MICROBIAL GENOMICS STRUCTURE AND FUNCTION

Newsletter #3 July 2007

ARC Centre of Excellence in Structural and Functional Microbial Genomics

From the Director

I am sure all scientists would agree that one of the delights of practising science is the international perspective and the international connections, collaborations and indeed friendships that flow from scientific activities. As I write this paragraph I am en route to Japan, a country in which I have had the privilege of living and working in the past and of developing exactly the kinds of collaborations and friendships to which I refer. The international and mutlicultural nature of science, especially in Australia, is appropriately reflected in the Centre personnel. It therefore comes as no surprise that three of the Centre staff and students (Jamie Rossjohn, Keith Al-Hasani and Arek Rainczuk) highlighted elsewhere in this newsletter were born out of Australia, but have chosen Australia as the place to make their contribution to science. We are all familiar with the often heard notion that sport and the arts can play important roles in breaking down barriers. It is my belief that as scientists we have an equal responsibility to use our international contacts, reputations and activities to facilitate and encourage better understanding, tolerance and cooperation amongst all cultures and nationalities. I look forward to the day when national borders are a thing of the past and to the role that science has played in bringing that about.

The first half of 2007 has brought some major successes and honours to Centre CIs, with significant publications in Nature and Nature Biotechnology. I join all Centre staff and students in congratulating Jamie Rossjohn, Julian Rood and all the researchers who have contributed to these outcomes.

Ben Adler
Director

HIGHLIGHTS

Noted Centre Chief Investigator Professor Jamie Rossjohn honoured with two new awards

Professor Jamie Rossjohn has recently been awarded the 2007 Commonwealth Health Minister's Award for Excellence in Health and Medical Research.

The prize is awarded each year to an outstanding Australian health and medical researcher during Australian Medical Research week.

The award recognizes Professor Rossjohn, an ARC Federation Fellow, as one of Australia's most eminent structural biologists. In 2004 he was the recipient of the Science Minister's Prize for Life Scientist of the Year.

In May, Professor Rossjohn was also awarded the prestigious 2007 Gottschalk Medal.

This award, bestowed by the Australian Academy of Science, recognizes outstanding research in the medical sciences by scientists less than 40 years of age. It is named in honour of the late Dr Arthur Gottschalk, FAA, formerly from Germany, who was a leading glycoprotein research scientist in Australia for more than 20 years.

The main focus of Professor Rossjohn's research investigates three broad areas of biomedical science, namely immunity, infection and rational drug design. The aims of this research are to apply structural biology to gain an understanding of how pathogenic bacteria cause disease, why immune systems work the way they do, and the development of therapeutics to combat diseases.

This involves the use of techniques, such as x-ray crystallography, which provides information on the three dimensional structure of proteins and can subsequently reveal intricate knowledge about how they function. Jamie heads the Monash University Protein Crystallography Unit or PCU housed in Monash University's Department of Biochemistry and Molecular Biology. The unit is an integral part of the Centre's core infrastructure – the high through put microbial pipeline – and vital to the Centre's projects involving the identification of new drug targets.

In addition to working in a leading laboratory, that has generated more than 100 research papers in the areas of infection and immunity, Jamie also spends his time mentoring post-doctoral researchers and PhD students, as well as, promoting science to primary school students.

The Centre would like to extend its congratulations to Jamie on the latest additions to his highly impressive career accolades.

Professor Jamie Rossjohn's lab:
www.med.monash.edu.au/biochem/staff/rossjohn.html

RESEARCH NEWS

Footrot vaccine project breakthrough

Footrot in sheep may be about to become a disease of the past thanks to a flagship Centre project which is leading the way in the development of a new vaccine against the devastating veterinary disease.

The highly contagious disease of the feet of sheep causes severe lameness and loss of body condition, and is estimated to Australian wool and sheep meat farmers up to $100 million per year.

The research, which is using a vaccine development approach known as reverse vaccinology has identified eight proteins in the causative agent of footrot, the bacterium *Dichelobacter nodosus*, that are potential antigens for a new cross-protective vaccine.

