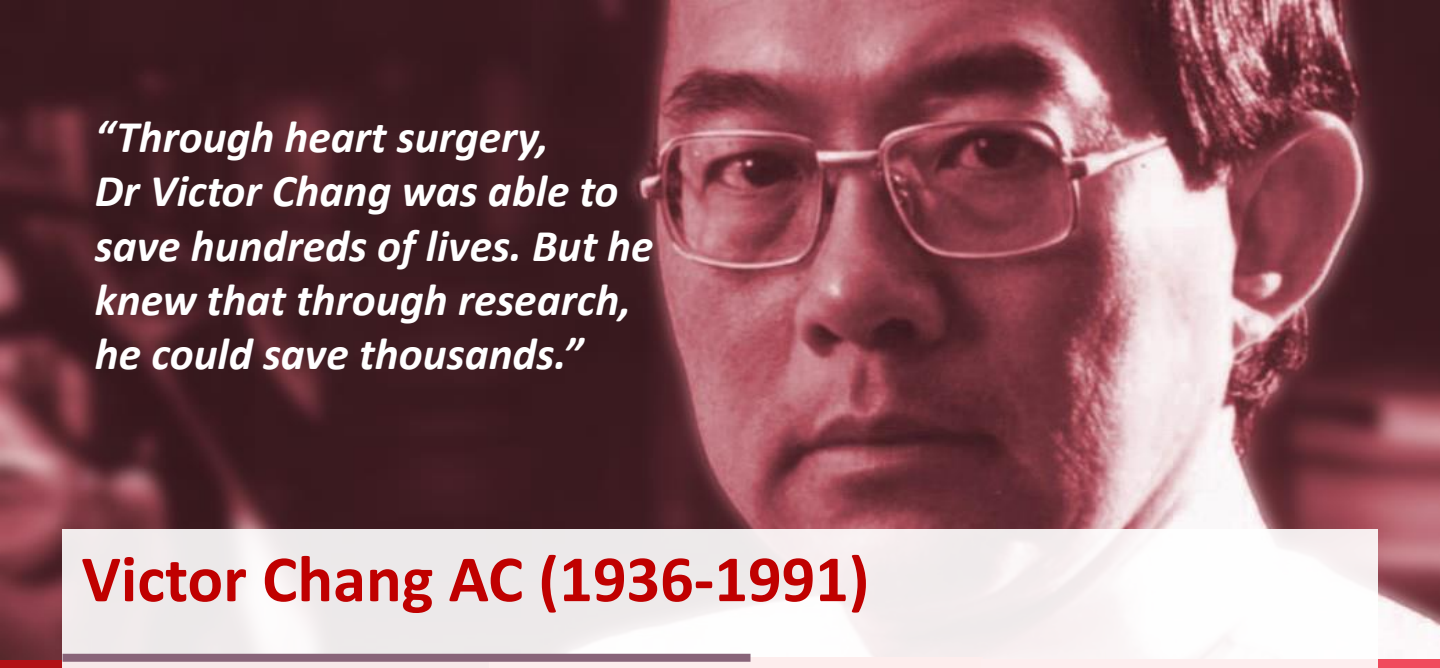
Victor Chang
Cardiac Research Institute

SCHOOL PROJECT MATERIAL 2018

Dr Victor Chang AC, 1936-1991
Pioneer of modern heart transplant surgery and humanitarian.



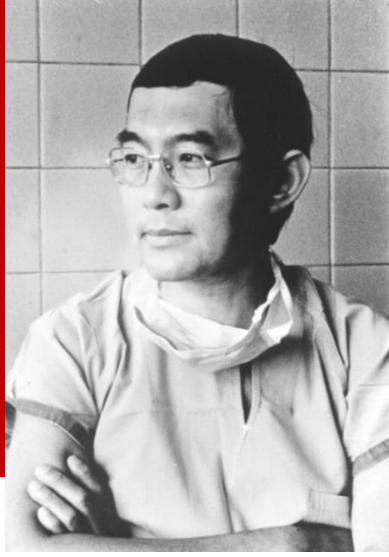
"Through heart surgery, Dr Victor Chang was able to save hundreds of lives. But he knew that through research, he could save thousands."

Victor Chang AC (1936-1991)

Dr Victor Chang was one of Australia's most gifted heart surgeons, a pioneer of modern heart transplant surgery and a humanitarian. A national hero, Victor Chang was hailed as 'the most prominent doctor in the southern hemisphere', and his revolutionary work in the field of heart transplantation had implications for cardiac patients around the globe.

