



MARCH
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AUTUMN
EDITION

FROM THE CEO

Dr Stephen Prowse



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FROM THE CEO*Dr Stephen Prowse, CEO***Trends in emerging infectious diseases**

An important paper by Kate Jones et al, including our colleagues from the Consortium for Conservation Medicine in the United States of America, has recently been published in *Nature* and can be viewed at www.nature.com/nature/journal/v451/n7181/full/nature06536.html.

This paper discusses global trends in emerging infectious diseases. The analysis is most interesting in that the majority of pathogens involved in emerging infectious disease events are of bacterial or rickettsial origin. This can be attributed in part to the emergence of human immunodeficiency virus (HIV) and is driven by socio-economic factors such as population density and antibiotic use.

The data showed that emerging infectious disease events have increased since the 1940s, suggesting that the threat is also increasing. A majority of events are caused by zoonotic pathogens with most having a

wildlife origin. This highlights the importance of understanding the factors that increase the interaction between wildlife and humans that lead to disease transmission. There has been a significant increase in vector-borne diseases, adding support to the notion that changes in climate are affecting disease emergence.

The analysis has led to the hypothesis that emerging infectious disease events caused by zoonotic pathogens are correlated with wildlife diversity, and those caused by drug-resistance are more strongly correlated with socio-economic conditions. The analysis also suggests that disease emergence is largely a product of anthropogenic and demographic changes, and is a cost of human economic development.

These hypotheses reinforce the 'one health' approach being taken in our rebid planning.

Plans for the Biosecurity CRC Mark II

As most of you would be aware, the Government has announced a review of the National Innovation System. Included in this review is a review of the Cooperative Research Centres (CRC) program. This has meant that there will be a delay of at least six months in the release of guidelines and the call for applications for new and continuing CRCs.

The Australian Biosecurity-CRC Board met last week and endorsed the strategy of progressing with the development of the rebid proposal so that we are well placed when guidelines are released. It is the intention to have a near final proposal that should require fine tuning.

Australia Day honours

Two AB-CRC Board members and one key scientist featured prominently in the Australia Day Honours list.

Dr Gardner Murray, the former Chief Veterinary Officer of Australia and a current member of the AB-CRC Board, received the Officer of the Order of Australia Award for service to the development and implementation of policies related to animal and plant health, pest and disease control, quarantine, food safety, agricultural trade and emergency management, and to veterinary science.

Dr Roly Nieper, who is the Chairman of the Board of Animal Health Australia and serves on the AB-CRC Board, received the Member of the Order of Australia Award for service to the primary industry sector through the development and implementation of programs and policies in the fields of animal health and welfare, livestock export, and infectious disease control and management.

One of our key scientists, Dr Lorna Melville, who is with the Northern Territory Department of Primary Industries, received the Member of the Order of Australia Award for service to veterinary science in the field of virology through research, advisory roles and surveillance programs in the area of arbovirus infection.

AB-CRC DEVELOPED TEST USED FOR FIRST-LINE DIAGNOSIS OF EQUINE INFLUENZA

By Dr Hans Heine, AB-CRC scientist

A test developed for bird flu by the Commonwealth Scientific and Industrial Research Organisation's (CSIRO) Livestock Industries' Australian Animal Health Laboratory (AAHL) in Geelong and the AB-CRC is now successfully being used as a first line diagnostic test for equine influenza.

Equine influenza is caused by a strain of influenza virus that is related to, but differs from the strains causing bird flu. The test can detect virus genome (nucleic acid) of both these as well as other strains of influenza virus and is completed within a few hours. Swift diagnosis of equine influenza was a key to controlling the disease. A rapid diagnostic test for influenza ensured that appropriate control and containment measures could be implemented quickly.

The new test was designed to detect influenza type A viruses of different genetic lineages from a wide range of hosts and independent of geographic region of origin. Influenza viruses are a moving target and they mutate at a fairly rapid rate, typical for ribonucleic acid (RNA) viruses. In addition, birds can carry viruses over a long distance, viruses can jump host species, for example from birds to swine or humans under certain conditions, and different virus strains can recombine to form new virus strains.

The new test was transferred to all major government veterinary laboratories in Australia and New Zealand to enhance the regional capabilities to detect and manage an influenza outbreak. The AB-CRC, CSIRO, the Rural Industries Research Development Corporation and the State veterinary diagnostic laboratories supported trials to validate the tests and ensure accurate and rapid detection of the influenza virus. This has been critical to the test's successful application in the equine influenza outbreak where it has now been used many thousand times in labs around Australia.

