RESEARCH PROJECTS UNDER MANAGEMENT

A new unit in Veterinary Public Health and Food Safety at the University of Sydney MLA P.PSH.0194

FA&VPH Staff

Professor Michael Ward
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Summary

There is a deficiency in capacity to predict, prevent and manage emerging product integrity threats to the red meat sector. The present project is aimed at capitalising on the established partnership between University of Sydney and Meat and Livestock Australia through additional co-investment, specifically to address the pressing needs in veterinary public health and food safety which underpin international market access and competitiveness of Australian red meat.

While effort is made in Australia to respond to threats, it is fragmented across jurisdictions and constrained by both manpower and mandate issues within the various agencies. Consequently there is risk of system failure in the event concurrent threats or rapidly changing market requirements. It is estimated that 97% of Australia's red meat exports currently supply key, high value, Pacific rim markets where prices are maintained through consumer expectations of product safety, as well as taste and tenderness. Consequently the GVP of Australia's red meat sector is highly sensitive to threats to product integrity. National preparedness to meet current and future threats may be insufficient to guarantee continued access to these markets. Overseas countries who are competitors or potential competitors for market access have invested heavily in research and training in the university sector, specifically in the areas of veterinary public health and food safety and in Australia may not be sufficient to meet the ongoing routine demands of importing countries.

Objectives:

- Establish a new unit in Veterinary Public Health and Food Safety in the Faculty of Veterinary Science
- Appoint a new Chair to lead the unit
- Deliver broad outcomes for the red meat industry through research and training including:
- Decreasing production costs
- Maintaining market access
- Reducing risks of loss of export market access
- Increasing microbiological safety of product
- Advancing technology to maintain competitiveness
- Promoting research activity
- Educating to increase human resource capacity
- Advocacy
- Change management and planning for future change

Source of funding

Meat & Livestock Australia

Project timeframe

January 2006 – January 2012

Bovine Johnes Disease – Basic and applied research for improved diagnosis and prevention MLA P.PSH.0297

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	Dr Kumi de Silva	Dr Karren Plain
	Dr Auriol Williams	Ms Adelyn Bolithon
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	Mr Nobel Toribio	Mrs Anna Waldron
	Mrs Ann-Michele Whittington	
PhD Students	Ms Satoko Kawaji, Mrs Kate Bower, Mr RB Gurung, Ms Shyamala Thirunavukkarasu	
National Collaborators	Dr Ian Marsh, NSW Department of Industry & Investment, Elizabeth Macarthur Agricultural Institute (EMAI)	
International Collaborators	Dr Jayne Hope, Compton Institute, UK Dr Gregers Jungerson, Danish Veterinary Laboratory Dr Yasuyuki Mori, National Animal Health Institute, Japan	

Summary

Bovine Johnes disease (BJD), caused by *Mycobacterium avium* subsp. *paratuberculosis* is a significant issue for the dairy industry in south eastern Australia and a sporadic problem in beef cattle. Efforts to reduce the within-herd prevalence of BJD within the dairy industry have been quite successful using conventional technologies, and concomitant efforts to prevent spread to the beef cattle sector also appear to be well accepted by the industry. A vaccine for BJD may soon be available; this is likely to be a valuable tool to reduce prevalence in heavily infected dairy herds.

Internationally, BJD is considered to be a significant threat to the livestock sector. Several studies have confirmed direct economic loss, but a greater threat exists because of a perceived link with Crohns disease in humans, and the need to apply the precautionary principle in order to ensure future market access for livestock products. Public health authorities in many developed countries have adopted a neutral position on the possible link between *M a paratuberculosis* originating in livestock and the occurrence of the organism and disease in humans. However there are large research programs on BJD in the EU/Europe, Japan and North America and smaller research programs in many other places. For market access insurance, Australia needs to be engaged with R&D at an international level. Currently there is very little active research on BJD in Australia. A very large research program on ovine Johnes disease (OJD) (National OJD Control and Evaluation Program) has been completed and has led to substantial capacity in this field of research that can now be applied to BJD.

This project addresses substantial opportunities:

- Australia is in a good position to capitalise on research advance in BJD that will come from the EU and North America because of close scientific and professional collaboration and interactions through the International Association for Paratuberculosis (IAP) and the Johnes Disease Integrated Program (JDIP). Australia can expect to obtain greater understanding of the causative bacterium and its evolutionary background, and better herd diagnostic tools, for example environmental sampling. These advances will become available without direct investment, but may be limited in extent or applicability in the Australian context.
- Australia currently has a large research program on pathogenesis and early detection of OJD (MLA project OJD.031). This project has resulted in collaborative ties with researchers in Scandanavia (BJD), New Zealand (JD in sheep and deer) and Japan (BJD). The techniques and infection models developed through the project are directly applicable to BJD research.

Source of funding	Meat & Livestock Australia
Project timeframe	January 2008 – June 2011

Ovine Johnes Disease – Applications of basic research on enhanced diagnosis and prevention
MLA P.PSH.0311

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PhD Student	Ms Satoko Kawaji, Mrs Kate Bower, Mr RB Gurung, Ms Shyamala Thirunavukkarasu	
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Summary

Ovine Johnes disease (OJD) is caused by *Mycobacterium avium* subsp. *paratuberculosis* (MAP) remains a significant issue for sheep industries throughout southern Australia. It can be responsible for significant losses if left uncontrolled. Vaccination to reduce the prevalence of clinical disease within infected flocks has been very successful, with widespread adoption by affected producers. In addition, vaccination is used to improve flock status in a risk based trading scheme. However, vaccination does not prevent infection, and rates of shedding of MAP remain high on several properties where the vaccine has been used, there are injection site reactions in sheep and occupational health and safety risks for producers. Furthermore, some producers have ceased to vaccinate due to reductions in flock mortality rates, high cost of vaccine and reduced farm incomes due to the drought. In addition, producers in some regions where OJD is uncommon or absent continue to exclude sheep from endemic regions, which is impacting on trading options of producers. Food safety is also a concern. Although controversial and still unproven, MAP has been proposed as a potential cause of Crohns Disease in humans.

Internationally, JD is considered to be a significant threat to the livestock sector, regardless of the species affected. Public health authorities in many develop countries have adopted a neutral position on the possible link between MAP originating in livestock and the occurrence of the organism and disease in humans. Nevertheless, animal health authorities in many countries have introduced, or plan to introduce control programs for JD. These will depend on research programs on JD in the EU/Europe, Japan and North America and smaller research programs in many other places. These countries are trading partners and/or competitors of the Australian red meat industries. For market access insurance, Australia needs to be engaged with R&D at an international standard. Currently there is very little basic research on JD in Australia other than that in a recently completed MLA project, OJD.031. That research program led to a substantial Australian capacity in this field of research. The research needs for OJD are complementary to those of BJD.

This project is a program of basic and applied research that aims to develop new diagnostic tests for OJD and, through a program of basic research on the pathogenesis of the disease, increase understanding of the immune response to infection, dormancy of the bacterium and how this relates to chronic infection and transmission of the bacterium.

Source of funding Meat & Livestock Australia

Project timeframe January 2008 – June 2011

Evaluation of the effectiveness of Gudair™ vaccination for the control of OJD in flocks vaccinating for at least five years MLA P.PSH.0309

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National Collaborators	Dr Jeff Eppleston, Central Tablelands Livestock Health & Pesticides Authority Dr Evan Sergeant, AusVet Animal Health Services

Summary

Ovine Johnes disease (OJD) caused by *Mycobacterium avium* subsp. *paratuberculosis* (MAP) is a major issue for the sheep industries of southern Australia, causing significant on-farm losses, division within the industry, plus potential public health concerns. Control of OJD in Australia now depends heavily on use of Gudair ™ vaccine to control on-fa losses and to reduce the risk of disease spread. Research undertaken during the six-year National Ovine Johne's Disease Program (NOJDP) demonstrated that the current vaccine is highly effective in reducing mortalities due to OJD and shedding of organisms, but some sheep still develop severe clinical disease, shed heavily and die. This research supported the registration of the vaccine for use in sheep in Australia, and it is now widely used as a disease control and risk management tool. However, the original vaccine evaluation was undertaken in a single generation of vaccinated lambs in three heavily infected flocks in the central tablelands area of NSW, under conditions of very high challenge. This has given rise to speculation that:

- Efficacy of the vaccine might have been underestimated because of the high-challenge situation in the trail flocks; and
- The vaccine may be more effective in lower-prevalence flocks than was observed in the high-prevalence trial flocks.
- Although modelling suggests that long-term use of vaccine will provide highly effective control and suppression of shedding, even in heavily infected flocks, this has never been verified experimentally. This has important implications for the value attributed to flock-vaccination in any flock-assurance scheme, as highlighted in recent discussions for continuation of the national program.

Further research on vaccine efficacy is well advanced, in a longitudinal study of shedding from three generations of sheep vaccinated as lambs (MLA project OJD.033). However, as this project is limited to only 12 flocks in central NSW and final results are not expected until early 2009, there is a need for a broader study on the impact of vaccination on shedding rates in flocks of varying initial prevalence. As recent results from OJD.033 have indicated that the profound decrease in shedding over time may not be achieved in all participating flocks, the reasons for this need to be investigated. In addition, investigations in a greater number of flocks to support this project and to provide an earlier indication of longer-term effects of vaccination in flocks of known infection and vaccination history, is needed.

The purpose of the project is to evaluate the effectiveness of Gudair™ vaccine in reducing OJD prevalence and bacterial shedding in a range of flocks of known OJD prevalence, at about five years after the commencement of vaccination.

Source of funding	Meat & Livestock Australia
Project timeframe	January 2008 – January 2010

Extended examination of changes in within-flock prevalence of Mptb shedding following vaccination with Gudair ™ for OJD in flocks with high, medium and low initial prevalence MLA P.PSH.0565

FA&VPH Staff	Professor Peter Windsor Professor Richard Whittington Mrs Anna Waldron
National Collaborators	Dr Jeff Eppleston, Central Tablelands Livestock Health & Pesticides Authority Dr Evan Sergeant, AusVet Animal Health Services

Summary

Ovine Johnes disease (OJD) caused by *Mycobacterium avium* subsp. *paratuberculosis* (MAP) is a major issue for the sheep industries of southern Australia, causing significant on-farm losses, division within the industry, plus potential public health concerns. Control of OJD in Australia now depends heavily on use of Gudair ™ vaccine to control on-farm losses and to reduce the risk of disease spread. Research undertaken during the six-year National Ovine Johne's Disease Program (NOJDP) demonstrated that the current vaccine is highly effective in reducing mortalities due to OJD and shedding of organisms, but some sheep still develop severe clinical disease, shed heavily and die.

This Project will continue the work of OJD.033 in assessing the long-term efficacy of Gudair ™ vaccine for reducing bacterial shedding in merino flocks in the central tablelands of NSW of initial low, medium or high OJD prevalence. OJD.033 commenced in 2003 in 12 flocks (only 11 achieved complete data) and demonstrated significant decline in shedding on most farms but persistence of low rates of shedding on 10 0f the 11 farms at completion of the sampling in 2008, when all sheep in the flocks were vaccinated.

Industry recommendations were to extend the study to determine the rate of decline and degree of shedding when all animals in these 11 flocks are second generation vaccinates, that is, progeny of lambs born when the entire flock consisted of approved vaccinates. The 11 flocks will continue to be assessed for an additional 3 rounds of sampling at 2 yearly intervals and the OJD prevalence rates will be compared to current estimates.

The purpose of the project is to assess the long term efficacy of Gudair™ vaccine for the reduction in bacterial shedding in flocks of initial low, medium or high OJD prevalence. The major outcome from the project will be to better enable producers and their advisors to predict the infectivity of flocks over an extended period since the commencement of a vaccination program, for the purposes of trading sheep, the cessation of vaccination and the removal of risk status from a flock. The information provided will inform the decision making process of stakeholders who may review the ABC Scheme on the basis of further information provided through this project.

By September 2015, the project will have measured changes in shedding in 11 OJD infected flocks on 6 occasions since vaccination commenced in 2002, providing accurate estimates of the decline and risk of shedding from vaccinated sheep in flocks of varying initial OJD prevalence. This information will enable producers and advisors to predict the infectivity of flocks following an extended period of vaccination and is important for advising on the trading of sheep, the cessation of vaccination and the removal of a risk status from a flock.

Source of funding	Meat & Livestock Australia
Project timeframe	July 2010 – January 2016

Eradicating footrot by specific vaccination AWI EC511

FA&VPH Staff	Professor Richard Whittington Dr Om Dhungyel Mrs Natalie Schiller Mrs Rebecca Maurer
PhD Student	Mrs Vidya Bhardwaj
National Collaborators	Emeritus Professor John Egerton Dr Jeff Eppleston, Central Tablelands Rural Lands Protection Board Dr John Seaman, NSW Department of Primary Industries Dr Alison Lee, Department of Primary Industries, Victoria Dr Neil Buchanan, Department of Primary Industries and Resources, South Australia Dr Mick Middleton and Dr Cameron Bell, Tasmanian Department of Primary Industries, Water and Environment

Summary

Footrot is caused by the bacterium *Dichelobacter nodosus*, a parasite of the feet. This bacterium is unable to survive off the foot for more than one week. Eradication of footrot is therefore possible if all sheep with footrot are removed from a flock. Current techniques to achieve this are labour intensive, expensive and often take several years to achieve eradication. Vaccination is an alternative approach.

Current footrot vaccines contain ten strains of bacteria to provide coverage of the major *D. nodosus* serogroups. These vaccines offer only temporary (12 weeks) protection against footrot, so they are used in control campaigns, rather than for eradication. It has been demonstrated that eradication of footrot using vaccines is possible if the vaccines only target one or two groups of the bacterium at a time because immunity is long-lasting. This project will evaluate this approach under Australian conditions.

