



Biomed Benchmark

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New facility and robots to accelerate research

Monash Antibody Technologies Facility (MATF), unique world-wide because of its use of high-speed manufacturing robots, will change the way local and international scientists carry out research.

The facility, which is new to the School of Biomedical Sciences, will produce antibodies for use in scientific research throughout Australia.

Antibodies are proteins found in the immune system that defend the body against disease and are one of the most important reagents used in life sciences. They are vital for research into cardiovascular disease, neurological disorders, inflammation, brain diseases, cancer and also drug development.

MATF will offer custom-made antibodies produced a lot faster than other facilities. The

antibodies will be made by robots, being built by Tecan. The robots will be capable of creating upwards of 3000 monoclonal antibodies per year, which is the highest projected throughput of any facility world-wide and encompasses the entire production process.

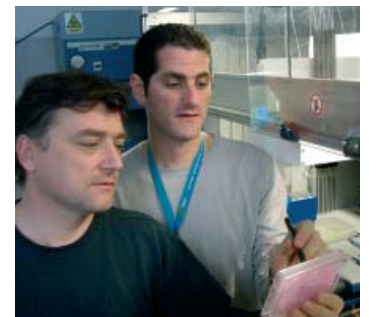
Alan Sawyer, Director of MATF, claims that the new robotic equipment will change the way scientists can access antibodies for their research.

"There is nothing on this scale currently available," Alan Sawyer said. "We will be increasing the number of antibodies produced per year by a factor of ten. This

service will mean that scientists can expand the way they think about their research now that availability of these critical reagents is no longer a limiting factor."

The opening of the Australian Synchrotron this year is a contributing factor to setting up MATF at Monash University.

"A synchrotron is a big reason to have an antibody facility," Deputy Director Michael Spiegel said. "The synchrotron and MATF together will attract international academics and major pharmaceutical companies to Clayton for research."



Alan Sawyer and Michael Spiegel

MATF is funded by the Department of Innovation, Industry and Regional Development (DIIRD), Monash University, ASCC and the National Collaborative Research Infrastructure Strategy (NCRIS).

Immune cell discovery spells hope for chemotherapy patients



Professor Richard Boyd

Professor Richard Boyd of the Monash Immunology and Stem Cell Laboratories has led a team of researchers in identifying a group of cells that help to rebuild the immune system following chemotherapy.

The finding is part of a \$5.23 million research program funded by a 2007 National Health and Medical Research Council's Programs scheme, of which Professor Boyd is the chief investigator. Together with co-investigators, Professors Alan Trounson, Claude Bernard and Ban Hok Toh, the program is combining stem cell therapies with rebuilding of a key part of the immune system – the thymus.

Professor Boyd found that mesenchymal cells are involved in restoring a damaged thymus by supporting the growth of surrounding cells.

Chemotherapy, necessary to kill off cancerous cells, severely depletes the immune system and injures the thymus which compromises a patient's ability to fight infections and help ward off the return of the cancer.

Although other researchers have examined the role of mesenchymal cells, Professor Boyd's group is the first to discover how these cells behave once the thymus has been damaged by treatments such as chemotherapy.

"We now know that mesenchymal cells act as 'immune conductors' in the thymus," Professor Boyd said. "They reduce the inflammation caused by chemotherapy in surrounding cells."

In response to chemotherapy, the mesenchymal cells increase their production of several growth factors (proteins) which help stimulate other cells to begin rebuilding the thymus.

"The research has not only shown us how the cells operate, but also how they work together. Understanding how this organ behaves, has implications for enhancing the recovery rate of a damaged thymus which we hope will increase cancer recovery rates."

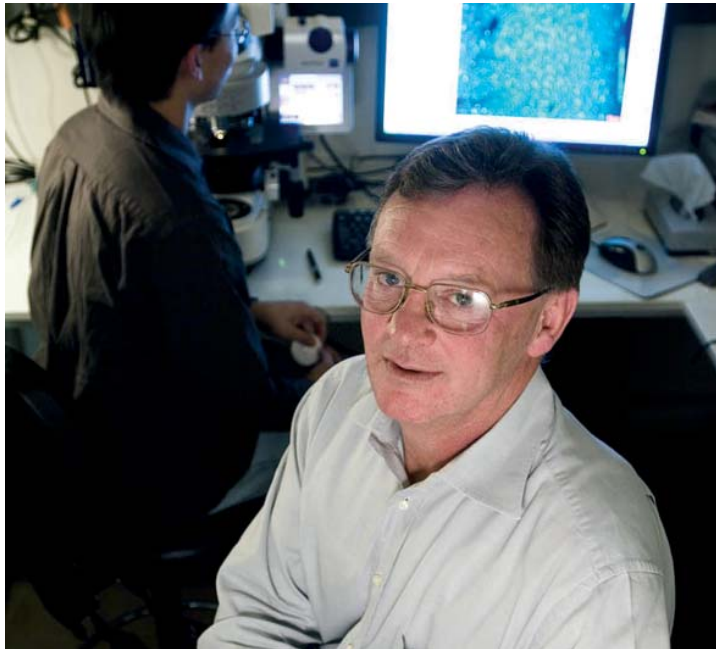
New era for Department of Physiology

Eminent neuroendocrinology researcher, Professor Iain Clarke, will take the Department of Physiology into a new era with his recent appointment as Head of Department.

Professor Clarke investigates brain control of the endocrine (or hormonal) system as well as factors underlying or associated with obesity.

In 2005, 3.24 million Australians were classified as obese. It is estimated that, if these figures continue, 28.9 per cent of the Australian population will be considered obese by 2025.*

Professor Clarke researches how the brain controls food intake and energy expenditure. His work also extends to how obesity impacts on reproduction, stress and other functions. This work is carried out with both national and international collaborators.



Professor Iain Clarke

Recently, Professor Clarke and his collaborator, Professor G Lincoln in Edinburgh, published in the highly-prestigious journal *Science*. The paper provided

new insights into the timing mechanisms in mammals, which has helped researchers to understand how the body adapts to different seasons.

Currently, Monash University is in the developmental stages of building a strong university-wide obesity initiative which will encompass all aspects of obesity research.

"In my new role, I am committed to developing obesity research as a major initiative of the university," Professor Clarke said.

The Department of Physiology has areas of key research strengths which include fetal physiology, cardiovascular health, cognitive neurosciences and metabolic functions (obesity).

"Our intention is not only to use the departmental strengths as a platform to create even greater contributions to the knowledge of physiology but also to cross link these activities both within the department and the school."

*Economic Costs of Obesity – Access Economics PTY Limited

The Governor's visit highlights medical research growth



Governor of Victoria, Professor David de Kretser AC

The School of Biomedical Sciences recently welcomed the Governor of Victoria, Professor David de Kretser AC, to Monash University.

Professor de Kretser, who was the foundation director of the Monash Institute of Medical Research (MIMR) and has been at the forefront of reproductive medicine for the past 40 years, was invited to the university to hear a presentation about the School of Biomedical Sciences.

Professor Christina Mitchell, Head of the School of Biomedical Sciences, invited Professor de Kretser to discuss how to position and promote biomedical sciences to improve its profile both locally and nationally.

STRIP 2 and 3, currently being constructed on the Clayton campus, will house some of the school's research activities. Of the school's 400 research staff

and 285 higher degree research students, 540 staff and students will be accommodated in the buildings.

In 2009, some of the school's research strengths – cancer, fetal and baby health, infectious diseases, neurosciences, pharmacology/drug design, regenerative medicine, stem-cell research, structural biology/bioinformatics and vascular health – will be brought together in a cohesive structure in STRIP 2 and 3 buildings.

"Our major research activities will be brought together into two main buildings and, with the latest technology and facilities, will encourage collaborations and strengthen research," Professor Mitchell said.

"The Governor offered advice and suggestions about possible ways of moving forward to integrate the school's research capabilities and promote collaboration."

Academic awarded national science medal

Professor Jamie Rossjohn, whose research in biomedical sciences has included insights into how killer T-cells recognise viruses, has received the prestigious 2007 Gottschalk Medal.

The Gottschalk medal is presented by the Australian Academy of Science to a scientist under 40 years of age for their outstanding contribution to medical sciences. It recognises the contributions to science by the late Dr Arthur Gottschalk, a German scientist and leading authority in glycoprotein research, who spent more than 20 years in Australia.

Professor Rossjohn, an Australian Research Council Federation Fellow, is investigating three broad, yet interrelated areas of biomedical science,

namely immunity, infection and rational drug design. His research program aims to provide answers into how pathogenic bacteria cause disease, central questions relating to immunity, and the development of therapeutics to combat diseases.

His main approach is to study the three-dimensional shape of proteins using a technique called X-ray crystallography, a field that is dependent on synchrotron radiation.

Recently published in the highly prestigious journal *Nature Immunology* (2007), Professor Rossjohn and his collaborators provided important insight into how killer T-cells recognised viruses.

Professor Rossjohn's research team and collaborators have provided seminal insight into important biomedical problems, publishing more than 100 research papers in this area. He was also a recipient of the 2004 Science Minister's Prize for Life Scientist of the Year.



Professor Jamie Rossjohn

Groundbreaking research into disease in sheep

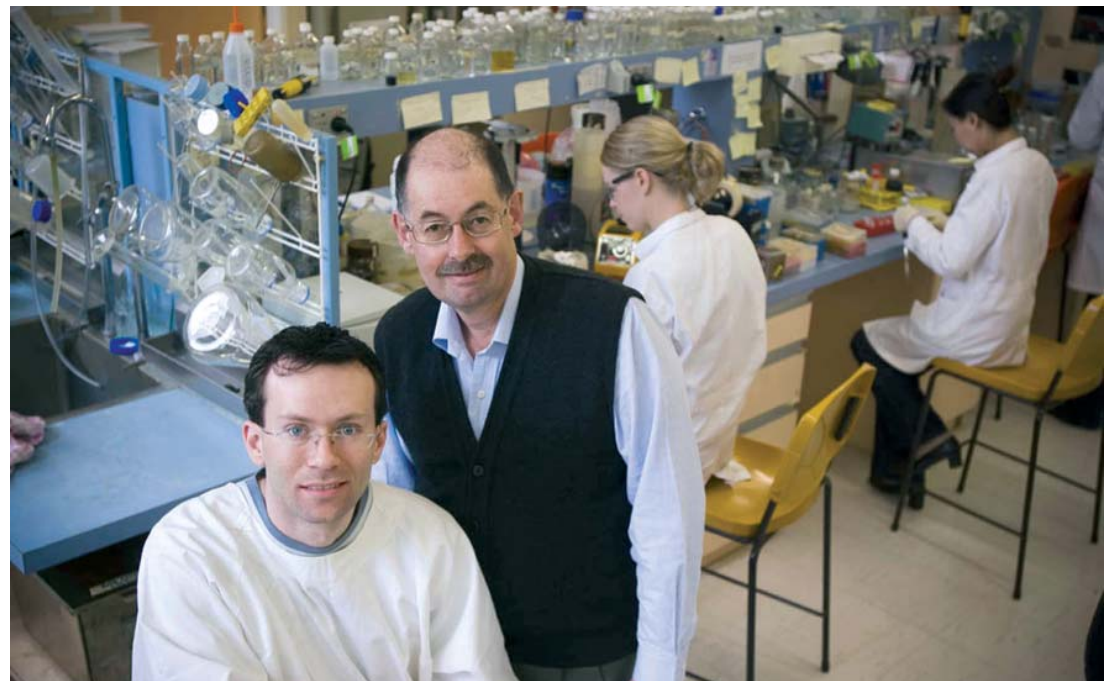
Footrot in sheep may become a disease of the past thanks to new research and upcoming vaccine trials.

The highly contagious disease of the feet of sheep causes severe lameness and loss of body condition, and is estimated to cost Australian wool and sheep meat farmers about \$20 million per year.

Australian research leaders Professor Julian Rood and Dr Dane Parker from the Australian Research Council Centre of Excellence in Structural and Functional Microbial Genomics (located within the School of Biomedical Sciences) worked for eight years with Drs Ian Paulsen and Garry Myers at The Institute for Genomic Research (TIGR) in Maryland, USA.

The project involved determining the complete DNA sequence of the pathogenic bacterium which causes footrot, *Dichelobacter nodosus*, which was then analysed to identify proteins that are potentially exposed on the surface of the bacterium and therefore more likely to elicit an immune response.

This breakthrough identified eight proteins in the footrot bacterium



Professor Julian Rood (right) with Dr Dane Parkes

that are potential antigens for a new cross-protective vaccine.

"We are hopeful this approach will find the 'chink in the armour' to develop a vaccine that will ultimately eliminate, or dramatically reduce, the incidence of footrot," said Professor Rood who has been researching footrot for over 25 years.

Dr Ian Paulsen, project leader at TIGR said "determining the genome sequence of *Dichelobacter nodosus* not only provides the basis for vaccine development, but also valuable scientific insight as it is the smallest genome of an anaerobic bacterium yet sequenced."

The research was funded by the United States Department

of Agriculture and the Australian Research Council and involved researchers based at Monash University, TIGR and the University of Arizona. If future funding applications are successful, the first vaccine sheep trials will be conducted at the end of this year at the University of Sydney's facilities at Camden.

Leading the fight against the Buruli (Bairnsdale) Ulcer

An international team of researchers, led by Dr Tim Stinear, has unlocked the inner secrets of the Buruli (Bairnsdale) Ulcer, a bacterial disease affecting more than 60 Victorians each year.

The team is the first to complete the DNA sequence (genome) of this flesh-eating bacterium, called *Mycobacterium ulcerans*. They have its complete blueprint and are using it to identify gene targets which will be used in further research to improve diagnosis, and to develop drugs and vaccines with the aim of preventing the disease.

“Having the full genome sequence of this pathogen provides a source of hope and direction for the fight against what is a terrible but neglected disease,” Dr Stinear said.

“Analysis of the genome has given us an understanding into how the bacterium causes the disease and this is the first step in working out how to prevent it.”

The disease begins as an infection beneath the skin while an unusual toxin destroys fat cells and suppresses the immune system. Advanced stages of the disease result in massive skin ulcers, causing deformities and permanent disability. Victims often need

extensive surgery to remove ulcers and repair skin defects. Antibiotics are not always effective and there is no vaccine.

In 2006, 63 cases were reported in Victoria alone; in previous years, fewer than 30 cases were reported throughout the entire nation. The reasons for this sudden increase are unknown. The disease is also known to exist in 30 other countries – most predominantly in Africa where it is in epidemic proportions.

“The genome sequence will be a rich resource for the international community to address the key research priorities surrounding Buruli ulcer. We now know how *M. ulcerans* makes its toxin



Dr Tim Stinear

which opens up new avenues for the development of therapeutics to end its production and so stop the disease,” he said.

Kidney health in preterm babies



Dr Jane Black

Dr Jane Black and her research team are investigating kidney development in preterm babies, and, in a world first, will look at kidney structure in prematurely-born baboons.

Recently awarded a National Health and Medical Research Council grant, Dr Black is examining whether or not being born prematurely can detrimentally affect the number of functional units (nephrons) in the kidney, and consequently kidney growth in a newborn baby.

Since loss of the functional units of the kidney ultimately leads to kidney failure, it is important for an individual to have as many nephrons as possible at birth for long-term renal health.

“When preterm babies are born, they are delivered at a time when their kidney is still being formed. We want to know what happens after preterm birth and if the kidney

keeps growing like it would when they are in the womb,” said Dr Black.

Working in collaboration with the Southwest Foundation for Biomedical Research in San Antonio, USA, Dr Black is investigating whether the functional units in preterm baboons continue to form after birth, if the structure is the same and if the kidney is functioning normally.

Also working with clinicians in the neonatal intensive care unit at Monash Medical Centre, Dr Black will soon begin looking at kidney function in preterm babies.

“We are hoping to identify various factors in the neonatal care of babies that might affect the formation of the kidneys.

Things like antibiotics and assorted classes of drugs we know can be potentially harmful. What we want to do really is maximise nephron growth because you don't get any more new nephrons after they finish forming in early development,” said Dr Black.

As one of the highest ranked grants awarded by the NHMRC last year, Dr Black is aware of the interest her research is generating within the scientific community. Already with collaborations in San Antonio and Salt Lake City in the United States, and partnerships with pathologists in Adelaide, she is hopeful that this initial grant will yield considerable further research in the future.

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