



Australian Government  
National Health and  
Medical Research Council

N H M R C

# 10 OF THE BEST RESEARCH PROJECTS 2008

WORKING TO BUILD A HEALTHY AUSTRALIA



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# 10 OF THE BEST RESEARCH PROJECTS

*10 of the best* celebrates success stories from 10 of Australia's leading health and medical research teams, whose work has been funded by the Australian Government through the National Health and Medical Research Council (NHMRC).

The projects showcased here are representative of hundreds of highly successful and international-standard projects funded each year by NHMRC.

*10 of the best* is testament to the excellence and innovation of Australian health and medical research.

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## THE COMMONWEALTH GOVERNMENT'S COMMITMENT TO RESEARCH

The Rudd Labor Government is committed to health and medical research, and is proud to support the NHMRC's work in researching some of our most serious health problems. This booklet highlights 10 of the best high quality research projects being conducted by Australians to provide evidence on ways to combat some of our biggest health challenges as a nation.

Work on diabetes, cancer, obesity in children and dental health are just a sample of the research projects showcased in this booklet. However much work still needs to be done on reducing the burden of these and other diseases which can have such an impact on Australian families. Finding better ways to treat people or preventing the disease in the first place is why research of the kind highlighted here is so vital.

The Innovation Review being conducted by my colleague, the Minister for Innovation, Industry, Science and Research, Senator the Hon Kim Carr, will have an important role in determining the direction of Australia's research, not only into health and medicine, but science and technology

generally. It will highlight the emerging issues and lead the way for future investments in NHMRC, and through it Australian health research.

In the 2008-09 Budget the Government committed \$617 million to NHMRC for research (an increase of \$123 million from the 2007-08 Budget).

This commitment will grow in future years to encompass not only our key health priorities, but also to take up the challenge of predicting future health problems and finding ways to treat them or prevent them altogether.

A handwritten signature in blue ink, reading "Nicola Roxon".

The Hon Nicola Roxon MP  
Minister for Health and Ageing



## NHMRC AND THE HEALTH OF AUSTRALIAN MEDICAL RESEARCH

Health and medical research delivers new insights into the human condition and the processes that lead to ill health.

As you will see from the projects in this booklet, Australia continues to make a strong contribution to uncovering the causes of serious and debilitating illnesses that affect millions of people in Australia and around the world.

Chronic diseases – diabetes, arthritis, asthma – are huge and growing burdens.

Cancer, cardiovascular disease, obesity and mental illness continue to challenge us.

Prevention, delay in onset and more effective treatments are all possible through research.

Health care is Australia's largest single industry and, like all industries, research and innovation are essential.

There is still much to learn if we are to better prevent ill health, to more effectively deliver health care based on evidence, and if we are to discover new therapies and cures.

To do that we need to ensure that the knowledge gained is transferred into practice to further improve the health care industry and to benefit those most affected.

NHMRC continues to support excellence in research, and the best, cleverest and most innovative researchers.

It gives me great pleasure to know that NHMRC funding has contributed in a very large way to helping these researchers meet the challenges of preventing or better treating illness and disease.

A handwritten signature in blue ink, which appears to read 'Warwick Anderson'. The signature is fluid and cursive, with a long horizontal line extending to the right.

Professor Warwick Anderson AM  
Chief Executive Officer  
National Health and Medical Research Council

**Mi** MONASH INSTITUTE  
OF MEDICAL RESEARCH  
INSTITUTE OF MONASH UNIVERSITY AND SOUTHERN HEALTH

Uterine Stem Cells



## TARGETING STEM CELLS TO TREAT ENDOMETRIOSIS

Up to 15 per cent of women of reproductive age suffer from endometriosis, in which the lining of the uterus grows outside the uterus.

Current treatments are generally unsatisfactory, as are treatments for other gynaecological conditions like pelvic floor prolapse which often results from childbirth and can affect up to 50 per cent of women.

A new approach based on harnessing specialised uterine stem cells involved in the monthly regeneration of the uterine lining could lead to much improved treatment options and insights into other conditions such as endometrial cancer.

Dr Caroline Gargett



## BETTER TREATMENT FOR ENDOMETRIOSIS TARGETING STEM CELLS

### Project title

Identification and characterisation of cells with high proliferative potential in human endometrium

### Chief investigator

Dr Caroline Gargett

### Funding

The NHMRC invested \$409,575 in this project over three years from 2004.

