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## FROM THE CEO

Dr Stephen Prowse



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**FROM THE CEO***Dr Stephen Prowse, CEO*

Planning for the next iteration of the Biosecurity CRC is well underway with our new bid workshop attended by 65 people from Australia and the region late last month. At this workshop the broad framework and themes for our projects and programs were developed. A key theme running through the thinking for the new CRC was the concept of ‘one health’.

‘One health’ seeks to improve the health and well-being of all species by enhancing cooperation and collaboration across the public health, environment and livestock sectors to combat emerging infectious disease (EID) threats. The concept of ‘one health’ has been developed as a result of an increased understanding of the factors leading to the emergence of zoonosis and recognises that human and animal health are inextricably linked.

The term “one medicine” was coined in the 1960s by Calvin Schwabe, a veterinary scientist and epidemiologist at the University of California, who died last year.

Laura Kahn further developed the notion within her article in “*Emerging Infectious Diseases*”. She also wrote a vision statement together with Florida veterinarian Bruce Kaplan and former government virologist and biotech executive Thomas Monath, which has now been supported by dozens of prominent researchers.

‘One health’ shall be achieved through joint efforts in:

- Education between medical and veterinary schools, and schools of public health;
- Communication with biosecurity stakeholders;
- Assessment, treatment and prevention of cross-species disease transmission;
- Cross-species disease surveillance and control efforts;
- Better understanding of cross-species disease transmission;
- Developing and evaluating new diagnostic methods and therapeutics for the prevention and control of diseases across species; and
- Informing and educating political leaders and the public sector.

In North America, both the American Veterinary Medical Association (AVMA) and the American Medical Association (AMA) have identified that the nexus between human health and animal health is of great importance.

The sleeping giant in this is wildlife disease. In recent years there has been increased recognition that diseases are emerging from wildlife and crossing to livestock and humans. Improved systems and processes to identify the risks and factors causing this emergence are challenging.

The Biosecurity CRC Mark II aims to create a vibrant and dynamic ‘one health’ regional partnership to protect the social, health, environmental and economic prosperity of Australia and the region from EID threats.

This is an exciting vision that extends across the public health, agriculture and environment sectors, across national borders and across scientific disciplines, to achieve significant mutual benefits for biosecurity for Australia and the region.

We look forward to working with prospective partners over the next six months to build the Biosecurity CRC Mark II.

## AB-CRC SCIENTISTS IN CSIRO DISCOVERY OF NEW BAT VIRUS IN HUMANS

*Article reproduced with permission from CSIRO Livestock Industries*

Led by Linfa Wang, CSIRO Livestock Industries scientists in collaboration with researchers from the National Public Health Laboratory, Malaysia, have discovered a new bat-borne virus, Melaka virus (MeV). Bats are known reservoir hosts of an increasing number of zoonotic viruses (animal viruses capable of also infecting people).

The virus was isolated from a hospital patient in Malaysia and is the latest in a number of viruses of probable bat origin (including SARS) believed to cause acute respiratory disease in humans. This is the first known report of a virus in the *Orthoreovirus* genus being associated with clinical disease in humans. Evidence to date strongly indicates that Melaka is a zoonotic virus capable of leaping the species barrier from animal to human and then able to spread within human populations.

Retrospective research revealed several other members of the patient's family developed similar symptoms approximately one week later and showed serological evidence of infection with the same virus. The delay in symptom onset suggests human-to-human transmission took place.

Research indicates Melaka virus is closely related to the two previously discovered bat-borne viruses, Pulau virus and Nelson Bay virus.

According to the leader of the Malaysian team, Dr Kaw Bing Chua, bats were examined as a host, not only because previous unknown viruses have been found to have originated in bats, but because epidemiological tracing revealed the family were exposed to a bat in the house one week prior to the patient showing clinical symptoms of the virus.

The Australian Animal Health Laboratory (AAHL) plans to continue working closely with the group in the National Public Health Laboratory and other Malaysian scientists to identify how widely distributed the virus is and how many related viruses there are in the bat reovirus group.

