ARC/NHMRC RESEARCH NETWORK FOR
PARASITOLOGY

NEWSLETTER

Issue No. 30 November 2009

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Dear Network Participant,

This month we congratulate Network Participants who won ARC Linkage, ARC Discovery, and NHMRC Grants, Awards and Fellowships; the total value of grants was more than $18 million dollars, which shows just how strong parasitological research is in Australia.

As you know, the ASP Council has agreed to provide funding to continue the ARC/NHMRC Research Network for Parasitology for at least another 2 years. This means that, amongst other things, there will be a welcome return of the Network Researcher Exchange, Training and Travel Award scheme in 2010 – stay tuned for more details early in the new year. The Network Mentorship Scheme will also continue and we'll maintain our very successful outreach and public awareness programs. Unfortunately, we won't be able to directly support our Network e-resources as we have been able to in the past. However, the expertise that has been built up over the last 5 years – especially next-generation sequencing (they have done something like 30 microbial genomes in the last year) – still exists at the Victorian Bioinformatics Centre and can be accessed by our members on a very reasonable user-pays basis. Contact Ross Coppel (ross.coppel@med.monash.edu.au) to discuss your needs.

As part of the new iteration of the Network, you will need to be an ASP member to be eligible to apply for grants administered by the Network. But, of course, being a member of the ASP is great value - you will recoup the very modest membership fees in the discount you get for the annual conference!

The ASP and the Network are looking at the strategic development and future of Australian Parasitology in the early part of 2010 and feedback from members is an essential part of this process. We invite all ASP members and Network participants to complete a survey as part of the strategic planning for the ASP. Please click on the following link or cut and paste into your browser to enter the survey http://www.surveygizmo.com/s/204180/asp-member-survey

For Network participants in NSW, our "Parasites in Focus" exhibition is on display at the Wollongong Science Centre. And don't forget, if you haven't already, grab a copy of the latest issue of "Cosmos" (Issue 29 Oct/Nov 2009) magazine, which features images from our "Parasites in Focus" exhibition.

This will be our last Newsletter for 2009 and, indeed, our last under the ARC and NHMRC banner. Lisa and I would, once again, like to say what a privilege and thrill it has been to work with you all for the last 5 years. And, we're looking forward very much to what the future will bring to Australian parasitology over the next 2 years as well! I hope that you all enjoy a well deserved rest over the Christmas and New Year break.

Best wishes,

Nick

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

Congratulations

Congratulations to Network Participants who were recently awarded ARC Discovery Grants

Andrew Thompson and colleagues (Murdoch University)
Functional proteomics of *Giardia*

Robin Gasser, Aaron Jex, David Littlewood (University of Melbourne)
Mitogenomics using a massively parallel reactor platform from barcoding to diagnostic tools for pathogens of major socioeconomic importance

Robin Gasser, Andreas Hofmann, Alex Loukas, Paul Sternberg (University of Melbourne and QIMR)
Elucidating structure and function of activation associated secreted proteins (ASPs) in blood feeding hookworms – toward new methods of control

Alex Maier and colleagues (La Trobe University)
Biogenesis of red blood cell membrane modifications by the malaria parasite *Plasmodium falciparum*

Grant Hose, John Ellis and colleagues (Macquarie University and IBID, UTS)
Testing the biodiversity function paradigm for the provision of clean water in aquifers

Brian Cooke and colleagues (Monash University)
Structural and functional alteration of red blood cells by *Babesia* **parasites**

Robin Gasser, Paul Sternberg, Alex Loukas (University of Melbourne and QIMR)
Elucidating a key developmental switch in *Haemonchus contortus* **using a massively parallel picolitre reactor sequencing coupled genomic and bioinformatic platform**

Ross Waller, Geoff McFadden (University of Melbourne)
Investigations of Australian *Hematodinium* **species (sp.): a dinoflagellate parasite damaging major crustacean fisheries in Australia and worldwide**

Malcolm McConville and colleagues (University of Melbourne)
Mannosyl transfer processes in *Leishmania* **and mycobacteria**

Mal Jones, Geoff Gobert (University of Queensland)
Discovery of pathways to embryogenesis in pathogenic flatworm parasites using microdissection and transcriptomic technologies

Congratulations to Network Participants who recently received NHMRC Career Development Awards and Fellowships

Stuart Ralph (University of Melbourne)
Plasmodium **tRNA synthetases as drug targets**

Aaron Jex (University of Melbourne)
An integrated pipeline for understanding the molecular epidemiology of waterborne and zoonotic disease.