Objectives of the project:

1. Produce specific footrot vaccines for local (Australian) strains of the footrot bacterium.
2. Evaluate the use of these targeted footrot vaccines using one or two different antigens per vaccination in the eradication of virulent footrot in Australian sheep.
3. Demonstrate the use of these vaccines to remove virulent footrot on 12 commercial farms across areas of high footrot prevalence in southeast Australia.
4. Evaluate the minimum interval between vaccination with different vaccines to deliver an accelerated eradication program (less than twelve months between different vaccines).
5. Enable application for a minor use permit from the Australian Pesticides and Veterinary Medicines Authority (APVMA) to allow the use of these vaccines on-farm and also aid transfer of the vaccine to commercial production facilities.

Source of funding	Australian Wool Innovation
Project timeframe	July 2005 - June 2010

The role of *Dichelobacter nodosus* genes in pathogenesis of footrot in sheep

FA&VPH Staff

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Dr Om Dhungyel
Mr Craig Kristo

National Collaborators

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NSW Department of Industry & Investment,
Elizabeth Macarthur Agricultural Institute
Professor Julian Rood*, Monash University

Summary

Ovine footrot is a highly infectious bacterial disease that is of major ongoing concern to the Australian wool industry, causing significant economic losses as a result of its effect on wool production, farm management, animal welfare and the cost of control and treatment programs. The causative bacterium is *Dichelobacter nodosus*.

The overall objective of this research is to develop improved methods for the control and treatment of ovine footrot. The specific research aims are:

1. To identify *D. nodosus* genes that are differentially expressed in the virulent footrot lesion.
2. To determine the role of differentially expressed genes in the disease process.
3. To determine the value of whole genome based microarrays for the epidemiological analysis and diagnosis of field isolates of *D. nodosus*.
4. To identify surface or secreted *D. nodosus* antigens that induce the production of bactericidal antibodies in sheep.
5. To determine the vaccine potential of *D. nodosus* antigens that are either essential for the disease process or induce the production of bactericidal antibodies.

The successful completion of the project should lead to the subsequent commercial development of a protective footrot vaccine, with significant cost savings to wool producers and the Australian wool industry. It will also lead to a greater understanding of the epidemiology of footrot infections and may result in the development of improved methods for the laboratory diagnosis of ovine footrot.

This research program represents the pre-commercialisation phase of the development of a new generation of footrot vaccines. The successful identification of candidate antigens that can be used to develop a protective footrot vaccine will be subject to the uncertainty of dealing with a variable biological system.

Source of funding

Australian Research Council, Centre for Structural and Functional Microbial Genomics

Project timeframe

February 2005 – December 2010

* Principal investigator

Topical and cryoanaesthesia for livestock husbandry

FA&VPH Staff	Professor Peter Windsor
PhD Students	Ms Sabrina Lomax Ms Crystal Espinoza
National Collaborators	Associate Professor Peter Wynn, Charles Sturt University Dr Robert Cranna, Bayer Australia Limited Dr Meredith Sheil, Animal Ethics Pty Limited

Summary

Painful husbandry procedures – tail –docking, castration, dehorning, ear-knotching, branding, and mulesing (sheep only) – are routinely conducted without analgesia in Australian livestock, resulting in acute pain and stress responses in millions of young animals each year. This is rapidly becoming a critical animal welfare issue, with important social, political and commercial ramifications. To date, practical and economic constraints have bee a barrier to the development of effective pain management strategies.

The aim of the project is to address this issue by investigating the use of topical and cryo-anaesthesia as an effective, practical and cost-effective analgesic option that can be used on-farm for large-scale production systems. Specific aims:

1. To develop a novel technique of achieving rapid pre-operative local tissue anaesthesia using cryo-anaesthesia with supercooled CO_2 gas application to wooled or fur covered skin;
2. To investigate the impact of using (i) pre-operative cryo-anaesthesia and (ii) post-operative topically applied local anaesthetic applications, both alone and in combination, during those painful routine animal husbandry procedures on:
   - pain prevention and alleviation, using an indicator of pain and stress that the CIs are developing (direct sensory testing), and conventional indicators such as beta endorphin and cortisol, and behavioural analysis of treated and untreated animals; and
   - recovery indicators such as animal behaviour, blood loss, wound healing, and weight gain, including a powerful digital wound-mapping technique that the CIs are developing.
3. To develop a novel biochemical approach to measure acute adrenergic responses in lymphocytes isolated from animals subjected to the production procedures. This will be assessed by quantifying tyrosine phosphorylation of β_2-adrenergic receptors in lymphocytes. It has been shown previously with pigs, this technique provides a measure for reliabity and indicating the magnitude of the acute response to stress.

Source of funding	Australian Research Council Linkage Grant
Project timeframe	January 2008 – December 2011

Susceptibility of previously untested Basin fish species to EHN Virus, and the epidemiology of EHN Virus in the wild MD743

FA&VPH Staff	Professor Richard Whittington Dr Joy Becker Mrs Alison Tweedie Mrs Rebecca Maurer Mr Jesse McIvor
PhD Student	Ms Anneke Rimmer
National Collaborators	Dr Dean Gilligan & Mr Martin Asmus NSW Department of Industry & Investment, Narrandera Fisheries Centre

Summary

Epizootic Haematopoietic Necrosis Virus (EHNV) is a serious threat to a number of native fish species in the Murray-Darling Basin. This virus, unique to Australia, was first isolated in 1985 in Redfin perch. It is characterised by sudden high mortalities of fish. On autopsy, the fish display necrosis of the renal haematopoietic tissue, liver, spleen and pancreas. Experimental work demonstrated that a number of native species were susceptible to the disease, including the threatened Macquarie perch and Silver perch, as well as mountain galaxias. The virus has been recorded from Victoria, NSW and the ACT. The spread of EHNV has been aided by its relative resistance. It can be readily transmitted from one location to another on nets, fishing lines, boats and other equipment. It was found that the virus retains it infectivity after being stored dry for 113 days. Once ENHV has entered a water body it is considered impossible to eradicate.

Objectives:
- to validate earlier findings of susceptibility of native fish to EHNV
- to determine the susceptibility of infection by EHNV of a range of previously untested fish species in the Murray-Darling Basin
- to investigate the epidemiology of EHNV in wild populations of priority fish species
- to develop a test to determine exposure of wild populations of priority fish species to EHNV
- to identify the extent to which EHNV is a risk to native fish in the MDB

Anticipated outcomes:
- improved knowledge of the susceptibility of fish in the Basin to EHNV
- improved capacity for management of EHNV in the Basin
- improved management of redfin perch in the Basin
- improved human capacity for aquatic health issues in the Basin

Source of funding	Murray-Darling Basin Authority
Project timeframe	November 2006 – June 2011

Aquatic Animal Health Subprogram: Tools for investigation of the nodavirus carrier state in marine, euryhaline and freshwater fish and control of NNV through integrated management FRDC 2008/041

FA&VPH Staff	Professor Richard Whittington Dr Joy Becker Mr Craig Kristo
PhD Student	Mr Jeffrey Go
National Collaborators	Dr Peter Kirkland, NSW Department of Industry & Investment, EMAI Jane Frances, NSW Department of Industry & Investment, Port Stephens Edla Arzey, NSW Department of Industry & Investment, EMAI Mark Crane, Australian Animal Health Laboratory, CSIRO John Humphrey, NT Department of Primary Industries Dr Ian Anderson, Queensland Department of Primary Industries & Fisheries

Summary

The outcomes of previous projects on NNV infection on barramundi has informed disease control practices, and led to standard diagnostic tests being made available in aquatic animal health laboratories throughout Australia. In 2005-2006 there was a quantum leap in DNA-detection technology, with the advent of readily available real time quantitative PCR methods. Simultaneously there were outbreaks of NNV in barramundi in South Australia and Australian bass in New South Wales. The nodavirus isolates responsible for these two outbreaks were significantly different to the strains of nodavirus previously isolated in Australia and were not optimally targeted by the specific molecular detection test (nested RT-PCR) developed in the previous FRDC-funded projects.

Research needs for NNV were coordinated with collaborative approach whilst noting that the disease was internationally notifiable. A workshop was convened to develop a research plan with stakeholders representing FRDC, barramundi farmers, the recreational fishing sector, federal and state governments, the international research industry, universities and animal health diagnostic laboratories.

It was determined that the validated and routinely used tests for determining disease status, particularly of subclinically-infected fingerlings and broodstock, and for high-throughput sample testing requirements are inadequate. Real time quantitative PCR is a routinely used tool in most laboratories around Australia and has significant advantages of over conventional gel-based PCR tests. These include a reduction on test-turn-around times, increased sample throughput, reduced OH&S risks, reduced risk of contamination and false-positive results and greater compatibility with robotic reagent preparation and delivery systems. Application of a standardised real time PCR test for detection of betanodavirus is required to address this gap in capability. Development and application of serological tests, for the detection of infection (antigen detection to indicate current infection) and exposure to the virus (antibody detection to indicate previous infection) will complement the real time PCR test and provide urgently required information regarding the merits of using antibody status as an indicator of infection in a wild or cultured fish population and whether antibody positive fish should or should not be used as broodstock.

Source of funding	Fisheries Research & Development Corporation
Project timeframe	February 2010 – October 2012

Aquatic Animal Health Subprogram: surveys of ornamental fish for pathogens of quarantine significance FRDC 2009/044

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PhD Student	Ms Anneke Rimmer
National Collaborator	Associate Professor Mark Lintermans, University of Canberra

Summary

This project addresses the FRDC strategic challenge: Maintain and improve the management and use of aquatic natural resources to ensure their sustainability, because:

- native finfish species such as Murray cod are currently threatened by viruses suspected to be entering Australia through the trade in ornamental fish; this may prevent threatened species recovery and may also preclude successful aquaculture of these species;
- the domestic ornamental fish aquaculture industry may be threatened by the same means;
- the results of surveys for specific viruses will inform policy development, import risk analysis and directly contribute to the understanding of risk

In project 2007/007 and previous studies it was determined that ornamental fish entering Australia may carry pathogens of quarantine concern, specifically gourami iridovirus (GIV) and cyprinid herpesvirus 2 (CyHV2). Ornamental fish are imported under a policy based on formal Import Risk Assessment (IRA). In 2008 Biosecurity Australia announced the formal commencement of an Import Risk Analysis under the regulated process to review Australia's freshwater ornamental finfish policy with respect to quarantine risks associated with GIV. Australia has imported a large number of gouramis for many decades. The 1999 IRA considered several species of gouramis and concluded that specific risk management measures were required for these species due to biosecurity risk posed by iridoviruses, including GIV. Australia's quarantine measures include that gouramis are held in an export premises for a minimum 14 day period prior to export, health certification stating that they are sourced from populations with no known significant clinical disease in the last six months, and that the fish are held in post-arrival quarantine for a minimum of 14 days. These are key features which need to be reviewed.

A second impact is that the developing Australian ornamental fish aquaculture industry may be at risk due to introduced pathogens. This is of reverence for goldfish, where domestic breeders claim that their stock succumb to diseases such as CyHV2 disease when brought into contact with imported goldfish in wholesale and retail premises.

There is a need to determine whether GIV and CyHV2 are entering Australia despite quarantine practices, and further, to determine whether either virus is already established in farmed or wild ornamental fish in Australia.

This project has been developed in close consultation with the Commonwealth Department of Agriculture, Fisheries & Forestry (DAFF), the Murray Darling Basin Commission and in consultation with FRDC.

Source of funding	Fisheries Research & Development Corporation
Project timeframe	February 2010 – November 2012

Studies of the Epidemiology and Risk Factors Involved in the Pathogenesis of Acorn Calf Disease in Australia MLA B.AHE.0004

FA&VPH Staff Dr Jenny-Ann Toribio
Professor Peter Windsor

PhD Student Mr Peter White

Summary

This project is being undertaken to improve the understanding of the epidemiology of the acorn calf disease syndrome, particularly its geographic and temporal distribution, and risk factors associated with disease occurrence.

The project will involve a nationwide survey of public and private veterinarians who have been involved in rural practice for the past five years requesting information about affected calves that meet the case definition for acorn calf disease and about cases that resembled acorn calf disease including: number affected, clinical signs, gross pathology, location, date and breed. The survey will provide, for the past five years: a crude estimate of the annual prevalence of acorn calves in Australia; and, a description of the spatial-temporal distribution of acorn calves.

A retrospective examination will also be undertaken of case records of previous outbreaks in Australia. This study will provide confirmation of the annual prevalence of confirmed cases of acorn disease in Australia; spatial-temporal distribution of confirmed cases; and, information about potential risk factors common among confirmed cases.

A case-control study will be done on properties with confirmed cases of acorn calf disease since 2003 to identify case and control herds on each affected property, and at least one neighbouring property as a control property. Face-to-face questionnaires will be administered with the owner/manager of each affected and control property to collect information about each property and its management during the gestation period of affected calves. Risk factors associated with the occurrence of acorn calf disease will be identified.

Source of funding Meat & Livestock Australia Limited

Project timeframe April 2007 – September 2010

Improving productivity and profitability of smallholder shrimp aquaculture and related agribusiness in Indonesia ACIAR FIS/2005/169

FA&VPH Staff

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Dr Jenny-Ann Toribio
Dr Richard Callinan

International Collaborators

Dr Endhay Kusnendar, Dr Achmad Poernomo, Dr Budi Prayitno, Dr Syahrun and Arief Taslihan,
Ministry of Marine Affairs and Fisheries, Indonesia

Summary

Shrimp are the most important export product in Indonesia's fisheries sector, and all levels of government actively promote shrimp farming (traditional, semi-intensive and intensive) to improve prosperity in coastal communities and to generate foreign exchange. Farming at each intensification level can be profitable and sustainable, provided biosecurity, productivity, environmental and social requirements are properly managed. To remain competitive and to protect export market access, governments and industry supply chains are increasingly recognising the importance of international food safety standards, and of marketing and value-adding as effective competitive strategies.