Dr Chang personally saved hundreds of lives. In 1984, he led a team of surgeons who successfully performed a heart transplant on schoolgirl, Fiona Coote. At the age of 14, Fiona defied all odds to become Australia's youngest heart transplant survivor, and some three decades later remains very well.

In that same year, Dr Chang founded the National Heart Transplant Program at St Vincent's Hospital, which has since performed thousands of successful transplants. Dr Chang also played a key role in developing an artificial heart valve and an artificial heart assist device.



Born in Shanghai to Australian born Chinese parents in 1936, Victor Chang (Yam Him) came to Australia in 1953 and completed his schooling at the Christian Brothers College in Lewisham. In 1962 he graduated from Sydney University with a Bachelor of Medicine and Bachelor of Surgery.

After training in cardiothoracic surgery at the Mayo Clinic (USA) and in the UK, he returned to St Vincent's Hospital, Sydney. For the next two decades, he operated alongside his colleagues Dr Harry Windsor and Dr Mark Shanahan, who had performed Australia's first ever heart transplant in 1968.

A caring surgeon and humanitarian, Dr Chang was passionate about the power of discovery. He had a bold vision to establish a world-class medical research institute, knowing that while he could save hundreds of lives through surgery, he could save thousands more through research.

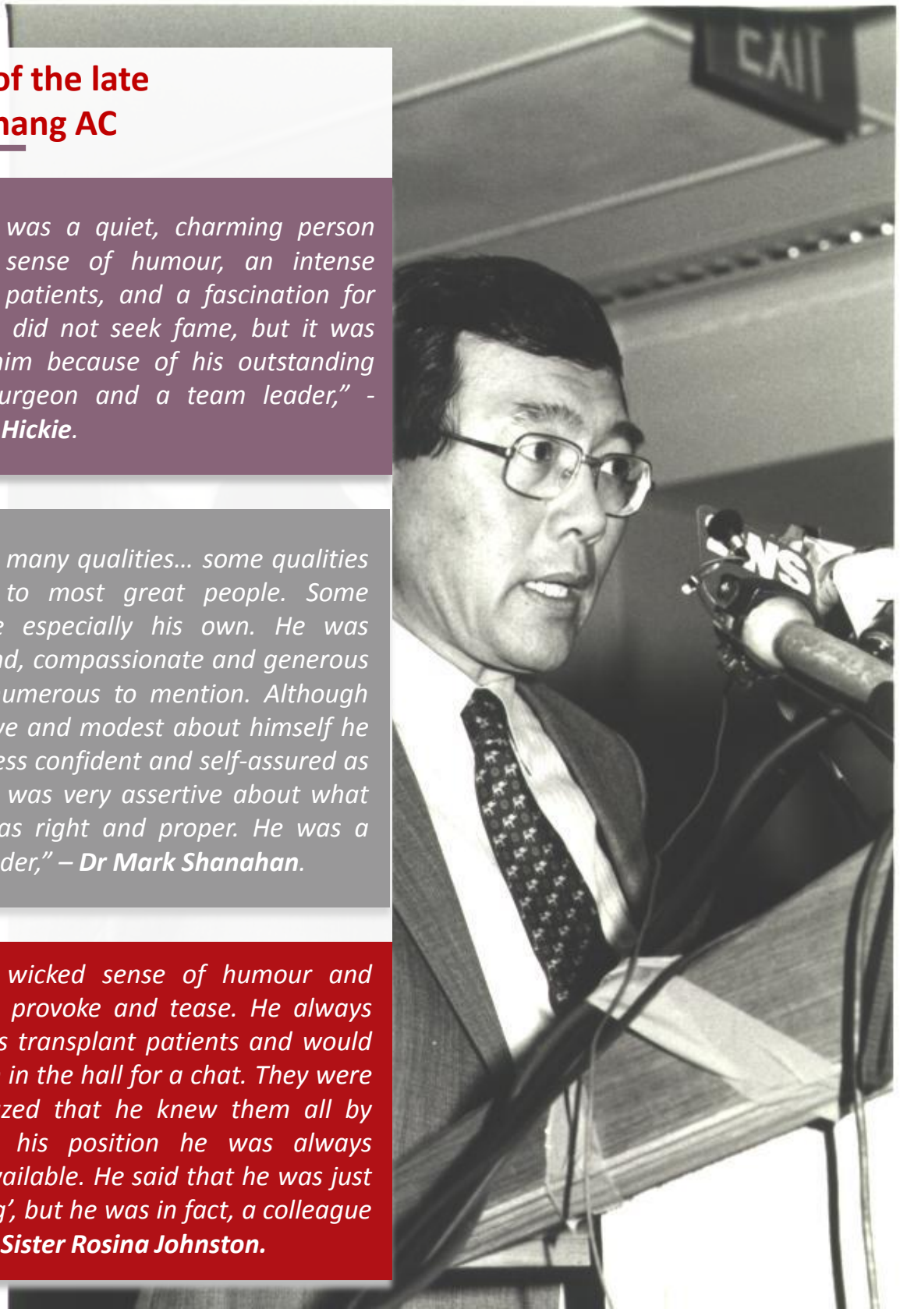
Victor Chang died in tragic circumstances on a Sydney street on 4 July 1991. He is remembered as a quiet, charming man, much loved by his patients and friends, his wife Ann and his children Vanessa, Matthew and Marcus. The Victor Chang Cardiac Research Institute is dedicated to his memory.