James G Beeson (WEHI)
SRF A

Congratulations to Network Participants who were recently awarded NHMRC 2009 Project Grants

Kevin Saliba, Kiaran Kirk, Alex Maier, LeannTilley (ANU and LaTrobe University)
The Na+/H+ exchanger and H+-pumping pyrophosphatases of the malaria parasite

Ross Andrews, Rick Speare, Jonathan Carapetis, James McCarthy, Allen Cheng, Theresa Kearns, Eddie Mulholland, Deborah Holt, Peter Markey (MSHR)
Impact of an ivermectin mass drug administration program against endemic scabies and strongyloidiasis

Nicholas Anstey, Tsin Yeo, Stephen Duffull, Daniel Lampah, Enny Kenangalem (MSHR)
Endothelial dysfunction as a therapeutic target in severe malaria

Katja Fischer (QIMR)
Functional Analysis of Novel Scabies Mite Serpins

Michelle Gatton, Qin Cheng, Richard Price (QIMR)
Development and application of theoretical models of *Plasmodium* **transmission to guide malaria elimination efforts**

Congratulations

Christian Engwerda, Paul Kaye (QIMR)
Tissue specific antigen presenting cell functions during infection

Alex Loukas, Jeffrey Bethony (QIMR)
Apical membrane proteins as targets for a schistosomiasis vaccine

Alex Loukas, Banchob Sripa, Jason Mulvenna, Mal Jones (QIMR)
Interactions between excretory/secretory proteins of the carcinogenic liver fluke and host cells

Don McManus, Gail Williams, Yuesheng Li, Jiagang Guo, Allen Ross, Donald Harn Jnr, (QIMR)
Impact of the Three Gorges Dam on transmission and future control of human schistosomiasis in China

Jason Mulvenna (QIMR)
Unravelling the tetraspanin web in the schistosome tegument

Ashraful Haque (QIMR)
IL-2/anti-IL-2 complexes in immunity to blood stage malaria infection and prevention of cerebral immunopathology

Simon Foote and colleagues (Menzies Research Institute)
ENU mutagenesis to identify targets for hostdirected therapy against malaria

Leann Tilley, Eric Hanssen, Don Gardiner (La Trobe University and QIMR)
Trafficking of the major virulence protein to the host cell surface in malaria parasite infected erythrocytes

Brendan Crabb, Paul Gilson, Kerstin Leykauf (Macfarlane Burnet Institute for Medical Research and Public Health)
Signalling during red blood cell invasion by *Plasmodium falciparum*

Brian Cooke, Artur Scherf (Monash University)
Exported malaria kinases and red blood cell remodeling

Brian Cooke, Mohandas Narla (Monash University)
SBP1 and altered structure and function of malaria-infected red blood cells

Marshall Lightowlers (University of Melbourne)
Immunological prevention of cysticercosis and hydatid disease

Stephen Rogerson, Anthony Jaworowski, Kevin Kain (University of Melbourne)
Phagocytic clearance and immune activation in malaria

Stuart Ralph (University of Melbourne)
Cytosolic and organellar tRNA synthetases in *Plasmodium falciparum*

Jake Baum, Stuart Ralph (WEHI and University of Melbourne)
Dissecting the molecular basis of the malaria parasite-erythrocyte tight junction complex

Jake Baum, Geoff McFadden (WEHI and University of Melbourne)
Investigating cytoskeletal dynamics across the lifecycle of the malaria parasite

Ray Norton, Robin Anders (WEHI and LaTrobe University)
Structure and interactions of a disordered malaria surface protein: implications for antigenicity

Tim Davis, Ivo Mueller, Harin Karunajeewa, Peter Siba, Kevin Batty, Tim St Pierre (UWA)
Novel artemisinin-based combination therapies for children exposed to high transmission of multiple *Plasmodium* **species**

Chris Peacock, (UWA)
Comparative analysis of human and kangaroo *Leishmania*: **defining human pathogenicity genes**

ASP strategic planning survey

The ASP and the Network are looking at the strategic development and future of Australian Parasitology in the early part of 2010 and feedback from members is an essential part of this process. We invite all ASP members and Network participants to complete a survey as part of the strategic planning for the ASP. The survey results will provide input into the ASP strategic planning workshop to be held in February 2010.

Please click on , or cut and paste, the following url into your browser to enter the survey
http://www.surveygizmo.com/s/204180/asp-member-survey

The survey will close on Friday 4th December 2009.

Researcher news

Dr Rowena Martin, NH&MRC Australian Biomedical Fellow in the Research School of Biology, at the Australian National University and at the School of Botany, University of Melbourne.

Dr Rowena Martin is a NHMRC Australian Biomedical Fellow in the Research School of Biology, at The Australian National University and at the School of Botany, University of Melbourne. Here, she speaks to Lisa Jones about a paper, published recently in Science, "Chloroquine Transport via the Malaria Parasite's Chloroquine Resistance Transporter" by Rowena E. Martin, Rosa V. Marchetti, Anna I. Cowan, Susan M. Howitt, Stefan Bröer, Kiaran Kirk, 25 September 2009, Vol 325, Science.

