

LuminesCent

Researchers put the spring into stem cell growth

Researchers at the Centenary Institute have found a unique springy substance called tropoelastin to significantly increase the growth of blood-forming stem cells outside of the body. Published in leading journal *Nature Biotechnology*, lead author Professor John Rasko said these findings could improve stem cell transplants.

Professor Rasko, Head of Gene and Stem Cell Therapy at Centenary, said: "Our research demonstrated that physical forces created by elasticity play a key role in the growth of blood-forming stem cells. It may also mimic the environment of stem cells inside our body. We discovered blood-forming stem cells like it to be super stretchy because, like a cat on a sofa, they like to pull on their environment."

Dr Jeff Holst, first author of the publication and a senior researcher at Centenary, combined routinely-used cell hormones with tropoelastin to coat the plates on which the cells were grown. The researchers found growing stem cells on tropoelastin alone could create the same amount of stem cells as the current hormone-based methods. But the combination of the two produced a super effect that could triple the number of stem cells created.

(Main image) Professor John Rasko (standing) and Dr Jeff Holst find a springy surface can boost the growth of stem cells – a finding they hope will help people who have to undergo a bone marrow or cord blood transplant to treat disease, damaged or faulty stem cells.

(Inset) Cell being stretched on a springy bed of tropoelastin.

These findings could be good news for the 1,100 Australians who receive life-saving stem cell transplants (bone marrow and cord blood transplants) each year to treat diseased, damaged or faulty stem cells caused by various conditions or treatments such as leukaemia or chemotherapy.

Professor Rasko explained: "By increasing the number of stem cells we can grow outside of the body we could use less bone marrow or cord blood to get the same result or use the same amount to get a much better result."

These findings could also benefit gene therapy. More stem cells grown outside of the body would effectively provide more time for clinicians to modify genes outside the body to correct serious genetic diseases, such as sickle cell disease and thalassemia, which affect millions of people worldwide. ©

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DIRECTOR'S MESSAGE



Over the past few years, with help from our generous supporters, we have been committed to developing infrastructure and policies that allow our wonderful researchers to soar in their projects.

Our increasing success with NHMRC grants (p3) peaking this year at about 60% (against a national average of 24%) attests to the hard work of our scientists and science support staff. It is also a big THANK YOU to all of you who have so generously given to our Institute.

This does not mean we can now rest on our laurels. Indeed one of the most notable events from last year was the meeting we had with the esteemed scientists on our prestigious Scientific Advisory Board or SAB (back page). I am delighted to say that whilst independent evaluation from the SAB was very positive, they had some great suggestions for improving even further. The SAB believes we have much to be proud of, and our research is on track to continue to make a significant contribution to advancing the diagnosis and treatment of life-threatening illnesses (p7).

Demonstrating this contribution we are making to the world, our researchers announced some major findings late last year.

Our research included discovering a unique way to grow stem cells (cover story), revealing a heart and mind link in sudden unexpected death (p3) and finding a new way to kill drug-resistant ovarian cancer cells (p4).

We also unveiled a new research system to help detect and analyse rare cells (p2). This new equipment will help our researchers improve and accelerate the pace of their work.

All of these achievements have only been made possible by the generous support we have received from our individual donors – and here I want to thank especially those who have agreed to make regular monthly donations, community fundraisers, granting bodies, corporate supporters, volunteers and colleagues. It is this giving spirit that allows us to discover breakthrough findings to change the face of major life-threatening diseases like cancer, cardiovascular disease and infectious diseases.

I also want to mention some groups who regularly go 'above and beyond' for our researchers: our Board members, our trustees and our special benefactors. These dedicated individuals generously donate their time, their expertise and their capital to help us.

We look forward to working together towards another productive year.



Professor Mathew Vadas

World-first system to detect rare cells

A world-first research system at the Centenary Institute will give Australian researchers a new weapon to detect and analyse rare cells involved in cancer and other life-threatening diseases.

The BD LSR9 Flow Cytometer is housed at the Centenary Institute as part of the Advanced Cytometry Facility (ACF) – a joint venture run by the Centenary, the University of Sydney and the Bosch Institute.