Linfa said the discovery of Melaka virus will make future diagnoses of unknown viruses more accurate as it can now be added to the list of new and emerging viruses.

The research was published in the internationally renowned journal *Proceedings of the National Academy of Sciences*, USA. Issue 27, Volume 104, pp.11424-11429. ([www.pnas.org](http://www.pnas.org))

## AB-CRC DEPUTY CEO APPOINTED TO UNITED NATIONS COMMITTEE

Professor John Mackenzie was nominated to participate in a committee of specialized experts at the United Nations in New York to update the technical guidelines and procedures available to the Secretary General for the timely and efficient investigation of alleged use of chemical, biological or toxin weapons. The committee was established by the Office for Disarmament Affairs following a request from the General Assembly to the Secretary-General for the 1989 Guidelines and Roster of Experts to be updated.

While nominated as an expert by the Australian Government, Professor Mackenzie was also appointed as the official representative of the World Health Organization to the committee. The committee will meet again for its second session at the end of November at which time the report to the General Assembly will be drafted.

## AB-CRC RESEARCH TOWARDS MOSQUITO-FREE ARBOVIRUS SURVEILLANCE FOR JAPANESE ENCEPHALITIS VIRUS

An AB-CRC research project has developed a novel way of detecting Japanese encephalitis virus (JEV) antigens in infected mosquitoes, leading to the development of 'mosquito-free' arbovirus surveillance method.

JEV was first isolated in Japan in 1935. Since then JEV has been found in Russia, Far East and South East Asia, the Indian subcontinent and Nepal. However, while JEV has a long and deadly history across Asia, and is common in Papua New Guinea, it is rare in Australia.

Mosquitoes become infected with JEV by feeding on domestic pigs and wild birds infected with JEV. Infected mosquitoes then transmit JEV to humans and animals during the feeding process. Suitable vector mosquitoes such as *Culex annulirostris* and hosts (e.g. water birds) are widespread across the Australian mainland. There are also many wild pigs in north eastern Australia to act as amplifiers for the virus.

Because of this risk, Australia has an active JEV monitoring program. The Australian Quarantine Inspection Services' sentinel pig strategy is based on the JEV infection cycle: an infected mosquito bites a pig and the pig becomes a breeding factory for the disease.

Unfortunately, the sentinel pig program had some drawbacks. It can take two weeks for signs of JEV antibodies to show up in the pigs' blood, which is an unacceptable delay for a potentially deadly disease. And pigs are big and expensive to maintain. However, the most serious problem with using pigs as sentinels for JEV is that this is dangerous. The virus is capable of replicating in pigs, effectively making the sentinel pigs part of the risk of an outbreak.

A viable alternative to detecting JEV without using animals was actually trapping and testing mosquitoes using mosquito traps. The traps work by using a gas cylinder of carbon dioxide effectively replacing the sentinel pig. To ensure that mosquito traps were an effective replacement, they were run in parallel with the sentinel pig program for four years to compare results. JEV was able to be identified in mosquitoes within a week but the traps had some problems, namely varying success rates of makes and models of trap, traps could become clogged with mosquitoes, destruction of mosquitoes by fan blades, fungus infections in the humid wet tropics inhibited viral checking and battery failure.

In addition, the levels of JEV infection of mosquitoes can vary between regions, impacting on the numbers needed to confidently determine if JEV is present. While U-bend traps proved the most effective, the development of a 'mosquito-free' arbovirus surveillance method would eliminate the need to process hundreds of

thousands of mosquitoes captured in a large scale JEV surveillance program in northern Australia.

ABCRC scientists have now established that JEV antigen can be detected using molecular tools (polymerase chain reaction, or PCR) in mosquito saliva on a sugar-soaked pad. Mosquitoes can be trapped and fed a sugar solution from a sugar-soaked cotton pad or 'pledget' which is then processed for JEV antigen, eliminating the need to test the mosquitoes themselves.

These results show we are one step closer to turning 'mosquito-free arbovirus surveillance' into reality.