The equine flu outbreak in August 2007 in Sydney came out of the blue and taught an important lesson for infectious disease control: be vigilant, be prepared and expect the unexpected. The team at AAHL is already preparing for future challenges and

is developing new procedures and tests to safeguard against potential test failures caused by changing and newly evolving avian influenza H5N1 strains.

AN UNEXPECTED VISITOR TO AB-CRC BIRD FLU OPERATION

AB-CRC virologist Dr Graham Burgess got more than he bargained for during a recent wild bird surveillance operation near Townsville, finding a wayward 1.8 metre saltwater crocodile had become trapped in one of his bird cages.



Dr Burgess' wild bird screening program, supported by the AB-CRC and the Australian Government Department of Agriculture, Fisheries and Forestry (DAFF), is part of an Australia-wide program that looks for avian influenza viruses in wild birds. Dr Burgess and his team from James Cook University have been taking samples from wild ducks for

almost a year to screen for bird flu, including testing for the highly pathogenic H5N1 strain that has killed birds and people overseas, though so far no birds in Australia have tested positive for this strain.

So he was pretty surprised when he got the phone call just after sunrise of their unintentional catch. The crocodile, along with several other juveniles, had been released a few years earlier as part of another group's research. While all other crocodiles were recaptured, even professional trappers hadn't been able to bring the last one in.

"They had been trying to catch him for over a year, because he was getting pretty big and was becoming a threat, but he was pretty devious," said Dr Burgess. "Then one morning, on a routine check, we found that we had accidentally caught him in one of our bird traps," he said. "It was a pretty unlikely find."

The AB-CRC study is the first to systematically monitor the presence of bird flu virus strains in wild bird populations of northern Queensland, one of the two major entry points for birds migrating to Australia from the Asia-Pacific region. Wild bird populations, in particular ducks, are thought to be the natural reservoir for avian influenza viruses, though the viruses that circulate in these populations are usually not pathogenic for the ducks.

For more information, please contact
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AILEEN PLANT CO-AUTHORED PUBLICATION ON COMMUNICABLE DISEASE CONTROL NOW AVAILABLE

A comprehensive book on the principles and practice of communicable disease control written by Charles Watson and Aileen Plant is now available. Dr Watson, a professorial research fellow at Curtin University of Technology has steered *Communicable Disease Control* to print following the untimely death of Dr Aileen Plant in 2007.

"Aileen wanted to write a book that would give practical help to those involved in communicable disease control in Australia. This first volume describes all the public health strategies that can be used, and a second book is planned with detailed information on each disease," said Dr Watson.

The core of the book is devoted to strategies that can be used to control communicable disease: legislation; surveillance; sanitation and

personal hygiene; immunisation; case finding, screening and contact-tracing; isolation and quarantine; antibiotic treatment; outbreak investigation; and media management during an outbreak. Plant and Watson describe when and how each strategy can be employed. Featured throughout the book are Australian statistics, legislation, policies and case studies. All health professionals, whether from public health, medicine, nursing, or environmental health, who need a practical guide to how to protect people from infectious disease, will find the book of value, as will those who are studying to work in the field. Those involved in the management of outbreaks and hospital infection control will find it of particular interest.

"Robert Hall is helping me with the editing of the second book detailing infectious diseases, which should be finished this year. I know Aileen would have been thrilled to see the work finally in print!" Dr Watson added.

Communicable Disease Control costs \$49.95 and is published by IP Communications. To purchase copies, please phone 03 9811 6818 or e-mail: ipcomm@bigpond.com

AB-CRC SCIENTIST RECEIVES AWARD

Congratulations to AB-CRC PhD student Ania Gubala who recently took out an award at the 4th Australian Virology Group Meeting.

Ania won a student poster prize for her submission titled *Characterization of Australian rhabdoviruses isolated from insects and animals*. Ania commenced PhD studies at AAHL in 2005, following release from her position as a research assistant at the Defence Science and Technology Organisation (DSTO). Ania is supervised by AAHL's David Boyle, University of Queensland's Ross Barnard and David Proll from DSTO. Her PhD project, titled *Evaluation of rapid molecular detection and characterization systems for risk evaluation of unknown viruses isolated in Australia* is being conducted under the auspices of the AB-CRC.

CRC PROGRAM UNDER REVIEW

Senator Kim Carr, Minister for Innovation, Industry, Science and Research recently announced a review of the CRC program as part of a broader review of the National Innovation System.

The review panel, to be chaired by Dr Terry Cutler, will examine the overall strategic

direction of CRCs, looking at the full range of issues, including governance and program design matters, the level and length of funding needed to support the program's objectives, as well as its overall scope and effectiveness.