Advanced Cytometry Facility Academic Director Professor Nick King said: "Previously, a researcher had to run a sample of cells two or three times using complex labelling systems, which made it difficult to detect rare cell populations. It's like a detective gathering two or three sets of partial fingerprints then piecing them together. The new cytometer will give us a greater range of labels to analyse cells so we only have to run one sample. By generating a more complete 'fingerprint' from one sample, we can make more accurate and direct measurements of cell populations."

Centenary Institute Head of T Cell Biology Professor Barbara Fazekas de St Groth added: "We can now obtain more information from a single analysis than we could from multiple analyses requiring over 10-times more sample material. This will speed up the pace of our research into crucial causes of chronic disease."

Funding for the \$1 million BD LSR9 Flow Cytometer and related systems was kindly provided by the Australian Research Council (ARC), National Health and Medical Research Council (NHMRC), the University of Sydney, University of New South Wales and the Centenary Institute. ©



Extra lasers on the new flow cytometer will give researchers unprecedented ability to detect and analyse rare cells.



Professor Barbara Fazekas de St Groth from Centenary is interviewed about how the new research system will accelerate the pace of research.

Centenary secures major NHMRC grants

Cancer, diabetes, asthma, liver transplant, inflammatory disease and tuberculosis research projects at the Centenary Institute have received funding from the highly competitive National Health and Medical Research Council (NHMRC) Project Grants.

"About 60 per cent of the research projects we applied for funding from the NHMRC Project Grants were successful in receiving this critical grant money. This is an excellent result for the Centenary Institute and it's a much higher success rate than the national average. This money will play a significant role in helping us improve our knowledge of the leading causes of diseases that could ultimately lead to improved diagnosis and treatment options," said Centenary Institute Executive Director Professor Mathew Vadas.

The successful Centenary Institute research projects include:

- Strategies to improve the effectiveness of the immune response against cancer by enhancing the CD4 T-cell mediated anti-tumour immunity – Professor Barbara Fazekas de St Groth
- Discovering when and how B-cells repair damaged genes, which is important for immunity, effective vaccination and protection against cancer – Dr Christopher Jolly
- Investigate how melanoma growth capacity may contribute to therapy resistance by analysing the cell cycle in real time – Dr Nikolas Haass



Image of Dr Bertolino copyright Gary Jones

Dr Patrick Bertolino's research investigating liver transplant acceptance and the implications for effective organ transplants is one of nine Centenary Institute projects to receive a NHMRC grant.

- Improving the rates of returning people with diabetes to insulin-independence by examining the mechanisms of rejection and acceptance of islet grafts – Professor Barbara Fazekas de St Groth
- Control of allergic lung inflammation to help people with asthma – Professor Barbara Fazekas de St Groth
- Mechanisms of liver transplant acceptance and the implications for effective organ transplants – Dr Patrick Bertolino
- Improve the understanding of inflammatory diseases (e.g. arthritis, chronic obstructive pulmonary disease, inflammatory bowel disease, psoriasis) by investigating the dynamics and mechanisms of neutrophil migration – Professor Wolfgang Weninger
- Impact of Influenza A on immunity to tuberculosis (TB) – Professor Warwick Britton
- Identifying genes to help develop new drugs for TB – Dr Nick West ©

PhD student helps uncover a deadly heart and mind link

Investigating sudden deaths in people with epilepsy was a major focus for PhD student Emily Tu, who presented the groundbreaking findings at a leading international congress. Ms Tu also co-authored a paper published in esteemed journal *Brain Pathology*.

Sudden unexpected death in epilepsy (SUDEP) is the most common cause of epilepsy-related death causing about 150 Australian deaths each year, yet the underlying cause remains a mystery.

"Epilepsy is a neurological disorder and we do not know the exact causes leading to SUDEP," said Ms Tu. "However, we do know a number of genetic cardiac disorders also cause sudden unexpected deaths. I looked at a set of cardiac genes in a group of people who had died from SUDEP and found potential genetic variants, which could play a key role in SUDEP. This suggests a possible link between the heart and brain in the sudden death of epilepsy patients."

Ms Tu and her fellow researchers checked the post-mortem blood samples of SUDEP cases from 1993 to 2009 for the three most common long QT syndrome genes (KCNQ1, KCNH2 (HERG), SCN5A). Of the 48 cases that could be analysed, they found the faulty genes were present in six (13%) cases.