The project focuses on 'traditional' smallholder farmer groups and associated supply chain enterprises. In its first two years, staff will develop and validate model programs combining enterprise-level interventions ('better management practices', BMPs) and participatory extension methodologies delivered and supported by appropriately skilled extension and health management services. Separately, the project's steering group will identify, coordinate and, where appropriate, facilitate enhancement of support services, skills and processes necessary to enable widespread, independent program adoption. In the project's final year, staff will monitor dissemination, using existing Indonesian resources, of appropriately contextualised programs.

Source of funding

Australian Centre for International Agricultural Research

Project timeframe

January 2007 – June 2011

Control of nodaviral disease in tropical marine finfish hatcheries: Enhanced Biosecurity through the application of contemporary biotechnology, epidemiology and pathobiology - Indonesia ACIAR FIS/2005/137

Farm Animal Health Staff	Professor Richard Whittington Dr John Humphrey Dr Joy Becker Dr Navneet Dhand Mrs Alison Tweedie Mr Paul Hick
International Collaborators	Dr Endhay Kusnender, Director Fishery Development, Directorate General of Aquaculture, Ministry of Marine Affairs &Fisheries

Summary

Disease remains a major threat to successful tropical marine finfish aquaculture and a number of microbial and parasitic diseases causing death, debilitation, poor growth and high economic loss are known to be common to Indonesia and Australia. Pre-eminent among these is the nodaviral disease viral nervous necrosis. VNN is a disease of global distribution, occurring in diverse marine finfish species. The disease has emerged over the past two decades in Australia and Indonesia as a major limiting factor to economically viable and sustainable mariculture. Despite the regional importance of VNN, the underlying epidemiology and pathogenesis of the disease in the fish are poorly understood and fundamental to the development of effective strategies to control or prevent VNN is an understanding of its epidemiology and pathogenesis.

The University of Sydney is currently developing and evaluating a polymerase chain reaction (PCR) assay of high sensitivity and specificity for the detection of VNN with the objective of transferring this technology to diagnostic laboratories throughout Australia. This assay, together with other serological methods under development, is being used as a valuable research tool to better understand the epidemiology and pathogenesis of VNN. The potential synergies between the current Australian research and the implementation of the research outcomes in Australia and Indonesia are clear; both countries have VNN as major, industry limiting disease and consequently rational control measures are difficult to implement. The detection of asymptomatically infected carrier fish preventing spread of disease to new areas, and the means whereby the pathogenesis and epidemiology of nodavirus infections may be investigated and understood.

A collaborative research project is underway between Australia and Indonesia to develop practical on-site strategies for the control of VNN in select Indonesian marine finfish hatcheries. This project will be based on an evaluation of current Biosecurity in the hatcheries, diagnostic capacity and the application of PCR technology to determine pathways or infection leading to VNN under Indonesian conditions. The specific objectives of this short-term project are:

1. Evaluate current Biosecurity measures in select Indonesian marine finfish hatcheries and diagnostic capacity in select Indonesian laboratories as a basis for determining functional and operational improvements in hatchery management and control of VNN
2. Enhance the knowledge base of Indonesian laboratory staff in aquatic animal pathology, epidemiology and molecular diagnostics through training workshops at the University of Sydney focussing on the use and limitations of PCR as a research tool
3. Establish contemporary PCR technology for the diagnosis of VNN within select Indonesian laboratories through transfer of technology supported by on-going collaboration and quality assurance standards

Source of funding	Australian Centre for International Agricultural Research
Project timeframe	March 2009 – January 2010

Determinants for WSD outbreaks in Indonesian smallholder shrimp ponds – a pilot study of both locality factors, WSSV genotype distributions and pond factors – ACIAR FIS/2009/035

Farm Animal Health Staff	Professor Richard Whittington Dr Richard Callinan
National Collaborator	Dr Peter Walker, Scientist, CSIRO Livestock Industries
International Collaborators	Mr Arief Taslihan, Senior Scientist, Epidemiology Directorate General of Aquaculture, Ministry of Marine Affairs & Fisheries Professor Bambang Sumiarto, Dean Faculty of Veterinary Medicine, Gadjah Mada University

Summary

There is increasingly strong evidence derived mainly from other current ACIAR projects that successful smallholder shrimp farming at any locality in Indonesia is likely to depend on interactions between several site-specific physical and environmental characteristics, the distribution and load of various white spot syndrome virus (WSSV) genotypes in host populations, the virulence and/or competitive fitness of these genotypes for farmed shrimp, and the maintenance of suitable pond environments and Biosecurity.

This study is designed to improve our understanding of these interactions. Objectives are:

1. To determine the stability of white spot disease (WSD) outbreak-associated WSSV genotypes when passaged through WSSV-free *Penaeus vannamei*, WSSV PCR test-negative *P. monodon* and selected other WSSV PCR test-negative, non-penaeid hosts;
2. To identify, using locality-specific environmental data, pond environmental data and data on WSSV genotype distribution and dynamics, the likely determinants for WSD outbreaks at a suitable, broadly representative locality in South Sulawesi.

This project formally brings together, for the first time, agencies involved in earlier or concurrent ACIAR studies of WSD and related issues. It will be administered in Indonesia by Gadjah Mada University and has two sequential components. The first will examine the stability of WSSV genotypes, as determined by tandem repeat sequence (TRS) number, when the virus is passaged between penaeid and non-penaeid hosts. Findings will inform the second component, a pilot study of interactions between locality factors, WSSV genotypes and pond factors in small holder shrimp ponds at a selected locality in South Sulawesi.

Taken together with findings from FIS/2005/169, we expect the SRA findings will enable relevant agencies, and ultimately farmers themselves, to better identify localities suitable for smallholder shrimp farming using better management practice (BMP) programs and inform modification and simplification of these programs, thereby improving both profitability and adoption rates.

Source of funding	Australian Centre for International Agricultural Research
Project timeframe	June 2009 – June 2010

Diversification of smallholder coastal aquaculture in Indonesia – ACIAR FIS/2007/124

Farm Animal Health Staff	Professor Richard Whittington Dr Mike Rimmer
National Collaborator	Associate Professor Jesmond Sammut, University of New South Wales Dr Joanne Millar, Charles Sturt University
International Collaborators	Professor Ketut Sugama, Directorate General of Aquaculture, Ministry of Marine Affairs & Fisheries Mr Sugeng Raharjo, Brackishwater Aquaculture Development Centre, Takalar Mr Coco Kokarkin, Brackishwater Aquaculture Development Centre, Ujung Batee Dr Rachmansyah, Research Institute for Coastal Aquaculture, Maros Dr Projo Danoedoro, Faculty of Geography, Gadjah Mada University

Summary

While brackishwater pond (*tambak*) aquaculture in Indonesia is an important livelihood activity in coastal areas, many small-scale farmers are struggling to continue farming shrimp. Viral diseases are causing crop losses, input costs (particularly for feed) are rising, and commodity prices for shrimp are declining due to strong competition in a global marketplace. As a result, many farms are out of production or are producing limited quantities of shrimp; recent ACIAR-funded research has revealed that while small-scale shrimp farms predominate in South Sulawesi, they only contribute about 5% of total shrimp production. While some farms have successfully adopted Better Management Practices (BMPs) for shrimp farming to overcome production constraints, successful implementation depends on specific site-related, socio-economic and logistical criteria being met. A large proportion of farms will not be able to meet the criteria required for shrimp BMP implementation: consequently, these farms must be provided with alternative production strategies of they are to remain (or become) viable.

This project will test and evaluate the economic viability of alternative commodities for brackishwater pond culture such as tilapia, milkfish, grouper, crabs and sea cucumbers. Evaluation trials will be undertaken in South Sulawesi and Nanggroe Aceh Darussalam (Aceh) provinces to build on the outcomes of previous and ongoing ACIAR projects.

The project will also incorporate support for mariculture development of offshore islands of Nanggroe Aceh Darussalam province. Additionally, grow trials with grouper will be undertaken in collaboration with the fish seed production centre on Pulau Simuelue to promote the use of more sustainable culture practices.

The main expected impact of this project will be to increase the income of *tambak* farmers in South Sulawesi and Nanggroe Aceh Durassalam provinces who, for a range of reasons, are unable to farm shrimp. Socio-economic survey data from South Sulawesi survey indicate that 53% of *tambak* farming households has a total monthly income less than AUD 60. In Aceh, about 50% of people involved in *tambak* farming fall below the poverty threshold. Social benefits will accrue from increased social stability due to increased employment opportunities in rural areas and increased access to seafood, with resultant health benefits.

Source of funding	Australian Centre for International Agricultural Research
Project timeframe	January 2010 – December 2013

Best practice health and husbandry of cattle, Cambodia ACIAR AH/2005/086

FA&VPH Staff	Professor Peter Windsor
PhD Students:	Ms Luzia Rast Mr John Stratton
National Collaborators:	Dr Tristan Jubb, Tristan Jubb Veterinary Consulting Dr Joanne Millar, Charles Sturt University
International Collaborators:	Dr Suon Sothoen, Department of Animal Health & Production, Cambodia Dr Werner Stur, CIAT, Lao PDR Mr Mak Soeun, Agricultural Extension Department, Cambodia Mr Chea Neng, Royal Academy of Cambodia

Summary

The Kingdom of Cambodia is a country of 15 million people and 2.4 million hectacres, 34% of GDP is provided by agriculture with 6% from livestock, including 3.2 million cattle and 0.7 million buffalo. Almost 80% of the land is lowland and still ploughed by draft animals. These are increasingly paired castrated oxen rather than buffalo, with cattle increasing at 4.52% and buffalo decreasing at -0.7% annually. The market for meat is growing rapidly in south-east Asia due to demand from neighbouring countries and estimated at 3% pa between 1993 and 2020. With the majority if large ruminant livestock in Cambodia held by small village producers and up to 25% of cattle currently exported, an opportunity to increase cattle production and address rural poverty exists. However production income is limited by common diseases such as Haemorrhagic Septicaemia, Foot and Mouth Disease, Blackleg and parasites plus poor nutrition, breeding and general husbandry and livestock management practices.

This project aims to improve profitability of large ruminant production by smallholders through adoption of well known disease control and husbandry practises. It builds on ACIAR projects AS1/2002/099 (Control of fasciolosis in cattle in Cambodia) and is led locally by the in-country coordinator of that project. A systems approach will be used to identify which knowledge-based interventions are valued by village farmers and developing a concept of 'best practice animal health and husbandry' for cattle and buffalo production Cambodia.

It has these objectives:

1 to confirm current knowledge of disease limitations to large ruminant production;
2 to implement, test and demonstrate the value of interventions preventing key diseases, preventing introduction of diseases and managing reproduction;
3 to assess attitudes of farmers in targeted communities to health, husbandry and market issues; and,
4 to improve knowledge of cattle supply chain and key drivers for change in the targeted communities.

Source of funding Australian Centre for International Agricultural Research

Project timeframe July 2007 – November 2010

Best practice health and husbandry of cattle and buffalo in Lao PDR ACIAR AH/2006/159

FA&VPH Staff	Professor Peter Windsor
PhD Student	Ms Luzia Rast
National Collaborators	Dr Tristan Jubb, Tristan Jubb Veterinary Consulting Dr Joanne Millar, Charles Sturt University
International Collaborators	Dr Syseng Khounsy, Department of Livestock and Fisheries, Lao PDR Dr Werner Stur, CIAT, Cambodia Mr Yongthong Sihanath, National Agriculture and Forestry Extension Service, Lao PDR

Summary

Lao PDR is a country of 4.5 million people with livestock accounting for approximately 20% of agricultural GDP. The population of cattle and buffaloes is approximately 2 million with annual increases of up to 2% for cattle and 0.75% for buffalo, with the demand for meat growing rapidly in south-east Asia, estimated at 3% pa. The majority of large ruminant livestock held by small village producers and up to 25% of cattle are currently exported. This has created an opportunity to increase beef production and value and address rural poverty. However production income is limited by endemic diseases such as toxocariasis and HS plus poor nutritional, breeding and general husbandry and livestock management practices.

This project will improve smallholder knowledge of large ruminant disease control and husbandry. It builds on ACIAR projects AS1/2002/099 (Control of fasciolosis in cattle in Cambodia) and ASI/2003/001 (Control of transboundary diseases in Laos), is led locally by the in-country coordinator of ASI/2003/001, and will be implanted closely with AH/2005/159 (Best practice cattle health and husbandry, Cambodia) which commenced in 2006involving the same Australia team from the University of Sydney. A systems approach will be used to examine limitations of disease and husbandry knowledge to productivity, identifying which knowledge-based interventions can be delivered by the project staff working closely with village farmers, and developing a concept of 'best practice animal health and husbandry' for cattle and buffalo production in Laos.

It has these objectives:

1 to confirm current knowledge of disease limitations to large ruminant production;
2 to implement, test and demonstrate the value of interventions preventing key diseases, preventing introduction of diseases and managing reproduction;
3 to assess attitudes of farmers in targeted communities to health, husbandry and market issues; and,
4 to improve knowledge of cattle supply chain and key drivers for change in the targeted communities.

Source of funding	Australian Centre for International Agricultural Research
Project timeframe	May 2008 – November 2011

Livestock movement and managing disease in Eastern Indonesia and Eastern Australia ACIAR AH/2006/156

FA&VPH Staff	Dr Jenny-Ann Toribio
PhD Student	Ms Edwina Leslie
National Collaborators	Dr Ian Patrick, University of New England Dr Stan Fenwick, Murdoch University Dr Joanne Millar, Charles Sturt University Dr Bruce Christie, NSW Department of Industry & Investment
International Collaborators	Dr Sugiyarto, Disease Investigation Centre, Denpasar, Indonesia Dr Maria Geong, Department of Livestock Provinsi NTT, Indonesia Ir Muktasam, University of Mataram, Indonesia Dr Annie Ambarawati, Udayana University, Indonesia

Summary

Management of animal and animal product movement is an essential component of control programs for transboundary animal diseases (TAD). This project, focusing on critical transboundary diseases (highly pathogenic avian influenza (HPAI) and classical swine fever (CSF) in Eastern Indonesia and foot and mouth disease (FMD) and CSF in Eastern Australia, will strengthen capacity for effective disease control by identifying livestock trade patterns that are high risk for disease transmission and by supporting formulation and pilot implementation of policy designed to restrict, manage and/or monitor these livestock movements.

This project aim will be achieved by undertaking two types of activities:

- Risk Assessment – collection of data on chicken, duck and pig movements and related drivers, conduct of risk assessment to identify the highest risk movements; and estimation of risk reduction and economic benefit likely to be achieved by alternate mitigation strategies (such as restriction, vaccination, surveillance of these movements).
- Policy Development – introduction to use of risk and economic information to inform decisions on livestock movement in disease control programs; development of a framework to define and evaluate alternate policies on livestock movement; pilot implementation of a proposed policy; and refinement of the proposed policy based on pilot outcomes.

Government agencies responsible for animal disease control and quarantine in Eastern Indonesia are committed to control and aiming for eradication of HPAI and CSF. Disease control incorporating targeted poultry movement, surveillance and vaccination activities will lead to lower HPAI occurrence in Bali and Lombok. This will benefit all community sectors by increasing the availability of safe poultry products for home consumption, local sale and trade to other provinces, and by reducing perceived risk from HPAI for the tourist industry. Better CSF control from targeted movement, surveillance and vaccination activities leading to eradication will benefit NTT, where prok is the main meat source, by increasing output that will provide additional income and protein sources for smallholder families.

In Eastern Australia will be collected on informal pig movements in the non-commercial sector of the pig industry and use risk assessment to identify movement patterns that pose the greatest risk for the spread of CSF and FMD. Given the dire consequences of CSF or FMD for the Australian livestock industries, the presentation of this currently unknown information to stakeholders will progress discussion on the potential implications of informal pig trade for exotic disease preparedness and response in Australia.

Source of funding	Australian Centre for International Agricultural Research
Project timeframe	January 2008 – December 2011

Cost-effective biosecurity for non-industrial commercial poultry operations in Indonesia ACIAR AH/2006/169

FA&VPH Staff	Dr Jenny-Ann Toribio
National Collaborators	Dr Ian Patrick, University of New England (Project Leader) Dr Tristan Jubb, Livestock Health Systems Australia
International Collaborators	Dr Arief Daryanto, Bogor Agricultural University, Indonesia Dr Didin Sudiana, Directorate General Livestock Services, Indonesia Mr Don Utoyo, Indoesian Poultry Industry Forum, Indonesia Dr Annie Ambarawati, Udayana University, Indonesia Dr Tahlim Sudaryanto, Indonesian Centre for Agriculture Social Economic and Policy Studies, Indonesia

Summary

In South East and Eastern Asia, over 200 people have died, and over 200 million poultry have died or been slaughtered, consequent to infection with HPAI virus. Since it was first identified in Indonesia in 2003, HPAI has become endemic in 31 of the 33 provinces. Along with Newcastle disease, Gumboro and other poultry diseases, HPAI is responsible for significant economic loss particularly in the Non-Industrial Commercial Poultry Sector (NICPS) and village poultry sectors. High mortality rates, decreases in demand for poultry and poultry products in affected areas, continuing human deaths and the risk of a global pandemic, ensure that control of HPAI remains a priority for Indonesia. Considerable resources are being allocated by the GoI and donor agencies to control HPAI in the village poultry sector. Improving biosecurity in this sector will reduce the likelihood of flocks becoming infected and, therefore, reduce the risk of large numbers of infected birds being dumped into live bird markets.

The aim of the project is to improve the economic viability of commercial broiler and layer producers through the sustainable adoption of cost-effective biosecurity measures. The project will:

- Develop an industry-driven and supported approach to improving on-farm biosecurity in the NICPS;
- Define the biosecurity measures that will improve the biosecurity and the economic viability of NICPS in Indonesia and;
- Facilitate adoption of cost-effective farm and community biosecurity measures in NICPS.

To achieve this will require government policy support to improve poultry trading systems, particularly with regard to live bird and wet markets.

The project will identify appropriate, efficient and effective poultry biosecurity measures for NICPS farms. Resources will then be devoted to training of farmers and advisors and facilitating the introduction of these biosecurity systems within communities. Trainers will be accredited, farms will be audited and accredited, and the service industry that provides loans, credit, after-sales and membership services to poultry farmers will be encouraged to introduce minimum biosecurity conditions in their contracts and pricing structures.

By the end of the project there will be:

- approximately 200 farm advisors (private and public) trained, 200 farmers trained, 600 farms adopting minimum biosecurity standards and a market in Bali developed for products from HPAI-free farming systems;
- communities with private incentives to improve their on-farm Biosecurity;
- farmers with improved management and production systems better able to control HPAI (and other poultry diseases such as ND and Gumboro) leading to improved income and income stability;
- a reduced likelihood of HPAI outbreaks, therefore reduced possibility for pandemic.

Source of funding	Australian Centre for International Agricultural Research
Project timeframe	May 2008 – November 2011

Campylobacter jejuni through the food chain: from range through processing

FA&VPH Staff
Professor Michael Ward
Dr Priti Goswami

PhD Students
Ms Sarah-Jane Wilson
Mr Tenzin

Summary

Campylobacter jejuni is the leading cause of bacterial gastroenteritis in the United States, with an estimated cost of treatment and loss of productivity exceeding $1 billion annually. Earlier epidemiologic case-studies linked campylobacteriosis to the handling and consumption of contaminated poultry. However, studies indicate that the prevalence of *C. jejuni* contamination in poultry samples has decreased over time, and campylobacteriosis from the consumption of poultry products has also declined. Nevertheless, *C. jejuni* continues to be a substantial health burden, being second in 2006 to *Salmonella* (14.81/100,000) in total food-borne cases in the US. This indicates that other sources for *C. jejuni* contamination are present in the food chain.

Beef products have had a major role in *C. jejuni* outbreaks in the US over the past five years. The Foodborne Outbreak Response and Surveillance Unit of the Centers for Disease Control (CDC) reported five confirmed outbreaks of campylobacteriosis due to ground beef or ground beef products since 1999, which have affected 199 individuals. A *C. jejuni* prevalence of 57 to 73% in feedlot cattle has been estimated, based on fecal samples. However, the prevalence of *C. jejuni* on carcass meat is unclear. Preliminary data has shown *C. jejuni* in 94% of the carcasses sampled along the ventral midline cut. This region is frequently trimmed and sent to the grinders for the production of ground beef. Findings suggest that *C. jejuni* isolates recovered from cattle are pathogenic to man. Based on preliminary data, it is hypothesized that virulent *C. jejuni* are introduced into ground beef from trimmings, and that the *C. jejuni*-contaminated trimmings pose a serious risk factor for consumers.

This hypothesis is being tested by sampling feedlot cattle from range to processing, isolating *C. jejuni* from cattle beginning at the range, at the feedlot, and right through to the production of fine ground beef. In addition, environmental samples are being obtained from birds residing at the feedlot, feed, feed bunks, watering units, and the floor of pens designated for the holding of the calves. At the processing stage, carcasses are being sampled using both the USDA-APHIS and ventral midline methods, in order to evaluate differences. Isolates obtained from these samples are being examined for genotypic differences, antibiotic resistance, and virulence traits. A temporal increase in *C. jejuni* prevalence through the feedlot cattle production cycle, and phenotypic and genotypic consistencies between environmental, cattle and meat isolates will allow hypothesis testing

The specific aims of this project are:
1. isolation of *C. jejuni* from the feedlot environment and beef cattle from range to slaughter;
2. determine the genetic diversity of *C. jejuni* isolates; and
3. assess the antibiotic susceptibilities and virulence properties of bovine *C. jejuni* isolates.

Source of funding
United States Cooperative State Research, Education and Extension Service - Food Safety and Epidemiology Program

Project timeframe
September 2008 − August 2011

What role does wildlife play in emergency disease? The case of the feral pig ARC LP100200110

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National Collaborators
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Associate Professor Stephen Sarre, University of Canberra
Dr Andrew Woolnough, Department of Agriculture & Food, WA
Dr Graeme Garner, Department of Agriculture, Fisheries & Forestry
Dr Ian Marsh, NSW Department of Industry & Investment, EMAI

Summary

This project is based on the feral pig, an introduced wildlife species. Wildlife populations have been responsible for many recent disease emergencies with economic and human health impacts, but our understanding limits management, prevention and preparedness.

This project will use feral pigs in northern Australia as a case study for characterising wildlife disease dynamics (using Salmonellosis) with a novel integration of population and epidemiological genetic approaches, demographics and simulation modelling. We will then address a problem of great importance to agriculture in Australia – the role of feral pigs in trans-boundary infectious disease transmission.

In collaboration with project partners, a framework (tools and methods) will be developed to assist understanding and management of wildlife disease and its impact on domestic livestock production, specifically:

- Quantify and describe endemic disease transmission in feral pigs and cattle in northern Australia;
- Forecast the potential role that feral pigs might play in exotic trans-boundary animal disease (eg Foot-and-Mouth disease and Classical Swine Fever) incursions;
- Define appropriate surveillance and mitigation strategies for managing trans-boundary disease incursions involving feral pigs and other wildlife populations.

By achieving these aims, a core biosecurity objective of the partners will be addressed: preparedness for emergency disease events. Achievement of these aims will also result in a conceptual leap forward in our understanding of wildlife disease epidemiology, thus improving the management of many endemic wildlife diseases of importance for the partners.

Source of funding
Australian Research Council Linkage Grant
Department of Agriculture & Food, Western Australia
Australian Government Department of Agriculture, Fisheries & Forestry
Cattle Disease Contingency Fund Pty Limited

Project timeframe
July 2010 – June 2013

Improving compliance of legislative and industry requirements among pig producers ABCRC AL.108R

Farm Animal Health Staff	Dr Marta Hernandez Jover Ms Sharon Roche
National Collaborators	Dr Trish Holyoake, NSW Department of Industry & Investment Mr Tony Abel and Mr Bill Salter, Australian Pork Limited

Summary

The goal of the project is to initiate a program to benchmark and increase compliance among pig producers with legislative and industry requirements.

Key deliverables for the project:

- Compile a registry of "non-compliant" producer in PigPass Database;
- Obtain demographic details of these producers (size, motivation for growing pigs, marketing, preferred communication methodologies) to assist with future targeted communications;
- Benchmarking on tattoo and PigPass NVD compliance and QA uptake, swill feeding and biosecurity awareness/implementation at the start and the end of the project to measure the effectiveness of extension undertaken;
- An improved compliance with legislation relating to swill feeding, post farm gate pig identification, exotic disease recognition and the Model Code of Practice for Animals-Pigs;
- An improved compliance with industry requirements relating to PigPass NVD completion and adoption of quality assurance systems;
- A model for industry (saleyard and domestic abattoir)-driven extension to improve compliance among their suppliers; and
- Information on barriers to adhering to the legislation and industry requirements listed above

Source of funding	Australian Biosecurity Cooperative Research Centre for Emerging Infectious Disease
Project timeframe	May 2009 – October 2010

Epidemiological investigations into the 2007 equine influenza outbreak RIRDC PRJ-004314

Farm Animal Health Staff	Dr Navneet Dhand Professor Michael Ward Dr Jenny-Ann Toribio
PhD Students	Ms Kathrin Schemann Mr Simon Firestone
National Collaborators	Dr Nina Kung, Queensland Department of Primary Industries Dr Paul Freeman, NSW Department of Industry & Investment Dr Barbara Moloney, NSW Department of Industry & Investment

Summary

The first ever outbreak of Equine Influenaza (EI) in Australia in 2007 resulted in considerable economic losses and hardship throughout the horse industry, particularly the racing and breeding sectors. Taking advantage of the knowledge and experience gained from controlling this incursion, we plan to conduct a thorough review of the temporal and spatial distribution of EI and the mechanisms that facilitated (or halted) the spread of the infection. By blending cutting edge technologies with the classical epidemiologic techniques and by combining the power of mathematical simulation models with the real outbreak data, we aim to refine guidelines to assist disease control authorities make informed decisions in the event of a future incursion of EI in Australia. Detailed analysis of the spread of EI may also yield critical insights into the ecology and transmission of influenza viruses in general in naïve populations.

The project aims to answer many crucial questions about the 2007 equine influenza outbreak such as: How did EI spread among the Australian horse population and across state boundaries? What factors facilitated its spread and how its spread could have been better controlled? Answering these questions will provide critical insights into the spread of contagious viral diseases in naive animal populations under Australian conditions. These aims will be achieved through 3 specific objectives:

1. Critical evaluation of the features of the 2007 EI epidemic;
2. Investigation of the spread of EI virus (EIV) under Australian conditions; and
3. Evaluation of the effectiveness of biosecurity measures in preventing the spread of EI.

Source of funding Rural Industries Research & Development Corporation

Project timeframe October 2008 – October 2011

Improving reproductive performance during seasonal infertility: Identification of "at risk" sows and the role of oocyte quality

FA&VPH Staff	Dr Trish Holyoake, Commenced in 2008 with NSW Department of Industry & Investment Dr Chris Grupen, Reprogen, University of Sydney
National Collaborators	Pork CRC QAF Meat Industries CHM Alliance Australian Pork Farms
PhD Student	Mr Michael Bertoldo
Summary	During seasonal infertility (SI), farrowing rate typically declines between 5 and 15%. The major components of the proposed project address the outcomes of a Seasonal Infertility Workshop (2006) to (1) "Identify risk factors associated with SI from existing databases" and (2) "Determine if oocyte quality and ovarian characteristics in gilts and sows is poorer in summer and autumn than at other times of the year." To achieve these outcomes, we will work closely with three major pork production groups: PIC/CHM, QAF and APF. **Project Deliverables:** 1. Early identification of "at-risk" sows for mid- to late-term pregnancy loss during seasonal infertility. 2. Identification of micro-environmental (pen specific) factors that contribute to mid- to late-term pregnancy loss during seasonal infertility. 3. An understanding of the role of oocyte quality during seasonal infertility. 4. Data to support the theory that pheromones are involved in pregnancy loss during seasonal infertility. 5. An understanding of the role of stress and metabolic state of sows as contributors to mid-to-late term pregnancy loss in SI.
Source of funding	Pork CRC
Project timeframe	March 2007 – March 2010

Healthy Dogs, Healthy Communities: The impact of education about dog health on human health outcomes

FA&VPH Staff	Dr Robert Dixon Dr Graeme Brown
Students	Ms Sophie Constable Ms Jade Norris Ms Layla Schrieber
National Collaborators	Ms Julia Hardaker, Animal Management in Rural and Remote Communities Ms Verna Simpson, Humane Society International
Summary	The project will explore the impact that education about dog health and welfare will have on the human health burden in 2 remote Aboriginal Communities in the Northern Territory, one in the desert, the other in the tropics. The change in human clinical data, especially those associated with zoonoses will be measured over time, before and after the introduction of a culturally relevant education program. Disease surveys of dogs will be undertaken twice a year to assess the background level of disease over a period of three years.

Source of funding	Humane Society International
Project timeframe	June 2007- June 2010

COMPLETED PROJECTS

An epidemiology and pathobiology, training and research unit at the University of Sydney MLA AHW.007

FA&VPH Staff	Professor Richard Whittington Dr Jenny-Ann Toribio Dr Nick Malikides Ms Hannah Forsyth Mrs Anna Waldron Ms Marion Saddington
National Collaborators	Australian Biosecurity CRC
International collaborators	Professor Ian Gardner, University of California Davis
Summary	In 1999 the gross value of Australian livestock production was $13.4bn of which $11.5bn came from exports. The Australian economy and the rural sector depend on this trade, which is based on efficient production, marketing, quality assurance and access to major markets in the developed world. Most of these markets have a favourable status for the major epidemic diseases of livestock. Compared to many competitors, Australia enjoys privileged access due to the historical absence of important livestock diseases. This project was undertaken because a critical shortage of the skills required by the livestock industries is looming. The loss of animal health laboratories, trained livestock health specialists, together with the loss of government employed district veterinary officers and epidemiologists, has dramatically weakened the national defences against disease incursions, threats to product integrity and market access. The aim of this project was to establish a new teaching and research unit in the Faculty of Veterinary Science. Research and training programs in epidemiology, disease surveillance, pathobiology and food safety were developed and delivered to postgraduate and undergraduate students. A new post graduate degree program in Veterinary Public Health Management commenced. Ties were established with overseas universities to enable future development of joint teaching and research programs. Staff from the unit are active in the research community, in industry groups and the media, ensuring wide communication of research results. Staff work together with stakeholders in the livestock sector to promote the benefits of the research programs. This MLA project has led to immediate benefits for industry, and many of these will endure into the long term: undergraduate veterinary students are better equipped to enter rural veterinary practice; graduates working in animal health now have a flexible post graduate coursework program to learn skills in epidemiology and public health for immediate application; a steady stream of young post graduates is becoming available to fill retirement positions; young post doctoral fellows and PhD research students have greater opportunity to work on real world problems and provide service longer term to the livestock sector; significant critical mass now exists to conduct research on priority livestock health issues.
Source of Funding	Meat and Livestock Australia Limited
Project timeframe	February 2002 – January 2006

Pathogenisis of OJD Strategic Research for Diagnosis and Prevention MLA OJD.031

FA&VPH Staff	Professor Richard Whittington	Dr David Emery
	Dr Kate Bosward	Dr Kumi de Silva
	Dr Lyrissa Di Fiore	Dr Deborah Taylor
	Dr Doug Begg	Ms Nicole Carter
	Dr Reena Mehta	Mrs Anna Waldron
	Mrs Rebecca Maurer	
PhD Students	Ms Sally Browne	Ms Kate Goldsmith
	Mr Sanjeev Gumber	Ms Ling Zhong
	Ms Satoko Kawaji	
	Mr Ian Marsh	
National collaborators	NSW Department of Primary Industries, Elizabeth Macarthur Agricultural Institute	

Summary

Ovine Johne's disease is a chronic and intractable problem. Spread of the disease has continued despite stringent regulatory measures, and in the absence of compensation for affected producers has led to severe division within the industry. Vaccination and risk-based trading have been accepted as an interim approach to limit further spread of the disease.

There is clearly an urgent need for better diagnostic tests. The main requirement is for a test that can detect infection in young sheep before the onset of faecal shedding. The test needs to be sensitive, specific, accurate, cost effective and able to distinguish an active infection from one that has died out. New automated technology platforms will be needed if tests are to have wide application in the sheep industries.

None of the work on OJD to date has included basic research. However, the need for this has been recognised and there are opportunities to take advantage of new technologies.

Consequently the aims of this program were to research fundamental aspects of OJD including host-pathogen interactions at the cellular level. Protemics, genomics and advanced immunology techniques were applied to *in vivo* and *in vitro* models to study the early stages of infection and contrast these with events later in the disease process. The aim was to discover new pathways for disease development and expression that can be exploited later for development of diagnostics, vaccines and chemotherapeutics. Significant progress was made, with three patents pending, a new direct faecal test developed, a panel of antigens for immunodiagnosis awaiting evaluation and many host genes discovered that are involved in early pathogenesis. This project will extend into two new projects to validate technology and extend the findings to cattle.

Source of Funding Meat and Livestock Australia

Project timeframe September 2002 – January 2008

Changes in within-flock prevalence of *Mycobacterium paratuberculosis* shedding following vaccination with Gudair in high and low prevalence flocks MLA OJD.033

FA&VPH Staff

Professor Peter Windsor
Professor Richard Whittington

National Collaborators

Dr Jeff Eppleston,
Central Tablelands Livestock Health & Pesticides Authority
Dr Evan Sergeant, AusVet Animal Health Services

Summary

The purpose of the project is to validate the widespread use of Gudair® vaccine for the reduction of bacterial shedding in medium/high prevalence flocks and the prevention of increased shedding in low prevalence flocks. The major outcome from the project will be to allow producers to predict the infectivity of flocks over time following the commencement of a vaccination program.

There is much producer interest, both at an individual and industry level, in the use of Gudair® vaccine to control the impact of OJD in flocks varying in disease prevalence from very low to very high. This project will observe changes over time in the prevalence of mycobacterial shedding following the commencement of a Gudair® vaccination program in flocks varying in initial OJD prevalence. Up to four flocks, each with high, medium or low OJD prevalence at the commencement of a vaccination program will be sampled over a six-year period to estimate changes in the prevalence of shedding as the proportion of vaccinates in the flock increases.

The relevant industry questions being addressed in this project are as follows:

- how long will it take for a vaccination program to reduce mycobacterial shedding to a level where safe trade in low risk sheep can occur?
- can the disease be eradicated by long-term vaccination?
- how effective will vaccination be in low prevalence flocks in the control zone?
- will vaccination prevent the increase in losses commonly seen in long-term infected flocks?
- can healthy sheep be vaccinated on arrival at an infected property so that infection and shedding is prevented?

Source of funding

Meat and Livestock Australia

Project timeframe

January 2003 – March 2009

Revisting the Mulesing Operation AWI EC830

FA&VPH Staff

Dr Katrina Bosward
Professor Paul Canfield
Associate Professor Geraldine Hunt

PhD Student

Ms Michelle Lepherd

Summary

Mulesing was introduced to the Australian sheep industry by J.H.W. Mules in 1931 as a measure for the prevention of blowfly strike in sheep, and in particular, the Merino. The wrinkliness and wooliness of the Merino sheep breech makes it highly susceptible to urine and faecal staining, leading to a high risk of blowfly strike. Mulesing involves the removal of skin from around the breech and tail to decrease wrinkles and increase the size of the bare area around the perineum. The result is a significant reduction in staining, with the area drier and less attractive to blowflies. Mulesing prevents the debilitating illness and death that occurs due to blowfly strike, however, it is acknowledged that sheep suffer short-term stress and pain since the operation is performed without analgesia or anaesthesia.

This project is one of a suite of AWI projects aimed at assisting Australian wool growers to find humane alternatives to mulesing. The primary objectives of the project include putting the mules operation on an evidence-based, scientific and quantitative footing as a foundation for investigating, devising and comparing alternative procedures. Initially, the Faculty team studied the conformation of the breech, and assessed patterns for applying chemical or other non-surgical alternatives to mulesing. Subsequently, a significant portion of this project has focussed on the local and systemic affects of mulesing and mulesing alternatives. Wound healing that occurs with the traditional mulesing operation as well as that with the proposed mulesing alternatives has been examined from the gross to the ultrastructural level, with immunohistochemical studies providing an assessment of wound contraction. In addition, the systemic response to mulesing and mulesing alternatives has been studied utilising haematology, biochemistry and acute phase protein measurements to document the acute phase response that occurs following treatment. Together, these findings have allowed the documentation of the wound healing and acute phase response that occurs with mulesing as it is currently performed, and to make comparisons with proposed mulesing alternatives allowing for a more humane method of altering the breech conformation to be developed.

Source of Funding

Australian Wool Innovation

Timeframe

June 2005 – December 2008

Enabling technologies of RNAi and cell culture for internal parasites of sheep MLA AHW.032

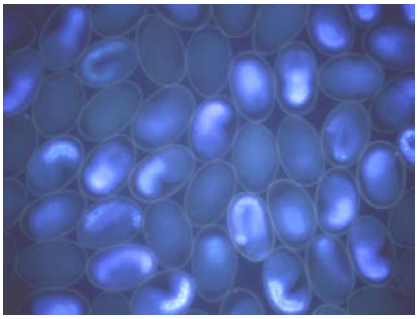
FA&VPH Staff Professor Nick Sangster

Postdoctoral Fellow Dr Michelle Power

Technical Officer Ms Krishanthi Gunarathnam

Summary

Research into the biology of sheep nematode parasites suffers from the lack of molecular techniques to study gene function and cell biology. Techniques such as RNA interference and cell culture have potential to improve our understanding of parasites and to identify novel control targets.



Nematode eggs

RNAi is a technique of gene silencing wher ıes can be switched off and the effects observed. If the affected worms are affected (for example, are paralysed) the gene product may be a good candidate as a control target. Cell culture allows the study of isolated worm components. Given that it is difficult to cultivate these parasites *in vitro*, cell culture could open up approaches to studying cell biology that are currently unavailable.

In this project we have developed phenotyping tools that will be used to measure RNAi effects and have commenced the gene knockout experiments. These are currently available in the free-living stages of the parasite, but the ultimate aim is to develop the technique for parasites in sheep. Cells recovered from worms have been grown in culture. These will be used to study defined cell types and as a platform for RNAi. They offer several potential advantages as it may be easier to deliver RNA to these cells and their responses will be simpler to interpret than responses in sheep.

The aim is to develop tools for further research. This project falls into a multi-institutional research program with the aim of discovering targets for improved parasite control.

Source of Funding Meat and Livestock Australia
Australian Wool Innovation

Project timeframe February 2004 – February 2006

Analysis of critical genes in the sheep/*Haemonchus* relationship

FA&VPH Staff	Professor Nicholas Sangster Associate Professor David Emery Dr Tony Rowe
National Collaborators	The SGP includes scientists from: CSIRO Livestock Industries, University of Melbourne and the University of Sydney
Summary	This project dovetails in with our existing project on the sheep/ *Haemonchus* relationship. The emphasis in this new project is to add value by carrying out DNA microarray experiments to identify sets of sheep genes which are up or down regulated during critical events in establishing immunity to *Haemonchus*. Further work to validate these genes will be performed using quantitative PCR and immunocytochemistry. The aim is to identify genes which may act as future markers for selection of sheep able to mount effective immune responses to worms.
Source of Funding	Meat and Livestock Australia Australian Wool Innovation
Project timespan	May 2004 – April 2007

Linked Project Characterisation of critical genes in the sheep/*Haemonchus* relationship

Source of Funding	Meat and Livestock Australia and Australian Wool Innovation within the Sheep Genomics Project (SGP)
Project timeframe	November 2005 – July 2007

Aquatic Animal Health Subprogram: Current and future needs for aquatic animal health training and for systems for merit-based accreditation and competency assessments
FRDC 2005/641

FA&VPH Staff

Professor Richard Whittington
Mr Matt Landos
Mr Navneet Dhand

National collaborators

Dr Brian Jones*,
Fisheries Department Western Australia

*Principal investigator

Summary

Aquatic animal health service providers have expressed concern that there is a shortfall of aquatic animal health professionals to support Australia's aquaculture industries. Despite this need, most current Australian education systems/institutions do not adequately cover aquatic animal health. For example, there is a need for research and training in subjects such as invertebrate immunology, identification of nutritional disorders, water quality issues, taxonomy of pathogens, development and implementation of modern diagnostic methods and development of vaccines. As an example of this wider educational approach, the University of Tasmania currently provides a training course in histopathology of aquatic animals that is targeted at, and in part run by, non-veterinarians. There is also a need for continuing education. Identifying accreditation mechanisms to ensure competency in professionals providing aquatic animal health services to the aquaculture sector is another requirement for the industry.

The aim of this project was to evaluate and clearly define current and future needs for aquatic animal health training and for systems for merit-based accreditation and competency assessment. Stakeholder consultations were used to define current and future needs for aquatic animal health support among Australia's aquaculture industries, both established and emerging. Succession planning, merit-based accreditation of experts, and competency assessment, as well as the reluctance of institutions to provide training for what may be perceived to be a very small and specialised market were identified as issues. The outcomes were considered by the National Aquatic Animal Health Technical Working Group and a formal submission was made to the Aquatic Animal Health Committee (AAHC).

Source of Funding

Fisheries Research and Development Corporation

Project timeframe

April 2005 – June 2006

Aquatic Animal Health Subprogram: Establishment of a national aquatic animal health diagnostic network FRDC 2005/621

FA&VPH Staff

Professor Richard Whittington
Mr Matthew Landos
Mr Navneet Dhand

National collaborators

Dr Brian Jones,
Fisheries Department Western Australia
Dr Mark Crane
Australian Animal Health Laboratory, CSIRO

Summary

The lack of many serious diseases is one of Australian aquaculture's prime competitive advantages to meet future global demand for seafood. Maintenance of this high health status through initiatives which reduce the risk of disease incursions and facilitate early detection and response to emerging disease problems is seen as critical to continuing industry expansion. The range of commercially significant aquatic animal species, and their diseases, is increasing steadily. Due to limited resources it is clear that, , diagnostic laboratories cannot develop proficiency in the diagnosis of all significant diseases. As a consequence, expertise in specific diseases has developed in different laboratories throughout the country. To take advantage of this development, to ensure that expertise in different diseases is available Australia-wide, and to create a consistent system of aquatic animal disease diagnosis and reporting, it is proposed that a national network of laboratories be established for the diagnosis and monitoring of aquatic animal diseases. This needs to be underpinned by a formal quality assurance program. Through a consultation process, uniform data standards and reporting formats need to be developed and adopted by all jurisdictions. Standard diagnostic tests and operating procedures also need to be developed and subsequently adopted by laboratories within the network.

This project was concerned with the establishment of the network and commencement of activities, including proficiency tests ("ring tests") designed to assist laboratories in further developing their diagnostic capabilities and/or to allow demonstration that performance of a particular test is at a nationally accepted standard, using Australian and New Zealand Standard Diagnostic Procedures (ANZSDPs). In this way the confidence of stakeholders in the quality of the diagnostic service is increased.

Specific objectives were to:

- Make recommendations on the structure and function of the network of receival and reference laboratories
- Establish a laboratory network for aquatic animal disease diagnosis
- Facilitate transfer of knowledge and technology in aquatic animal diagnostics
- Develop a model for national laboratory proficiency (ring) testing as a mechanism to enhance the proficiency of the diagnostic network.

A database was developed on national capacity and this is now hosted by the Commonwealth Department of Agriculture, Fisheries and Forestry.

Source of Funding

Fisheries Research and Development Corporation

Project timeframe

June 2005 – June 2006

Biotechnology and epidemiology to control nodavirus in barramundi aquaculture

FA&VPH Staff Professor Richard Whittington

PhD Student Mr Paul Hick

National Collaborators
Mr Glenn Schipp, Darwin Aquaculture Centre
Mr Craig Foster, Marine Harvest Ltd
Ms Lorna Melville and Dr John Humphrey,
Berrimah Veterinary Laboratory

Summary

Production of farmed barramundi has increased by more than 1200% in the Northern Territory since 2001 but is threatened by nodavirus infection.

To achieve growth targets for barramundi aquaculture in northern Australia the University of Sydney and the three industry partners will collaborate to:

1. Control nodavirus infection
2. Develop new technologies to detect nodavirus using immunoassay and surface enhanced laser desorption ionisation mass spectrometry (SELDI)
3. Develop an integrated disease control strategy based on epidemiological survey data, and ensure that it is practical and able to be widely adopted.

Control of nodavirus infection is required also to meet the national goal to boost aquaculture production to $2.5 billion by 2010. This project meets two designated national research priorities: frontier technologies for building and transforming Australian industries and protecting Australia from invasive diseases and pests. It will develop biotechnological and epidemiological tools to control nodavirus, improve biosecurity of finfish in the wild and on farms in Northern Territory, Queensland, Victoria, New South Wales, South Australia and underpin growth of the barramundi aquaculture industry in regional areas. The benefit will be increased employment and investment with economic and social returns. This project has support from all States and Territories.

Source of Funding Australian Research Council Linkage Grant

Project timeframe January 2006 – December 2008

Aquatic Animal Health Subprogram: Optimisation of PCR tests for diagnosis of megalocytivirus (gourami iridovirus) and cyprinid herpesvirus 2 (goldfish herpesvirus) FRDC 2007/007

FA&VPH Staff

Professor Richard Whittington
Dr Joy Becker
Dr Michelle Dennis
Mr Matthew Landos

National collaborators

Dr Brian Jones, Fisheries Department Western Australia
Dr Mark Crane, CSIRO

Summary

This project was developed in order to meet a gap in diagnostic capability in Australia for the megalocytivirus group of iridoviruses and cyprinid herpesviruses. Megalocytiviruses cause killing diseases that have devastated aquaculture enterprises particularly in Asia. Cyprinid herpesviruses are also significant, the focus of this project is CHV-2, which infects goldfish and may not be present in Australia. The urgency to do this work was highlighted by a megalocytivirus disease outbreak in Murray cod in Victoria in 2003, and by the discovery in 2004 that imported ornamental fish harboured the viruses that killed Murray cod. In addition there is a need for a targeted surveillance program to determine whether CyHV-2 is present in both domestic goldfish breeding populations and imported goldfish.

The importation of several species of gouramis into Australia in the ornamental fish trade is associated with a high risk of introduction of viruses in the Megalocytivirus genus (Family iridovirae), specifically Gorami iridovirus (GIV). Valid tests for these viruses do not yet exist in Australia. Rapid assays to distinguish these viruses from internationally notifiable agents such as Red Sea Bream Iridovirus (RSIV) are not available either, so there are risks to international trade through inaccurate diagnosis of GIV.

Goldfish are the most popular ornamental fish species in Australia. There has been a viable domestic production industry for more than 50 years. This production has supplied wholesalers, and in the case of many smaller operators, supplied direct to retail shops or the public through markets. In the last 10 years imported goldfish numbers have continue to grow, in part, due to their competitive price. The imported goldfish have been subjected to the AQIS requirements for import certification and a 3 week holding period before release. In the past 6 – 7 years anecdotal evidence suggests mortality rates of domestically produced goldfish increase when these fish are mixed in retail shops with imported goldfish. This scenario has been described and followed up with histological and electron microscopy examinations in NSW and WA. These investigations have revealed pathology consistent with CyHV-2. It has been suggested that the imported goldfish are carrying latent CyHV-2 infections and that domestic breeding stock in closed facilities remain free from this disease agent hence naïve and highly susceptible when exposed.

This project aims to provide the diagnostic capability and a sampling regime to further investigate these concerns. Specific objectives include:

- To optimise PCR for detection of megalocytivirus
- To optimise a PCR for detection of CyHV-2 in goldfish
- To transfer technology to diagnostic laboratories in Australia

Each of the aquatic animal health diagnostic laboratories in Australia have expressed a need for diagnostic capacity. End-users indicating need for the project data include regulatory agencies (AQIS, Biosecurity Australia), governmental diagnostic laboratories in the States and aquatic animal health network.

Source of Funding

Fisheries Research and Development Corporation

Project timeframe

October 2007 – September 2008

Bovine Pink Eye

FA&VPH Staff	Associate Professor John House
National Collaborators	25 Veterinary Practices from around Australia
International Collaborators	Dr John Angelos University of California, Davis
Masters Student	Mr Craig McConnell

Summary

Infectious bovine keratoconjunctivitis (IBK) is considered the most common ocular disease of cattle throughout the world. IBK is important both in terms of animal welfare and as a cause of lost production.

Despite the susceptibility of the causative bacterium, *Moraxella bovis*, to a large number of antimicrobial compounds the treatment of affected cattle has many disadvantages and the prevention of IBK is therefore preferable. *M. bovis* virulence factors including the production of leukotoxin, protease, and β-hemolysin along with the presence of fimbriae on the bacterial cell surface that play a role in adherence. *M. bovis* fimbrial proteins act as immunogens and vaccination with isolated fimbriae stimulates bovine anti-fimbrial antibodies. However, strains of *M. bovis* are known to differ in their fimbrial antigens, with two types of fimbriae identified along with at least seven distinct serogroups of fimbriated *M. bovis*. Efficacious application of fimbrial based IBK vaccines requires production of a polyvalent vaccine targeting specific regional isolates.

The aims of this project are:

- to conduct a survey of *Moraxella bovis* strains in Australia to determine the prevalence of different serotypes across the country
- to determine which virulence attributes are common to most isolates
- to design a pink eye vaccine applicable to prevention of bovine infectious keratoconjunctivitis in Australia.

Funding	Schering Plough Animal Health
Project timeframe	Due for completion - January 2006

Prevention and Treatment of Environmental Mastitis

FA&VPH Staff Associate Professor John House

Masters Student Ms Lucy Shum

Summary

The prevalence of contagious mastitis in dairy cattle has dropped over the last 20 years. Environmental mastitis subsequently accounts for the largest proportion of intramammary infections and the associated losses in production. Surveys of mastitis conducted in Australia have reported that *Streptococcus uberis* is the most frequent environmental mastitis pathogen and suggest that coliform mastitis is relatively infrequent in Australian dairy cattle. These prevalence surveys have been conducted in Victoria and reflect the prevalence of disease in pasture fed dairy cattle.

Over the last 10 years there has been a steady and continuing trend toward intensification of the dairy industry with more farms providing supplementary feeding and some farms feeding total mixed rations similar to dairy production systems in Europe and the United States. Working with intensive dairy production systems in NSW we have observed a higher incidence of coliform mastitis than reported in Victorian surveys.

The objective of this study is to determine the prevalence of different mastitis pathogens on intensive dairies in NSW and to investigate the interaction between diet and environment on the major groups (coliforms and streptococci) of environmental pathogens.

Funding Pfizer Animal Health

Project timeframe January 2004 – December 2006

***Dam* mutants of Salmonella *typhimurium* as modified live vaccines in calves**

FA&VPH Staff Associate Professor John House

National Collaborators Dr Keith Walker and Dr Michael Hornitzky
NSW Department of Primary Industry & Investment,
Elizabeth Macarthur Agricultural Institute

International Collaborators Dr Michael Mahan and Mr Doug Heihoff
University of California, Santa Barbara

BSc (Hons) Student Ms Jennie Mohler

Summary Salmonellae are important pathogens of animals and man. They can cause food poisoning in humans upon consumption of contaminated meat and animal products. This proposal is based on our previous discovery that *Salmonella typhimurium* containing mutations in the *dam* gene that prevent DNA adenine methylase (*dam*) expression are virulent yet confer protective immunity as modified live vaccines in murine, avian, and calf models of typhoid fever. One of the principal challenges to the development of commercial livestock vaccines is that multiple *Salmonella* strains are often endemic on farms, and traditional vaccines normally elicit protection against a single strain. We have recently shown that *dam* mutant *Salmonella* confer cross-protective immunity to multiple *Salmonella* strains when used as modified live vaccines in murine and avian models of typhoid fever.

Specific aims include to:

- determine if *Salmonella dam* mutant vaccines can confer cross-protective immunity against multiple *Salmonella* isolates in calves. A principal concern with all modified live vaccines is safety.
- introduce additional attenuating mutations (e.g., *aroA*) to reduce the virulence capacity of the *Salmonella dam*$^-$ vaccine without compromising efficacy in calves.
- determine if *Salmonella dam*$^-$ vaccines can be used as a platform for delivering passenger antigens to elicit protection against the cognate pathogen. We have chosen the Enterotoxogenic *E. coli* (ETEC) K99 fimbriae as a model passenger antigen since ETEC strains that express K99 fimbriae account for nearly all cases of ETEC infection in newborn calves and K99 fimbriae are a known immunogen that confers protective immunity against clinically relevant ETEC infections in calves and other species. The K99 fimbriae antigen from ETEC clinical isolates will be expressed in *dam*$^-$ *Salmonella*. Vaccine efficacy will be assessed by elicitation of protective immunity against ETEC diarrheal disease in calves via passive colostral transfer of protective antibodies from vaccinated cows.
- develop safe and effective vaccines against *Salmonella* infection of cattle, and to demonstrate that this vaccine platform may be used to express cognate antigens from other pathogens thereby promoting the health and productivity of livestock, reducing *Salmonella* contamination of livestock, livestock-derived food products, and enhancing food safety.

Source of funding United States Department of Agriculture

Project timeframe

Reducing antibiotic usage in pig herds:controlling *Lawsonia intracellularis* by vaccination, housing and hygiene

FA&VPH Staff	Dr Trish Holyoake Associate Professor David Emery
National Collaborators	Dr Alison Collins, Elizabeth Macarthur Agricultural Institute, NSW Department of Primary Industries Boehringer Ingelheim Pty Ltd, Australia
PhD Students	Ms Megan Donahoo

Summary

Proliferative enteritis (PE) is a major disease in the global pig industry. It is caused by *Lawsonia intracellularis* and is currently prevented by feeding pigs antibiotics. The project will provide two scientists (APAIs) with training in epidemiology and immunology applicable to livestock industries and biosecurity. The ultimate aim of the project is to reduce antibiotic use on pig farms to make the pork industry in Australia more globally competitive, and to benefit human health by reducing the risk of amplifying strains of antibiotic-resistant bacteria.

There are three complementary streams of the research plan. The first stream will provide essential research to maximise the adoption of a commercial vaccine (Enterisol® Ileitis, Boehringer Ingelheim) as an alternative to antibiotics to control PE. Experiments will be undertaken to improve the efficacy of Enterisol® to control PE under Australian pig management systems and to induce immunity to Australian field isolates of *Lawsonia intracellularis* (LI). In particular, we will:

- measure the protective efficacy and the immune response of vaccinated pigs against Australian LI isolates;
- increase the ability of the vaccine strain of LI to induce an effective immune response in vaccinated pigs by modifying its administration (extending the "antibiotic-free" window);
- identify the antibiotics that do not interfere with the vaccine strain of LI's ability to infect pigs, hence allowing producers to continue to medicate in the face of concurrent disease while they vaccinate against LI;
- establish the feasibility of vaccinating pre-weaning as an alternative to post-weaning as a way of avoiding the inherent post-weaning problems of concurrent medication and ease of administering vaccine through bulk water-delivery systems;
- elucidate immune "markers" of protection to provide the commercial partner, veterinarians and pig producers world-wide with an objective measure of vaccine efficacy.

The second stream will compare the infection dynamics of LI in pigs reared in "traditional" concrete-based housing and in increasingly popular, welfare-friendly, bedded housing, so management strategies can be developed to control PE in these systems, as an adjunct to vaccination.

The third stream will provide accurate and definitive data on the impact of PE on the pig industry in Australia, including the seroprevalence of LI infection on farms in Australia, the cost of antibiotics used to control PE and direct measures of the effect of LI infection on pigs' carcass composition using a CT scanner. This data will provide accurate information on the impact of LI infection on the use of antibiotics and the profitability of the Australian pig industry and so supply the rationale to vaccinate and/or modify management to reduce antibiotic use.

Source of Funding	Australian Research Council Linkage Grant Boehringer Ingelheim Pty Ltd, Australia
Project timeframe	February 2006 – December 2008

Peri-urban and remote regional surveillance for biosecurity within the pig industry in eastern Australia

FA&VPH Staff	Dr Trish Holyoake Dr Jenny-Ann Toribio Dr Marta Hernandez-Jover
PhD Student	Mrs Nicole Schembri
National Collaborators	Department of Agriculture, Fisheries and Forestry NSW Department of Primary Industries Victorian Department of Primary Industries Queensland Department of Primary Industries SA Department of Primary Industries & Resources WA Department of Agriculture Rural Lands Protection Boards of NSW QAF Meat Industries Australian Pork Ltd

Summary

Preliminary studies have found disturbing gaps in our ability to identify and monitor pig health in a significant sector of the pig-rearing community in Australia – the small-scale pig producers in peri-urban and regional areas. Currently pigs raised in small-scale enterprises pose a high risk to Australia's animal health industries due to our lack of knowledge about their movements, health and management practices implemented in these herds.

In this project we will develop systems to minimise the risk of exotic disease occurring in Australia by targeting this sub-population of the pig-rearing community. In particular work will focus on:

- Identification of the locations and practices of peri-urban pig producers
- Improved methods for tracking pig movements
- Mechanisms for health surveillance
- Improved extension in relation to disease detection and swill feeding

Funding	Australian Biosecurity Cooperative Research Centre for Emerging Infectious Disease
Project timeframe	February 2005 – August 2008

Specialised management of gilts and their progeny

FA&VPH Staff Dr Trish Holyoake

National Collaborators QAF Meat Industries

PhD Student Ms Yvette Miller

Summary

This project seeks to address two problems. The first is the broad issue of a shortage of veterinarians with pig-specialist skills in Australia. There are few veterinarians entering the industry, despite many opportunities available to them working with commercial farms, educational institutions, pharmaceutical companies and regulatory organisations.

The second problem this project seeks to address is the relatively poor health and performance of gilt progeny relative to sow progeny. Gilts are completely different animals than mature sows and can act as a health destabilising factor in herds. Overseas, producers are segregating gilt progeny and sow progeny to:

1. stabilise PRRS in the progeny, to the extent that PRRS does not occur clinically in the mature sow herd; and
2. manage Mycoplasma pneumonia.

On farms that segregate progeny, vaccines are only used in gilt progeny. Segregation has resulted in a 3 fold decrease in pneumonic lung lesions at processing in P2 progeny (35% incidence of lesions in P1 progeny vs 12% in the progeny of mature sows). On farms where only sow progeny are housed, nursery drug costs are less than half that of gilts ($1.85US/pig vs $0.72US/pig).

The proposed project seeks to:

1. provide extensive training for a post-graduate veterinarian in pig health and production to provide for succession in the Australian pig industry
2. improve the pre-weaning growth performance of gilt progeny using supplemental milk
3. identify risk factors that explain why gilt progeny perform poorly, relative to sow progeny
4. develop management strategies to control the risk factors and hence improve their performance

Source of Funding Australian Pork Ltd
QAF Meat Industries

Project timeframe February 2005 – January 2008

Improving the performance of gilts and their progeny: the role of immunity

FA&VPH Staff	Dr Trish Holyoake
National Collaborators	Pork CRC QAF Meat Industries NSW Department of Primary Industries
PhD Student	Ms Yvette Miller

Summary

Preliminary research provides strong evidence to indicate that immune differences may be crucial to the health and observed growth differences of gilt and sow progeny. The deliverables of this project include:

- An Australian data set demonstrating that gilt progeny reared on sows can perform equally in terms of growth performance to slaughter relative to sow progeny.
- Identification of immune and/or nutritional/orexigenic parameters in colostrum and/or milk from sows that are likely to be responsible for providing this subsequent growth performance advantage to their progeny-relative to gilt colostrum and/or milk
- Evidence to support or disprove the hypothesis that any differences in the passive immunity provided to the progeny of sows relative to gilts is the result of a difference in their innate immunity and/or a difference in how they respond to active immune system challenge.
- Determination of any differences in the immune response of the progeny themselves to a novel antigenic challenge (tetanus toxoid).

Outcomes from the project will lead to recommendations for on-farm management strategies, commercial opportunities for pharmaceutical and nutrition companies and links into other Pork CRC research

Source of Funding	Pork CRC
Project timeframe	July 2007 – June 2008

Management strategies to improving the performance of gilt progeny

FA&VPH Staff	Dr Trish Holyoake
National Collaborators	Pork CRC QAF Meat Industries NSW Department of Primary Industries
PhD Student	Ms Yvette Miller
Summary	The project seeks to develop intervention strategies to improve the growth performance of gilt progeny. The first experimental stream will provide data to support or discount the feeding of supplementary milk to the progeny of gilts prior to weaning at two seasonal extremes (summer and winter) as an aid to improving their growth performance. This study will also provide baseline information on birth weight, growth parameters (weight gain, feed efficiency, morbidities, mortalities, carcass variation) and milk production and intake differences between the two sub-populations that will assist us to understand why there are the growth performance differences and determine how we might manipulate these differences to improve growth performance in the future. As a sideline, it may also assist us to improve sow longevity, through improved farrowing house management. The outcomes of the second experimental stream will include: • Determining the importance of PE as a performance limiting factor on farms. • Provide baseline information that would support the decision on whether to vaccinate gilts and/or sows prior to farrowing against PE. • Provide information that would support or disprove the medication of sows around the time of farrowing to reduce the transmission of LI infection to progeny. • Determine if there is a need to vaccinate both gilt and sow progeny against LI infection to prevent PE. • Measure the relative infection rates of gilt and sow progeny as a guide to potential benefits from rearing the two sub-populations separately.
Source of Funding	Pork CRC
Project timeframe	July 2007 – June 2008

Review of arbovirus surveillance needs and the National Arbovirus Monitoring Program (NAMP)

FA&VPH Staff	Professor Michael Ward Dr Marta Hernandez Jover
Summary	The Terms of Reference for the review: - Identify and describe the future national arbovirus surveillance needs in Australia and near northern Asian and Pacific neighbours for agriculture, public health (zoonotic arboviruses) and the environment and the benefits of a future national surveillance program to address these needs: - Assess the contemporary relevance of the four objectives of the NAMP and the appropriateness of the NAMP to deliver on future national needs (identified in TOR 1 above); - Recommend an evaluation method applicable to NAMP and other targeted national animal disease surveillance programs; - Evaluate the effectiveness, including the cost effectiveness, of the current NAMP activities in meeting each of its four objectives by applying the recommended evaluation method (identified in TOR above). Provide practical recommendations to address any shortfalls or needs for refinement of the NAMP; - Identify and describe current and potential collaborations in arbovirus surveillance with public health and environment agencies and identify efficiencies for livestock arbovirus monitoring; - Identify and describe arbovirus surveillance research needs for agriculture; - Provide a view on the NAMP contribution to, and consistency with, the National Animal Health Surveillance Strategy (NAHSS)
Source of funding	Animal Health Australia
Project timeframe	October 2008 – April 2009

Live bird market research

FA&VPH Staff

Dr Marta Hernandez Jover
Professor Michael Ward
Dr Jenny-Ann Toribio
Mrs Nicole Schembri

Summary

Live bird markets in overseas countries (eg Asia and United States) have been implicated in the spread of low pathogenicity (LP) and highly pathogenic (HP) avian influenza viruses and other infectious diseases of birds. Little is known about live bird markets and sales in Australia, and the Biosecurity risks associated with them.

A Biosecurity Consultative Group (BCG), comprising representatives of the Department of Agriculture, Fisheries and Forestry (DAFF), Animal Health Australia (AHA) and poultry industry sectors, was formed as a result of a resolution from the 2007 Government-Industry Avian Influenza Forum. At a meeting of the BCG in February 2008, poultry industry representatives identified live bird markets and bird sales as posing a possible Biosecurity risk to commercial poultry producers. This project is a part of a broader commitment by DAFF to assist the poultry industries in documenting and enhancing their Biosecurity systems.

Objectives

1. Identify the locations of the major live bird markets in Australia in relation to the location of the major commercial poultry-producing areas
2. Describe the characteristics of the sale of live birds at the markets, including:
   a. number and types of poultry presented for sale
   b. method of sale
   c. type of vendors involved: commercial producers, hobby farmers, poultry fanciers etc
   d. type of housing of birds at the live market
3. Describe parameters related to Biosecurity:
   a. cleaning and disinfection of housing and market venue
   b. traceability system used for birds presented for sale
   c. register and identification of vendors and buyers
   d. location of vendors
   e. destination of birds post-sale and proportions: processors, hobby farmer, private slaughter, returning to property of origin etc
4. Describe links between the live bird markets and commercial poultry companies or processors (including ducks and game bird companies/processors), such as delivery vehicles, personnel, equipment (eg crates/cages/pallets) etc.

Source of funding

Australian Government Department of Agriculture, Fisheries and Forestry

Project timeframe

August 2008 – January 2009

Building capacity to model emerging disease threats in the intensive livestock industries

FA&VPH Staff	Dr Jenny-Ann Toribio
PhD student	Mr Sam Hamilton
National Collaborators	Dr Graeme Garner and Dr Mike Nunn Department of Agriculture, Fisheries and Forestry

Summary

Emerging infectious diseases have the potential to cause significant impacts on animal health, public health, the economy and/or the environment. A good understanding of the epidemiology and likely spread of these diseases, should they be introduced to Australia, is a necessary component of effective preparedness and response planning. At present there is a shortage of people in Australia with skills to undertake comprehensive epidemiological modelling of animal and human diseases.

This project offers the opportunity to develop advanced skills in disease modelling through the development of a stochastic spatial simulation model for a disease of concern to the Australian intensive livestock industries. Diseases that pose a serious threat include Newcastle disease and highly pathogenic avian influenza for the poultry industry and classical swine fever for the pig industry. Disease modelling, by evaluating the behaviour of an exotic disease under Australian conditions and the effect of alternate control strategies, is recognised as an important tool to support Australia's preparedness for a disease incursion. This project, working with government and industry, will develop a new model of the spread of highly pathogenic avian influenza within the Australian intensive livestock population to address issues associated with assessing the extent, impact and control of disease outbreaks. This model will be used to enhance national disease planning and will provide technical underpinning for Australia's outbreak management policies.

Source of Funding	Australian Biosecurity Cooperative Research Centre for Emerging Infectious Disease
Project timeframe	February 2005 – February 2008

Assessment of the risks to animal biosecurity associated with small landholders ABCRC 3.086R

FA&VPH Staff	Dr Marta Hernandez Jover Dr Jenny-Ann Toribio Dr Trish Holyoake
National Collaborators	Dr Tony Martin, Project Leader Department of Agriculture & Fisheries Western Australia (DAFWA) Dr Danny Roberts, DAFWA Dr Neil Guise, DAFWA Dr Nina Kung, Queensland Department of Primary Industries & Fisheries Dr Sandy McKenzie, Queensland DPI&F Dr Patricia Swift, Queensland DPI&F Dr David Pitt, Queensland DPI&F
Summary	It is commonly said that "peri-urban small landholders" or "hobby farmers" pose biosecurity threats to mainstream livestock production in Australia. Just what these threats might be, and their magnitude and significance within the arena of Australian animal biosecurity, have not been defined. In recent years the increasing numbers of "lifestyle farmers" and small landholders have been studied by various researchers aiming to define who they are, what motivates them, and their Biosecurity-related and other attitudes and practices. This project aims to build on this work, and to identify a series of animal Biosecurity risks associated with small landholders around Australia. The magnitude of these risks will be assessed both in absolute terms and relative to the magnitude of equivalent risks not involving small landholders. The project this sets out to determine whether, for selected threats to Australian livestock (such as epidemics of exotic disease), small landholders add significantly to the risks. The project will tap into existing knowledge of small landholders by holding a project planning workshop in conjunction with the National Small Landholder Extension Forum to be held in April 2008. From the planning workshop a series of risk assessments (RAs) will be designed, and these will be carried out ion NSW, WA and possible Queensland. Consistency and collaboration will be assured through a series of project meetings. Two of the RAs will build directly on the recently completed USyd ABCRC project on surveillance in peri-urban pigs in eastern Australia. Outcomes of the project will be reports of the RAs, which end-users may then take to inform policy decisions on prioritisation and resource allocation in the areas of animal biosecurity and small landholder engagement. Risk analysis also involves risk management and risk communication, and this project will identify appropriate potential risk mitigation opportunities, and in partnership with the National Small Landholder Extension Network will lay the groundwork for any necessary communication programs.
Source of funding	Australian Biosecurity Cooperative Research Centre for Emerging Infectious Disease
Project timeframe	October 2007 – September 2009

Adopting a strategic and practical approach to the problem of unwanted animals in rural communities: a study of the Companion Animal Welfare Scheme (CAWS)

FA&VPH Staff	Dr Robert Dixon
BSc(Vet) Student	Ms Megan Prendergast
National Collaborators	Dr Mark Lawrie, RSPCA NSW

Summary

Companion Animal Welfare Schemes are community based and means-tested cat and dog desexing programs that are run by the RSPCA and cofunded by local government and philanthropic organisations. They target rural areas of social disadvantage and aim to improve the health and welfare of companion animals through desexing and education programs. This project will assess the effectiveness of these programs using a number of measures. These will include data of the number of animals treated, household census of animals, the reduction in the numbers of animals presented at local animal pounds and the changes in owner attitudes toward the health and welfare of their pets. The outcomes will have impact on policy and managerial systems for both government and non-government organisations.