Dr Gargett's team from left, Isabella Ciurej, Louie Ye, Sonya Hubbard, Tu'uhevaha Kaitu'u-Lino, Hong Nguyen and Erah Anwar

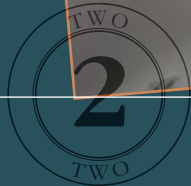
Following the breakthrough discovery that two types of adult stem cells are involved in the monthly regeneration of the endometrial lining of the uterus, the research identified their location in the endometrium and demonstrated that both are stimulated by estrogen.

Culturing of one has shown that it can develop into fat, bone, cartilage and smooth muscle cells, raising the prospect of using these as a basis for remedial tissue engineering applications.

Uterine stem cells from women with a prolapsed pelvic floor could be used to grow tissue to repair and support their pelvic floor, while controlling the cells' activity could lead to better treatments for endometriosis.

This project is led by Dr Caroline Gargett, a Senior Scientist at the Centre for Women's Health Research in the Monash Institute of Medical Research. The initial discovery of the two stem cell types earned her an Established Scientist Award from the European Society for Human Reproduction and Embryology, and generated strong media coverage in Australia and overseas.

**“I was so pleased that this hidden, embarrassing disorder was projected into the lounge and dining rooms of many Australians, to raise awareness of this major healthcare and lifestyle problem for many women.”**



## HELPING TO MAKE OLD WOUNDS DISAPPEAR

The faster a wound heals, the better the body is protected against blood loss and infection.

But in its haste to heal, the body creates scar tissue that can cause chronic pain and disability. Children recovering from burns can be most affected as scar tissue over joints limits their mobility, requiring surgical interventions as their bodies grow.

This research project has identified the important role played by a single protein in stimulating cell proliferation and migration as a wound heals.

It has also shown that mice with a reduced genetic capacity to produce the protein heal more efficiently than normal mice.

Associate Professor  
Allison Cowin



## MAKE OLD WOUNDS DISAPPEAR

### Project title

Function of the flightless protein in wound repair and scar formation in skin

### Chief investigator

Dr Allison Cowin

### Funding

The NHMRC invested \$427,750 in this project over three years from 2004.

Associate Professor Allison Cowin's team from left, Huater Chan, Tony Lin, Xanthe Strudwick, Zlatko Kopecki and Damien Adams

Addressing the challenge of applying this discovery to create a practical treatment, the research team is developing a novel antibody which suppresses production of the protein.

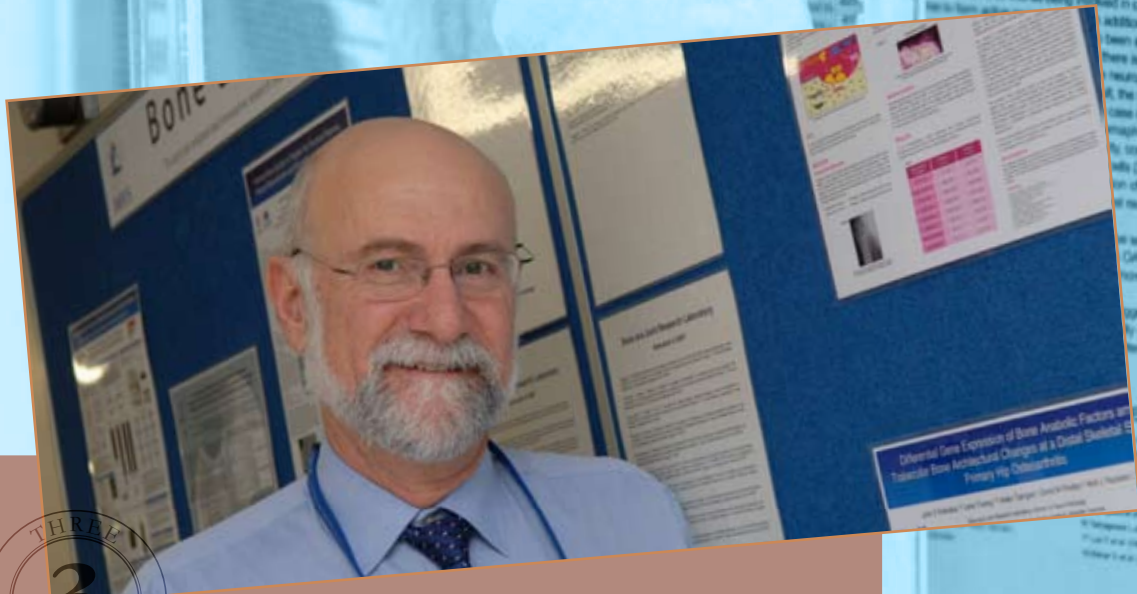
When the antibody is applied to wounds, the healing process is improved and the creation of scar tissue reduced, raising the prospect that as sufferers of burns and other serious injuries recover they can look forward to the site of the injury looking like it did before.