For more information please contact

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## WEST NILE VIRUS SUSCEPTIBILITY AND TRANSMISSION

AB-CRC scientists have completed valuable research into WNV susceptibility and transmission in Australian avifauna with some unexpected results.

Dr John Bingham of CSIRO's Australian Animal Health Laboratory in Geelong lead the project aimed at enhancing Australia's capability to detect virulent WNV in the event of an incursion.

"At the time of its arrival in North America, WNV was new to that ecosystem. It became a significant threat to the human and animal populations, causing the death and illness of large numbers of people, horses, wild birds and other animals. Within four years it had spread to affect most of that continent from a focus initiated in New York city," said Dr Bingham.

"The most prominent indicator species, particularly during the early phases of an outbreak, were birds of the family *Corvidae* (crows, jays and magpies). These species appear to be extremely susceptible to WNV with high mortality rates following neurological disease," he added.

Initially, the AB-CRC project was to determine if WNV (New York strain) early detection methods, such as dead bird pick-ups, are valid in an Australian situation, by testing the response of common urban bird species to a WNV challenge.

Australian representatives from the *Corvidae* family, namely little ravens (*Corvus mellori*), were trapped, placed under camera surveillance and challenged with WNV. Using the principal virus detection method of cell culture assays and neutralisation tests already established at AAHL, the infection status of the ravens was monitored. Positive infected formalin fixed mouse tissues for a range of flaviviruses were generated as positive control material and the monoclonal antibody 4G4 was determined to be effective for use in immunohistochemistry tests.

"After two trials on ravens it was determined that ravens are relatively resistant to the New York strain of WNV which was unexpected as all North American corvids are highly susceptible to WNV," said Dr Bingham.

"These findings indicate that, at least in the first instance before viral adaptation, corvids may not be efficient early warning sentinels, but may be reasonably efficient at amplifying the virus for mosquito transmission given viral titres results," he added.

It is likely that several bird/mosquito cycles will take place through each season of vector proliferation which may render the virus more or less virulent. However, a single further passage in ravens did not indicate a change in pathogenicity to that species.

However, even a slight increase in virulence (by using a WNV that is better adapted to the Australian species) may change the WNV surveillance status of these bird species.

Endemic, low virulence KUNV, which is classified in the same lineage as virulent WNV, occurs in the northern regions of Australia and infections with this virus have to be distinguished from those of exotic, high virulence variants. In an infection trial with Kunjin virus (KUNV), it was found that ravens will support an inapparent infection.

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## AB-CRC PARTICIPATES IN SCIENCE MEETS PARLIAMENT

The AB-CRC participated in the inaugural Western Australian 'Science@Parliament Informing the Future' event in Perth on 14 August. The event was held at Parliament House and was structured around having scientists from particular areas available to talk to politicians on a casual ad hoc basis.

The Premier brought Members of Parliament into the event and introduced it over a lunchtime break with a presentation from Chief Scientist Professor Lyn Beazley, who also promoted the Square Kilometre Array (SKA) project.

The event was focused around science informing 'our agriculture', 'our health', 'our oceans', 'our changing climate', 'our energy', 'our environment', 'our future scientists', 'our high-tech future', 'our mineral wealth' and 'our water resources'.

Deb Cousins represented the AB-CRC during the day which provided a good opportunity to meet with Members of Parliament and a great opportunity to network with researchers working in other areas. The overall premise was to promote science in general to Members of Parliament rather than lobbying particular causes. There was good representation from Parliamentarians at the evening cocktail event, along with invited heads of government departments and industry representatives, where Professor Beazley introduced WA Premier's Science Fellows including AB-CRC Deputy CEO Professor John Mackenzie as well as the newly reconstituted Premier's Science and Innovation Council of which Deb Cousins is a member.

The feedback from the event suggested it was worthwhile and with some changes it will be restaged in 2008.

## NEXT STEPS FOR ESTABLISHING A BIOSECURITY CRC MARK II

*By Lisa Adams, Director of Research Development*

Following up from CRC Rebid Planning Forum held in Brisbane in July, the next steps in preparing a business case for establishing a Biosecurity CRC Mark II are outlined below.