Source of Funding	RSPCA NSW
Time frame	January 2007- November 2007

Attitudes to animals and empathy to others of clients of the Society for the Prevention of Cruelty to Animals Veterinary Clinic in Hong Kong

FA&VPH Staff	Dr Robert Dixon Dr Lun Li (Faculty Associate)
Student	Ms Annabel Sutch
International Collaborator	Dr Michael Bradley, SPCA Hospital, Hong Kong
Summary	This project aims to explore existing attitudes to animal welfare in and the empathy to others of veterinary clients of the SPCA's veterinary hospitals in Hong Kong. Mainland China is undergoing major changes with increasing affluence and education of the population. Pet ownership is also increasing in Mainland China and this may be a reflection of social change. Hong Kong has been relatively prosperous and educated for a number of decades and pet ownership has also been relatively high. Despite such changes there has been little study of community attitudes to animals in either Mainland or Hong Kong China. It is important to explore attitudes to animals of Chinese veterinary clients. Current animal practices in China include acts such as skinning animals alive, and insufficient space, food, or water for caged animals at markets. This contrasts with pet animals which can be as well looked after as pets in Australia. China itself has an edict for a Harmonious Society not only between people but also between humans and animals. Changes in such attitudes may be the harbinger of, or driver for policy and cultural change regarding the welfare of animals in Mainland China.
Project timeframe	February 2008- December 2008

Attitudes of Chinese Veterinary and Non-Veterinary University Students towards the Ethical Treatment and Welfare of Animals

FA&VPH Staff	Dr Robert Dixon Dr Lun Li (Faculty Associate)
International Collaborators	Staff of the School of Veterinary Science, Shanxi Agricultural University China
Summary	This project aims to explore existing attitudes to animal welfare in veterinary students and non-veterinary students at Shanxi Agricultural University, China. This is being done in order to prepare new culturally appropriate animal welfare education resources for introduction into the University's Veterinary Curriculum, the first inclusion of the study of animal welfare in any University Veterinary Curriculum in China. Graduating veterinarians will then be better prepared to improve animal welfare standards in China, a direction sanctioned by the Central Government of China.
Project timeframe	June 2008- June 2009

Healthy Dogs, Healthy Communities: evaluating the impact of new interdisciplinary interventions to enhance dog health and welfare in remote indigenous communities

FA&VPH Staff	Dr Robert Dixon Dr Jenny-Ann Toribio Dr Graeme Brown
PhD Students	Ms Sophie Constable Ms Jade Norris
Masters Student	Ms Layla Schrieber
National Collaborators	Dr Richard Malik, Faculty of Veterinary Science Dr Roselyn Dixon, Faculty of Education, University of Wollongong Dr Shelley Walton, Menzies School of Health Research, Darwin

Summary

This project, which focuses on the dog, also recognises that the dog harbours a number of diseases that can infect humans. It examines the relationships between culturally-appropriate education, dog health and welfare, and human health and welfare in Indigenous communities. The project will document the health and welfare of dogs, institute dog health programs and use these data in an educational intervention to improve the health and welfare outcomes of dogs in these communities.

It aims to demonstrate that the improvement of the health and welfare of dogs through sustainable dog health programs is directly due to the specifically-designed educational intervention and that the improvement of dog health and welfare will also impact on human health and welfare in Indigenous communities. Dog health programs will indirectly improve the expectations, standards and self-worth of many Indigenous Australians. As a consequence, the national benefits include the development of environmentally sustainable Indigenous communities, and the strengthening of Australia's social and economic fabric especially in rural and remote areas.

Source of funding	Australian Research Council Linkage Grant Animal Management in Rural and Remote Indigenous Communities RSPCA NSW Warlukurlangu Artists Aboriginal Association IDEXX Laboratories Australia
Project timeframe	January 2007- December 2009

Advanced surveillance systems - electronic data collection and decision support

FA&VPH Staff	Dr Jenny-Ann Toribio Associate Professor Peter Thomson
National Collaborators	Dr Angus Cameron and Dr Chris Baldock (deceased) AusVet Animal Health Services
PhD Student	Mr Richard Shephard

Summary

Under-reporting of disease events in farm animals has been identified in numerous studies and is a significant gap in Australia's national surveillance processes in that it becomes difficult to generate information to support claims of freedom from disease and reduces our capacity for early detection of emerging disease problems. The main sources of animal health surveillance information are veterinary laboratories, but these sources have been declining and represent only a small proportion of animal disease events and provide virtually no information on the health status of livestock in the remote pastoral regions of northern Australia which are the main supply areas of our beef exports. This project is a collaboration between researchers and industry to develop tools that assist with the collection of animal disease information using electronic systems based on a pilot project involving beef producers in northern Queensland. The outcome will assist producers and disease managers in collecting and analysing information on disease in Australian livestock and providing evidence for regional freedom from disease.

Electronic data capture can be achieved either by using a web-based data submission system (providing real-time access to a centralised database and allowing instant analysis), or by the use of hand held computing devices. In this current project both systems will be developed in a staged fashion. A web-based system will be followed by a hand-held device for data entry. A central component of each system is the Bovine Syndromic Surveillance System (BOSSS) a tool to assist farmers identify disease problems. This artificial intelligence system controls flow of information about individual diseases, disease investigation and control based on examination of reported signs, and will promote the capture of negative sign data (ie signs that are definitely not present). It provides producers with information about the most likely diseases that can explain reported signs and undertakes a differential examination of these listed signs by questioning the user about the presence (or absence) of key differential signs. The data are entered into a syndromic database that includes negative signs and has enhanced ability to differentiate disease and investigate potential exotic disease events.

This project will result in:

- An internet-based animal health information system enabling data entry, data analysis and reporting as a syndrome surveillance system for use by producers in remote areas.
- User-friendly computer-assisted diagnostic aids to help producers in remote areas.
- Software to be used on hand held devices which permits data entry and access to computer-assisted diagnostic aids in the field.
- Software and simple methods to transfer data from hand held devices to a centralised database for more sophisticated analysis of aggregated data as part of Australia's overall disease surveillance system for cattle.

Source of Funding	Australian Biosecurity Cooperative Research Centre for Emerging Infectious Disease
Project timeframe	February 2004 – March 2007

Investigations of Borna Disease Virus in Australia

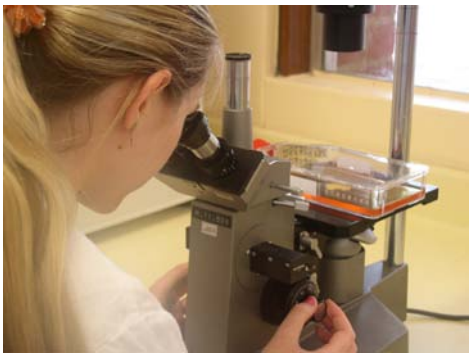
FA&VPH Staff Associate Professor Jennie Hodgson

National collaborators

Dr Robert Flower*
Ms Sandra Kamieh
North Shore Hospital

*Principal investigator

Summary



Borna disease virus (BDV) is a neurotropic RNA virus that can cause clinical disease in humans, horses, cats and sheep. Reports of its presence in Australia have been made, but have been unsubstantiated. These reports required verification with regard to human and animal health in this country as well as implications for export of animals from Australia.

The aim of this study is to investigate in various species whether BDV could be detected in Australia, by use of various serological and molecular techniques. Specific objectives include:

- Investigate and determine the prevalence of BDV in horses and cats using serological and molecular techniques.
- Investigate whether BDV or a BDV-like agent can be detected in the human population and if so, to determine the prevalence of BDV infection in humans, primarily blood donors, pregnant women, long-term multiply transfused haematology and depressed patients.
- Investigate whether BDV is associated with altered cytokine production in depressed patients, as opposed to a control population.
- Use definitive confirmatory serological tests for the detection of BDV.
- Obtain sequence data of isolates of BDV in Australia and compare to existing sequences of BDV for evidence of variation.

Source of Funding Rural Industries Research and Development Corporation

Project timeframe February 2003 – January 2006

Exploring animal welfare education materials currently available to primary, secondary and tertiary students

Farm Animal Health Staff Dr Robert Dixon

Summary The project will explore current education materials available in all forms for primary, secondary and tertiary (including TAFE and Vocational Education and Training – VET) students in the area of animal welfare providing:

- a summary of the key animal welfare issues covered and the perspective they are present from;
- level of demand for animal welfare education resources;
- explore the activities of other organisations ie NFF, RSPCA, AVA and CIWF in this field;
- recommendations regarding a need for education materials for either primary, secondary or tertiary students

The report to MLA formed the basis for the Australian Animal Welfare Strategy Review of Educational Resources in Animal Welfare 2007. MLA has undertaken a policy review in this area.

Source of Funding Meat and Livestock Australia

Project timeframe October 2005 – January 2006

OTHER COMPLETED PROJECTS

Lameness in sheep and other ruminants in Bhutan
National survey of the prevalence of footrot and development of specific footrot vaccine for Bhutan

Farm Animal Health Staff	Emeritus Professor John Egerton Dr Om Dhungyel
International Collaborators	Department of Livestock Services, Royal Government of Bhutan
Source of Funding	Australian Centre for International Agricultural Research Royal Government of Bhutan
Project timeframe	June 1999 – July 2002

Management of footrot in small ruminants in the hill districts of Nepal and Control of footrot in small ruminants in Nepal – vaccination and serosurveillance.

Farm Animal Health Staff:	Emeritus Professor John Egerton Dr Om Dhungyel Professor Richard Whittington
International Collaborators	Overseas Development Administration, Government of U K Lumle Agricultural Research Centre, Royal Government of Nepal.
Source of Funding	Australian Centre for International Agricultural Research (ACIAR) Overseas Development Administration, UK Royal Government of Nepal
Project timeframe	July 1993 – June 1999

Exposure Factors – OJD Infection & Clinical Disease (OJD.002)

FA&VPH Staff	Professor Richard Whittington Dr Om Dhungyel Ms Anna Waldron
PhD Students	Ms Helen McGregor Mr Sanjeev Gumber
National Collaborators	Professor Kym Abbott, Charles Sturt University Novartis Australia Ltd Merial Australia Pty Ltd
Source of Funding	Meat and Livestock Australia
Project timeframe	September 1999 – December 2004

Effects of whole-flock vaccination for OJD MLA OJD.015

FA&VPH Staff	Professor Peter Windsor Professor Richard Whittington Dr Om Dhungyel
PhD Student	Ms Helen McGregor
Source of Funding	Meat and Livestock Australia
Project timeframe	September 2000 – June 2004

Development of diagnostic and reference reagents for epizootic haematopoietic necrosis virus of finfish FRDC 2003/621

FA&VPH Staff	Professor Richard Whittington Ms Kylie Deece
National collaborators	Australian Animal Health Laboratory, CSIRO
Source of Funding	Fisheries Research and Development Corporation
Project timeframe	March 2003 – August 2004

A study of the biological and economic impacts of OJD in affected sheep flocks in NSW MLA OJD.023

FA&VPH Staff	Dr Jenny-Ann Toribio Professor Peter Windsor
PhD Student	Mr Russell Bush
Source of Funding	Meat and Livestock Australia
Project timeframe	September 2001 – October 2005

Epidemiology of ovine Johne's disease – pasture contamination level, age susceptibility and diagnostic tests MLA OJD.028

FA&VPH Staff	Professor Richard Whittington Dr Om Dhungyel Mrs Anna Waldron Ms Natalie Schiller Ms Angela Reeves
PhD Students	Ms Helen McGregor Mr Sanjeev Gumber
National collaborators	Australian Animal Health Laboratory, CSIRO
Source of Funding	Meat and Livestock Australia Limited
Project timeframe	November 2001 – June 2005

Identification of risk factors for OJD-infection level in sheep flocks MLA OJD.038

FA&VPH Staff	Dr Jenny-Ann Toribio Professor Richard Whittington
PhD Student	Mr Navneet Dhand
National collaborators	Dr Jeff Eppleston, Central Tablelands Rural Lands Protection Board Dr Evan Sergeant, AusVet Animal Health Services
Source of Funding	Meat and Livestock Australia
Project timeframe	January 2004 – June 2005

Neuromuscular physiology of nematode parasites of sheep

FA&VPH Staff	Professor Nick Sangster
International collaborators	Dr Janina Demeler Dr Arbeit Fellow (University of Hannover)
Source of Funding	Australian Research Council Pfizer Australia
Project timeframe	August 2003 – August 2005

Pilchard herpesvirus infection in wild pilchards FRDC 2002/044

FA&VPH Staff	Professor Richard Whittington
National collaborators	Dr Brian Jones*, Fisheries Department Western Australia Ms Melanie Crockford CSIRO Australian Animal Health Laboratory *Principal investigator
Source of Funding	Fisheries Research and Development Corporation
Project timeframe	December 2002 – December 2005

Enhancing the contribution of livestock within smallholder mixed farming systems in the Philippines - The Leyte Livestock Improvement Program (LLIP)

FA&VPH Staff	Dr Jenny-Ann Toribio
National collaborators	Dr Richard Clark – Project leader - Queensland DPI Dr Fay Rola-Rubzen – Curtin University Dr Bob Pym – University of Queensland
International collaborators	Dr Alberto Taveros – Project Leader Dr Agnes Taveros, Dr Eugene Lañada, Dr Fe Gabunada Leyte State University
Source of Funding	Australian Centre for International Agricultural Research (ACIAR)
Project timeframe	February 2000 – December 2005