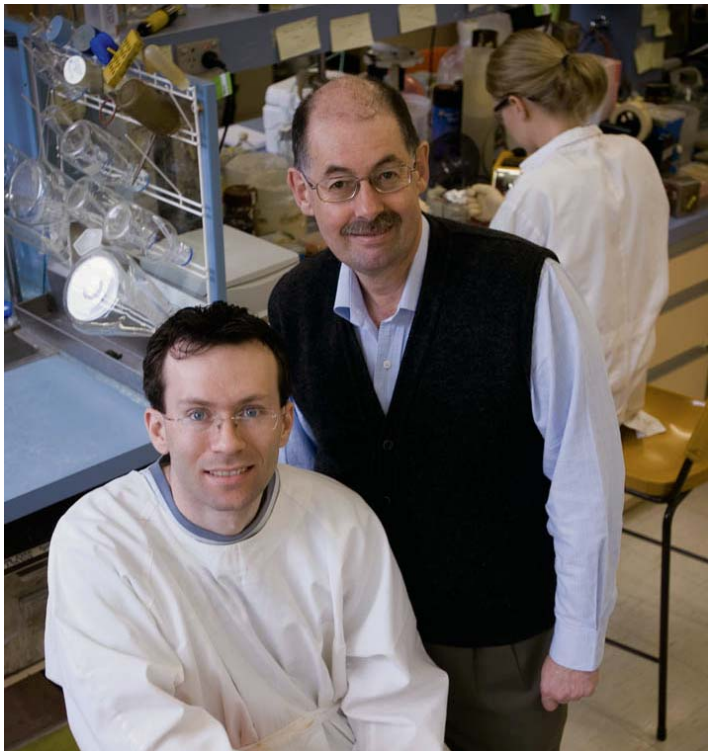
The findings recently published in Nature Biotechnology, are the culmination of 8 years collaborative work on the D. *nodosus* bacterium, which has been funded by the Centre, the Institute for Genomic Research (TIGR), Maryland USA and the Veterinary Science department of the University of Arizona, USA. The project, utilizing the basic theorem of reverse vaccinology, involved the determination of the bacterium's complete DNA sequence, 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.

Joint first author's on the Nature Biotechnology paper Dr Garry Myers and Dr Dane Parker (Monash University) said the research represented an excellence example of how modern genomic science had the potential to impact on primary production.

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

The reverse vaccinology or genomic approach has been made possible by the Centre's generic high throughput pipeline, established at Monash University in 2006.

Professor Rood and his collaborative team have also worked with Centre Associate Professor Richard Whittington of the Veterinary Science Faculty of the University of Sydney, New



Dr Dane Parker (left) and Professor Julian Rood (right) in Professor Rood's lab

South Wales. If future funding applications are successful the first vaccine sheep trials will be conducted at the University of Sydney's facilities at Camden in collaboration with Professor Whittington.

Professor Jamie Rossjohn's research team, along with collaborators at the University of Melbourne, has also recently published in a prestigious journal. In these new findings, Professor Rossjohn and his team have provided important insight into how killer T-cells recognize viruses. The findings were published in the June edition of Nature.

Professor Julian Rood's lab:
www.med.monash.edu.au/microbiology/research/rood.html

STAFF PROFILE

Dr Keith Al-Hasani

Research Fellow Dr Keith Al-Hasani is a member of Centre Director Professor Ben Adler's laboratory. Keith received his PhD from Monash University working on serine proteases and pathogenicity islands in *Shigella*, the cause of bacillary dysentery. Prior to joining the Centre, Keith worked as a postdoctoral scientist with the Cell and Gene Therapy group at the Murdoch Children's Research Institute in the development of vectors for second generation human BAC libraries, as well as, making the first humanized transgenic mouse model fully dependent on human alpha-globin production for thalassemia research.

Keith's current research is focused on identifying protective antigens by way of 'reverse vaccinology' in order to develop vaccines against fowl cholera and ovine footrot.

