

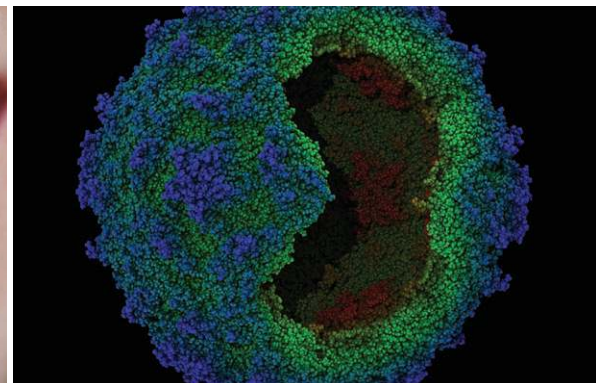


Australian Government



## SCIENCE COLLABORATION IMPROVES HEALTH

**Australia's impact on world health has been profound: from devices helping deaf children hear, to cancer-preventing vaccines and even the development of penicillin.** But there is much more to come. Australians are working, often with researchers from the United States, on hundreds of projects including medical spin-outs from genome research, HIV vaccines, the use of phones to diagnose mental illnesses, and a suite of drugs to prevent and treat obesity and diabetes.



### From bionic ears to eyes and spines

The first multi-channel bionic ear was invented by Professor Graeme Clark in Melbourne in the 1970s. Today, Cochlear, the Australian company that emerged from that discovery, has an 80 per cent share of the global market. They have brought sound, language, music and ease of communication into the lives of more than 200,000 people worldwide.

The knowledge gained is now leading to a suite of bionic initiatives for spinal cord repair, calming epilepsy storms and the bionic eye. The Bionic Ear Institute (BEI) has strong US links and several National Institutes of Health contracts. BEI's research has also been developed into sound processing technologies used widely in phone headsets, and in a new generation of low cost, self-fitted hearing aids developed by America Hears and Australia Hears.

### Vaccines against cervical cancer

Two revolutionary vaccines are now available in America to fight cancer. Gardasil and Cervarix both prevent infection by the virus responsible for most cervical cancers.

Two more vaccines are in clinical trials to treat women who have already been infected.

All four vaccines are largely the invention of Professor Ian Frazer and his team at the University of Queensland in Brisbane.

Professor Frazer worked with Australian biotechnology giant CSL Ltd and US pharmaceutical corporation Merck & Co to commercialize Gardasil. The vaccine is now recommended for adolescent girls by the US Food and Drug Administration as a protection against cervical cancer.

### Blood products for rare disorders

CSL is also the world's second biggest manufacturer of blood products with a major research and manufacturing capability in the US, where it collects and fractionates plasma to create highly specialised medicines for people with chronic life-threatening diseases such as primary immune deficiency, bleeding disorders and other rare diseases. CSL offers a broad range of therapies. Some of these treat conditions so rare that CSL provides the only product of their kind available in the US; for example, Riastap is used to treat patients with a congenital deficiency in human fibrinogen.

CSL is also one of five manufacturers that supply seasonal influenza vaccine to the US, and developed and supplied H1N1 vaccine.

### Preventing tooth decay

Another product of Australian research is the cow's milk extract known as Recaldent, which can reverse tooth decay, and was developed by Professor Eric Reynolds and co-workers at the University of Melbourne. It is used as an active ingredient in toothpastes, mouth washes and chewing gum. Trident White Gum alone generates more than US\$50 million in sales in the US.

### Seeing early Parkinson's

Medical trials in the US on a new imaging technique developed by the Australian Nuclear Science and Technology Organisation (ANSTO) could open a window into new diagnostic options for patients with Alzheimer's disease or Parkinson's disease. An agreement with Bayer Schering Pharma stems from studies performed by ANSTO scientists who discovered new ways to obtain images of neuroinflammation, believed to be an early characteristic of these debilitating diseases.

### Supercomputing for the biological sciences

IBM is collaborating with the government of the Australian state of Victoria and the University of Melbourne to develop a supercomputer complex for the biological sciences. Known as the Victorian Life Sciences Computation Initiative, the center aims to transform life sciences research by providing computer resources to generate meaningfully complex simulations of biological systems. Already, the program has led to the first simulation of a complete polio virus of more than 3.6 million atoms.

### Rapid diagnosis

Staff from the Menzies School of Health Research in Darwin in Australia's Northern Territory are working with colleagues at the Northern Arizona University to develop a test that will enable doctors to diagnose patients with melioidosis more rapidly. First noticed during the Vietnam War, melioidosis is also known as Nightcliff Gardeners disease, because infection generally comes about through contact with the soil in northern Australia and Southeast Asia. The disease was responsible for 10 deaths in the Northern Territory during the 2010 wet season. It is caused by an antibiotic-resistant bacterium, *Burkholderia pseudomallei*, and listed by the US Department of Homeland Security as a category B potential bioterror threat.

### New collaborations

#### Stem cell research

An AU\$28-million Victoria-California Stem Cell Alliance has been formed between the State of Victoria and the California Institute of Regenerative Medicine, one of the world's largest stem cell research organizations. It is funding projects aimed at removing some of the practical barriers to the therapeutic application of stem cells, such as investigating how

stem cells might be used to treat multiple sclerosis, Alzheimer's and Parkinson's disease.

### New cancer drugs

In 2010, the Walter and Eliza Hall Institute for Medical Research (WEHI) in Melbourne signed a tripartite agreement with the world's oldest biotechnology company Genentech of San Francisco and pharmaceutical giant Abbott of Illinois to develop better cancer drugs. The research will employ WEHI's expertise to specifically target the survival machinery of cancer cells.

### Global health

The Bill and Melinda Gates Foundation has invested tens of millions of dollars into Australian studies on topics as diverse as how to eliminate the mosquito-based transmission of dengue fever, the development of vaccines against HIV and malaria, and the production of nutritionally enhanced bananas.

### Nobel impact

The close relationship between health and medical research in Australia and the US starts right at the source, with basic studies into human biology. Since World War II, Australians have won seven Nobel Prizes for Physiology or Medicine.

Two of these researchers maintain laboratories in the US. Professor Peter Doherty, who shared the prize in 1996 for the discovery of how the immune system recognizes virus-infected cells, works part of the year at St Jude Children's Research Hospital in Memphis.

Professor Elizabeth Blackburn, who shared the prize in 2009 for work on telomeres, the protective structures at the ends of each strand of our DNA that are thought to play an important role in the ageing process, is Professor of Biology and Physiology at the University of California, San Francisco.

IMAGE CREDITS: DR IAN FRAZER ADMINISTERS THE FIRST AUSTRALIAN GARDASIL VACCINATION, UNIVERSITY OF QUEENSLAND; DENGUE-CARRYING MOSQUITO *Aedes aegypti*, CSIRO; TEETH, ISTOCKPHOTO; VIRTUAL POLIO VIRUS, JASON ROBERTS/VIDRL.

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