Memories of the late Dr Victor Chang AC

"Victor Chang was a quiet, charming person with a good sense of humour, an intense interest in his patients, and a fascination for technology. He did not seek fame, but it was foisted upon him because of his outstanding ability as a surgeon and a team leader," - ***Professor John Hickie****.*

"Victor had so many qualities… some qualities are common to most great people. Some however were especially his own. He was abundantly kind, compassionate and generous in ways too numerous to mention. Although gentle, sensitive and modest about himself he was nevertheless confident and self-assured as a surgeon. He was very assertive about what he thought was right and proper. He was a great team leader," – ***Dr Mark Shanahan****.*

"Victor had a wicked sense of humour and dearly loved to provoke and tease. He always had time for his transplant patients and would often stop them in the hall for a chat. They were constantly amazed that he knew them all by name. Despite his position he was always gracious and available. He said that he was just 'one of the gang', but he was in fact, a colleague and a friend," – ***Sister Rosina Johnston.***



Victor Chang Cardiac Research Institute

The Victor Chang Cardiac Research Institute

The Victor Chang Cardiac Research Institute is dedicated to finding cures for cardiovascular disease and has earned its place on the global stage as one of the most respected facilities in the world.

Renowned for the quality of its medical breakthroughs, the Victor Chang Institute uses innovative transplantation techniques and conducts complex molecular and genetic analysis, to discover better ways to diagnose, treat and ultimately prevent the onset of heart disease.

Founded in 1994, the Victor Chang Institute is the legacy of legendary heart transplant surgeon, Dr Victor Chang. Beginning with just two scientists, the Victor Chang Institute is now home to more than 300 researchers and staff.

History of the Victor Chang Cardiac Research Institute

1936

Victor Chang born in Shanghai to Australian-born Chinese parents.

1953

Victor migrates to Australia as a student at the Christian Brothers College, Sydney.

1962

Victor graduates from Sydney University with a Bachelor of Medicine, Bachelor of Surgery, becoming an intern and, later, a registrar in cardiothoracic surgery at St Vincent's Hospital, Sydney.

1968

Dr Harry Windsor and Dr Mark Shanahan perform Australia's first heart transplant at St Vincent's Hospital.

1984

The National Heart Transplant Program is founded at St Vincent's Hospital by Dr Victor Chang.

April 8th, a team of doctors led by Dr Chang, operates on 14-year-old Fiona Coote, who becomes Australia's youngest heart transplant recipient.

1986

Dr Chang awarded Australia's highest recognition, a Companion of the Order of Australia (AC).

1990

Dr Victor Chang spearheads the Heart of St Vincent's Appeal. This appeal raises much-needed funds for a Cardiac Transplant Ward and Cardiac Diagnostic Unit at St Vincent's Hospital, Sydney.

1991

Victor Chang dies in tragic circumstances in Sydney on the 4th of July.

1994

The Victor Chang Cardiac Research Institute is officially launched on the 14th of February by then Prime Minister, the Hon Paul Keating MP, with Kerry Packer, AC, as Patron and Prof Robert Graham as Executive Director. It was founded, originally under the auspices of the Sisters of Charity and St Vincent's Hospital – the Sisters recognising the importance of research as fundamental to better health outcomes.

1995

The Victor Chang Cardiac Research Institute is accredited as an independent research organisation, with the Hon Neville Wran, AC, QC as its inaugural chairman.

1996

The Institute's temporary premises at the Garvan Institute of Medical Research are opened by the late Diana, Princess of Wales.

The Victor Chang Cardiac Research Institute hosts its first International Symposium on Molecular Structure, Function and Development of the Heart.

1997

Death of Diana, Princess of Wales – Victor Chang White Rose Day named in her memory.

The Victor Chang Cardiac Research Institute formally becomes affiliated with the University of New South Wales.