- Establish the Program Development Team (August 07)
- Finalise strategic directions and associated flagship project areas (August 07)
- Issue a call for project abstracts (September 07)
- Program Development Team to assess abstracts against criteria and shortlist projects; flagship, possible flagship, other and outside of scope (final decisions to be taken by the National Steering Group with co-opted members if required) (October 07)
- Develop full project proposals (October – November 07)
- Engage stakeholders and 'end users' to provide feedback on directions and to secure investment (August – November 07)
- Develop strategy to increase the profile of the planning initiative, drawing on key people and projects (August 07 with ongoing review)
- Economic analysis of the new business case (December 07 – February 08)

- Establish timelines and commitments with stakeholders: Stage One Business Case due in March 2008 with 'in principle' commitments, Stage Two Business Case due in August 2008 with confirmed commitments, notification of funding outcome in December 2008, project commencement from July 2009
- Develop interim initiatives to maintain momentum and keep ideas on the boil (August 07 with ongoing review).

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## STAKEHOLDER REVIEW OF REMOTE AREA SURVEILLANCE NEEDS AND TOOLS

*By Deb Cousins, Director Application & Linkage*

In early June the AB-CRC's Application & Linkage Program facilitated a stakeholder review of remote area surveillance and considered the potential of the hand held bovine syndromic surveillance system (BOSSS [www.ausvet.com.au/bosss/](http://www.ausvet.com.au/bosss/)) as a remote area surveillance tool.

BOSSS, as many of you will recall, was Richard Shephard's PhD project funded by MLA, AHA and the AB-CRC. Richard was our first student to complete his PhD studies with his thesis awarded in June 2007.

The workshop, held just outside Brisbane from 5-6 June 2007 was supported by MLA, AHA and the AB-CRC. The continual heavy rain that lasted from the pre-workshop dinner to the end of the workshop stifled our attempts at exercise in the morning but brightened the eyes of every Queenslander in the group.

The workshop was attended by 32 invited delegates representing state and territory governments, federal government, the livestock industries, a number of corporate and private livestock producers, North Australia Beef Research Council, Katherine Primary Industries Advisory Council, agriculture consultants, universities, SMEs in livestock health & epidemiology, and the AB-CRC.

The broad objectives of the workshop were to: 1) discuss the needs and opportunities of remote area surveillance in Australia, 2) update and inform delegates on the BOSSS research, and as well as the progress to date on the implementation of BOSSS, and 3) discuss the challenges associated with use of such systems with a view to finding a way forward.

The workshop consisted of a series of presentations and general discussion sessions, followed by group activities that addressed a

number of focus questions. Presentations were made on remote area and national surveillance systems (Angus Cameron, AusVet and Kevin deWitte, AHA), research achievements (Richard Shephard and Rafael Calvo, USyd) and the implementation of BOSSS to date (Stephen Prowse, Ian Whan, Allied Resource Economics (who also provide a presentation on behalf of one of our producers Emma Jackson, from Wolverton Pastoral Company who was a late apology), Jon Cobb (S. Kidman & Co, based at Glengyle Station, NT), Karen Skelton (QDPIF) and Michael McGowen (UQ). Nigel Perkins AB-CRC/AusVet ably facilitated the discussion and we ended up with five recommendations to follow through with.

The delegates' cross-sector experience brought enhanced understanding of the extensive beef cattle industry to this topic. It was recognised that a tool like BOSSS might have different applications for producers and state based organisations that collect surveillance data. The recommendations included 1) further liaison with state/territory departments to determine opportunities for adding data to validate the system, 2) continued communication and consultation with innovative producers and the university sector to enhance uptake of the system, 3) building on the recognized strengths of syndromic surveillance

as a tool for training and awareness including in university teaching programs and in private practices servicing beef producers. It was

generally recognized that the BOSSS system was somewhat ahead of the internet technology needed to support it in remote regions so further action on the use of the mobile version will wait on the outcome of the research to build the platform within a mobile phone. It remains a challenging area.

Feedback from those that attended was positive, supporting the benefit of face-to-face communication between stakeholder groups, especially when complex issues are being discussed, and when the stakeholder group is diverse.

