ARC Centre of Excellence in Structural & Functional Microbial Genomics
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FROM THE DIRECTOR

Bacterial genomics continues to make major contributions to the elucidation of fundamental aspects of the interaction of bacteria with the environment and also with the hosts that they colonise and in which they sometimes cause disease. Numerous metagenomics projects worldwide in a range of animal species as well as in humans are aimed at understanding the role of microbiota in the maintenance of health and homeostasis. The genomics era has likewise led to an explosion of knowledge at the cellular and molecular level about the mechanisms by which pathogenic organisms cause host damage. Whole genome sequencing of multiple strains of bacterial species has allowed the identification of very minor differences, sometimes at single nucleotide level, that result in profound differences in virulence, resistance to antibiotics or other properties. Over the forthcoming months, I am honoured to represent the Centre as an invited speaker at the International Leptospirosis Conference in India and at the Gordon Research Conference in the USA. It will be a pleasure to highlight the Centre's genomics research at these forums.

The Centre's international profile continues to grow, with the appointment of two international adjunct members of our Scientific Advisory Board. **Professor John Prescott**, University of Guelph, Canada, is an acclaimed veterinary researcher and former Editor-in-Chief of *Veterinary Microbiology*. **Professor Joachim Frey**, Institute of Veterinary Bacteriology University of Berne, Switzerland, is a world expert in veterinary bacteriology, with particular expertise in the role of toxins in a number of veterinary infections. Both will attend the Centre's Annual Scientific Meeting in November and we look forward to working with them.

The Centre was a sponsor of the very successful conference on pore-forming toxins held in April at the Monash Prato Centre in Italy and chaired by Centre CI James Whisstock. In 2010, the Centre is organising the first Prato Conference on the Pathogenesis of Bacterial Diseases of Animals, chaired by Centre CI Julian Rood. Details are found later in this Newsletter. Centre staff and students were also prominent at the Infection and Immunity Conference held jointly by Centre partner CSIRO Livestock Industries and the Victorian Infection and Immunity Network on the Gold Coast last month.

Finally, it is a pleasure to welcome Desmond Gul to the Centre in the role of Research Administrator. With a background in research as well as in research administration, Desmond will play a major role in the administration of the Centre's research, outreach, financial and other activities.

Ben Adler
Director

Centre staff and associates at the Infection and Immunity Conference 2009, Gold Coast

RESEARCH HIGHLIGHTS

Regulation of virulence in *Pasturella multocida*

P. multocida is the causative agent of a wide range of diseases in animals including fowl cholera in birds. Pathogenic fowl cholera isolates express a capsular polysaccharide composed of hyaluronic acid that is essential for virulence. Centre PhD student Jason Steen has identified three spontaneously arising acapsular *P. multocida* strains and used whole genome sequencing to show that each of these acapsular strains had mutations within *fis*, predicted to encode a DNA nucleoid-associated transcriptional regulator. Complementation of each mutant with an intact copy of *fis* returned capsule expression.

DNA microarray analysis comparing the transcriptome of the *fis* mutant with that of the wild-type strain showed that Fis regulates at least 30 genes in *P. multocida* including other known virulence factors. Jason is completing his PhD under the supervision of Dr John Boyce, Dr Marina Harper and Prof Ben Adler.

Protein interaction during conjugative transfer of pCW3 plasmid

In a paper published in the *Journal of Bacteriology* in May former Centre PhD student Jenny Steen showed that the putative coupling protein TcpA interacts with other pCW3-encoded proteins to form an essential part of the complex that is responsible for the conjugative transfer of this resistance plasmid. Based on these studies she was able to construct a model that describes the interaction of the proteins in this complex. Jenny was supervised by Trudi Bannam, Julian Rood and Rod Devenish and currently has a postdoctoral position at the University of Queensland.

OTHER NEWS

New Centre Administrator

The Centre welcomes Desmond Gul who has recently joined the Centre as the Research Administrator. His role is to provide support to the Centre Director and the Scientific Committee with the Centre's research activities, particularly with funds management, funding bodies reporting requirements, marketing and communications and the identification of the Centre's research and business development opportunities.

Originally from Singapore, Desmond moved to Auckland and completed his Masters in Molecular Genetics, working on developmental genes in zebrafish embryos. He then went off to dance professionally and returned to Science 4 years later and worked for the Health Research Council of New Zealand as the Research Coordinator, managing the funded research projects and their funding round processes. He moved to Melbourne about 3 years ago and was working in international public health for Monash University before taking up this position at the Centre.