As part of the review, the review panel has called for submissions to key questions from interested stakeholders who can also attend public meetings for open discussion around Australia during March.

Submissions to the review must be lodged by 30 April 2008.

To register interest in participating in public forums and to be kept abreast of review activities and progress simply email innovationreview@innovation.gov.au.

For more information on the review of the National Innovation System and the CRC program review, visit www.innovation.gov.au/innovationreview.

AB-CRC CONVENES CHIKUNGUNYA WORKSHOP

By Deb Cousins, Director Application & Linkage

On 13 February, the AB-CRC convened a one-day workshop focusing on the emerging Chikungunya virus and its potential implications for the AB-CRC, Australia and the region.

Chikungunya is a mosquito-borne virus most commonly spread by the Dengue mosquito (*Aedes aegypti*), and the Asian tiger mosquito (*Aedes albopictus*). The virus is endemic in the Asia Pacific region and many countries are in the midst of outbreaks. Eight cases of people infected with Chikungunya have been reported in Victoria, however all were infected overseas.

The Chikungunya Stakeholder Workshop was held at Queensland University in St Lucia, Brisbane. The workshop was originally conceived as a small roundtable discussion with Chikungunya experts. However stakeholder interest in the topic saw it develop into a full workshop with 25 delegates, with strong representation from the health sector.

The early part of the forum centered on providing an overview of Chikungunya from an international perspective. John Mackenzie, AB-CRC Deputy CEO, gave an overview of the characteristics of the virus and its epidemiology, as well as a discussion of the history of Chikungunya infections and recent outbreaks in the region. Scott Ritchie from Queensland Health provided information on disease ecology, including virus vectors and habitats outside of Australia.

Chikungunya risk to Australia and current research in the area was the focus of the second set of presentations. An excellent presentation describing clinical symptoms and

including comments on potential changes in Chikungunya virulence was provided by Bart Currie (Menzies University). David Smith (PathWest WA) provided a comprehensive review of imported cases diagnosed in Australia and current detection capability. Newer methods of detection, including a commercial serodiagnostic test being developed, were covered by Andreas Suhrbier (Queensland Institute of Medical Research).

Dr Andrew Van Den Hurk (Queensland Health) reported on AB-CRC funded research that suggested Australian mosquitoes may be potential vectors of the virus.

“This is the first study to prove that native mosquitoes can be infected by the Chikungunya virus,” said Dr Van Den Hurk. “Ordinarily you might not expect native Australian mosquitoes to be as susceptible as previously identified vectors overseas, however it seems that they may have the potential to carry the disease just as efficiently.”

“Until now, the only proven vectors for transmission of Chikungunya were limited to Northern Queensland,” he continued. “But some of the species we’ve implicated in our study are much more widespread, distributed throughout most of coastal Australia. Bottom line is, if an infected individual came into Australia, we have mosquito vectors that would facilitate local transmission of the virus.”

Deb Cousins facilitated the afternoon sessions which included smaller group discussions of risk pathways. Top of the agenda was identifying gaps in knowledge about Chikungunya, and groups then considered the implications of these knowledge gaps as they relate to policy, research, and education and training.

Bart Currie (Menzies University) provided a succinct summation of the highlights and take home messages of the meeting and Stephen Prowse wrapped up the workshop with his views on the outcomes of the workshop and a list of the research topics that were relevant to the AB-CRC.

Feedback from attendees indicated the forum was timely, informative, well-received and productive. The key findings of this meeting are currently being summarised and will be available shortly in the *Chikungunya Stakeholder Workshop Final Report* on the Application & Linkage page of the AB-CRC website.

OVERSEAS TRAVEL ENHANCES KNOWLEDGE OF WEST NILE VIRUS ESTABLISHMENT RISK

Student placement scholarship report by Cassie Jansen, PhD student

During the third year of my PhD study entitled *An entomological investigation of the risk of*

establishment of West Nile virus in eastern Australia, I had the opportunity to travel abroad to enhance my PhD experience. With the support of both an AB-CRC Student Placement Scholarship and a University of Queensland Graduate School Research Travel Grant, I travelled to Brazil and the United States of America.

In the Brazilian city of Manaus, I attended the Biology of Disease Vectors Course hosted by the Oswaldo Cruz Foundation. The course, also supported by the United Nations Children’s Fund (UNICEF)-United Nations Development Fund (UNDP)-World Bank-World Health Organization (WHO) Special Programme for Research and Training in Tropical Diseases, brought together early career researchers from all over the world to experience two weeks of intensive training. The course focused on the application of modern molecular and quantitative approaches to the study and control of disease vectors and facilitated networking among vector-borne disease researchers. Special emphasis was placed on the biology of vector/pathogen interactions.