1998

The inaugural Princess' Lecture held in honour of the late Diana, Princess of Wales, delivered by Professor Sir Magdi Yacoub.

The Paul Korner Seminar series is established to recognise the outstanding contributions of Professor Paul Korner, a pioneer of cardiovascular research in Australia. The series is presented weekly, providing our young scientists with the opportunity to present an update of their research progress and achievements.

2000

Dr Victor Chang voted Australian of the Century by the people of Australia.

2004

Launch of the Victor Chang School Science Awards to recognise the scientific achievements of students from schools within the west, south and south west of Sydney.

2005

Her Royal Highness Crown Princess Mary of Denmark is Guest-of-Honour at The Victor Chang Royal Ball.

The Victor Chang Cardiac Research Institute mourns the death of Patron, Kerry Packer, AC.

2006

Construction commences on the nine storey Lowy Packer Building in Darlinghurst, which will become the Victor Chang Cardiac Research Institute's new home.

2007

Michael Renford, son of the late Des Renford, swims the English Channel to raise money for the Victor Chang Cardiac Research Institute.

Chain Reaction inaugural charity bike ride, raising money for children with heart defects.

2008

Construction of the Lowy Packer Building is complete and formally opened by Her Royal Highness Crown Princess Mary of Denmark on September 3rd. Princess Mary also attends a dinner with His Royal Highness Crown Prince Frederik at the Institute.

The Hon Neville Wran retires as Chairman and becomes a Patron of the Institute.

Paceline INC. founder, Steve Quinn, cycles across the USA to raise money for research into cardiac arrhythmias and the Victor Chang Cardiac Research Institute.

2013

Steven Lowy AM, stands down as Chairman, leaving the board after 19 years as a Director of the Institute, including the last six as Chairman. Matthew Grounds is appointed as Chairman of the Board.

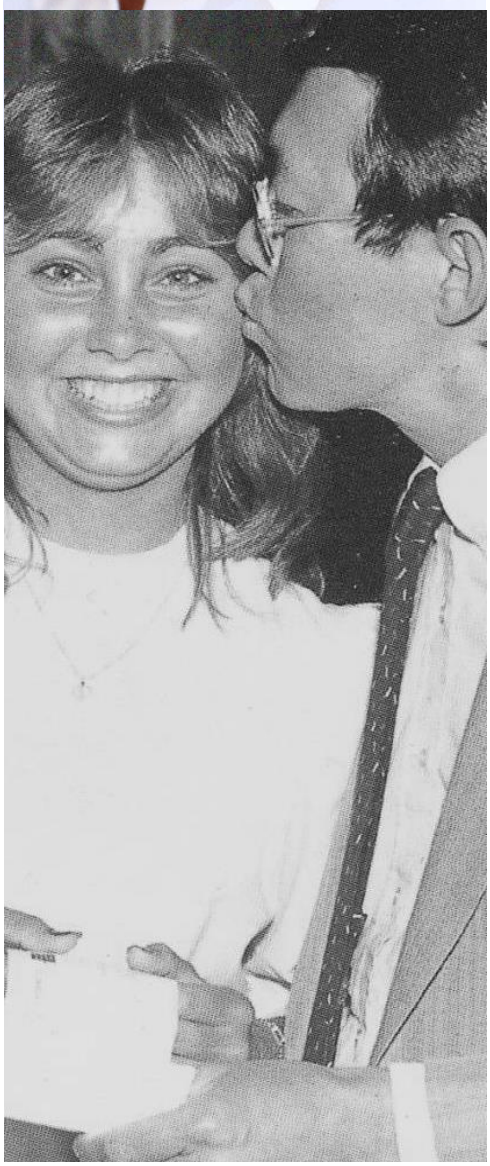
2014

The Hon Neville Wran dies, aged 87. *Tribute on page 54.*

Fiona Coote celebrates 30 years since her life saving heart transplant performed by Dr Victor Chang.

20 CELEBRATING 20 YEARS OF DISCOVERY 1994-2014

The Victor Chang Cardiac Research Institute celebrates 20 years of discoveries.



Fiona Coote

In April 1984, Tamworth teenager Fiona Coote became Australia's youngest and first female heart transplant patient. Dr Victor Chang operated on Fiona at St Vincent's Hospital after she suddenly fell gravely ill from viral-induced tonsillitis.

While the operation was a success, less than two years later, her body rejected the donor heart and Fiona had to undergo a second heart transplant.

Now, over 30 years since her first operation, Fiona is the longest-surviving heart transplant recipient in the southern hemisphere with her second donor heart still beating strong!