Ms Tu delivered a presentation of these findings at the Cardiostim 17th World Congress in France that captured the interest of scientists, cardiologists and electrophysiologists from around the world.

As Ms Tu's advisor and leader of this research Professor Chris Semsarian explained: "SUDEP occurs mainly in young people, so these findings could have a huge impact in saving lives through early diagnosis. The ultimate goal will be to use genetic screening of patients with epilepsy to identify gene mutations that could increase the risk of sudden unexpected death."

While the findings are a major first step in understanding the cause of SUDEP, more research is needed to determine the exact role these genetic mutations play. ©



Centenary Institute PhD student Emily Tu and her advisor Professor Chris Semsarian discover a deadly heart and mind link in sudden unexpected death in epilepsy.

RESEARCHER PROFILE

Meet Centenary's cell whisperer

While he wouldn't say it himself, Associate Professor Pu Xia is a talented amateur artist in Chinese calligraphy and water colours. Shu Fa or Chinese calligraphy is a relaxing yet disciplined exercise so it's no wonder Dr Xia uses a creative yet strategic approach to paint a brighter future.

Most people understand that diseases like cancer come from gene mutations. But few understand that numerous factors drive these mutations and these mutations then need additional factors to cause disease. As head of our Signal Transduction lab, Dr Xia investigates the critical factor of communication between cells and how this can lead to disease. Dr Xia and his team are trying to crack this communication code to develop an understanding to develop new strategies or treatments to interrupt the signals that can cause disease.

Why did you become a medical researcher?

"I was a clinician for 10 years in China. As a doctor I'd talk to patients and try to treat them and maintain their health. If you're a good doctor you can save maybe hundreds or thousands of individuals but basic science looks at the whole population so the benefits are long term and the potential to help people is huge.

"I became a basic scientist because I believe that every revolutionary stage in the treatment of disease came from basic science. Some examples include the discovery of penicillin to combat bacteria or insulin to treat diabetes."

What do you hope to achieve at the Centenary Institute?

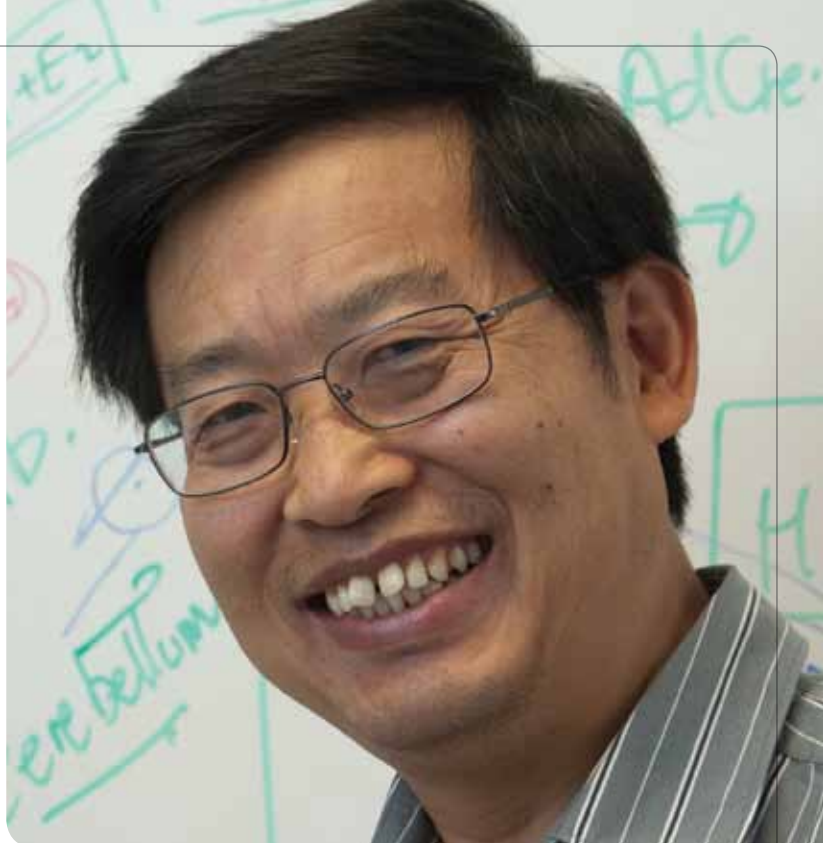
"My goal is to help people with cancer, diabetes and heart attacks. Most people think that this is quite a wide area to cover. But, from a molecular level, we have a single protein and a signal pathway so it all comes down to the question about cell communication.

"I believe that all disease comes from basic cell communication problems. By understanding normal cell communication we can then identify when it changes and how we might be able to cut off communication that might lead to disease.

"For example, one of our research projects is looking at a particular molecule that is an enzyme. There's already a lot of evidence to support that this enzyme uses important language to communicate with cells. But what we found is when this enzyme is overused it can cause serious reactions like normal cells turning into cancer cells. So if we can target this enzyme and cut off its communication channel with other cells then we may be able to slow down or even kill cancer cells."

What do you like about the Centenary Institute?

"This Institute operates at a high national level. It's also competitive internationally, particularly in the area of basic cancer research. We have many good scientists and good technology so it's easy to collaborate to make my research more productive. Our location is also ideal - close to the hospital and the university. The university is important in basic science, the hospital is good for clinical science and we bridge these two areas together." ©



"My goal is to help people with cancer, diabetes and heart attacks. Most people think that this is quite a wide area to cover. But, from a molecular level, we have a single protein and a signal pathway so it all comes down to the question about cell communication."

Breakthrough in ovarian cancer

Drug-resistance is a major obstacle in curing ovarian cancer but Dr Xia and his team have found a drug that kills ovarian cancer cells that breaks the resistance mechanism.

Published in *Autophagy*, the researchers found the drug (FTY720) had a potent effect in human ovarian cancer cells, even in those resistant to cisplatin - the most commonly used chemotherapeutic drug in ovarian cancer.

Dr Xia described the findings as a breakthrough because unlike current treatments, FTY720 kills ovarian cancer cells through a unique, irreversible process called necrosis so the cancer cells cannot resist, repair and relapse.

While this research is a major first step toward developing a more effective treatment for ovarian cancer, Dr Xia is seeking collaborations to conduct further pre-clinical and clinical trials so the treatment could eventually be used for women with ovarian cancer. ©

Heartfelt events

Two families who have lost young loved ones to sudden arrhythmic death held memorial events to raise awareness and money for our genetic heart disease research.

Jenny Bamford and her family held the sixth annual Peter "Wally" Bamford Memorial Concert at The Old Canberra Inn as a tribute to their son and brother Peter – a talented musician that tragically passed away in 2004. Jenny's event raised an incredible \$7,302. The success of this event is due to all the hard work from the entire family including Peter's dad Rick, his three brothers Dan, Brett and Luke and sister Amy (and all their spouses) and his aunty Sandra.



Jenny and Rick Bamford and their family held the sixth memorial concert in honour of their son and brother Peter who loved music.

After the tragic death of her 15 year old son Jacob in 2009, Leeann Richards also wanted to make some sense of her loss by giving back to the community. Leeann, with the help of Jacob's grandparents and uncle, held a trivia and auction night at St Mary's Leagues Club, a BBQ at Bunnings and sold arm bands to raise a remarkable \$24,967. Leeann's efforts were awarded a NSW finalist spot in the 2010 Pride of Australia Medal.



Leeann Richards supported by family and friends at the Trivia and Auction night in tribute to her son Jacob.

The Centenary is incredibly grateful to the Bamford and Richards families for their generous support and amazing efforts. ©

Please help us to discover tomorrow's breakthroughs today



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- OR Call us** on 1800 677 977 (toll free) from Monday to Friday.
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Other ways you can help our researchers:

- Please contact me about including the Centenary Institute in my Will.
- Please send me a brochure on becoming a Research Partner so I can make regular monthly donations to the Centenary Institute.
- I would like to organise or participate in a fundraising event to support the Centenary Institute, please contact me about how I can help.
- Please let me know about Centenary Institute Tours and Open Days so I can find out more about your research.

We value our relationship with you and wish to keep you informed about our work. We also recognise the importance of your privacy and the safeguarding of your personal information so we are careful with all your details and use them to contact you only about issues we believe will be important to you. The Centenary Institute complies with the Federal Privacy Act and has a Privacy Policy that can be downloaded from www.centenary.org.au. If you have any questions relating to our Privacy Policy or if you do not wish to receive information from the Centenary Institute, please call us on 1800 677 977.

