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

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National Collaborators
Australian Biosecurity CRC

International collaborators
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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
The aim of this project was to demonstrate whether pastures of low infectivity can be prepared and effectively used to reduce the level of OJD infection, potential production losses and mortalities from OJD in adult sheep in endemic infected flocks.

Sheep were exposed to different levels of *M. ptb*, from birth to weaning and/or from weaning onwards. The different levels of exposure were high (H), medium (M) and low (L) with the level of exposure in the H groups about 10 times higher than in the M groups. The L groups were not deliberately exposed to *M. ptb* but accidental contamination at very low levels did occur. The experiment was replicated.

The study demonstrated that careful management of young sheep can reduce the level of OJD in the flock and reduce the death rate. Steps taken to limit the degree of exposure of pre-weaned lambs to infection from pastures will lead to reduced rates of severe infection in those sheep in later years. Continuous exposure to OJD bacteria throughout early life results in higher infection rates than exposure which is limited to either the pre-weaning or the post-weaning period alone. A critical factor in management is to provide ‘low risk’ pastures to young sheep at weaning to give them a break from exposure to infection which occurs in the lambing paddocks.

Producers who successfully limit the infection will find themselves in an improved position. Additionally, by using the library of samples collected during the experiment, many more insights will be gained into the epidemiology of OJD, including the relationship between age at first exposure and the time before excretion of the organism, seroconversion, sub-clinical disease effects, clinical disease and death. These insights may allow the development of additional management options and systems which restrict the impact of OJD in flocks and will also improve the overall understanding of the pathogenesis of the disease, interpretation of existing and new diagnostic tests and the value of emerging research tools.

**Source of Funding**  
Meat and Livestock Australia

**Project timeframe**  
September 1999 – December 2004
Effects of whole-flock vaccination for OJD (OJD.015)

FA&VPH Staff
Professor Peter Windsor
Professor Richard Whittington
Dr Om Dhungyel

PhD Student
Ms Helen McGregor

Summary
Vaccination with Gudair ® vaccine in OJD infected flocks has commenced in Australia. To date, use of vaccine has been recommended to be limited to lambs in an attempt to protect sheep before OJD pathology becomes advanced. As vaccination is considered by many graziers to be their best option for reducing losses and managing the disease, careful documentation of the effects of vaccination in a high prevalence infected flock and in older sheep will enhance knowledge and understanding of the benefits of the whole-flock vaccination strategy.

The proprietors of a farm reported a very high mortality believed to be due to OJD. Early estimates suggested that 25% of the flock had died in 1999. A preliminary investigation by The University of Sydney supported the owner’s initial suspicion, with post mortem findings suggesting an annual mortality rate of 18.1% (+/- 12%). Vaccination of all sheep was favoured as the quickest way to reduce the OJD-contamination of pastures, the incidence of OJD and the death rate due to OJD.

The study concluded that vaccination combined with management changes led to a significant decline in the risk of OJD mortality and effective control of OJD in a heavily infected flock. Findings also suggested that vaccination may be beneficial in sheep as old as 8 months, even when exposed to a heavily contaminated environment since lambing. This information will have immediate application to a large number of affected producers in NSW who have chosen or are considering vaccination as their major or initial method of OJD control.

This study provided the first estimate of flock mortality due to OJD based on objective data and was central to explaining the economic impact of OJD in high prevalence flocks. This information assisted development of rational control programmes.

Source of Funding
Meat and Livestock Australia

Project timeframe
September 2000 – June 2004
A study of the biological and economic impacts of OJD in affected sheep flocks in NSW (OJD.023)

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

PhD Student
Mr Russell Bush

Summary
Anecdotal reports of the extent of mortality due to ovine Johne’s disease ranged from less than 1% to over 20% of adult sheep per year, but there were no objective data. The aim of this study was to estimate the annual mortality rate due to OJD on twelve affected sheep flocks in four different regions of NSW using the methods developed in project OJD.015.

OJD mortality estimates were derived from farm records (livestock inventories) and quarterly farm visits (necropsy inspections). A most likely cause of death was determined for 362 sheep on the basis of findings related to the environment, clinical signs, gross pathology and histopathology. OJD was most likely to have contributed to the death of 250 of these sheep. OJD mortality increased from 1 year of age (10.4%) to peak at 4 years of age (35.6%) and was very similar between wethers (49.6%) and breeding ewes (50.4%).

On the 12 farms, the average OJD mortality rate based on inventory records was 6.2% (range 2.1% to 17.5%), more than twice that considered acceptable (from all causes) in sheep flocks in southern Australia. The OJD prevalence in 2-year old sheep based on pooled faecal culture ranged from 0.7% to > 23% on the 12 farms and was found to be associated with OJD mortality rate.

The average decrease in gross margin due to a farm being infected with OJD was 6.4% (range 2.2% to 15.4%) and the average estimated cost of OJD losses on the 12 farms over the 12- month study period was $64,100 ($15,569 to $154,083). The average estimated cost of annual OJD losses/DSE was $7.68 ($0.84 to $20.51) while annual OJD losses/ha were $65.92 ($6.75 to $244.80).

This study provided the first objective data on the true impact of OJD and the findings are generally applicable to sheep flocks in southern Australia. Industry groups claiming that OJD does not present a threat on-farm can now be provided with accurate figures on direct losses attributable to OJD within the endemic area of NSW. There was a wide range of impacts, with some very high mortality rates. The data can be used to justify vaccination programs, other control options and the general concept of disease control and prevention.

The challenge for industry is to use the scientific findings from this study and other recent research to prepare education and extension material to address issues of misinformation about OJD and to develop cost effective strategies for the future control and management of OJD.

