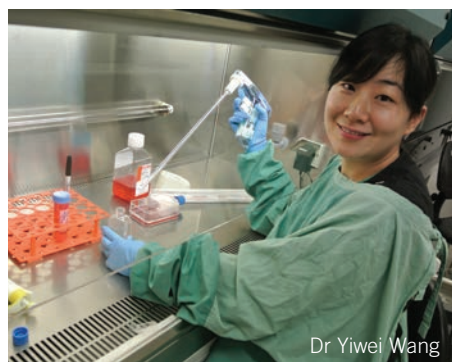


Burns research group puts the focus on building human skin

Scientists at the ANZAC Research Institute are inching closer to finding the key to skin regeneration – not an artificial skin, but one which will be a living and functional organ with the capacity to grow hair, produce sweat and feel heat or pain.

The development of such a skin equivalent will revolutionise the treatment of burns, reducing the impact of scarring and opening the way for patients to resume their lives without the physical and mental trauma that frequently follows burns surgery.



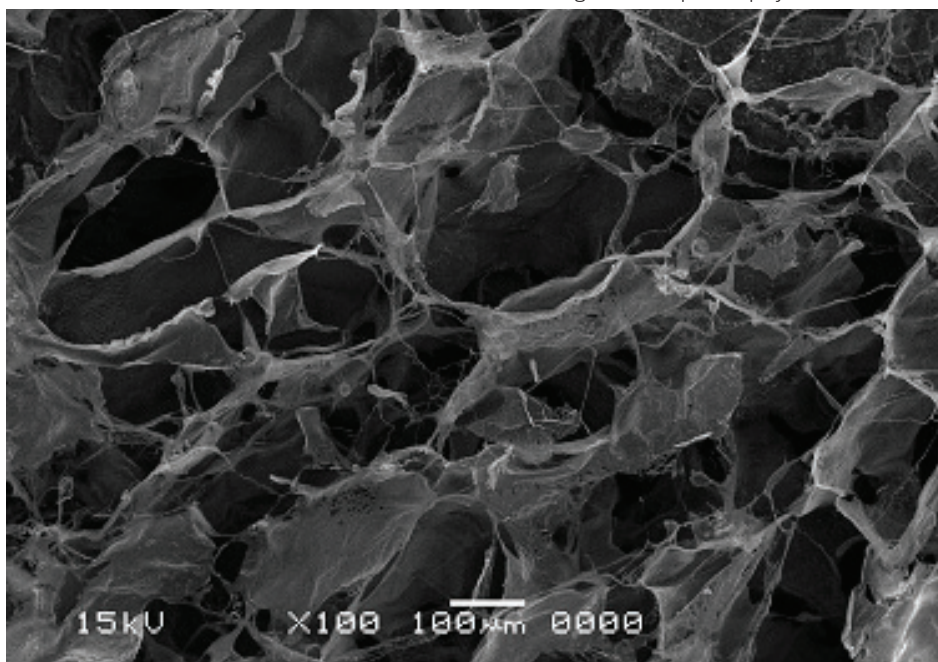
Dr Yiwei Wang

Dr Yiwei Wang predicts it will be about five years before skin tissue engineering reaches a stage where it is ready to be tested on human patients.

“At the moment we are working with mice, and then we will move to testing it on pigs because they have skin structures that are quite close to human,” she says.

Working in conjunction with staff in the Burns Unit at Concord Hospital, Dr Wang is using a biodegradable and porous polymer

Biodegradable & porous polymer skin scaffold



skin scaffold which is constructed over the wound, and then has cultured skin cells attached.

As Professor Peter Maitz, medical director of the Burns Unit and head of the ANZAC Institute Burns and Reconstructive Surgery team, explained in an earlier edition of *discovery*, skin cannot be transplanted, and artificial skins developed to this point lack elasticity and are unable to fulfil all the functions of the body’s largest organ.

Dr Wang says stem cell technology has led to enormous breakthroughs in overcoming these hurdles.

“With stem cells in the skin we will be able to differentiate cells that determine functions such as hair follicles, sweat glands, neurons and blood vessels. So then it won’t be just a covering skin but a fully functional skin with elasticity,” she explains.

Dr Wang completed her pharmacy degree in China, moved to Australia in 2003 to study for her Master’s degree at Sydney University, and then, working on a study of skin scaffolding and tissue engineering, finished her PhD in the UK. She joined the ANZAC Research Institute in late 2009.

Because Dr Wang works with the Burns Unit she sees the terrible scarring that many patients will carry for the rest of their lives.

“Every week we have a meeting with surgeons, nurses, social workers, nutritionists and other researchers,” she says.

“We sit down together and discuss the cases and their treatments, and what can be done to help. For me it is so rewarding to be making progress towards the development of a genuine human skin that can replace the skin that these patients have lost.”

“Rocket ship” speeds up important research

Its formal name is the BD Influx Cell Sorter, but to scientists at the ANZAC Research Institute, it's known as the “Rocket Ship”.



