

Victoria's leadership in medical research Melbourne, Australia

The Victorian biomedical research sector continues to perform excellent research and strengthen its international reputation. Focussing on research to improve the health and wellbeing of the community, it makes basic research discoveries, translates these discoveries to clinical applications and therapies and moves to commercialise these discoveries.

Recent Highlights

Cardiovascular Disease

Radio waves to control high blood pressure (November 2010)

The Baker IDI Heart and Diabetes Institute published the results of a clinical trial involving a novel treatment for high blood pressure (hypertension). The trial used a catheter device that emits radio waves to switch off the nerves to the kidney and thereby reduce blood pressure. The study was performed in patients where conventional treatments had failed. The results showed the device was safe and 84 per cent of patients treated showed a significant improvement in their blood pressure. The researchers hope that the effects of the treatment, which reduces the risk of stroke and heart attack, will be permanent.

Blood vessels differ between men and women with heart disease (February 2011)

Women who complain of chest pain are less likely to be diagnosed with coronary artery disease than men; however, they are more likely to die from their heart condition than men. This contradiction may have been explained by a study from the Molecular Cardiology Unit of St Vincent's Institute, Melbourne.

A collaborative study with St Vincent's Hospital examined the heart muscles from patients who underwent heart surgery and found that the walls of the small blood vessels in women are thicker than those in men. Since blood vessels with thicker walls are more likely to limit blood flow this may result in chest pain and heart attacks even though the coronary arteries appear to be clear.

Erythropoietin links blood stem cells to bone cells in the bone marrow (March 2011)

The Stem Cell Regulation Unit at St Vincent's Institute has shown that the hormone erythropoietin (Epo) does more than increase red blood cell numbers. Epo is used to treat anaemia but recent results in mice have shown that in the bone marrow, Epo also acts on immune cells (B cells) and bone cells. In the studied mice, treatment with Epo increased the number of red blood cells but it also caused bone loss. When the mice were given drugs (normally used to treat osteoporosis) to reduce their bone loss, the drugs also reduced the red blood cell gains, demonstrating a link between the bone cells and blood stem cells. The discovery of this link may help the management of those patients who receive Epo treatment for anaemia and who also suffer osteoporosis or bone fractures.



Cancer

Leukaemia research moves from the laboratory to the clinic (March 2011)

A clinical trial on leukaemia has been designed to test the safety of a new therapy developed in Melbourne by Monash University with the Ludwig Institute for Cancer Research. The team has developed a new monoclonal antibody which targets a molecule found on the surface of leukaemia and other cancer cells known as EphA3. The new antibody (KB004) has proved to be successful in animal studies and appears to trigger leukaemia cell killing and recognition by the immune system. Years of basic laboratory research on the role of EphA3 in cancer have led to this new trial in the clinic.

Melanoma treatment is tailored to the tumour (March 2010)

The Peter MacCallum Cancer Centre's Molecular Oncology laboratory is developing personalised treatment of melanoma. Analysis of the mutations carried by melanoma tumours identified distinct types of melanoma depending on the genetic alterations that they carried. Clinical trials on patients whose tumours carried different mutations then compared the effects of different therapies on the different melanoma types. The laboratory aims to use the identified genetic mutations to guide the selection of therapy in an individual for best effect.

Ovarian cancer proteins identified (April 2011)

The Ovarian Cancer Biomarker laboratory at Prince Henry's Institute, Melbourne is working to develop an early test for ovarian cancer. An effective early test is needed because ovarian cancer patients usually only show symptoms once the disease is well advanced and when treatment is less likely to be successful. The research identified hundreds of proteins which were changed in cancer patients and which acted as signals of the disease. From these, a group of ten proteins was defined which indicated early disease in ovarian cancer patients. Current testing of this panel of proteins in a larger group of patients will bring a new test a step closer.

Infectious Diseases/ Immunology

Malaria parasite 'caught' invading red blood cells (January 2011)

The malaria parasite has been caught in the act invading red blood cells. This is the first time that such molecular detail has been possible. Research at the Walter and Eliza Hall Institute, in collaboration with the University of Technology, Sydney, used new techniques to culture the parasite combined with super high resolution microscopy to see the fine details of the parasite's invasion process. This will help to understand the mechanics of the parasite's entry and consequently will aid vaccine development.

Protein shapes up to kill cells (November 2010)

Structural biology research performed at Monash University with the Peter MacCallum Cancer Centre has shown how a protein—Perforin—acts to kill cells. Perforin is a key component of our body's natural defences against pathogens as it acts to punch holes in cells infected with viruses. It is secreted by white blood cells along with toxic enzymes and once Perforin has created the pores, the toxins can enter and kill off the infected cells. The study involved the Australian Synchrotron in Melbourne to work out the structure of the protein complex.

A fragmented approach to tame peanut allergy (December 2010)

Allergy to peanuts is the most common cause of a life-threatening reaction to food. A collaborative study between The Alfred Hospital and Monash University has brought a treatment for peanut allergy a step closer. The study identified fragments of peanut proteins that stimulated the immune response without provoking a severe allergic reaction, or anaphylaxis. This work could lead to a vaccine, or an allergy treatment, in the near future.