The final report has been completed and sent to MLA. The full report will be placed on the web for interested parties. In line with one of the recommendations, Deb Cousins has had follow up meetings with both PIRSA and DAFWA to consider state-based opportunities for inputting data to BOSSS to validate the system.

## STAFF PLACEMENT REPORT

*By Dr. Marta Hernández-Jover, Postdoctoral Research Fellow*

One of the objectives of our AB-CRC project on peri-urban pig producers in eastern Australia is to evaluate the current disease surveillance systems post-farm-gate and develop standard operating procedures for health surveillance at saleyards and processing plants.

The evaluation of the likelihood of disease detection under current systems and the alternative procedures would provide very useful information for the project. In order to do a qualitative and quantitative analysis for the project, we needed to gain some skills on risk analysis and assessment. In her previous correspondence, Dr. Naomi Cogger from the Epicentre of Massey University (New Zealand) had suggested that collaboration between both institutions would improve our skills and understanding about the risk analysis process.

Dr Cogger offered me the opportunity to attend the introductory course on Import Risk Analysis she was teaching at Massey University and I decided to apply for a staff placement. AB-CRC approved my application to attend the course and also undertake a collaboration period working on the evaluation of the likelihood of disease detection.

During the first week of my placement I attended the import risk course and learned the basics of a risk analysis, which can be applied to our

area of interest. The course gave me a general overview of the different steps of conducting risk analysis including hazard identification, risk assessment, risk management and risk communication. However, it mainly focused on hazard identification and risk assessment including release, exposure and consequence assessment as well as risk estimation. The course had a qualitative and quantitative approach. For the quantitative risk analysis a software program (@Risk) was used.

During the second week of my placement I applied the knowledge gained during the course on investigating the likelihood of disease detection in the pig industry in Australia working in collaboration with Dr Cogger. The main objective of this second week was to investigate the different pathways of transitions and movements of pigs in Australia and evaluate the likelihood of disease detection according to each specific pathway. After defining the piggery operations, farms, type of animals and different post-farm-gate destination of pigs, a scenario tree describing the movement of pigs from non-commercial producers was developed.

This scenario tree will be used for a qualitative and quantitative evaluation of disease detection and notification at saleyards and abattoirs in eastern Australia. An abstract has been prepared for presentation at the annual conference of the Australian and New Zealand Chapter for the Society for Risk Analysis next August in Hobart.

The two week placement has been a great opportunity for me in terms of professional

experience as I gained skills on risk analysis which will be very useful for me and for the AB-CRC project, I met very professional people and I spent two weeks in an epidemiology centre widely considered to be one of the leading groups in the world.

Moreover, it has been a very good personal experience, being in a new country and discovering its spectacular landscape, especially thanks to the hospitality of Dr Cogger and her family.

## INAUGURAL AB-CRC PHOTOGRAPHIC COMPETITION

*Entries close 1 October 2007*

Capture the essence of biosecurity or emerging infectious disease in an image and you have a chance to win \$3000 in prizes in the AB-CRC's first photographic competition.

Entry is open to AB-CRC staff and affiliates, their colleagues, family and friends. Images may represent the AB-CRC as a whole or be relevant to a specific area of ABCRC research. Technical images as well as creative images are equally welcome and the interpretation of biosecurity or emerging infectious diseases can be broad or narrow. Photographs can be either colour or black & white and there is no limit to how many images can be entered. The electronic submission of photographs as a JPEG file is preferred and file sizes should be between 300KB and 2MB with a resolution of 120dpi.

The best overall photograph selected will be awarded \$1500, and the runners-up will each win \$750. Prizes will be awarded by our judging panel according to relevance, originality, creativity, & technical excellence. Winners will be announced at the AB-CRC National Workshop from the 13-16 November 2007 and the winning images will be published in Homefront and Sentinel.

Entry forms and full terms and conditions for the competition can be found at <http://www1.abcrc.org.au/pages/TechTransfer.aspx?MenuID=11>

Submit your completed entry form and CD of images to:

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