However you refer to it, this amazing and rare piece of scientific equipment is a giant leap forward in revealing the secrets that make us the species that we are.

Associate Professor Georgina Clark, of the Dendritic Cell Biology and Therapeutics group, is one of those who's seen the huge advantages of the Cell Sorter.

“It's a machine where we get a lot of white blood cells, attach an antibody on to those cells that's got a marker which is activated fluorescently. The antibody-tagged cells then go through the machine and we take off the ones that are positive for the marker that we want and discard the rest, the ones that are negative and we don't need,” says Dr Clark.

“We keep all that sterile, so then we can collect those cells and do experiments on them. Or the machine allows us to put nine different coloured markers on one cell so you can divide a population of cells on nine different parameters.”

Or to put it another way, the Cell Sorter allows researchers like Dr Clark to identify one cell out of 10,000 or even 10 million.

“It means we can do things we couldn't do otherwise,” she says, with obvious pleasure.

Purchase of the Cell Sorter was made possible by grants totalling \$445,000 from the National Health and Medical Research Council, Ramaciotti Foundation, Cancer Australia and the Gwynvill Group plus support from the ANZAC Research Institute.

Become an everyday hero and help the institute

We don't all have the training, skills or knowledge to be medical researchers, but all of us can be heroes in our own right by supporting the work at the ANZAC Research Institute.

You can be a hero by building your own personal fund-raising page. It takes only a few minutes to build and email to all of your friends to help support the Institute's causes. Through Everyday Hero the ANZAC Research Institute is trying to making it easier, more efficient and more rewarding for people to contribute.

This can be achieved by increasing the participation in fundraising by businesses and households alike, and by including giving in as many everyday transactions as possible.

You can also enjoy your fundraising by linking it to events and television programs, such as Channel Ten's 1 Million Challenge, Sydney Morning Herald Half Marathon or The Sun-Herald City2Surf.

Please use the following link: <http://www.everydayhero.com.au/charity/view?charity=1832> or go to our own website www.anzac.edu.au and click on the 'donate now' tabs to get started as one of our own everyday heroes.

ANZAC Summer Scholarships encourage a new generation of researchers



Rushad Bachan, Sarah Johnston, Harry Crane, Sarah Kim, Carina Blaker, Desmond Ka Kit Li, Lakshmi Chitra Varanasi, Xiaojie Wang, Laura Myfanwy White

The ANZAC Research Institute took 14 dedicated and motivated undergraduate students under its wing over the 2011-12 summer, providing them with the opportunity to develop research projects under the guidance of senior scientists over an eight week period.

The Summer Scholarship scheme was initiated by the Institute in 2004 and adopted a year later by the University of Sydney Medical School and has been recognised with a national tertiary education award by the Australian Living and Teaching Council for “Outstanding Contribution to Student Learning.”

The 14 researchers who made the Concord campus their home this summer was the largest group to have taken advantage of the special opportunities

and facilities which the Institute offers this next generation of medical scientists.

The students were; Sarah Kim, Ali Phillip Mourad, Carina Blaker, Rushad N Bachan, Annie Wen, Desmond Ka Kit Li, Sarah Johnston, Lakshmi Chitra Varanasi, Harry Crane, Laura Myfanwy White, Xiaojie Wang, Bianca Varney, Sai Sivananda Chaganti and Yi Wei Sim.

Two top ranking students, S Kim and D Ka Kit Li, represented the Institute and competed for the University's Dean's Prize in medical research, with Sarah Kim being awarded second place.

We always welcome these young medical researchers to the Institute and wish them every success as they start their careers in science.

Government supports blood cancer research

The NSW Government has awarded \$3.47 million over 5 years in a competitive grant process to advance a major project at the ANZAC Research Institute investigating the diagnosis and treatment of blood cancers.

Health Minister Jillian Skinner has announced the grant during a visit to the Concord Hospital campus, saying it's a key part of the government's commitment to boosting medical research.

"The cutting edge research will have a direct impact on cancer outcomes across the state, providing our doctors and nurses with the latest information and expertise to provide world class care," she said.

The funding goes to the Dendritic Cell Biology and Therapeutics group, headed by Professor Derek Hart, which is discovering key immune markers and biological processes which will provide new diagnostic and therapeutic products for improving patient care.

Chief Cancer Officer and CEO of the Cancer Institute NSW, Professor David



Prof David Currow, Prof Derek Hart, Prof David Handelsman, Prof Nico van Zandwijk, Mr Matthew Swanborough (Concord Hospital), Dr Teresa Anderson (NSW Health)

Currow, says the funding grant is good news for people across NSW affected by acute myeloid leukaemia, recipients of bone marrow transplants and people diagnosed with Hodgkins and non-Hodgkins lymphoma.

Another \$3.5 million dollars over 5 years has also been granted to the Asbestos Diseases Research Institute, which shares a building and was co-located to utilise the scientific expertise and facilities of the ANZAC Research Institute. This funding goes towards programs to improve outcomes for people with asbestos-related cancer and their families.