Neuroscience

New drug offers hope for Parkinson's Disease (March 2011)

Parkinson's Disease (PD) sufferers lose their motor skills as they lose the cells from a region of their brain known as the *substantia nigra*. Recent research by the Mental Health Research Institute has investigated potential treatments for PD in animal models and tested novel compounds supplied by its commercial partner with encouraging results. One particular compound has been identified that can reduce the loss of the crucial brain cells and prevent the decline in motor function. This new drug is a candidate for further development and eventual clinical trials.

Sunlight linked to a lower risk of Multiple Sclerosis (February 2011)

Research from the Murdoch Childrens Research Institute, Melbourne University and Barwon Health has identified that exposure to sunlight and vitamin D levels influences the nerve changes in Multiple Sclerosis (MS) patients. MS is a progressive disease in which the nerve cells lose their fatty coating of myelin. Higher exposure to sunlight is associated with a lower risk of 'demyelinating' the nerve cells and a lower risk of developing MS. This finding adds to the understanding of risk factors for the disease.

Gene therapy for nerve cells in the ear (April 2011)

Research at the Bionic Ear Institute aims to return hearing to the deaf. Once a person becomes deaf, the nerve cells that a cochlear implant would stimulate are progressively lost from the inner ear, they wither and die. Recent studies by the Institute aimed to prevent this nerve loss by using gene therapy. Genes producing nerve survival factors (neurotrophic factors) were introduced directly into the cells of the cochlea. Importantly, the treatment did not damage the areas of the cochlea needed for an implant. The therapy appeared to become less effective after long periods of deafness indicating that a window of opportunity exists when this treatment will be most effective.

Stem Cells

Making stem cells for diseases (May 2011)

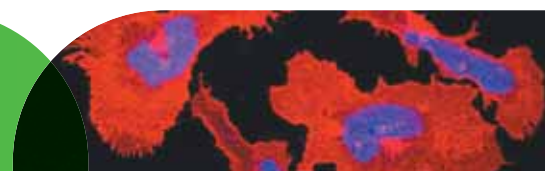
A team at Monash University and CSIRO Molecular and Health Technologies has made induced pluripotent stem cell lines (iPS cells) from mature kidney cells. These new cells can be manipulated to produce many different cell types including embryonic kidney cell types. The research aims to use these cells to model the development of kidney disease and to test new drugs and treatments on them. This adds to previous work from the Monash Institute of Medical Research which produced iPS cells from patients with Type 1 diabetes for the first time. Those cells can be used to produce the types of pancreas cells affected in diabetes.

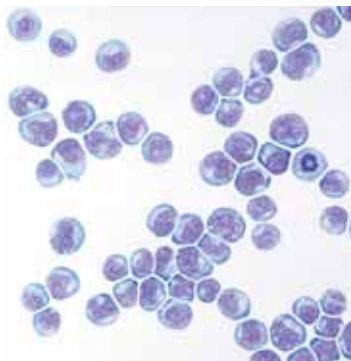
Stem cell renewal gene identified (February 2011)

New findings from the Walter and Eliza Hall Institute report that without the Erg gene, a mouse will quickly exhaust the stem cell population that gives rise to its mature blood cells, compromising its blood cell count. The gene is crucial to the maintenance of the stem cell population and consequently the number of normal blood cells generated from them. The researchers now want to identify the signals that trigger the generation of mature blood cells from the stem cell progenitors so that cells can be grown for therapeutic use.

Stem cells to patch up the broken heart (March 2011)

The O'Brien Institute continues to develop a stem cell therapy that can be combined with tissue engineering to treat heart defects. Recently, beating cardiac cells were engineered from adipose (fat) cells and currently, a 'cardiac patch' is being modelled which will be developed to treat damaged muscle caused by a heart attack. The research aims to produce a functional 'cardiac patch' from what is essentially an easily accessible source of unwanted tissue.





Clinical Trials/ Cohort studies

Early movement improves stroke recovery (January 2011)

The Florey Neuroscience Institutes published positive results from the ongoing AVERT study (A Very Early Rehabilitation Trial). Patients who were given intensive early mobilisation soon after they suffered a stroke (within 24 hours) on average were able to walk unassisted several days earlier than those who received standard care. They also fared significantly better in other measures of recovered function. These early interventions can now be introduced to standard care to improve the recovery of other stroke patients.

Abdominal fat is linked to macular degeneration and blindness (April 2011)

A person's abdominal fat has been linked to their risk of Age-Related Macular Degeneration (AMD) by a team of researchers from the Centre for Eye Research Australia. The link was uncovered in a study of 21,287 men and women aged from 40 to 69 years of age. It found that men with significant abdominal fat had a 75% increased risk of developing late-stage AMD. These new findings suggest that AMD is fundamentally an inflammatory disease and that the study has uncovered the effects of oestrogen (produced by the fat tissue) on inflammation.

Cannabis use increases the risks of psychotic symptoms (March 2011)

The Burnet Institute has combined the results from its prospective study with international datasets to look at the effects of cannabis use on mental health. Combined data from Germany, the Netherlands, New Zealand and Sweden have shown that cannabis use increases the risk of psychotic symptoms and disorders. It may also be one of the factors that precipitate schizophrenia in vulnerable people.

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