



Understanding DISEASE

...Finding a CURE

OUR RELEVANCE AND IMPACT

DISEASE/PROBLEM	STATISTICS/PREVALENCE RATES	COST TO PUBLIC HEALTH	CENTENARY'S ACHIEVEMENTS/ CONTRIBUTIONS
LIVER CANCER	Liver cancer is the sixth most common cancer in the world, with 782,000 new cases diagnosed in 2012. Liver cancer is the fifth most common cancer in men and the ninth in women. An estimated 782,500 new liver cancer cases occurred in the world during 2012, with China alone accounting for about 50% of the total. Rates are more than twice as high in men as in women.	\$50.7billion per annum	Liver Cancer: Developed models of liver cancer to increase our understanding of how cancer cells grow and spread.
LIVER DISEASE ▶ Fatty Liver ▶ Alcoholic Liver ▶ Cirrhosis ▶ Fibrosis	<ul style="list-style-type: none"> Affects over six million Australians (The Australian Liver Association). Non-alcoholic fatty liver disease (NAFLD) is the most prevalent affecting 5.5 million Australians Highest mortality in patients affected by alcoholic liver disease (rate by prevalence ~13%, ABS) amongst liver diseases Liver cirrhosis regardless of etiology is the main feature underlying liver cancer 		Major contributions to the understanding of how liver damage progresses.
DIABETES	<ul style="list-style-type: none"> 1 in 11 adults have diabetes (41.5 million) 46.5% of adults with diabetes are undiagnosed 12% of global health expenditure is spent on diabetes (\$673 billion) By 2040, 1 adult in 10 (642 million) will have diabetes 1 in 7 births is affected by gestational diabetes Three quarters of people with diabetes live in low and middle income countries 542,000 children have type 1 diabetes Every 6 seconds a person dies from diabetes (5.0 million deaths) 	The total annual cost for Australians with type 2 diabetes is up to \$6 billion including healthcare costs, the cost of carers and Commonwealth government subsidies.	Discovered enzymes that were used to develop a successful type 2 diabetes therapy
STROKE AND HEART ATTACK	Cardiovascular disease is the leading global cause of death, accounting for 17.3 million deaths per year, a number that is expected to grow to more than 23.6 million by 2030.	STROKE \$4.9billion Cost including the burden of disease is estimated to be \$54.3 billion	The laboratory of Cardiovascular Signaling has been focusing on explaining the molecular mechanism of a brain blood vessel disease, Cerebral Cavernous Malformation (CCM), which is a major cause of stroke in young people. It is hoped that this increased understanding of the disease will lead to new therapeutic targets.
SKIN DISEASE ▶ Psoriasis ▶ Atopic Dermatitis (Eczema)	PSORIASIS Published data on the prevalence of psoriasis in countries vary between 0.09% and 11.4%. In most developed countries, prevalence is between 1.5 and 5%. There is also evidence to suggest that the prevalence of psoriasis may be increasing. Many studies have demonstrated that psoriasis can impact substantially on QoL, even when a relatively limited body surface area (BSA) is affected. Atopic Dermatitis (Eczema) Atopic dermatitis (AD) is a chronic inflammatory skin disease posing a significant burden on health-care resources and patients' quality of life. It is a complex disease with a wide spectrum of clinical presentations and combinations of symptoms. AD affects up to 20% of children and up to 3% of adults; recent data show that its prevalence is still increasing, especially in low-income countries.	ATOPIC DERMATITIS AD is also a major burden financially with the cost of treatment for this condition reported to be \$3.8billion in 2008 in the US alone. Quality of life (QoL) assessments have shown that the impaired physical and mental functioning in patients with psoriasis and eczema is comparable to that seen in cancer, arthritis, hypertension, heart disease, diabetes, and depression.	PSORIASIS Raised public awareness of new treatment options for patients suffering from psoriasis. Discovered a novel population of immune cells that drive 'psoriasis-like' inflammation ECZEMA Developed new models of eczema and investigated the role of the immune system in the atopic disease. In 2013, we discovered a new cell type in the skin that participates in the atopic skin inflammation.
ASTHMA	The most recent revised global estimate of asthma suggests that as many as 334 million people have asthma, and that the burden of disability is high.	The report estimated the total cost of asthma in Australia in 2015 was \$27.9 billion, comprised of \$3.3 billion in economic costs and \$24.7 billion in "burden of disease" costs.	Identified a novel role for interleukin 2 in airway disease that may be of relevance in asthma.
ALLERGIES	4.1 million Australians (19.6%) have at least one allergy. If current time trends continue, there will be a 70% increase in the number of Australians with allergies affected from 4.1 million now to 7.7 million by 2050, and an increased proportion affected from 19.6% to 26.1%.	The economic cost of allergic disease was estimated to be \$9.4 billion from direct and indirect cost of medical care and loss of income and reduced productivity, with an additional \$21.3 billion from lost wellbeing (disability and premature death).	Have identified and continue to identify novel cellular and molecular pathways involved in allergic disease, which represent putative drug targets for therapy and prevention
GENETIC HEART DISEASE	Congenital heart disease (CHD) is the most common cause of major congenital anomalies, representing a major global health problem. Twenty-eight percent of all major congenital anomalies consist of heart defects (1). Reported birth prevalence of CHD varies widely among studies worldwide. The estimate of 8 per 1,000 live births is generally accepted as the best approximation. CHD, by definition, is present from birth. The most practical measurement of CHD occurrence is birth prevalence per 1,000 live births.	No data available.	Performed world first bi-national study of sudden cardiac death in the young, establishing the benchmark for investigation and management of families. Identified new disease genes in inherited cardiomyopathies leading to improved diagnosis and targeted therapies.

DISEASE/PROBLEM	STATISTICS/PREVALENCE RATES (PLEASE PROVIDE SOURCE)	COST TO PUBLIC HEALTH	CENTENARY'S ACHIEVEMENTS/ CONTRIBUTIONS
BLOOD CANCER/ LEUKAEMIA	8 people everyday will be diagnosed with a type of Leukaemia. Over 3,200 Australians are expected to be diagnosed with Leukaemia this year. Most common in children 0-14 years of age.	\$111million	miRNAs response to treatment in chronic myeloid leukaemia (CML). Epigenetic factors underlying abnormal splicing in acute myeloid leukaemia.
PROSTATE CANCER	More than 1.1 million cases of prostate cancer were recorded in 2012, accounting for around 8 per cent of all new cancer cases and 15 per cent in men.	est \$1.4 billion (2012)	Identified two amino acid transporters that supply the essential nutrient leucine to prostate cancer cells in primary and metastatic disease. Identified a glutamine transporter that is increased in prostate cancer and provides nutrients that fuel prostate cancer.
BREAST CANCER	Breast cancers is the most common cancer in women worldwide, with nearly 1.7 million new cases diagnosed in 2012.	\$184million (10%)	Identified a glutamine transporter that is increased in the hard to treat triple negative breast cancer subset, and is essential for these cells to survive.
TB	Tuberculosis (TB) is contagious and airborne. It ranks alongside HIV as a leading cause of death worldwide. 9.6 million people are estimated to have fallen ill with TB in 2014; 5.4 million men, 3.2 million women and 1.0 million children. An estimated 1.2 million people living with HIV developed TB in 2014.	Globally the cost for implementation of TB control for 2015 was US\$ 8 billion with US\$1.4 billion shortfall. Costs for research needed was US\$2 billion and amount estimated in 2013 was US\$677 million for ALL countries. TB research is grossly underfunded compared to HIV & malaria.	Components of the inflammatory response to TB may be used as biomarkers to help the diagnosis and monitoring of therapy. Dr Bernadette Saunders and Simone Barry have been studying the changes in cellular and plasma microRNAs during TB. One major goal of the TB-CRE is to find ways of overcoming the Detection Gap whereby up to a third of TB patients in high-burden countries remain undetected.
MELANOMA	The incidence of both non-melanoma and melanoma skin cancers has been increasing over the past decades. Currently, between 2 and 3 million non-melanoma skin cancers and 132,000 melanoma skin cancers occur globally each year.	Advanced melanoma is said to have cost \$422million in 2014.	We identified a population of drug resistant, "resting" cells using a 3D melanoma model. We also identified drug combinations that may work well together, as well as drug combinations that may lead to drug resistance. Developing novel methods for visualising melanoma growth in vivo and understanding the role of the immune system.
PANCREATIC CANCER	Pancreatic cancer is the twelfth most common cancer in the world (joint position with kidney cancer), with 338,000 new cases diagnosed in 2012.	One of the most costly cancers to the NSW economy (in terms of both financial and burden of disease costs).	We have developed a drug that may influence the tumour environment that will allow other therapies to work better for pancreatic cancer treatment.
