

# ARC Centre of Excellence in Structural and Functional Microbial Genomics

## From the Director

It is a great pleasure to welcome you to the first newsletter of the ARC Centre of Excellence in Structural and Functional Microbial Genomics. Future newsletters will be published biannually to keep centre staff, students, associates and collaborating partners abreast of centre activities, key research findings and other achievements, publications, visitors and the like. I encourage you all to contribute items to future issues. Remember, it is your newsletter. Contact details for contributions are listed elsewhere in this issue.

2006 marks the first complete year of the centre's activities. This year we have concluded our first vaccine trial for fowl cholera in chickens, in collaboration with CSIRO Livestock Industries, one of our key collaborating partners. A full patent application is in preparation.

New research initiatives for 2006 include a project on vaccine development against necrotic enteritis in chickens. This work is supported by the Australian Poultry CRC in conjunction with CSIRO Livestock Industries and is managed by centre research fellow Dr John Boyce and CSIRO's Dr Rob Moore.

A major new initiative this year has been the commencement of a suite of projects on mechanisms of innate immunity in collaboration with Professor Paul Hertzog and Professor Christina Mitchell. Their complementary expertise in cellular signalling pathways will be of enormous benefit to centre staff and students.

It is a pleasure to express my congratulations to Centre CI Professor Jamie Rossjohn on his award of a Federation Fellowship in the 2006 round. Jamie's fellowship research program is focused on both host and microbial aspects of infection and immunity and will enhance his already outstanding contributions to centre research programs.

I am very keen to receive feedback from staff, students, associates and partners about how we can enhance further the research and training activities of the centre.

Please feel free to contact me or Marianne Johnston at any time.

Ben Adler  
Director



## HIGHLIGHTS



### ARC Centre launch

On the afternoon of Wednesday, March 8 2006 the ARC Centre of Excellence in Structural and Functional Microbial Genomics was formally launched by Professor Erich Weigold, Executive Director of Physics, Chemistry and Geosciences of the Australian Research Council. The centre, which brings together a team of internationally renowned researchers, will operate over two departments





(Microbiology and Biochemistry and Molecular Biology) of the Monash University Faculty of Medicine, Nursing and Health Sciences endeavoring to elucidate key aspects of microbial pathogens and the hosts they infect. The centre also has various collaborators comprising of the University of Queensland, the University of Sydney, CSIRO Livestock Industries, the Victorian Bioinformatics Consortium, the Victorian Partnership for Advanced Computing, the State Government of Victoria through the Department of Primary Industries and the Australian Genome Research Facility as well as several industry partners such as Pfizer Animal Health, the Australian CRC for Poultry and Intervet International.

The focus of the industry collaborations are the development of veterinary vaccines for several livestock diseases including fowl cholera, ovine footrot, leptospirosis, necrotic enteritis in chickens and swine dysentery.

Centre Director, Professor Ben Adler said, "The launch of the centre has great implications for research into infectious diseases."

Deputy Vice-Chancellor (Research) Edwina Cornish added, "This (Centre) is a real role model to many in the university in how we can come together to create a critical mass to do world class-science."

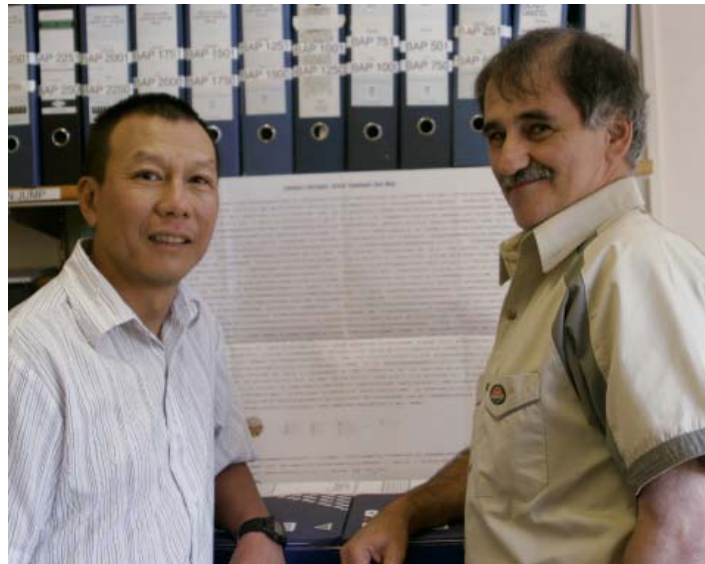
The centre has been funded over five years by the ARC, Monash University and the Victorian State Government Department of Innovation, Industry and Regional Development, as well as several industry contributors.

## Federation Fellowship for centre Chief Investigator Professor Jamie Rossjohn

In May 2006, Professor Jamie Rossjohn was one of two Monash University researchers to receive a Federation Fellowship in the 2006 round. The fellowship, awarded to support excellence in research by attracting world-class researchers to key positions and creating new rewards and incentives for the application of their talent in Australia, was bestowed in recognition of the insight Professor Rossjohn's team and collaborators have provided on host and microbial aspects of infection and immunity. The research findings have resulted in more than 90 published research papers. Jamie's team continues to make an outstanding contribution to the centre's research programs.

## Centre visitors

Professor Reggie Lo from the University of Guelph, Canada, visited the centre in January. He presented a seminar on the exiting work of his research group on vaccines against *Mannheimia hemolytica*, the principle cause of shipping fever in cattle, based on the use of transgenic plants expressing modified forms of the *M. hemolytica* leukotoxin.



In March, Dr Leok van Alphen, National Vaccine Institute (NVI), the Netherlands, presented the results of innovative work from the laboratory of Vaccine Research at NVI. Genetically modified Lipid A (a key bacterial membrane component) was engineered in Group B meningococcus, which had reduced inflammatory activity but retained its ability to elicit the production of protective antibodies.

## RESEARCH NEWS

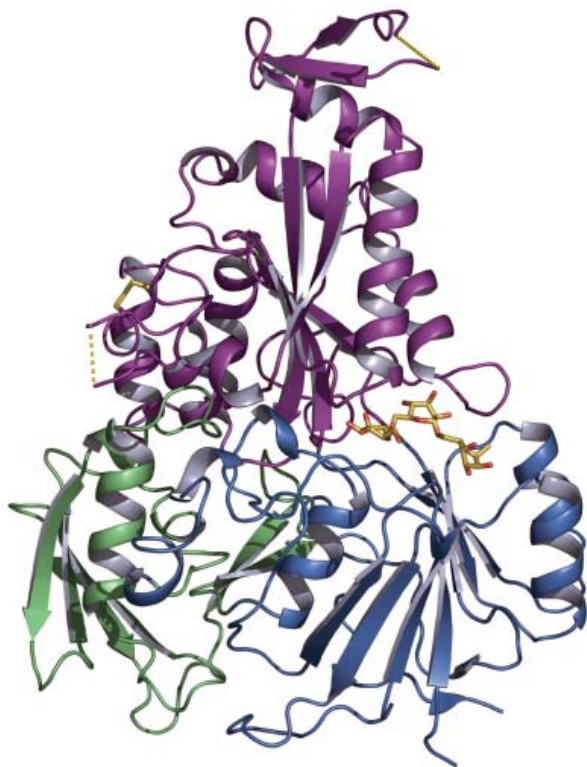


### The crystal structure of LpqW

Findings from a collaboration between Professor Ross Coppel's centre team and the Protein Crystallography Unit headed by Professor Jamie Rossjohn have resulted in the identification of the centre's first potential new drug target. The findings, which are an exemplary example of the centre's collaborative work, have resulted in the structural analysis of an essential protein, termed LpqW, revealing it as a key regulatory molecule in the PIM/LAM pathway of *Mycobacterium tuberculosis*. As the PIM/LAM pathway is integral to the cell wall biosynthesis of *M. tuberculosis*, the findings regarding LpqW have implications for the development of new drugs against *Mycobacterium* by targeting the PIM/LAM pathway.

*M. tuberculosis*, the causative agent of tuberculosis (TB), claims the lives of over two million people each year, and is also responsible for a range of animal diseases of economic importance such as Johne's disease. The thick and waxy cell wall of *M. tuberculosis* provides a protective barrier to many drugs whilst allowing the pathogen to persist within host macrophages. The emergence of multi-drug resistant strains of *M. tuberculosis* requires a new generation of drugs that will ideally target cell wall biosynthesis.