He loves Melbourne and is pleased to be coming back to genomics and being involved with the many exciting projects at the Centre. He hopes to get to know everyone in the Centre. In his spare time, he can still be seen dancing in the studios or doing aerial work on a rope or a trapeze at circus school – something he discovered while living in Melbourne.

Desmond can be contacted on 9902 9187 or by email Desmond.Gul@med.monash.edu.au .

Funding Opportunities for Students

The Centre is pleased to announce that funds are available for Centre students to visit other researchers and labs both nationally and internationally in conjunction with conference travel. This fund is to provide Centre students exposure to other labs and practices as well as opportunities to network with other researchers.

If you would like more information about this fund, please see Desmond Gul or Prof Ben Adler.

STAFF PROFILE

Xenia Gatsos

Dr. Xenia Gatsos has recently been appointed as a Research Fellow in Centre Director Professor Ben Adler's laboratory. Her project focuses on understanding the molecular mechanisms of pathogenesis in the animal pathogen *Pasteurella multocida*.

She completed her PhD in 2007 at RMIT University where she developed live oral vectored vaccines for use in the veterinary industry, and presented her results at ASM 2007 in Adelaide.

Following her post-graduate studies, Xenia moved to the Department of Biochemistry and Molecular Biology at the University of Melbourne. Under the supervision of Professor Trevor Lithgow, she worked on *Caulobacter crescentus*, an alpha-proteobacterium model organism of the mitochondrial progenitor. Her research focused on isolating and identifying protein complexes of the inner and outer membrane of *C. crescentus*.

Her current research focuses on the regulation of virulence factors in the veterinary pathogen *P. multocida*, in particular the regulation of capsule biosynthesis, an important anti-phagocytic component of the bacterium that aids in entry and survival within the host. A potential transcriptional regulator of capsule biosynthesis has been identified and its activities will be further characterized with the use of gel shift assays, DNase I footprinting and DNA-microarray analysis of mutant strains. These techniques will also be used to identify and characterize other operons and genes controlled by this transcriptional regulator, potentially unraveling an important regulon required for effective invasion and pathogenesis.

Xenia has been with the Centre for 4 months and is settling in well, immensely enjoying the company of her fellow researchers, and on many occasions enjoys bringing baked treats to share with her colleagues.

STUDENT PROFILE

Khalid Mahmood

Khalid Mahmood is a Centre PhD student working in Bioinformatics with Professor James Whisstock. His research mainly involves developing computational algorithms and tools to perform large scale molecular sequence comparisons. His focus is on approaches, involving dynamic programming, graph matching and machine learning methods to help solve the problems. Khalid received his BS(KFUPM) and MS(Monash) both in Computer Science, before starting his PhD. Coming from a computational background, the Whisstock lab and the Centre has provided an ideal environment for the fields to merge. This has helped Khalid learn and contribute towards developing new computational techniques for analyzing vastly growing biological data.

Khalid is admittedly a cricket tragic, and can't wait for the Ashes to start and the Boxing Day test later this year when Pakistan (his native country) is coming for the summer.

UPCOMING EVENTS

VIIN Post-doc Symposium

The Victorian Infection and Immunity Network (VIIN) will be holding its Post-doc Symposium on 20th August at the Walter and Eliza Hall Institute.

Keynote speakers include Dr Dena Lyras from Monash University and Assoc Prof Steve Turner from University of Melbourne.

Abstracts submission is now open and will close on 17th July.

Details of the Symposium and Abstract Submission can be found on: http://www.viin.monash.org/post-doc-symp-2009.html

ARC Centre Annual Scientific Meeting

This year, the Centre's Annual Scientific Meeting will be held over 3 days from 15-17 November at the Yarra Valley Conference Centre. The meeting will start on the morning of 15th November and will end after breakfast on 17th November.

The meeting will focus on the research projects currently taking place within the Centre and will also provide an opportunity for the Centre's Advisory Board members, Chief Investigators, Research Fellows and PhD students to meet together.

Prato Conference on Pathogenesis of Bacterial Diseases of Animals

The Centre is currently organising the above-mentioned conference which is scheduled for 6-9 October 2010 and will take place at the Monash Prato Centre, Italy.

This conference will focus on veterinary pathogens and will involve an integrated examination of the latest exciting data on disease epidemiology, bacterial adhesion, intracellular pathogens, extracellular pathogens and toxins, host-pathogen interactions, innate and acquired immunity, and vaccines, all as they apply to bacterial pathogens of animals.

More details will be released later and can also be found on the website: www.vetpath2010.org

CONTACT

Suggestions for articles are welcomed, as well as requests to be placed on the mailing list, and should be sent to:

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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 eluicidate 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.

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The Centre works in partnership with the following organisations: