ARC/NHMRC RESEARCH NETWORK FOR
PARASITOLOGY

NEWSLETTER

Issue No. 28 August 2009

Index

In this issue...

Dear Network Participant,

Another annual conference has come and gone, this year's being notable for the extremely high quality of presentations by our invited speakers as well as by our students and early career researchers – competition for the various awards from the ASP and the Network was fierce and my congratulations go to all the lucky winners.

Congratulations also to Brendan Crabb on the award of the Bancroft-Mackerras Medal, Maria Meuleman for being made a Fellow of the ASP, and Peter Holdsworth, who was appointed as a Member in the General Division of the Order of Australia in the Queen's Birthday Honours.

The conference also marked renewed commitment by the ASP to finance the continuation of the Network. Planning discussions have begun to shape the next two years in the life of the Network and we'll keep you informed as the strategic plan for the Network and the ASP evolves over the next few months.

Best wishes,

Nick

(Nick Smith, Convenor, ARC/NHMRC Research Network for Parasitology; nick.smith@uts.edu.au)

Delegates at the poster viewing session during the 2009 ASP & ARC/NHMRC Research Network for Parasitology Annual Conference.

Congratulations

Congratulations to Professor Brendan Crabb, Director of the Burnet Institute who was awarded Australia's most prestigious award for parasitological research, the Bancroft-Mackerras Medal by the Australian Society for Parasitology. Brendan, Tania de Koning-Ward and their research teams and collaborators have identified a critical vulnerability in the life cycle of malaria that offers hope for the development of new treatment options for this devastating disease. They have published their discovery identifying a molecular machine used by the malaria parasite to export its protein, in the prestigious international journal, Nature. "A newly discovered protein export machine in malaria parasites" T. de Koning-Ward et al. Nature, Vol 459, 945-950, 19 June 2009

The malaria parasite grows inside red blood cells but, being essentially a sack of haemoglobin, the red blood cell is not actually a great place to live. To survive, the malaria parasite, *Plasmodium falciparum*, has to move hundreds of proteins out of itself and to the outside of the red blood cell. While these proteins have many different functions that are crucial to the parasite, they all share one common feature - they must all pass through the same pore in a membrane that surround the parasite. Brendan and his colleagues at Deakin University and the Walter and Eliza Hall Institute of Medical Research, have discovered the identity of this protein pore.

Brendan says that, "Protein export machines are of great interest in biology but because of the enormous scale of the malaria problem this one also has practical health value. Therapies that block this pore interfere with many different crucial processes in the one hit and in that sense it is an Achilles heel of the malaria parasite."

Prof. Brendan Crabb, Burnet Institute, awarded the Bancroft-Mackerras Medal by the Australian Society for Parasitology.

Congratulations to Maria Meuleman from the International Journal for Parasitology who was made a Fellow of the Australian Society for Parasitology at the 2009 ASP & Network Conference. We will feature a profile of Maria in the next Network Newsletter.

Congratulations to the winners of the 2009 ARC/NHMRC Research Network for Parasitology Early Career Researcher Award for the best presentation:

Kate Hutson, The University of Adelaide, School Earth and Environmental Science for her poster presentation entitled "Parasite assemblages as indicators of population structure of southern garfish (*Hyporhamphus melanochir)*" Kate Hutson[1], EL Brock[1], M Steer[2]
[1]The University of Adelaide, Marine Parasitology Laboratory, School of Earth and Environmental Sciences, Adelaide, Australia; [2]South Australian Research and Development Institute, South Australia, Australia

Magda Ellis, pictured above receiving her award from Nick Smith, from the Queensland Institute of Medical Research for her contributed paper entitled "The effect of SNP variants located downstream from IL-5 on gene transcription and translation and their role in infection with *Schistosoma japonicum.*"
Magda Ellis[1], Honggen Chen[2], Yuesheng Li[1], Donald McManus[1]
[1]Molecular Parasitology Laboratory, Queensland Institute of Medical Research and The University of Queensland, Australia.; [2]Jiangxi Provincial Institute of Parasitic Diseases, PR China

Congratulations to the winners of the 2009 ASP Student Awards:
Traditional Poster

Annette Dougall, Menzies School of Health Research (Darwin) for her poster entitled "The search for a vector of *Leishmania* in the Northern Territory."
Annette Dougall[1], Bruce Alexander[2], Karrie Rose[3], Deborah Holt[1], Shelley Walton[1]
[1]Menzies School of Health Research, Charles Darwin University, Darwin, NT; [2]Liverpool School of Tropical Medicine, University of Liverpool, Liverpool, UK; [3]Taronga Conservation Society, Mosman, NSW

Cogratulations cont...

Tana Taechalertpaisarn, The Burnet Institute, Gilson/Crabb Laboratory for his poster entitled "Functional analysis of 6-cys domain protein merozoite surface antigens in *Plasmodium falciparum.*"
Tana Taechalertpaisarn[1,3], Paul Gilson[1], Anthony Hodder[2], Alex Maier[2,4], Matthew O'Neill[2], Monica Brown[2], Alan Cowman[2], Brendan Crabb[1]
[1]Burnet Institute, 85 Commercial Road, Melbourne, Victoria 3004, Australia; [2]The Walter and Eliza Hall Institute of Medical Research, 1G Royal Parade, Parkville, Melbourne, Victoria 3050, Australia; [3]Department of Medical Biology, University of Melbourne, Melbourne, Australia; [4]Department of Biochemistry and ARC Centre of Excellence for Coherent X-ray Science, Latrobe University, Melbourne, Victoria 3086, Australia

2-minute Oral Poster Presentation (Speed Dating)

Xie Wah Audrey Chan, Australian National University for her poster presentation entitled "Thiamine requirement and transport by the human malaria parasite *Plasmodium falciparum.*"
Xie Wah Audrey Chan, Kevin Saliba
Australian National University, Australia

Clare Smith, Menzies Research Institute (Tasmania) for her poster presentation entitled "Towards novel antimalarial treatments: A host-directed therapy and the haem biosynthetic pathway."
Clare Smith, Brendan McMorran, Simon Foote
Menzies Research Institute, Australia

15 minute Oral Presentation

Rowan Ikin, Institute for the Biotechnology of Infectious Diseases (IBID), University of Technology, Sydney (UTS) for his contributed paper presentation entitled "*Toxoplasma gondii* modulates Fasciola hepatica-induced Th2 responses."
Rowan Ikin, Nick Smith, Nicky Boulter, John Dalton, Sheila Donnelly, Catherine Miller
Institute for Biotechnology of Infectious Diseases/University of Technology, Sydney, Australia

Alana Zakrzewski, Institute for the Biotechnology of Infectious Diseases (IBID), University of Technology, Sydney (UTS) for her contributed paper presentation entitled "A dual role for the P2X7 receptor in toxoplasmosis?"
Alana Zakrzewski[1], Rowan Ikin[1], Nick Smith[1], Michael Lees[1], Nicola Boulter[1], Stephen Fuller[2], James Wiley[2], Catherine Miller[1]
[1]Institute for Biotechnology of Infectious Diseases/University of Technology, Sydney, Australia; [2]Department of Medicine, University of Sydney at Nepean Hospital, Australia

Congratulations to Dr Peter Holdsworth who was made a Member of the Order of Australia for "service to the animal health industry, particularly as a contributor to the development of international standards for the veterinary pharmaceutical sector."

Profile

Patrick Driguez is a PhD Student from the Molecular Parasitology Laboratory, Division of Infectious Diseases, Queensland Institute of Medical Research and The University of Queensland.

Patrick's Network Travel Award involved a collaboration between the McManus (Molecular Parasitology), Loukas (Helminth Biology), Doolan (Molecular Vaccinology) laboratories, QIMR with Prof Phil Felgner at the Protein Microarray Laboratory, University of California: Irvine (UCI) to produce the first reverse vaccinology protein microarray for *Schistosoma japonicum* and *Schistosoma mansoni*. This is also the first application of this technology to a metazoan parasite. This method is anticipated to become a standard parasitological technique and will be of value to the parasitology community at large.

Patrick tell us about your research?

"My PhD research is on vaccine discovery for Asian schistosomes using protein microarray technology."

"The main purpose of this exchange was the manufacture of the first schistosome protein microarray at the Protein Microarray laboratory at the University of California, Irvine. It's the first use of a reverse vaccinology/immunomics protein microarray for investigating a metazoan parasite. Through this collaboration, the development of the protein microarray and the associated skills and methods, we hope to make significant progress in the design of a schistosome vaccine, further understanding of the host/parasite interaction and make a valuable contribution to scientific knowledge," said Patrick.

Profile continued...

Patrick tell us about the technique you used?

"From the schistosome genome, known immunogens and potentially immunogenic proteins are selected. These genes are amplified and cloned. The resultant plasmids are used in a cell-free expression to produce recombinant proteins. These individual proteins are then spotted onto microarray slides."

"This 289 feature protein microarray was completed successfully. Fifty glass microscope slides with 16 pads per slide were printed in February 2009. A second batch of 50 will be made at a later date. On each pad is microarray with 289 proteins; 172 *Schistosoma japonicum* and 50 *Schistosoma mansoni* cell-free proteins were printed on the array as well as 48 recombinant protein spots and 19 controls."

"Antibodies from infected animals/humans and resistant sera are captured by the microarray proteins and then marked with labelled secondary antibodies. A laser scanner will resolve each protein spot and measure fluorescent and you can tell how reactive each protein is in sera (like a Western). Through this approach, new vaccine candidate molecules and biomarkers can be identified and then characterised".

Patrick says, "The first results from the microarray are very encouraging. The protein expression tags are present and >90% of the spots are full length proteins. Compared to naïve mouse and human sera, the microarrays are reactive to infected/exposed sera. Infected/exposed sera are reactive against known antigens and also some unknown proteins. We will further characterise the immune response of animal models and endemic populations in our future work."

"The manufactured microarray will be probed at QIMR with field-collected human sera from putatively resistant and infected individuals as well as the "semi-permissive" rat and radiation-attenuated larvae vaccinated pig animal models. The most promising antigens are expected to be surface or secreted proteins strongly recognised by the resistant sera types compared to control and infected sera. The antigens discovered using this high throughput screen will be expressed recombinantly and tested for vaccine efficacy. Furthermore, the combined *S. japonicum* and *S. mansoni* array may enable the discovery of cross-protective antigens."

"In addition to vaccine discovery we will also elucidate some of the mechanisms in the complex parasite/host interaction and may discover biomarkers of disease severity/susceptibility", says Patrick.

"The advantages of this technique is that it is very efficient – you get most of what you want, most targets expressed at the other end, but you lose some tertiary structure (protein folding) and might lose some epitopes – there are no guarantees." "But", Patrick said, "there is no ideal expression system."

Patrick said he wants to try to look at two different antibody classes per pad. He said, "Usually you look at one antibody class per pad. It is natural for someone infected with schistosomiasis to get high titres of IgE. I'd like to also look at IgG subclasses as some show protection."

Patrick, can this technique be used in Australia?

Patrick said that he "has the knowledge now for this technique and potential to pursue this and develop the technology in Australia. Also, the technique can be used in many other fields."

In addition to the scientific results gained via this exchange, the techniques and skills learnt through this high throughput screening and antigen discovery technology will be important to schistosome research, and other parasites and the diseases they cause and may inform vaccine research in parasitology as a whole.

Patrick how does your research relate to human disease?

Patrick said, "Now we can compare people in endemic areas, who have had no treatment against schistosome, and are resistant to schistosome antigens (i.e. they are naturally resistant), and people infected previously but who are not resistant and this should give us an indication of which proteins are important for resistance to schistosomiasis."

Patrick said, "Magda Ellis from our lab and her collaborators have been studying two groups of people in China; one who show strong resistance to schistosome infection despite being constantly exposed and another group who are highly susceptible to schistosomiasis, more prone to being infected and show acute disease."

Patrick said, "It is very exciting news that the genomes for both schistosomes have recently been published, and that these two parasites are closely related. If you pick a protein from one the other has a very similar set of proteins. If you use sera from Chinese people, anticipate to see some of the same proteins from *S. mansoni* light up – so, then we need to look at the protein in *S. japonicum*; that might lead to a cross-protective vaccine or an antigen that may protect against both species."

Patrick, what were the outcomes of your Network Travel Award?

This project has brought together three laboratories within the QIMR. The Loukas, McManus and Doolan laboratories, all members of the ARC/NHMRC Research Network for Parasitology, initially collaborated on this project and have submitted a grant, which is currently being reviewed. Patrick says "A review paper will soon be submitted by these collaborators and we anticipate further papers as the

Profile continued...

microarrays are fully utilised."

This Researcher Exchange award allowed Patrick to work at Phil Felgner's Protein Microarray laboratory, UCI for three months. During this time as a member of the lab Patrick developed a strong working relationship with Dr Felgner and the members of his lab,contributed to lab meetings and presented his work and the work of his Australian labs on two separate occasions. Patrick said, "This created a lot of interest in schistosomiasis research within the Felgner lab and our labs are currently investigating collaborations on co-infection studies. In addition to the protein microarrays, new technologies being trialled at the Felgner lab may be introduced into the collaborating laboratories at the QIMR in the near future".

Patrick says he is really enjoying his PhD, and found that his Network Travel Award was a fantastic experience, he says he felt inspired and enjoyed living in Orange County, California and working with other scientists at the University of Irvine.

Patrick is now busy finishing his PhD and we hope to hear more about his research in the future.