Associate Professor Allison Cowin of Adelaide's Women's & Children's Health Research Institute, who leads the project, is working to improve treatment for wounds across the spectrum from burns and trauma injury to chronic ulcers.

She founded the Australasian Wound and Tissue Repair Society and is strongly committed to developing therapies that improve the lives of patients.

**“There is no point doing research for the sake of research. We have to get involved in the commercialisation of the technology so that the public benefits.”**



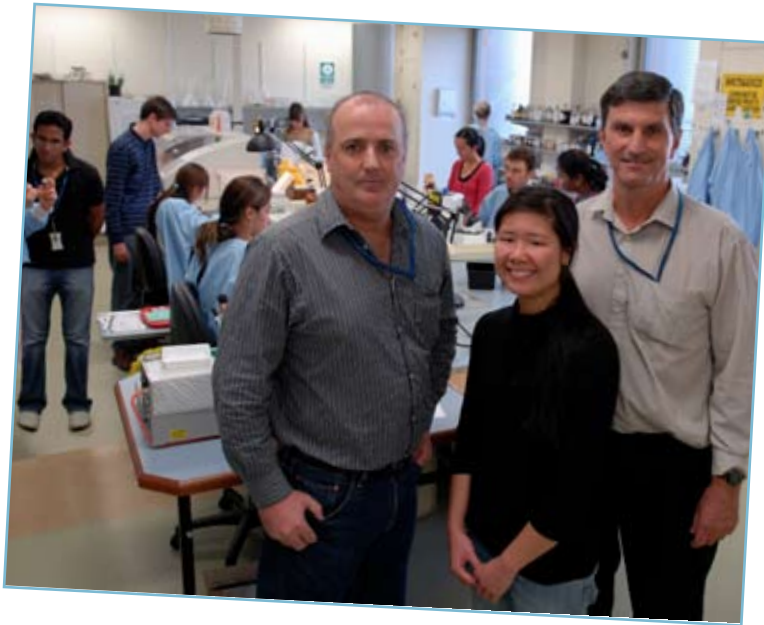


## RESEARCH EASES OSTEOARTHRITIS PRESSURE

Osteoarthritis affects an estimated 1.6 million Australians each year. The condition mainly affects the hands, spine and weight-bearing joints such as hips, knees and ankles.

Palliative treatments currently available for osteoarthritis fail to prevent the need for the surgical replacement of affected joints. The goal of this research is to find ways to slow the onset of the disease and its symptoms, thereby delaying and even avoiding the need for expensive joint replacement surgery with its attendant risks and relatively long recovery times.

Associate Professor Nick Fazzalari



## OSTEOARTHRITIS

### Project title

Healthy ageing research: early diagnosis of osteoarthritis

### Chief investigator

Associate Professor Nick L Fazzalari

### Funding

The NHMRC invested \$262,500 in this project over four years from 2003.

Associate Professor Nick Fazzalari's team from left, Duminda Kumarasinghe, Lachlan Smith, Sladjana Jovic, Helen Tsangari (absent from shot), Vivienne Le, Geetha Mohan Front: Ian Parkinson, Lena Truong, Peter Sutton-Smith

These discoveries have the potential to lead to the design of new therapies and diagnostic processes, leading to increased quality of life for sufferers. These include the development of genetic screening methods to identify the disease before symptoms are reported, new pharmaceutical treatment approaches and more effective lifestyle changes anticipated to delay and even prevent disease progression.

Ongoing research includes the identification of changes in gene activity during joint degeneration, the establishment of genetic markers to detect predisposition to the disease, and the review of general understandings of skeletal phenotypes.

In addition to easing the suffering of those living with the disease, a supplementary aim is to alleviate the pressures placed on those who care for them and to reduce the demand for costly surgery as our population ages.

“The greatest impediment to scientific advance is what we think we already know,” says Associate Professor Nick Fazzalari of the Institute of Medical and Veterinary Science and Hanson Institute in Adelaide, who leads this project.

His motivation as a medical researcher is to ease patient suffering.

**“We are especially driven towards further demystifying debilitating disease and illness, with the goal of improving quality of life and ultimately finding a cure.”**

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## MEASURING THE BURDEN OF INJURY IN AUSTRALIA

Reducing the burden of traumatic injury is a priority public health issue but measurement of injury burden is generally poor.

The commonly used measure is the mortality rate, a metric that does not provide information on outcomes for the more than 90 per cent of traumatic injury sufferers who survive.

This research program has developed a methodology to evaluate, measure and record the recovery of patients with serious injury – giving the survivors a voice and providing sensitive new tools for monitoring trauma care.

Dr Belinda Jane Gabbe



## BURDEN OF INJURY

### Project title

Outcomes of major trauma and sports injuries

### Chief investigator

Dr Belinda Jane Gabbe

### Funding

The NHMRC invested \$261,500 in this project over four years from 2003.

Dr Gabbe's team, from left, Libby Richards, Melissa Hart, Ann Sutherland, Diane Waters, Andrew Hannaford, Mimi Morgan, Peter Cameron and Sue McLellan

Tracking the outcomes for more than 3000 injured patients a year in Victoria has found that disability is prevalent up to 12 months after the injury.

Patients show an improvement in physical health after six to 12 months but there is a decline in their mental health.

It has also found that the strongest predictors of longer-term patient outcomes were compensation status, age and gender, with women, compensable patients and older patients more likely to experience poor results.

Long term monitoring will enable injuries at higher risk of poor outcomes to be identified, providing insights to drive improvements in trauma care.

Dr Belinda Jane Gabbe of the Department of Epidemiology and Preventive Medicine at Monash University, conducted this project funded by a Postdoctoral Training Fellowship.

Initially trained as a physiotherapist, she was working in sports medicine and rehabilitation until a part-time research position led to a change of career from clinical practice to research.

**“The project had a strong epidemiological and population health focus, an area of research that I had not been exposed to previously and I was immediately engaged due to its strong real-world application.”**



## SOLVING THE MYSTERIES OF CANCER

This collaborative research between epidemiologists and molecular biologists delivered new insights into environmental and genetic factors that contribute to causing several cancers that have an impact on Australians due to either severity or high incidence.

In the study of oesophageal cancers more than 2000 people were enrolled nationally and the shared study of ovarian cancer involved over 3500 women, providing the world's most comprehensive resources on these often fatal cancers.

Professor Adele Green



## CANCER

### Project title

Towards cancer control: population and molecular strategies

### Chief investigator

Professor Adele Green

### Funding

The NHMRC invested \$5,456,611 in this project over five years from 2002.

Professor Green's team, from left, Dr Nick Hayward, Dr Penny Webb, Dr David Whiteman and Professor Peter Parsons

These studies are large enough to identify the different causes and behaviours involved in the quite different types of oesophageal cancer and ovarian cancer.

Smoking and obesity raise the risk of subtypes of both — in different ways — and some genetic markers linked to these cancers have been identified.

The studies of skin cancer yielded new knowledge of the genetic basis of melanoma and showed that certain dietary factors and regular use of sunscreen can reduce the incidence of skin cancers in adults, especially squamous cell carcinoma.

Chief Investigator, Professor Adele Green of the Queensland Institute of Medical Research, said that while the research team had found the studies immensely

challenging because of the scale of data collection, processing and storage, all on limited funds, they had also found the experience highly rewarding.

**“In many instances such cancers may be ultimately preventable and we believe these studies may hold the key,” she said.**

**“Through our continued collaborations, we hope to show why these cancers occur and how their toll may be reduced in future generations of Australians.”**



## TACKLING THE CHALLENGES IN MALE REPRODUCTIVE HEALTH

Sperm are different from other cells in a man's body, so they need protection from his immune system.

If this protection falters, his reproductive system is open to attack, potentially causing infertility and chronic pain in the lower abdomen and scrotum.

This research has identified molecular mechanisms which normally operate to control these immune responses.

Associate Professor Mark Hedger



## MALE REPRODUCTIVE HEALTH

### Project title

Research Fellowship examining the emerging interaction between the male reproductive system and the immune system.

### Chief investigator

Associate Professor Mark Hedger

### Funding

The NHMRC invested \$607,000 in this project over five years from 2001.

Associate Professor Hedger's team, from left, Julie Muir, Lynda Foulds, Anne O'Connor and Dr Wendy Winnall

Several families of proteins and bioactive lipids in the testes have been discovered and characterised, along with specialised immune cells which operate within the testes to contribute to regulation of immune activity throughout the male reproductive system.

These findings provide new approaches to treatment of infertility, inflammatory conditions of the reproductive tract, and testicular cancer.