Open house opens minds

More than 100 guests joined Her Excellency Professor Marie Bashir AC CVO, Governor of New South Wales at the Centenary Institute for an exclusive behind-the-scenes tour of our cutting-edge research.

The Centenary Institute opened its doors for Science Week to give visitors a chance to go on an exciting tour to see working labs through the eyes of a medical researcher. As patron of the Centenary Institute, Her Excellency Professor Marie Bashir AC CVO, Governor of New South Wales said she was impressed with the excellent research the Centenary Institute is conducting to improve and save lives.

Join our Lab Tours in 2011

Interested in seeing our research first-hand?

Then come along to our 2011 Lab Tour nights on Wednesday 23 February and Tuesday 16 August from 5.30pm – 7:30pm.

You'll be updated on some of our key research projects and attend an exclusive first-hand lab tour with one of our leading researchers.

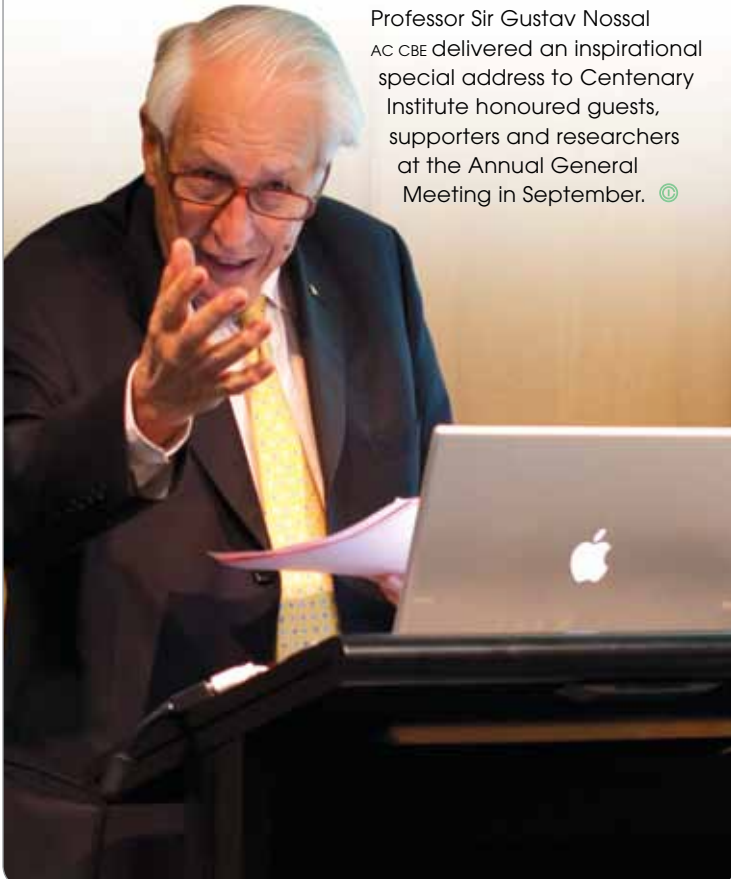
If you would like to attend these events, please call **LauraBeth on (02) 9565 6118** or email l.albanese@centenary.org.au ©



Dr Jeff Holst explains his prostate cancer research to Her Excellency Professor Marie Bashir at the recent Lab Tour night.

Sir Gustav Nossal inspires AGM guests

Professor Sir Gustav Nossal AC CBE delivered an inspirational special address to Centenary Institute honoured guests, supporters and researchers at the Annual General Meeting in September. ©



New system to track cells over time

Centenary researchers have been testing and evaluating Live Cell Imaging Systems since receiving generous funding from The Percy Baxter Charitable Foundation and The Ronald Geoffrey Arnott Foundation, managed by Perpetual.

Our researchers were very excited about the news of the critical funding of a Live Cell Imaging System as this new equipment will allow our researchers to perform time-lapse experiments on various cell types from cancer to tuberculosis.



The Live Cell Imaging System will be used by researchers from across all our labs to observe interactions between cell populations and investigate the behaviour of cells in complex, three-dimensional models. ©

Perpetual

Funded by The Percy Baxter Charitable Foundation and The Ronald Geoffrey Arnott Foundation, managed by Perpetual

Dedicated board member steps down

After nine years of dedicated service, the Honourable John Brown AO resigned from the Centenary Institute board of governors. Mr Brown has provided valuable guidance and contributions during this time including securing financial support to advance the work of our young researchers.