Don McManus and Patrick Driguez

News about a new teaching resource

Klaus Rohde, Professor emeritus, Zoology, University of New England, Armidale NSW, Australia, who has researched marine parasitology, evolutionary biology, ecology, ultrastructure and phylogeny of invertebrates, has generously made available a number of Google-knols on parasitology, which may be used as supplementary material for lectures.
Click on the following link to the knols or copy and paste the url into your browser.

http://knol.google.com/k/klaus-rohde/klaus-rohde-knols-english/xk923bc3gp4/69#

Announcements

Fourth International Conference on Phthiraptera (ICP4)
Urgup, Cappadocia, Turkey, June 13-18, 2010
website: www.icp4.org

The conference will be held at the Mustafa hotel (www.otelmustafa.com.tr)
Abstract submission deadline: December 31, 2009
Early Registration fee and deadline: $350 USD ($150 for students), December 31, 2009
Contact Steve Barker for more information s.barker@uq.edu.au

Events

The ASP & ARC/NHMRC Research Network for Parasitology present

"Parasites in Focus" photographs and interactive exhibits at the Northern Territory Library, Darwin, NT from end July until 6 September 2009.

Twenty-six superb photographic prints showing the amazing microscopic world of the parasite accompanied by two interactive exhibits: parasite game show "Who's my host?" and a "Virtual Microscope" to view parasites close up.

Network Mentorship Scheme

Early career researchers are encouraged to apply to the Network Convenor (nick.smith@uts.edu.au), in strict confidence, for funding to participate in the Network Mentorship Scheme. The scheme allows young investigators to be paired with experienced, successful researchers to discuss, plan, prioritise and set targets for their career. Typically, the early career researcher will fly to the institute of a senior parasitologist and spend a day there. Arrangements for professional development and progress to be reviewed by the pair annually can also be arranged.

Importantly, mentors need not be from an individual's home institution but can be drawn from across the Network. The scheme has proved very valuable for several young researchers and their mentors already.

To apply, simply write to Nick with a brief outline of your research interests and aspirations. You can also indicate a preferred mentor or ask Nick for advice on whom amongst the Network participants may be most suitable.

Positions Vacant

Check out the latest parasitology jobs on the Network website

www.parasite.org.au/arcnet/jobs

PhD in Population Genetics of Triclabendazole Resistance in Liver Flukes

APAI Award Available Immediately, School of Animal and Veterinary Sciences, Charles Sturt University, Wagga Wagga

The ARC has recently funded the Linkage Project "Liver fluke: improving disease control through understanding of parasite diversity, drug resistance and better diagnosis" by Profs Terry Spithill, Nick Sangster and Drs Tiggy Grillo at CSU and Glenn Anderson at Virbac Australia Pty Ltd.

This project aims to improve our ability to control liver fluke infection in livestock through a better understanding of the underlying basis of treatment failure and the development of improved diagnostic tools to promote better use of antiparasitic drugs. The major aims of the project are to:

1. define the existing genetic diversity and population structure of F. hepatica including populations susceptible and resistant to the drug triclabendazole;

2. develop superior diagnostic tests for liver fluke infection; and

3. apply these diagnostic improvements to measure the extent of resistance in the field in NSW and N Victoria.

This information will inform management decisions on parasite control.

The APAI student will use genetic markers and karyotyping to examine wild-type fluke populations from sheep and cattle in NSW and N Victoria to define the level of diversity and chromosomal ploidy in a single host animal, and within host populations. In addition, the inter population diversity between *F. hepatica* isolated from cattle and sheep, and between populations collected from diverse geographical locations, will be examined. We will also compare this diversity with flukes from animals not responding to triclabendazole treatment to determine whether "resistant" flukes exhibit lower diversity and distinct haplotypes and genotypes.

This project provides a sound basis for PhD training in molecular genetics, molecular phylogeny and parasite biology.
For details, contact Terry Spithill (tspithill@csu.edu.au; 02-6933 2439) or Nick Sangster (nsangster@csu.edu.au; 02 69334107). The work is based at the Wagga Wagga campus in new PC2 facilities at the School of Animal and Veterinary Sciences

http://www.csu.edu.au/faculty/science/savs

Biology Department, Massachusetts Institute of Technology

Two postdoctoral positions available immediately the lab of A/Prof Jeroen Saeij in the Biology Department, Massachusetts Institute of Technology.

A/Prof Jeroen Saeij's lab is interested in host-pathogen interaction and they are using the obligate intracellular parasite *Toxoplasma gondii* as a model. They have identified several *Toxoplasma* proteins that mediate strain differences in the modulation of host signaling pathways. They currently are looking for a Biochemist to identify the precise mechanism by which these proteins function (position 1). They have also identified host differences in resistance to *Toxoplasma*. They are planning to conduct a large scale study with the aim of understanding the molecular basis of the genetic variation in host response to *Toxoplasma* (position 2).

Applicants must have a PhD in biochemistry or molecular biology (position 1). For the second position programming experience and experience with handling large datasets is a plus.

For more information contact:
A/Prof Jeroen Saeij,
Massachusetts Institute of Technology, Department of Biology
Telephone: +1-617-324-5330 or E-mail: jsaeij@mit.edu

Prof Alan Sher, NIH, talks with delegates during the 2009 ASP & ARC/NHMRC Research Network for Parasitology Annual Conference.