Dr Al-Hasani also has a Bachelor of Arts (Monash) in advanced French studies. He has adopted as a personal creed, in light of his profession, the concluding line of Albert Camus' essay on *The myth of Sisyphus*, 'One must imagine Sisyphus happy'.

STUDENT PROFILE

Arek Rainczuk

Arek is a PhD student working with Centre Chief Investigator Professor Ross Coppel and Research fellow Dr Paul Crellin on mycobacterial cell wall biosynthesis. He is using *Corynebacterium* spp. as a biological model and attempting to characterize genes that are essential in mycobacteria by disrupting them in the related species *Corynebacterium pseudotuberculosis*.

Arek who has a Masters degree in Genetics from the University of Lodz, Poland moved to Australia from Poland with his wife last year. Whilst in Poland Arek was awarded a prestigious scholarship by the Polish Ministry of Education and graduated at the top of his class.

Arek was attracted to study in Australia due the standard of our universities and our beautiful and safe country with very friendly and welcoming people. He chose Monash University on the recommendation of a cousin who completed a PhD with Professor Spithill of the Department of Biochemistry and Molecular Biology.

Arek really enjoys working in the lab and gets very excited with every little success. In his free time he likes to travel around Australia with his wife.

OTHER NEWS

New Centre Associate

Dr Stuart Cordwell is one of the Centre's most recent associates. Dr Cordwell, a senior lecturer at the University of Sydney's School of Molecular and Microbial Biosciences, is recognized as a foremost innovator in the field of proteomics. Indeed he is one of the authors responsible for coining the term 'proteomics'. Stuart's current role with the Centre involves collaborations on several projects with Centre Director, Professor Ben Adler.

The Centre is, as always, grateful to all Associates for their contribution to the Centre research projects.

The Centre is also pleased to announce another recent addition to its Associates line-up. Dr John Boyce, who up until May of this year was a senior Centre Research Fellow, has recently been appointed to a senior lectureship position with the Department of Microbiology, Monash University. As John will continue to be heavily involved in several Centre projects, the Centre looks forward to continuing a formal association with his work.

UPCOMING EVENTS

BacPath9 – The Molecular Biology of Bacterial Pathogens

Centre staff and students will make a major contribution to the Ninth Australian Bacterial Pathogenesis Conference held at Lorne in September, with many presentations involving Centre personnel.

Full program details are now avilable on the BacPath9 website: *http://workshops.med.monash.edu.au/bacpath9/*

Centre Scientific Meeting 2007

The Centre Scientific Meeting for 2007 has been scheduled for Wednesday, 31 October.

The focus of this year's meeting, which will be a one-day symposium, will be on the research areas of the Centre Research Fellows and PhD students.

There will also be a concluding poster session.

The meeting will be located at South One Lecture Theatre at the Clayton campus of Monash University.

The ARC Centre of Excellence in Structural and Functional Microbial Genomics newsletter is compiled and edited by Marianne Johnston. Contributions are welcome and can be forwarded to Marianne via email marianne.johnston@med.monash.edu.au or fax 9905 8241. Marianne is located in STRIP1, Rm G93, (North end), phone number 9905 8610.

The ARC Centre of Excellence in Structural and Functional Microbial Genomics is an Australian Research Council (ARC) funded institute through the Centre of Excellence program. It aims to elucidate key aspects of microbial pathogens and the hosts they infect. The ARC Centres of Excellence are an Australian Government initiative designed to create prestigious hubs of expertise where high-quality researchers can maintain and develop Australia's international standing in research areas of national priority.

Contact us or visit us at:
www.microbialgenomics.net

STRIP1 (Building 75)
Monash University
Wellington Rd, Clayton
Victoria

Tel +61 3 9905 8610
Fax +61 3 9905 4811

Email: *ARCGenomicsCoE@med.monash.edu.au*

This work was produced with the assistance of the Australian Research Council under the ARC Centre of Excellence Program. The Centre is also grateful for major financial support from the Victorian State Government through the Department of Innovation, Industry and Regional Development.