Rowena tell us the story of your research in this area.

Rowena said, "Chloroquine was an important tool in the battle against malaria. The drug was developed in the 1930's but it wasn't until the mid-1940's that it was introduced as the frontline anti-malarial for both the treatment and prevention of the disease. There was massive worldwide (and at times uncontrolled) usage of chloroquine – the Brazilian government even added it to table salt in 1961! Despite this, resistance to the drug was relatively slow to develop and was first reported in the early 1960's. By the 1990s, however, resistant strains had spread throughout endemic regions, severely reducing the effectiveness of chloroquine."

Rowena's group is looking at the molecular mechanism of resistance in the malaria parasite *Plasmodium falciparum*. "The malaria parasite infects the red blood cell and takes up human haemoglobin into its vacuole, where it chops up haemoglobin into peptides and/or amino acids, which it can use; but the by-product is haem, which is very toxic. To combat this, the parasite incorporates haem into an inert crystal. Chloroquine is a very effective anti-malarial because it interferes with the formation of this crystal, so there are high enough levels of haem to kill the parasites," Rowena said.

What is your group working on now?

"We are focussing on the chloroquine resistance transporter – or 'PfCRT' - located on the vacuole of the malaria parasite; mutations in this protein confer chloroquine resistance. However, there has been a lot of debate and controversy over how the protein achieves this," Rowena said.

Rowena's group has succeeded in expressing PfCRT in oocytes from the frog, *Xenopus laevis*, and using this system, they have shown that the resistant form of the protein has the ability to transport chloroquine out of the digestive vacuole, whereas the sensitive form does not. Achieving expression was not straightforward; Rowena used a codon-harmonised form of the gene, and removed a number of protein targeting motifs that she suspected would cause PfCRT to be retained within the oocyte. Rowena and her PhD student, Rosa Marchetti, showed that without these changes, chloroquine transport activity could not be detected in oocytes expressing the resistant form of PfCRT, nor was the protein expressed at significant levels in the plasma membrane of the oocyte. Armed with this novel expression system, Rowena and colleagues went on to demonstrate that transport of chloroquine via mutant PfCRT is inhibited by verapamil, a drug long-recognised for its ability to reverse chloroquine resistance in vitro.

"One of the exciting things about the PfCRT oocyte system is that it allows us to examine interactions between the protein and different drugs", says Rowena. "Identifying novel

Researcher news continued...

chloroquine-like drugs that don't interact with mutant PfCRT and are, therefore, not substrates of the transporter, would be a step in the right direction in the search for a potent new quinoline antimalarial," she said.

Not surprisingly, a number of groups have sent novel resistance-reversers and chloroquine-like molecules to Rowena's group for them to test in the PfCRT oocyte system. Rowena said "Collaborating with these groups, each of which has substantial expertise in studying and/or synthesising novel antimalarial compounds, is very helpful for our research."

How long have you been interested in this area of research Rowena?

Rowena began working on PfCRT during her PhD, when she performed a detailed bioinformatic analysis of the protein (published in 2004). It was over the course of this work that she began formulating the hypothesis that codon-harmonisation and (the removal of) targeting motifs may play important roles in the successful expression of PfCRT in a heterologous system. In 2005, she set about testing these ideas as a postdoc in the laboratory of Kiaran Kirk and, after obtaining promising preliminary results, Rowena secured NH&MRC funding to pursue her ideas. Rowena's work is now split between the ANU and University of Melbourne.

Rowena tell us about your research work in Melbourne.

Rowena explained, "The work I am carrying out in collaboration with Geoff McFadden and colleagues at the University of Melbourne investigates whether knocking out the targeting motifs in PfCRT alters its location in the parasite. We plan to use immunofluorescence in conjunction with microscopy to determine the location of the modified protein; does it still traffic to the digestive vacuole or is it instead at the plasma membrane or even somewhere else in the cell?"

How will this research help people with malaria?

Rowena said, "The PfCRT oocyte system provides us with an opportunity to understand interactions between PfCRT and the quinoline class of antimalarials as well as compounds that reverse chloroquine resistance. By doing so, it has the potential to facilitate the rational design of novel chloroquine-like drugs that bypass the resistance mechanism, and/or clinically effective resistance-reversers."