Professor Currow says the translational research undertaken by Professor Nico van Zandwijk and his team will see NSW as a world leader in the prevention, diagnosis and treatment of mesothelioma.

Australia has among the world's highest incidence of malignant mesothelioma, a fatal cancer caused by asbestos.

These two projects at the Concord campus were the only projects funded by the NSW Cancer Institute in its first Translational Cancer Program Grants.

Advancing the fight against leukaemia



Dr Georgina Clark of the Dendritic Cell Biology and Therapeutics group has set herself.

"My real love is the CD300 family of molecules," says Dr Clark. That's not surprising, as this family of molecules was discovered by Dr Clark several years ago, in conjunction with a team of scientists led by Professor Derek Hart.

Dendritic cells are unique subsets of white blood cells and are responsible for initiating and directing immune responses. Dr Clark discovered the CD300 family plays a major role in this.

"We've identified cells that are really

significant in turning on and off the responses of a lot of the white blood cells, the dendritic cells and the monocytes that are important in taking up the foreign antigens, foreign bacteria and viruses.

"The other side of this is whether we can use these to target a particular disease, and that's where we're working now, in finding an alternative treatment for acute myeloid leukaemia."

The need to find that treatment acquired some urgency after a drug known as Mylotarg had to be withdrawn because of unacceptable side effects. Dr Clark's research has identified a new molecule, CD300f, which may lead to the development of a new antibody treatment for AML.

Dr Clark trained as a scientist in Melbourne, before moving to Oxford University in England to work in organ transplantation. She then joined Prof Hart's research team in New Zealand and later Brisbane, before both came to the ANZAC Research Institute in 2010 after Derek Hart

was appointed Professor of Transplantation and Immunotherapy at Sydney University.

"My whole research working life has been in the immunology and molecular biology of the molecules on the surface of white blood cells and how that interacts with the environment," Dr Clark explains.

Her other major project is in researching the CD300a and CD300c biomarkers, learning about their role in controlling the dendritic cells' response to inflammation. The work is concentrated at the moment on psoriasis, a relatively common inflammation of the skin caused by increased immune system activity.

The Dendritic Cell Biology and Therapeutics group is the newest at the Institute but is already regarded very highly for its research which could lead to dramatic developments in the field of organ transplants and in fighting diseases such as cancer, diabetes and inflammatory illnesses.

American grant recognises significant development in finding mutant gene



Associate Professor Marina Kennerson

The Muscular Dystrophy Association in the United States has awarded a research grant worth \$420,000 over three years to allow the ANZAC Research Institute's neuroscience team, led by Professor Garth Nicholson and Associate

Professor Marina Kennerson, to extend its groundbreaking investigations into the role of copper in motor neurons.

"This is basically the start of our work towards finding a treatment," says Associate Professor Marina Kennerson, who in 2010 earned international recognition for identifying mutations in a gene that is important for maintaining a balance of copper in a non fatal form of motor neuron disease.

As a founding member of the Institute's staff, A/Prof Kennerson has been working on finding the mutant genes that cause

degenerative and often fatal damage to the nervous system in diseases such as Charcot-Marie-Tooth, Motor Neuron Disease and Parkinson's Disease.

The US Muscular Dystrophy Association has now recognised the Institute's discovery that "mutations in the copper transport gene ATP7A cause slow but progressive degeneration of the extensions (axons) of the nerve cells called motor neurons that send signals to the limb muscles by dying back at the nerve ends."

"Copper is the third most important trace element in our system, after iron and zinc," explains A/Prof Kennerson.

"We believe the mutant gene leads to some deficit of trafficking of copper and what we're seeing is that the ends of the nerves die back. So we're asking what is the potential importance of copper at the ends of the nerves.

"We don't know whether it's a case of copper not being delivered down to the ends of the nerves or is if it is doing damage in the

actual cell body. This project allows us to look at it in a mouse model that mimics the human disease.

"We've made that same mutation in the mouse's gene and we're hoping to recreate the disease in the mouse. Then we can look at the ends of the nerves and we can stain for this protein and see if it's up in the spinal cord and where it should be moving in the nerves."

A/Prof Kennerson hopes her work may lead to a means of treatment, either by supplementing the nerves with copper or by reducing the amount of copper.

Motor neurons are affected in particular because they are different from other cells, often being metres in length. Charcot-Marie-Tooth is a non-fatal neurological disease, affecting about 1 in every 2500 people, destroying especially the nerves that control the arms, hands, legs and feet. It is the most common inherited neuromuscular disease, and is estimated to cost Australia \$220 million each year in paramedical and pension support.

GIVING OPPORTUNITIES

All gifts over \$2.00 are tax deductible

Please use this form if you wish to make a donation to help the ANZAC Institute in its exciting medical research, or if you would like to receive further information. We would love to hear from you, our supporters.

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