The course featured a strong practical component and included a number of ‘hands on’ sessions that encouraged technology transfer. All presenters were highly enthusiastic and very generous in sharing their wealth of

knowledge. A highlight for me was travelling to small villages along the Amazon River where residents were deeply affected by vector borne diseases, particularly Malaria and Leishmaniasis.

Upon leaving Brazil, I headed to sunny California to spend seven weeks working with the staff from the Center for Vectorborne Diseases, University of California, under the kind supervision of Dr William Riesen. Dr Reisen and his team were very generous hosts and their hospitality was overwhelming.

During my time at the University of California, I completed a study which examined the potential for the Australian arbovirus, Kunjin (KUN) virus, to infect North American vectors of West Nile (WN) virus. I conducted a comparative experiment whereby I infected two known WN virus vectors, namely *Culex quinquefasciatus* and *Culex tarsalis*, with an Australian strain of KUN virus and a North American strain of WN virus. My study compared the ability of these two viruses to infect, replicate, disseminate and be transmitted by these vector mosquitoes. This was complementary to my PhD project, part of which examines the vector competence of Australian mosquito species for WN virus.

Whilst in California, I was able to actively participate in arbovirus surveillance activities

in the field. This included the surveillance of both wild birds and mosquitoes using various trapping techniques. I worked alongside a dynamic research team, observing and assisting the processing of surveillance samples, in addition to my own samples that I generated during my experiments. I also learnt a number of virological techniques.

During a visit to Bakersfield, I had the opportunity to accompany members of the Kern County Mosquito Abatement District Agency on a tour of their mosquito abatement area. Kern County is known to be an area of heightened arbovirus activity particularly for WN virus. This provided a valuable insight into the practical aspects of WN virus control in California from a vector control viewpoint. During my time with the Agency members, I viewed the habitats of common WN virus vector mosquitoes, and observed first-hand the mosquito control procedures that are used to reduce populations of WN virus vectors. I also gained an appreciation of the various obstacles that are encountered by such large-scale mosquito control efforts.

In California, I was able to gain an in-depth understanding of how WN virus activity is monitored and controlled in a setting highly relevant to the Australian situation. In particular, I gained an appreciation for the importance of effective coordination and management of

surveillance and control programs on a large scale. Overall my trip provided an invaluable insight into the distribution, ecology and management of WN virus in a region where it has recently become established. In addition, this wonderful opportunity reinvigorated my enthusiasm for my PhD study - just what I needed to inspire me to finish off that thesis!

DEVELOPMENT OF DIFFERENTIAL DIAGNOSTIC TESTS FOR MEDICALLY SIGNIFICANT FLAVIVIRUSES

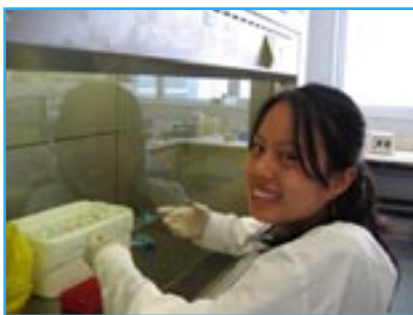
Vacation scholarship report by Linda Ly, undergraduate

My vacation project within the virology lab was an opportunity for me to define my Science major, and decide whether I wanted to complete my honours year after my degree or not. My supervisors were extremely supportive of my transition into the lab, and it was then that I applied for the AB-CRC Vacation Scholarship, which changed my holidays in more ways than one.

My project focused on flaviviruses and the monoclonal antibodies (mAbs) that were able to specifically detect either Japanese encephalitis, Murray Valley encephalitis or Kunjin virus. I had the opportunity to perfect my enzyme-linked immunosorbent assay (ELISA) to test the reactivity of the mAbs, and then

immunoblotting to establish what protein the mAbs bind to. After my project wrapped up, I realised that I was quite attached to the lab and staff members, so I immediately volunteered to work on some mosquito grinding to isolate any viruses that may be present (and the picture below is proof that I did do some serious work over the summer!).

My time in the lab was extremely rewarding, because this course allowed me to get to know staff and lecturers on a more personal level that no other courses I have ever attended could really offer. Completing this project made me realise that the amount of work that goes behind being an honours student, accomplishing a PhD thesis and publishing a paper must be seen to be believed. But now that I know what is coming, I wouldn't mind doing all of that sometime in the future (preferably in that order too).