Conference News

The XIIth International Congress of Parasitology (ICOPA) will be held in Melbourne, Australia, from 15-20th August 2010 at the new Exhibition and Convention Centre.

http://www.icopaxii.org/

2009 ASP & Network conference at The University of Sydney

Events

"Parasites in Focus" exhibition at the Wollongong Science Centre

60 Squires Way, Fairy Meadow (Innovation Campus)

Wollongong

Phone: (02) 4286 5000

Web: sciencecentre.uow.edu.au

Twenty-six superb photographic prints showing the amazing microscopic world of the parasite accompanied by three hands-on parasite exhibits: parasite game show "Who's my host?", "Virtual Microscope" and "Real Microscope" to view parasites close up in all their glory.

Check Network Events on our website to find out when Parasites in Focus will be at a venue near you, or contact Lisa (Lisa.Jones@uts.edu.au) if you would like to host the exhibition.

http://www.parasite.org.au/arcnet/events

This month's **Cosmos**, Australia's #1 Science Magazine, issue 29 Oct/Nov 2009 (http://www.cosmosmagazine.com) features six images from our "**Parasites in Focus**" exhibition.

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

Postdoctoral and Invitational Fellowships in Japan 2010

The Australian Academy of Science, in association with the Japan Society for the Promotion of Science (JSPS), invites applications from Australian researchers to undertake Postdoctoral and Invitational Fellowships in Japan. Postdoctoral Fellowships are for a period of twelve to twenty-four months; Invitational Fellowships are either short term, for fourteen to sixty days, or long term, for two to ten months. Researchers in any field of natural sciences, including technology, engineering and medicine may apply.

Applications close on Friday 5 February 2010.

Please see the website for information and guidelines.

Postdoctoral Fellowships:
http://www.science.org.au/internat/jspspd.htm

Invitational Fellowships (short term):
http://www.science.org.au/internat/jspsfst.htm

Invitational Fellowships (long term):
http://www.science.org.au/internat/jspsflt.htm

Position available for postdoctoral researcher or experienced research assistant in tropical North Queensland at James Cook University

Applications are invited for a postdoctoral researcher or highly experienced research assistant to join the Helminth Biology laboratory at James Cook University in Cairns (formerly of Queensland Institute of Medical Research). The project will commence in January 2010 at the School of Medicine Health and Molecular Sciences at James Cook University, Cairns campus. The successful applicant will work on a vaccine discovery and development program for blood-feeding helminths (hookworms and schistosomes) to be funded by the Bill and Melinda Gates Foundation and NHMRC. The project is multi-disciplinary and involves molecular biology, protein expression and purification, immunology and small animal work. The position is full-time.

Check the Network website for more details:
http://www.parasite.org.au/arcnet/jobs/job067.html

Or, contact Dr Alex Loukas on (07) 3845 3702 or Alex.Loukas@qimr.edu.au

Post-doctoral Research Fellow and Ph.D. opportunity at Monash University

Opportunities in Molecular Parasitology exist in the Cooke Laboratory in The School of Biomedical Sciences at Monash University for researchers wanting to become involved in exciting work to elucidate the cellular and molecular mechanisms by which parasites of red blood cells (malaria and *Babesia*) cause disease in humans and animals.

Two positions are currently available:

Post-doctoral Research Fellow
This individual will be involved in a project to elucidate the function of novel proteins in malaria and *Babesia* parasites that we believe play a role in host cell invasion and modification. The successful candidate will have a PhD and a track record in microbiology, molecular cell biology or a related area. Previous experience in molecular parasitology is highly desirable but not essential.

Ph.D. studentship
A position is available for a highly-motivated and enthusiastic PhD student. Applicants should have completed a BSc (Hons) degree and have been awarded a H1 or equivalent. The project will investigate the cellular and molecular mechanisms by which malaria and *Babesia* parasites modify red blood cells in order to establish a suitable environment for intracellular replication and evade the host immune response.

Check the Network website for more details:
http://www.parasite.org.au/arcnet/jobs/job070.html

Or, for further information or to apply contact:

Associate Professor Brian M Cooke
Tel(03) 9902 9146 or email: brian.cooke@med.monash.edu.au

Positions Vacant cont....

PhD scholarships at The University of Sydney

Stipend: $26,000p.a. OR top-up to that level for holder of APA or other transferable scholarship

Project 1: Immunopathology of bacterial meningitis

Project 2: Physiology and pathophysiology of indoleamine dioxygenase-2

Project 3: Immunopathology of cerebral malaria

Supervisors:
Prof Nick Hunt, Drs Helen Ball and Andrew Mitchell

Check the Network website for more details:
http://www.parasite.org.au/arcnet/jobs/job051.html

Or, for further information contact:
Nick Hunt (02) 9036 3242 or nhunt@med.usyd.edu.au
or Helen Ball (02) 9036 3238 or helenb@med.usyd.edu.au

Network participants and staff, Mike Johnson, Kate Miller, Wendy Relf, Marilyn Katrib, Nick Smith and Lisa Jones at the 2009 Eureka Prizes awards evening