Fiona Coote, Ann Chang and Princess Diana at the official opening of the Institute in 1996

Fiona remembers Dr Chang as *"someone who inspired confidence in all… he was fun, cheeky, charming. He loved life!"*

She believes her continued health and well-being is a combination of taking daily immunosuppressant medication, a good diet, exercise, plenty of rest and a healthy lifestyle.

Fiona has spent much of her life in the public eye and has used her high profile to support and raise awareness for a number of charitable organisations, including the Victor Chang Cardiac Research Institute.

In 1999, Fiona was appointed as a Member of the Order of Australia (AM) for her role in increasing public support and awareness of heart disease, as well as her work raising funds for seriously and terminally ill children.

At the Victor Chang Cardiac Research Institute we have **six** research divisions each dedicated to investigating different areas of heart disease.

Cardiac Physiology & Transplantation:

Heart transplantation is by far the most effective treatment for patients suffering advanced heart disease. But it is a last resort. That's why this research division is trying to discover better alternatives to heart transplantation.

Developmental & Stem Cell Biology

This division's goal is to understand how the heart forms in an embryo and the cause of congenital heart disease, birth defects, and recurrent miscarriage. Our scientists are also investigating stem cells in the heart and the heart's ability to regenerate itself.

Molecular Cardiology & Biophysics

This group aims to understand the pathways inside the heart and the source of inherited genetic heart diseases, like cardiomyopathies and arrhythmias. Arrhythmia is an electrical disorder of the heart and is one of the most common causes of death in Australia.

Molecular, Structural and Computational Biology

This division investigates the function of the heart in health and disease, and examines gene regulation. Understanding the structure and processes of proteins in the heart is crucial for diagnosing and treating disease.

Vascular Biology

The aim of this research is to understand atherosclerosis which is the hardening of blood vessels. Atherosclerosis is the leading cause of heart attacks and stroke in Australia. This laboratory studies factors that contribute to the disease and how they can be prevented!

Victor Chang Innovation Centre

The Victor Chang Innovation Centre is needed to help the nation's 3.7 million children and adults affected by cardiovascular disease. It will ensure patients in NSW receive the best possible cardiovascular care. Featuring cutting edge technology, it will attract world class researchers to NSW and allow us to make meaningful breakthroughs.

OUR RESEARCH DIVISIONS

Fast Facts!

10.8 million adults are either overweight or obese in Australia

340,000+ Australians are estimated to have had a heart attack at some time in their lives

Many **millions** of heart muscle cells are lost after a heart attack

40 Australians die because of a heart rhythm disorder everyday

Heart defects are the most common birth abnormality; **1 in 100** babies are born with congenital heart disease

Everyday your heart creates enough energy to drive a truck for **32** kilometres

40,000 zebrafish call the Victor Chang Institute home!

The DNA in your cells is shaped like a tightly coiled spiral; If you stretched out all the DNA in your body end to end, it would reach further than the moon and back again!

20,000+ genes are in the human body

In 2017, **98** people received a heart transplant

Surgeons now have up to **14** hours (previously **4** hours) to transplant a heart thanks to breakthroughs by the Victor Chang Institute & St Vincent's Hospital.

20,000 Australians suffer a cardiac arrest outside of hospital every year

Celebrating 20 years of innovation and discovery

Over the past two decades, the Victor Chang Cardiac Research Institute has made a plethora of major advances, many revolutionising our understanding of disease causation, mechanisms and medical treatments. Here are just a few examples of what we have achieved.

2014

World first transplantation of a 'dead' heart that had stopped beating for 20 minutes, to save the lives of patients with severe heart failure.

2012

Thanks to our scientists, an entire family is cured of a life threatening, inherited heart rhythm disorder. Some family members had such severe heart failure they were on the transplant waiting list.

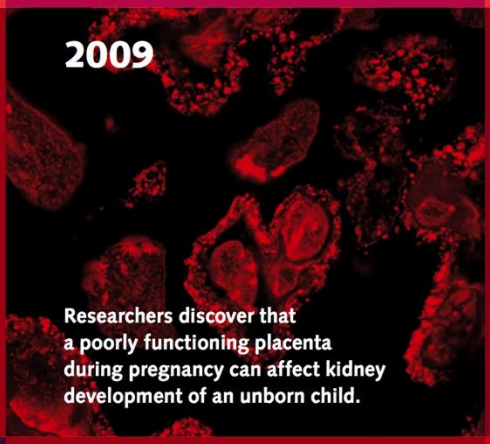
2013

For the first time, our scientists show the importance of a single gene (Nkx2-5) in forming the large vessels of the heart.

2009

The Victor Chang Cardiac Research Institute develops a unique preservation solution to protect transplant hearts for up to eight hours. Previously four hours was the maximum time.

2009



Researchers discover that a poorly functioning placenta during pregnancy can affect kidney development of an unborn child.

2007

Our breakthrough discovery demonstrates that certain types of congenital heart defects occur at a much earlier stage in the development of a baby than ever expected.

2000

We discover that without both copies of a single gene mutation, the heart cannot grow during development in the womb, but if only one is defective, it can result in a heart defect, such as a hole-in-the-heart.

1999

We demonstrate that epigenetic 'signals', which regulate the functioning of our genes, can be passed on from one generation to the next along with our DNA.

1999

Scientists discover the entire cellular machinery underlying growth and enlargement of skeletal muscle.

Victor Chang Cardiac Research Institute

2014

In another world first, our scientists develop a faster more reliable way of diagnosing patients at risk of sudden cardiac death.

2014

Overturning a century of dogma, we discover that the heart can regenerate in pre-adolescents, which potentially means a heart could heal itself.

2013

Researchers have found that obesity and diabetes during pregnancy can cause children to develop metabolic problems later in life.

2012

Our researchers make a landmark discovery that shows for the first time how 'nature' and 'nurture' interact to cause birth defects.

2011

Our scientists identify and characterise a new population of stem cells in the adult heart.

2011

Our team demonstrates how the potassium channels that carry electricity around the heart open and close, controlling heartbeats.

2010

Our breakthrough discovery reveals how the tiny motors on bacteria allow them to rapidly change direction and move towards nutrients and away from toxins. This is crucial to the spread of infections, such as those causing serious heart conditions.

2006

Scientists show that the diet of pregnant mothers can affect the health of their children and even their grandchildren.

2005

We discover how cells control the amount of protein produced by each gene, by studying tiny bits of genetic material called microRNAs.

2004

For the first time Victor Chang scientists prove diseases can be caused not only by a defective gene (mutation), but by an inherited defect in the expression of a gene (an epi-mutation).

2002

We find that a new drug treatmentcan slow the progression of pulmonary arterial hypertension – a serious and progressive disease.

1998

Victor Chang researchers participate in a major international trial that provides definitive proof that statins lower cholesterol and prevent death.

1997

Scientists develop a non-invasive test to predict those at risk of stroke from a clot in the heart.

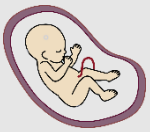
1994

Groundbreaking research reveals an enzyme previously only associated with clotting, has many functions and, uniquely, can also regulate how vigorously our heart can beat.

Victor Chang
Cardiac Research Institute

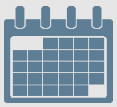
INTERESTING FACTS

1 The heart:



Is the first organ to form and function in the embryo.

Starts to beat and pump blood at around 22 days.



Starts to form at 18 days.

2 The heart beats:

70 times a minute.

10,000 times per day.

Approximately 2.5 billion times in a lifetime.

3 The heart pumps:

70-100ml of blood per beat.

Blood around the entire body in 23 seconds.

4 Cardiovascular disease:

Kills one Australian every 12 minutes.

Kills more people than any other disease in the world.

Is Australia's leading cause of death.

One Australian suffers a heart attack every 10 minutes.

WOMEN & HEART DISEASE

3 times more women die of heart disease than breast cancer

24 women die of heart disease every day in Australia

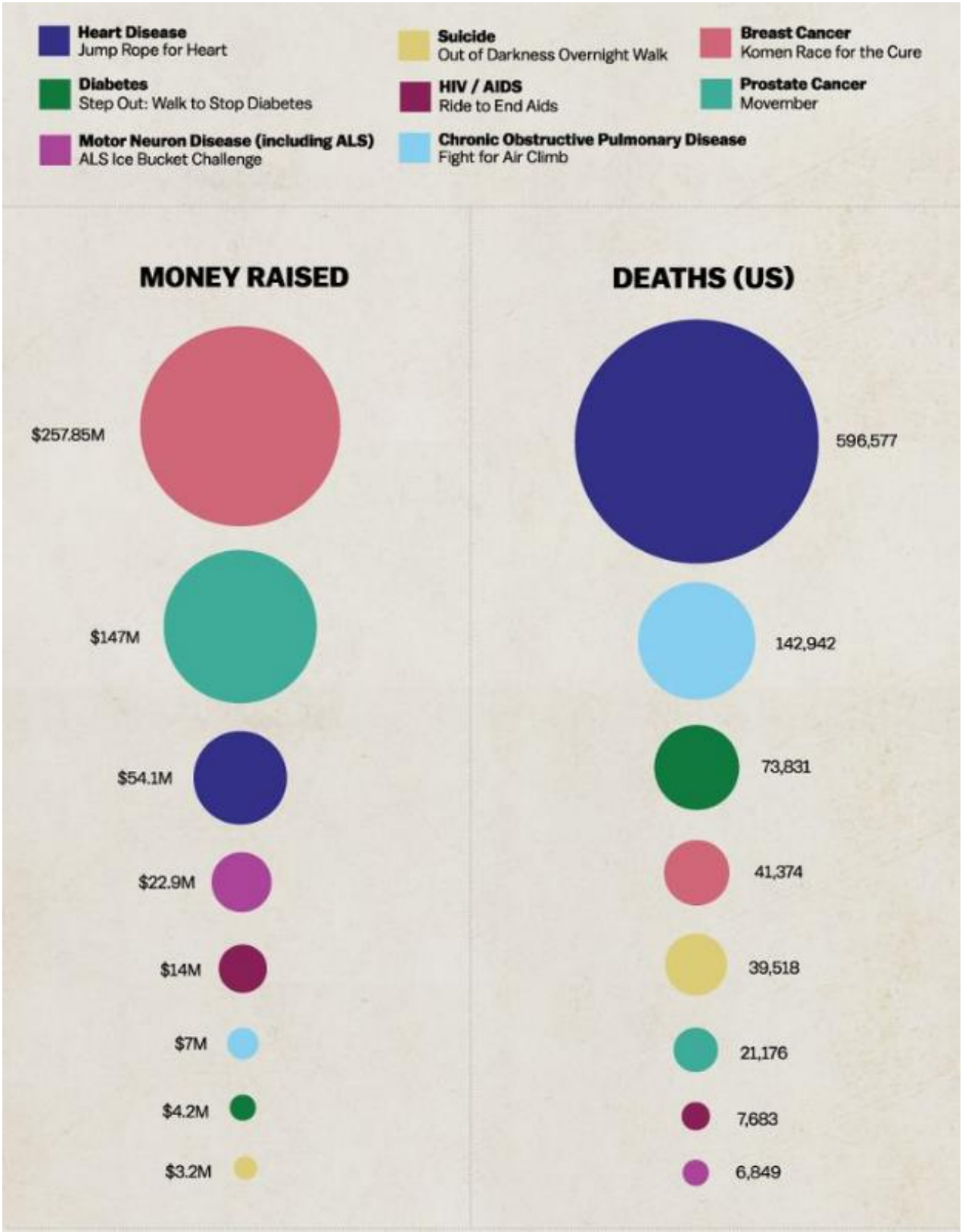
Many women have **different** heart attack **symptoms** to men

Heart attacks claim the life of **11** Australian women every day

50 Australian women suffer a heart attack every day

9 out of **10** Australians have at least one risk factor for Cardiovascular disease

Where we donate v diseases that kill us



Source: Statistics from 2011 Centre for Disease Control and Prevention Report.

Victor Chang Cardiac Research Institute

Heart transplants

Heart failure occurs when the heart becomes too weak to pump blood around the body. Millions of heart muscle cells die and cannot be repaired after injury like a heart attack. This is a major contributor to heart failure.

Heart failure may also be due to a chronic health problem like long-term high blood pressure, a problem with heart valves or from an inherited disease like cardiomyopathy.

Symptoms of heart failure include:

- Breathlessness
- Tiredness
- Swelling of the legs and abdomen
- Electrical disturbances affecting the heart's rhythm

In the most severe cases the only effective treatment is a heart transplant. When a patient needs a transplant they are put on the organ donor waiting list. In Australia, more than 100 people are waiting for heart transplants at any one time, often for up to two years. Sadly, one in five people will die whilst on this list.

In preparation for the procedure, the patient's kidneys, liver and other organs are tested and must be functioning well. If a patient fits all the criteria, they are added to the wait list and will be contacted as soon as a suitable donor heart becomes available. Heart transplant surgery usually takes about four hours if the procedure runs smoothly.

After the operation, the patient will normally stay in hospital for eight to ten days. They are then required to have regular check-ups, biopsies and attend rehabilitation sessions. Eventually, the patient is only required to have annual assessments to ensure their heart continues to function properly.

Directly after surgery most patients will suffer some form of organ rejection, especially in the first six months. This is because their body recognises the transplanted heart as 'foreign' and the immune system tries to 'reject' the new organ. Consequently, they remain on standard anti-rejection therapy for the rest of their life.

The average heart transplant can last ten to fifteen years and can be performed on people from infancy to 65, although results are not quite as good in patients over 60. If the transplant is successful and the patient recovers well, recipients can usually go back to work and lead a normal, physically active life.