They also offer prospects for innovative contraceptive strategies, and broader applications such as new ways to protect transplanted organs from attack by a recipient's immune system.

Chief Investigator, Associate Professor Mark Hedger of the Monash Institute of Medical Research at Monash University, was supported by an NHMRC Senior Fellowship Award.

He says the research involves particular challenges in drawing together the different knowledge sets and paradigms of reproductive biology and immunology.

**“It has been very satisfying to watch this research move from the fringes of reproductive medicine towards a more widespread acceptance of its importance by clinicians and researchers.”**

SIX



## REVERSING THE EFFECTS OF TYPE 2 DIABETES

Understanding the molecular basis of type 2 diabetes from its onset and through its progression is an urgent challenge in the battle to reverse this 21<sup>st</sup> century epidemic.

This research has yielded discoveries about the molecular basis for insulin resistance as the disease takes hold, indicating that it is linked to oxidative stress in the mitochondria, the energy warehouse of the cell.

It has also characterised the mechanism whereby insulin regulates glucose transport in muscle and fat cells, transforming scientific understanding of this crucial process that has proved a stumbling block for diabetes research since the 1960s.

Professor David James



Identification of a gene that controls energy expenditure in animals offers new approaches to therapeutic design, while development of a high-throughput assay for one of insulin's major metabolic actions has resulted in several licence deals with the pharmaceutical industry.

Investigation of traditional Chinese medicines has also identified new compounds that reverse insulin resistance in animals.

Professor David James of the Garvan Institute of Medical Research leads this project. He says type 2 diabetes involves a complex interplay between all major systems of an individual's body, genes and environment.

**“We have to begin to tackle some fundamental issues about our normal physiology that defines the axis between nutrition, lifestyle and our overall metabolism as this will impact on the health of people all over the world for the next 100 years.”**

## TYPE 2 DIABETES

### Project title

Identification of compounds for the treatment of human type 2 diabetes

### Chief investigator

Professor David James

### Funding

The NHMRC invested \$690,000 in this project over five years from 2002.

Professor James' team, from left, rear:

Mark Larance, Alexander Rowland, Timothy Couttas, Katarina Mele, Samantha Hocking, Jacqueline Stoeckli, Daniel Fazakerley, Lauren Kicknosway, Philip Hamilton, front: Ping Zhao, Jonathon Davey, Cordula Hohnen-Behrens, Kyle Hoehn, Jamie Lopez, Yvonne Ng, Georg Ramm and Manabu Chokki.

SEVEN





## LOOKING FOR NEW CLUES TO HELP HEAL BURNS

The most important outcome of this research is the discovery of a class of molecules that stimulate skin cells to increase production of collagen and related proteins.

It has the potential to change the fundamental understanding of how skin fibroblasts are stimulated to produce proteins like collagen, the most abundant protein in the body and the major building block of skin, bone and most other structural tissues.

Dr Timothy Rayner



## HEAL BURNS

### Project title

Development and commercialisation of a product for repairing photodamage in skin

### Chief investigator

Dr Timothy Rayner

### Funding

The NHMRC invested \$346,250 in this project over five years from 2002.

Dr Timothy Rayner's team, from left, Romana Borowicz and Bill Panagopoulos

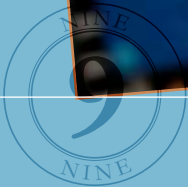
Through industry partner TGR BioSciences, this new knowledge is driving the development of innovative products for tissue repair and reconstruction.

These products will aim to speed up the recovery from traumatic injuries and surgery where tissue replacement is required. Reducing the time taken for tissue to regenerate will lead to improved healing and less time in hospital for the patient.

While two patent applications have been lodged, the work has not yet been published as research continues to refine and expand patent coverage and extend our knowledge of how these molecules work.

Chief Investigator, Dr Timothy Rayner of the University of Adelaide, received an Industry Fellowship to conduct this research. He believes his discoveries can advance our understanding of signals that stimulate repair of structural tissues following injury and could lead to a wide range of new therapeutic applications.

**“To have a direct impact on human health, research should ultimately result in new knowledge that leads to a change in practice or the development of a new or improved product, which generally requires commercial involvement to make it available to the patient.”**



## OBESITY: CLOSING THE GAPS FOR A HEALTHY FAMILY LIFE

This study was reported widely here and overseas when it discovered that a father's parenting influences a child's likelihood of becoming obese, but a mother's parenting didn't seem to influence weight status.

Achieving healthier home lifestyles for our children may therefore need to involve the whole family, rather than targeting mainly mothers.

The study of nearly 5000 five-year-old children revealed the rising prevalence of obesity in Australian children, and how those from poorer families were much more likely to be overweight.

Associate Professor Melissa Wake



## OBESITY

### Project title

Overweight/obesity, activity patterns and health in 4-year-olds: the Longitudinal Study of Australian Children

### Chief investigator

Associate Professor Melissa Wake

### Funding

The NHMRC invested \$108,800 in this project over two years from 2005.

Associate Professor Melissa Wake's team, from left, Louise Canterford, Bibi Gerner and Rosalie Bartels

It found that 15.2 per cent were overweight and a further 5.5 per cent obese, with children in the lowest demographic quintile 47 per cent more likely to be overweight or obese than those in the highest quintile.

The study also highlighted that even at this young age, rates of obesity are now higher in more disadvantaged children. This social gradient wasn't evident in the 1990s. It is of concern that obesity could be further widening the health gap between rich and poor.

Using data from the major *Longitudinal Study of Australian Children (Growing up in Australia)*, this was the first snapshot in a continuing effort to understand how a child's activity patterns, diet, parental characteristics, household income, and other factors can influence their weight.

By delivering new insights into the obesity epidemic, this study affirms the value of major, long term epidemiological research projects. Further, using existing datasets can provide exciting new findings at a fraction of the cost of setting up new studies.

Chief Investigator, Associate Professor Melissa Wake of the Murdoch Children's Research Institute, says the influence of demographic factors requires further study to inform public health initiatives.

But even before such work is complete, action is required to reverse the historically unprecedented trend for Australian children to be overweight.

**“Whether they are rich or poor, educated or uneducated, children or adults, Australians are far more likely than ever before to be obese - and that is a huge public health issue.”**



## LINKING WATER FLUORIDE WITH GOOD DENTAL HEALTH

Associate Professor Clive Wright

Fluoridation of most Australian water supplies over the second half of the 20th century has delivered substantial reductions in tooth decay. More people are retaining their teeth even as our population ages – in 2005-06 just 6 per cent of Australians had lost all their teeth, down from 14 per cent in 1987-88.

So should water fluoridation still be a priority public health strategy?

This research assessed the impact of changing dental needs on the cost-effectiveness of water fluoridation in Victoria by applying innovative economic modelling to estimate the lifetime cost of tooth decay to individuals and the community.



## FLUORIDATION

### Project title

The impact of declining dental needs of age cohorts on the cost-effectiveness of water fluoridation and supplementary preventive strategies

### Chief investigator

Associate Professor Clive Wright

### Funding

The NHMRC invested \$85,600 in this project over three years from 2002.

Associate Professor Clive Wright's team, from left, Dave Harrison and Mike Morgan

A major advance was the ability to account for the long term impact of an ageing population with lower rates of tooth loss and thus higher rates of often expensive dental treatment.

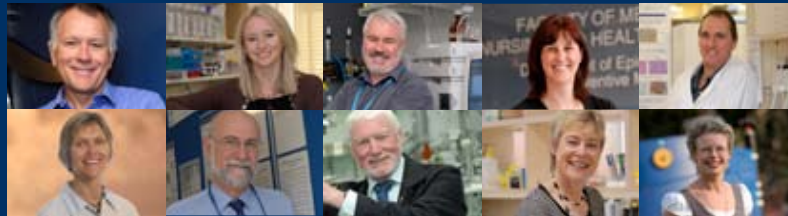
While finding that water fluoridation continues to be cost-effective, it also showed that this benefit declines as the population ages because as older people retain their teeth they require more complex restorative and periodontal treatment.

It showed that fluoridation provides a sound platform for dental health that should be optimised by complementary strategies aimed at limiting the need for dental treatment in older people and containing the costs of that treatment.

Chief Investigator, Associate Professor Clive Wright, led a team which included the late Dr Adele Campaign and Mr Knute Carter. The team was committed to developing a robust predictive tool to confidently inform decisions on the continued application of water fluoridation.

Now Chief Dental Officer with NSW Health, Associate Professor Wright knows that enhancing the accuracy of estimating future health needs is essential to inform the planners of health services.

“Conducting better evidence-based research on which we can base our policy and planning gives us the greatest satisfaction.”



*NHMRC IS AUSTRALIA'S PEAK BODY FOR HEALTH AND MEDICAL RESEARCH;  
FOR HEALTH ADVICE; AND FOR ETHICS IN HEALTH AND MEDICAL RESEARCH.*

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