Centenary Institute Chairman the Honourable Michael Egan said: "On behalf of the Centenary Institute, I thank John for his service and dedication. Since he first joined the board almost a decade ago, John has helped us take Centenary from strength to strength. John will remain a friend of Centenary and I look forward to his continued support of our researchers." ©

Running for research

Stephanie Arnold raised the most money for the Centenary Institute City2Surf fundraising team with a fantastic \$3,674.

While working at the Centenary Institute as a researcher, Dr Arnold decided to join our City2Surf fundraising team. "The Centenary Institute is doing some amazing medical research. I thought it would be great to help raise money by joining the City2Surf team. I was overwhelmed by the generosity of my family and friends."

If you're going in the City2Surf (or any other run, ride or swim) in 2011 and you'd like to raise funds for our research, please contact LauraBeth on (02) 9565 6118 or l.albanese@centenary.org.au ©

OTHER NEWS

Events address major challenges

Two outstanding educational events were held late in 2010 on the most pressing issues in melanoma research and using bioinformatics to improve research outcomes.

Leading international and local speakers spoke at the Centenary Institute to share knowledge with our researchers and visiting scientists who attended these comprehensive seminars. ©

Talented artist will be missed

Jasper Legge, who painted and donated the untitled abstract in the Reception at the Centenary Institute, died tragically from a heart attack at the age of 42.

Jasper's parents, Geoffrey and Alex, have been great friends of the Centenary Institute and have been responsible for the art work that is displayed throughout the Institute – artworks that inspire our researchers every day. Our deepest condolences to all Jasper's family and we treasure our reminder of his life. ©

Tree of hope

Hundreds of heartfelt messages from our Christmas Appeal decorated the Centenary Institute Christmas tree.

All of our researchers took the time to read these inspiring words of encouragement. Thank you to everyone for your uplifting comments! ©



Join us online



Find out more about our research or get updates on Centenary news and events at www.centenary.org.au




Check out the **Centenary Institute Australia Facebook page** today – don't forget to hit the Like button.



Get the latest Centenary Institute updates at **@centenaryinst**

Experts support Centenary's bright future

Four world-renowned scientists from the Centenary Institute's prestigious Scientific Advisory Board (SAB) met with our heads and future leaders to review the progress and future of our work.

Professor Matthew Vadas, Executive Director of the Centenary Institute said: "We are extremely fortunate to have these remarkable scientists share their knowledge with us. The Centenary Institute is committed to achieving excellence in our research and the SAB is a key means of doing that. After an intensive three-day meeting, the SAB members provided us with a very positive independent report. It confirms that we are on track to making a significant contribution to the health of people in Australia and worldwide." 



Members of our prestigious Scientific Advisory Board (pictured left to right): Professor Sir Marc Feldmann, Professor Ian Frazer, Professor Mathew Vadas, Professor Axel Ullrich and Professor Michael Good.

Thanks to Centenary's supporters

Grants

Australian Research Council (ARC), National Health and Medical Research Council (NHMRC), Cancer Council NSW, Cancer Institute New South Wales, National Heart Foundation of Australia, National Institutes of Health (NIH) in the US, The Percy Baxter Charitable Foundation and The Ronald Geoffrey Arnott Foundation - managed by Perpetual, The Prostate Cancer Foundation of Australia, Rebecca L Cooper Foundation

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Events Supporters

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Where there's a Will, there's a way to cure disease

Experiencing the shocking effects of cancer on loved ones, Allan Miller wanted to help protect future generations from this devastating disease by including a gift to the Centenary Institute in his Will.

"Cancer can hit people at any time and it affects people from all walks of life. My mother died when she was just 49. She had ovarian cancer that was treated but the cancer came back as a brain tumour and she died a year later. My father died of prostate cancer. I also had a number of aunts, uncles and a few friends die from cancer - some people were in their 40s and one young chap was just 25," said Allan.



"I think leaving money to research is the only way we will develop a better understanding of disease and hopefully protect future generations."

If you would like more information on leaving a gift in your Will, please contact Leisl on (02) 9565 6108 or email l.holterman@centenary.org.au 