Victor Chang Cardiac Research Institute

Congenital Heart Disease

Congenital heart disease (CHD) is a collective term for any type of abnormalities of the heart, aorta, or other large blood vessels which are present when a baby is born. Congenital heart defects change the normal flow of blood to the heart. CHD is the most common form of birth defect in the world, affecting 1 in 100 babies.

There are many types of congenital heart diseases and the severity varies in every baby. Some defects are simple and do not require treatment, while others are more complex or life-threatening, and may need multiple surgeries over many years.

Congenital heart disease can be classified into the following categories:

- **Holes in the heart** may form in the septum (wall that separates the heart chambers) or between the major blood vessels. A hole will allow oxygen-rich and oxygen-poor blood to mix. If a lot of blood is mixed due to large holes in the heart, the blood circulated around the child's body will not carry enough oxygen. This is commonly referred to as blue baby syndrome.
- **Obstructed blood flow** occurs when blood vessels or heart valves are narrower than normal due to a heart defect. When this happens, the heart muscle needs to work harder in order to pump blood through the valves and around the body. This can eventually lead to thickening or enlarging of the heart.
- **Abnormal blood vessels** occur when the blood vessels going to and from the heart do not form properly or are not positioned correctly, leading to a variety of heart defects. This ultimately affects the flow of oxygen-rich blood from the heart to the rest of the body.
- **Heart valve abnormalities** occur when heart valves cannot open and close properly, and oxygen-rich blood cannot flow easily to the rest of the body.
- **An underdeveloped heart** can occur when a major portion of the heart does not develop properly in the womb. As a result, the heart will not be able to work properly.
- **A combination of defects** can occur when babies are born with more than one heart defect which may have grave consequences for the child.

The heart is the first organ to form in the body and starts to develop when an embryo is the size of a sesame seed. Within the first six weeks of pregnancy, the heart begins to take shape and starts beating. During this time, the major blood vessels that run to and from the heart also begin to form. At this critical point in development, heart defects may occur. 80% of CHD cases remain unsolved which means doctors have no idea what caused them.

Heart Attacks

A heart attack results when an artery that supplies oxygen to the heart is suddenly blocked, starving the heart of oxygen. When this occurs, the heart muscle cells begin to die and the longer the heart is without oxygen, the more permanent the damage.

A heart attack can occur when one or more of your coronary arteries become blocked and starves your heart of oxygen. Coronary arteries carry oxygen-rich blood to the heart. If there is a build-up of fatty substances and cholesterol, the arteries will begin to narrow making it harder for oxygen to reach the heart.

Over time, these fatty substances harden and eventually become plaque. If the plaque ruptures, blood cell fragments known as platelets usually stick to the side of the artery that has been injured and can clump together to form blood clots. If a large clot forms, it can block a coronary artery which will result in a heart attack.

Heart attack symptoms vary for each person and can be especially different for men and women. Some people experience mild pain or no warning signs before a heart attack, while others undergo serious symptoms weeks or days in advanced.

The most common heart attack symptoms include:

- Pressure, tightness or pain in the chest and arms which may spread to the neck, jaw or back
- Nausea
- Indigestion or heartburn
- Cold sweat
- Fatigue
- Light-headedness or sudden dizziness

Heart attack warning signs can be different for women. Some common symptoms include:

- Nausea or vomiting
- Extreme fatigue
- Fainting
- Cold sweats
- Pressure in upper back
- Light-headedness
- Dizziness

If you are suffering from a heart attack, you need urgent medical attention at a hospital. A doctor will check your blood pressure, pulse and temperature and assess your symptoms.

Victor Chang Cardiac Research Institute

4 MAJOR RESEARCH BREAKTHROUGHS

Heart Regeneration

- Our scientists discovered special immune cells which are critical for repairing damaged hearts, spinal cords and retinas in zebrafish.

2014

2017

2017

2018

Revolutionising Heart Transplants

- Developed a unique preservation solution that can extend the time a donor heart can spend in transit.

Pregnancy Breakthrough

- Our scientists discovered a vital cause of birth defects and miscarriages.
- They also discovered a way to prevent many birth defects and miscarriages in mice.

Heart Attack Prevention

- Our scientists are pioneering a non-invasive technique to better identify patients at risk of heart attack.

CONTACT US

General Enquires

02 9295 8600

info@victorchang.edu.au

Victor Chang Cardiac Research Institute
Lowy Packer Building
405 Liverpool Street,
Darlinghurst NSW 2010

www.victorchang.edu.au

@VictorChangInst

Social Media

Victor Chang
Cardiac Research Institute