DR CHRIS JOLLY

46,003 (28.9%) of all deaths in Australia in 2015 were attributed to cancer[1] - it is projected that this number will increase to 55,714 in 2025[2]

Over the past few decades, we have seen considerable progress in the control of cancer – one of the most quickly-advancing and complex chronic diseases affecting the population. This group of diseases, however, continues to present many challenges. We as scientists strive and are dedicated to understanding cancers' underlying and cellular mechanisms. I know you will agree that medical research is one of the greatest hopes we have of finding better therapeutics in order to improve patient outcomes and – ultimately – find a cure.

Even though the overall incidences of cancer continues to increase, the good news is that real advances made daily are contributing to the increasing survival rates of those diagnosed with many cancers.

The recent Cancer in Australia 2017 report released by the Australian Institute of Health and Welfare reports that, between 1984-1988 and 2009-2013, the five-year relative survival for all cancers combined rose from 48% to 68% in Australia.[3] It is important for us to recognise that these statistics differ universally and by cancer type and population group.

A greater ability to detect diseases in their primary stages, and an ageing population, are key factors contributing to the increase in the overall cancer incidences, whilst the rise in the overall cancer survival rate can be attributed largely to a combination of two key influences - earlier detection and more effective treatments. This leads me to my area of research here at Centenary.

Today, we know that the root cause of all cancers is DNA damage inside our cells – in most cases this damage is caused by external influences such as smoking and the sun – but our own cellular processes can also play a role.

Deoxyribonucleic acid, more commonly known as DNA, was first observed by Swiss Biochemist Frederich Miescher in the late 1800's. Half a century passed before researchers unravelled the structure of the DNA molecule and recognised its central importance to fundamental biology.

Our DNA is constantly being chemically damaged, because our own cellular processes produce oxidative molecules, or because we are exposed to environmental mutagens. The ability to repair this damage declines as we or our cells age; it's each cell's ability to repair this damage that determines whether it will transform into a cancer cell or not. Understanding why some cells and not others repair damage is a key to developing more targeted treatment options for patients.

It is estimated that the number of new cancer cases diagnosed this year will exceed 134,000[3] and it is predicted that this will rise to 150,000 in 2020, an increase of 29% from 2010.[4]

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In my laboratory we are studying how DNA repair pathways work to prevent cancers. Using an exciting new gene editing technology we have been able to develop a new strain of mice lacking an enzyme that regulates the concentration of DNA building blocks (called "dNTPs") inside cells. Using this we have seen that a major factor determining the ability of DNA-repair enzymes to correct DNA damage in white blood cells is the availability of these DNA building blocks within each cell.

The concentration of DNA building blocks varies enormously when multiplying cells move through the DNA replication cycle. Our data is helping to further understand and explain why DNA repair is more effective in some stages of the cell replication cycle than others – especially in relation to the growth of cancers. Starving cancer cells of DNA building blocks may be an effective adjunct to traditional chemotherapy, with the potential to reduce debilitating side effects for patients. Any contribution we can make to better target cancer chemotherapeutics will provide individual patients with greater and more personalised treatment options, reduced physical and emotional trauma and more effective outcomes.

I am also working on a project where we have identified a gene that could affect a human patient's ability to undergo radiation or chemotherapy. These treatments could be fatal in humans with a mutation in this gene, as it controls the ability to make healthy new cells from tissue-resident stem cells following radiation. Our findings in this research could be used to personalise treatment of cancer patients, preventing potentially fatal side effects of chemotherapy or radiation.

I have been working in the field of DNA repair for 23 years, and it remains one of my passions. I was initially attracted to it because of a fascination with how life evolved, and it was a bonus to later realise that it was a field of critical importance to cancer. Like all our supporters, I believe in contributing to the health, prosperity and well-being of our nation through philanthropy. As a cancer survivor myself, I am one of our community members recorded in our nation's cancer statistics - my personal experience adds a different perspective to my research aspirations.

It is estimated that this year more than 2,500 Australians will be diagnosed with cancer each week.[3] It is hugely encouraging that we are seeing the overall cancer survival rate increasing in many of these cancers, however, without our supporters, who are committed to the fight to improve human health and save lives, medical research would not have been able to make the contribution it has so far.

You may not realise just how important donations are to the Centenary Institute! For every $1 Centenary receives in research grants, we need to raise another 70 cents in donations from the public to meet our full program costs. In 2016 Centenary secured $11 million in research grants – that means an additional $7.7 million needed in donations from the community.

Our work at Centenary affects all of us. The support of the community means so much to me and to all the scientists here at the Institute and truly contributes to us achieving a greater understanding of chronic diseases, identifying and developing more effective personalised treatment options for patients and providing you and I with healthier, longer lives.

Kind personal regards and thank you again.

Dr Chris Jolly
Head, DNA Repair Laboratory
Centenary Institute

Centenary Institute life saving research
Cancer. Inflammation. Cardiovascular.

A LOOK AT CENTENARY'S CANCER RESEARCH AND WHY IT IS SO IMPORTANT

The Australian Institute of Health and Welfare's (AIHW)recently released Cancer in Australia 2017 report, is a comprehensive national overview on cancer. Based on current data it estimates that in 2017 ***1 in 3 males and 1*** *in 4 females will be diagnosed with cancer by the age of 75. By the age of 85, the risk is estimated to increase to 1 in 2 for both males and females.*

Cancer is not one disease - it is a group of more than 100 different and distinctive diseases that have a substantial social and economic impact on individuals, families and our community. At Centenary our scientists are working on a number of these cancers including;

- Blood
- Bowel
- Brain
- Breast
- Leukaemia
- Liver
- Melanoma
- Pancreatic
- Prostate

Our research programs investigating cancer include;

- ACRF Centenary Cancer Research Centre
- Ageing
- Bioinformatics
- DNA Repair (all cancers)
- Gene & Stem Cell Therapy
- Human Viral & Cancer Immunology
- Immune Imaging
- Liver Immunology
- Liver Injury & Cancer
- Melanoma Cell Biology
- Melanoma Oncology and Immunology
- Molecular Hepatology
- Origins of Cancer
- Structural Biology
- Vascular Biology

If you are interested in making a donation to a specific area of our research, taking part in or holding a community fundraising event, please contact us on 1800 677 977 or email us at donations@centenary.org.au

Thank you for your ongoing support!

[1] www.abs.gov.au 3303.0 Causes of Death, Australia, 2015
[2] www.aihw.gov.au/cancer/mortality-trends-projections
[3] www.aihw.gov.au Cancer in Australia 2017
[4] www.aihw.gov.au Australia's Health 2014