Linda at work in Roy Hall's virology lab at the University of Queensland

APPLICATION OF AN ELISA FOR THE IDENTIFICATION OF MOSQUITO BLOOD MEALS COLLECTED FROM URBAN HABITATS

Vacation scholarship report by Andrew Nguyen, undergraduate

The six week project I undertook involved a placement with Queensland Health Forensic and Scientific Services in Brisbane. It involved the assaying of mosquito bloodmeals to determine which hosts they fed upon. The importance of this lies in the fact that many types of hosts are often involved in the transmission of viruses known to be threats to public health. By knowing the types of hosts that mosquitoes feed on in Australia, it was hoped the project results would help in determining the country's risk from exotic viruses.

When I first began the project I had no idea what fulltime laboratory work involved, let alone how it could contribute to Australia's biosecurity awareness. So aside from the brief practical work I had at university the semester before, my experience was mainly in the realm of theory. But what a difference six weeks can make. Starting slowly, and notwithstanding the trials and tribulations that are credited towards the scientific method, I gradually learned to assay hundreds of crushed mosquitoes and determine which hosts their bloodmeals came from.

I saw positive readings light up like Christmas decorations. But more importantly, I knew why. I had put theory into practice.

I learned a great deal from this experience. I probably cannot emphasise that enough. Not only did I obtain new techniques in laboratory diagnostics, but I also learnt much about research and its role in public health protection. Undertaking the vacation scholarship with the AB-CRC has allowed me to gain an insight into what a career in public health involves. It has also given me an understanding of the many interconnected processes and facilities that constitute the large web of public health preservation and infectious disease surveillance in Australia. I would strongly advocate other tertiary students take up this opportunity, given it was the previous years' reports which initially piqued my interest.

AILEEN PLANT MEMORIAL LECTURE

5pm, 17 April 2008
Curtin University of Technology

The inaugural Aileen Plant Memorial Lecture will be presented by Assistant Director-General for Health Security and Environment of WHO and Representative of the Director-General for Polio Eradication, Dr David L Heymann.

Further details available by contacting Curtin University of Technology on 08 9266 9266.

JOHN MACKENZIE RETIREMENT SEMINAR

3.00pm - 4.30pm, Friday 18 April
Bankwest Theatre, Curtin University of Technology

Refreshments follow in John Curtin Gallery

This farewell seminar is presented by Curtin University and the AB-CRC. Speakers are John Mackenzie, who will present *Emerging diseases in Asia-Oceania: What should we be doing to provide an early warning of potential threats*, David Smith who will present *Of Mice and Men (and Mosquitoes): It's a wonderful One World* and David L Heymann whose topic is to be confirmed.

Please RSVP by 10 April to Erin Rummer ph: 08 9266 1644 or email e.rummer@curtin.edu.au

2008 CRC ASSOCIATION ANNUAL CONFERENCE

21-23 May 2008
Australian Technology Park, Eveleigh, New South Wales

Registrations now open

The 2008 Annual Conference of the CRCA is an opportunity for Australian science and technology innovators to gain valuable insights from leading bureaucrats, academics and entrepreneurs about their experiences, their successes and their failures in this arena.

The CRCA Conference is not just for CRCs - it has been designed to be of value to anybody interested in the concept of cooperative research and innovation.

For more information, please visit www.crca.asn.au/conference/index.html

AUSTRALIAN MUSEUM EUREKA PRIZES

Entries Close 5pm AEST, Friday 2 May 2008

The Australian Museum Eureka Prizes are presented annually by the Australian Museum and are Australia's most comprehensive national science awards.

Prizes worth over \$200,000 will be awarded for excellence in the fields of Research and Innovation, Leadership, School Science and Science Journalism and Communication. For more information visit www.australianmuseum.net.au/eureka/

AB-CRC PHOTOGRAPHIC COMPETITION 2008

Entries close 19 May 2008

Capture the essence of biosecurity in an image and you have a chance to share in \$4500 in prizes.

Following the success of the last year's inaugural photographic competition, the AB-CRC is running the competition again in 2008 and you, your colleagues, friends and family are invited to enter.

Images should be relevant to the objectives of the AB-CRC. Equally welcome are those images representing technical aspects of research or those with a broader interpretation of biosecurity.

A new category has been introduced for professional photographers, whether employed full or part time with AB-CRC affiliate organisations or working for the AB-CRC but earning a portion of their income from photography.

Prizes will be awarded by the judging panel according to relevance, originality, creativity and technical excellence. The winners will be announced at the AB-CRC Annual Workshop from 23 to 26 June 2008.

More details and terms and conditions are available from the AB-CRC website. Download the entry form from: <http://www.l.abcrc.org.au/pages/TechTransfer.aspx>