The cell wall of *Mycobacterium* is an unusual complex, rich, in rare molecules that include the integral and related 'PIMs' and 'LAMs'. However, structural analysis of the 2.4Å crystal structure of LpqW, determined using synchrotron radiation at the Advanced Photon Source in Chicago, revealed it shared a similar scaffold to the distantly related substrate-binding proteins (SBPs). This implied that *Mycobacterium* adapted the structure of LpqW from existing protein architecture to fulfill a specific role in cell wall biosynthesis. Subsequent in silico docking studies have uncovered how LpqW could carry out its important function in the PIM/LAM pathway.



The findings are soon to be published in the *Journal of Molecular Biology*.

Professor Coppel's lab: [www.med.monash.edu.au/microbiology/research/coppel/rsch-rlc.html](http://www.med.monash.edu.au/microbiology/research/coppel/rsch-rlc.html).

Professor Rossjohn's Protein Crystallography Unit: [www.med.monash.edu.au/biochem/staff/rossjohn.html](http://www.med.monash.edu.au/biochem/staff/rossjohn.html).

## 12th IUBMB comes to Melbourne

Centre Deputy Director, Professor Phillip Nagley has led a successful bid, proposed on behalf of the Australian Society for Biochemistry and Molecular Biology (ASBMB), for a major scientific conference to be held in Melbourne in 2010. The 12th IUBMB Conference will be held in Melbourne, 26 September – 1 October 2010, in conjunction with the 21st FAOBMB Conference (Asian-Oceania region) and ComBio (the regular annual meeting in Australia of biochemists, molecular biologists, cell and developmental biologists and plant scientists). The theme of the conference, anticipated to exceed 2000 registrants, is 'The Molecules of Life: from Discovery to Biotechnology'. The Chair of the Scientific Program Committee will be Associate Professor Michael Ryan (La Trobe University). Working closely with the Melbourne Convention and Visitors Bureau, Professor Nagley (President of ASBMB) and his team first presented a bid to the regional organisation FAOBMB at its conference in Lahore, Pakistan, in November 2005, followed by a fully internationalised bid to IUBMB at the 20th International Congress of Biochemistry and Molecular Biology held recently in Kyoto, Japan, in June 2006.

## STAFF PROFILE



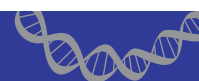
### Marianne Johnston

In March 2006, Marianne Johnston was appointed to the role of Research Programs Manager. Her role is to assist the director and CIs in the co-ordination of all aspects of project management, industry liaison and marketing within the ARC Centre. Marianne's educational background ranges from European history and Australian politics to biochemistry and chemistry (she has degrees in both Arts and Science) but she has a particular interest in Science Communication. Her former role was a projects coordination position with the Chemical Education and Outreach theme group of the Victorian Institute for Chemical Sciences (VICS) which was consortium of the chemistry schools of Melbourne, RMIT and Monash Universities. She has also been an active member of the Victorian Co-ordinating Committee for National Science Week for the last three years.



Marianne is located in the STRIP (Bld 75) Rm 223 and can be contacted on 9905 8592 or email ([marianne.johnston@med.monash.edu.au](mailto:marianne.johnston@med.monash.edu.au)).

## STUDENT PROFILE



### Tamas Hatfaludi



Tamas Hatafludi is one of the Centre's newest PhD students. Tamas, originally from Hungary, has lived in Austria for the last 13 years but moved to Australia in May to start his PhD – a Monash International Research Scholarship – with the Centre Pasturella group working on vaccine development. Tamas received his Masters in Microbiology from the University of Vienna in 2002. He has worked for the International Atomic Energy Agency in several positions dealing with food safety, nuclear emergency preparedness in agriculture and distance learning programs. Tamas came to Melbourne with his family and is a happy father of two.

## OTHER NEWS



### Research Fellow group

Centre Research Fellows wishing to network with other Centre Research Fellows are welcome to join the Research Fellow group. The Research Fellow group is an informal 'bunch' of centre post-doctorates. Activities of the group, at present, consist of casual meetings, usually over coffee, at approximately three month intervals.

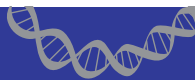
If you are interested in attending these meetings please contact Keith Al-Hasani by email ([Keith.Al-Hasani@med.monash.edu.au](mailto:Keith.Al-Hasani@med.monash.edu.au)) or Danielle Smith ([Danielle.Smith@med.monash.edu.au](mailto:Danielle.Smith@med.monash.edu.au)).