BOWEL CANCER	Colorectal cancer is the third most common cancer in the world, with nearly 1.4 million new cases diagnosed in 2012.	Expenditure for advanced bowel cancer treatments doubled from \$47million to \$96million between 2008/9 and 2012/13.	
THROMBOSIS	1 in 4 people worldwide die of conditions caused by Thrombosis. It is a leading cause of global death and disability.	\$116,970 per person per annum.	
ANAEMIA	Globally, anaemia affects 1.62 billion people, which corresponds to 24.8% of the population. The highest prevalence is in preschool-age children, and the lowest prevalence is in men. However, the population group with the greatest number of individuals affected is non-pregnant women.	It is a fundamentally incapably large value due to the number of diseases that carry anaemia as a symptom (ie. cancer, arthritis, heart disease, infectious diseases, inflammation).	The Structural Biology Program focuses on visualizing the molecular machines of our cells – proteins – using cutting edge research facilities. As such, our research provides 'blueprints' of drug targets involved in anemia and cancer, providing a critical platform for drug development targeting these diseases.
ATHEROSCLEROSIS	Atherosclerosis is an inflammatory disease of the arteries associated with lipid and other metabolic alterations and is the major cause of cardiovascular diseases. Atherosclerotic cardiovascular disease (ACD) includes two major conditions: ischemic heart disease (IHD) and cerebrovascular disease (mainly ischemic stroke). IHD and stroke are the world's first and third causes of death, respectively, causing 247.9 deaths/100,000 persons in 2013, representing 84.5% of cardiovascular deaths and 28.2% of all-cause mortality.	Australia spends more on cardiovascular diseases than on any other disease group. It is estimated that \$7,605million was spent on CVD in 2008-09 – 12% of all health care expenditure in Australia. Coronary heart disease was the most expensive cardiovascular disease, accounting for over 1/2 of CVD spending (\$2,028 million) in 2008-2009	Discovered a gene that protects the vascular system from development of atherosclerosis. This may allow the development of drugs that activate this gene or its pathway in those susceptible to the disease.
BRAIN CANCER	Brain cancer is the 17th most common cancer in the world, with 256,000 new cases diagnosed in 2012.	One of the least costly cancers to the NSW economy (in terms of both financial and burden of disease costs) at 9%.	Discovery of a chemical modification of proteins that is involved in how cancer cells metabolise sugar, and invented molecules that target this modification. Two of the molecules have completed Phase I testing in patients with solid tumours in the United Kingdom and Australia. Both molecules were well tolerated and one will be tested in a Phase II study in patients with brain tumours that will open for recruitment by the end of 2016.
AORTIC ANEURYSMS	Aneurysm disease is the 18th most common cause of death in all individuals, and the 15th most common cause of death in individuals >65 years of age. These figures are however an underestimation, as impact of aortic diseases is frequently attributed to diseases with similar presentation (i.e other cardiac diseases).	Cost comes under the CVD umbrella.	We have identified 2 new genes that are involved in the initiation of aortic aneurysm pathogenesis, and a novel pathway that may represent new therapeutic strategy for their treatment.