### Centre Associates

The Centre would like to take this opportunity to formally announce its various Associates; Dr Steve Bottomley and Professor Christina Mitchell (Department of Biochemistry and Molecular Biology, Monash University), Dr Tim Stinear (Department of Microbiology, Monash University), Professor Paul Hertzog (Monash Institute of Medical Research), Professor Bruce McClane (University of Pittsburg, USA), Dr Rob Moore (CSIRO Livestock Industries), Professor Richard Whittington (University of Sydney) and Dr Ian Wilkie (The University of Queensland).

The centre is grateful to all Associates for the valuable contribution they are making to the research program of the centre.

## UPCOMING EVENTS



### ABIC Conference

Over three days, August 6-9, Melbourne will be host to the major global Agricultural Biotechnology Conference International, ABIC2006. The major theme of ABIC 2006 is 'unlocking the potential of agricultural biotechnology'. The conference will feature international speakers, public events showcasing important agricultural biotech issues, interactive panel discussions and a major exhibition with over 80 exhibitors. The ARC Centre is a registered exhibitor.

Full details about the program are available from the ABIC website at [www.abic2006.org](http://www.abic2006.org).

### Centre Evaluation and National Science Week Event with Professor George Weinstock

From Monday, August 14 until Friday, August 18 Professor George Weinstock from the Baylor College of Medicine, Houston, Texas, USA, will be visiting the centre. Professor Weinstock is an expert on the molecular basis of infectious disease, studying difficult pathogens using molecular and genomic approaches. During his five day centre visit he will be completing an informal evaluation of the centre and will also be making an appearance at several special seminars. In particular, aside from chief investigator discussions, there will be an informal lunch time seminar for the centre PhD students and a gathering for the Centre Research Fellows (details to follow).

The timing of Professor Weinstock's visit has been scheduled in order to coincide with National Science Week – the national festival for Australian Science – and for this festival he will be delivering a free public lecture on the evening of Wednesday, August 16 on the topic of genomics in South One Lecture Theatre at 6.30 pm (refer [www.monash.edu.au/events/public-lectures/full.html#3](http://www.monash.edu.au/events/public-lectures/full.html#3)). All centre CIs, Research Fellows, RAs, students, associates and any other interested parties are invited to attend. Afterwards, lecture attendees will be able to view the Monash Science Centre's "63%H2O – The Body in Question" exhibition in a special open night viewing from 7.30 – 9.00 pm.

The evening is a collaborative initiative between the ARC Centre and the Monash Science Centre for National Science Week 2006.

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### New Protein Analysis Facility

The centre has pleasure in announcing the successful installation of its new Automated, Multiplexed, High Resolution Protein Analysis Facility (AMHRPAF). The AMHRPAF will provide access to cutting edge proteomic infrastructure and expertise for collaborative initiatives in all areas of medicine and biology. The facility will link world class research teams from the centre, various Monash affiliated institutions and organizations, providing a central facility for rapid and sensitive proteomic analysis of purified proteins, tissue extracts from animal models, through to clinical samples. The acquisition of the instrumentation is the result of funding from the Victorian State Government Department of Innovation, Industry and Regional Development (DIIRD). The facility has recently formed its own advisory committee, headed by Professor Ian Smith, and will operate under the governance umbrella of the ARC Centre and compliment the centre's protein purification workstation headed by Centre Associate, Dr Steve Bottomley.

Professor Smith will deliver an information seminar on the facility on Monday, August 14 at 1.00 pm in the Microbiology seminar room (Bld 53 – Clayton campus). All interested parties are invited to attend. For further information on how the facility may be of use to you please contact either Professor Ian Smith, [ian.smith@med.monash.edu.au](mailto:ian.smith@med.monash.edu.au) or Dr David Steer, [david.steer@med.monash.edu.au](mailto:david.steer@med.monash.edu.au).

A formal launch of the facility is planned for September 2006.

This newsletter was compiled and edited by Marianne Johnston:

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Contributions were also made from Ms Zara Marland, Professor Ben Adler, Professor Phillip Nagely and Tamas Hatfaludi.