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 (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

Summary
The aim of this project was to determine whether pasture contamination rates and the age of sheep when they are first exposed to infection influence the occurrence of ovine Johne’s disease. The outcomes were targeted to improve understanding of the development of OJD and will facilitate development of control strategies based on pasture management.

The principle conclusions from this study were that post-weaning lambs were highly susceptible to infection with M. paratuberculosis and if exposed to high levels of contamination a proportion will develop severe infection leading to clinical disease and death. Hoggets and adult ewes are less likely than lambs to develop clinical disease after exposure to M. paratuberculosis. Nevertheless, even adult ewes may become infected and later act as a source for transmission of the disease. Lateral spread of OJD is a serious threat; it is not necessary for infected sheep to be present in a paddock for transmission of infection to occur if infected sheep are present in neighbouring paddocks. Conventional wire strand fences do not prevent spread of infection. For diagnosis on a flock basis, pooled faecal culture is more effective than the agar gel immunodiffusion assay for detection of the infection at relatively early stages in young sheep. Pooled faecal culture detected infection in sheep only 6 months after first exposure to contaminated pasture, when they were 11 months of age.

Samples were stored from sheep in this project for later research, for example in project OJD.031. In addition, blood samples were provided regularly to CSIRO for validation of the gamma-interferon assay for diagnosis of OJD.

The results of this study will have immediate impact on the management and control of OJD as they provide objective data to support and extend current recommendations for livestock grazing management.

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  (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

Summary
The level of clinical disease experienced due to ovine Johne’s disease (OJD) appears to vary considerably between infected sheep flocks in Australia, even for flocks in the same locality that appear to have similar characteristics. This has led to considerable speculation about the potential importance of flock management, soil type, pH and micro-nutrients. Sound understanding about factors that influence disease expression will lead to management recommendations that improve on-farm disease control.

The aim of this project was to identify risk factors for OJD expression in infected flocks and improve the understanding of the epidemiology of the infection. The project consisted of a cross-sectional study on 92 infected properties located in New South Wales, Victoria, Tasmania and Western Australia. The information obtained from each included the OJD prevalence in specific groups of adult sheep measured using pooled faecal culture, details of farm and flock management and soil analyses from paddocks on which the sheep sampled had grazed.

A total of 31 significant farm/flock/management and soil variables were found. Some were likely to be a consequence of OJD infection, but the remainder appeared to be potential risk factors for the severity of the disease. There was a strong relationship between the PFC results and the duration of flock infection, the level of OJD mortality, dam stocking rates, as well as a relation with parent soil type. There was also a consistent but statistically non-significant trend for lower OJD levels in 4-year olds compared to 3-year olds, which may be due to deaths of affected sheep from 2 to 3 years of age. Wethers had significantly higher OJD levels than ewes, which strongly supports the anecdotal observation of higher losses in wether mobs. Higher OJD prevalence was linked to measures correlated with soil fertility including cation exchange capacity, phosphorus buffer index and organic matter content of soil.

Successful completion of this project enables the development of additional recommendations for on-farm control measures for OJD to support vaccination, and may help clarify the ecological niche of *M. paratuberculosis*, the potential for disease spread into areas not currently affected and the likely level of disease that would be experienced in these areas.

Source of Funding
Meat and Livestock Australia

Project timeframe
January 2004 – June 2005
Enabling technologies of RNAi and cell culture for internal parasites of sheep (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.

RNAi is a technique of gene silencing where genes 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
Neuromuscular physiology of nematode parasites of sheep

FA&VPH Staff
Professor Nick Sangster

International collaborators
Dr Janina Demeler
Dr Arbeiten Fellow (University of Hannover)

Summary
The neuromuscular physiology of nematodes is a rich source of potential parasite control targets. Nerves and muscle are also the site of the action of a range of current anthelmintic drugs. This project has two parts, one to explore the neuromuscular basis of ivermectin resistance with a view to developing resistance detection assays and the second is to discover novel neuropeptides and their receptors which may be useful targets for parasite control.

Several assays are used in the laboratory to measure: muscle contraction (using a force transducer), development, motility, migration and electrical responses in the pharynx of worms. The laboratory is equipped with electrophysiology gear that can be used to measure a range of electrical responses, including patch clamp and voltage clamp. The project aimed to understand the pharmacology of avermectin/ivermectin resistance in sheep nematodes. This information will help develop tools for molecular diagnosis in the future. The work showed that:

- drug action and resistance occurred at two distinct sites, pharynx and body muscle of worms
- the two major drug classes act in similar ways but their receptor populations are not identical in distribution in the worms or/and the three species of parasites
- resistance is most likely due to different mechanisms in the different species and even isolates of the same species. A single test for resistance is not likely to be found

Janina Demeler who carried out this work was awarded her Dr Arbeit at the Tierartzliche Hochschule Hannover and the prize for the best thesis in 2005.

Source of Funding
Australian Research Council
Pfizer Australia

Project timeframe
August 2003 – August 2005
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
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

**Summary**

The quantity and value of aquaculture production will increase relative to wild harvest fisheries globally and as a consequence the international community is taking great interest in disease threats to finfish aquaculture. Epizootic haematopoietic necrosis (EHN) is one of the viral diseases of fish listed by the Office International des Epizooties (OIE) and occurs in parts of Australia. Due to the extreme virulence of the causative agent EHN virus (EHNV), its restricted geographic range and limited opportunities for study outside Australia, this country hosts the OIE Reference Laboratory for EHNV, based jointly at the University of Sydney Faculty of Veterinary Science and CSIRO Australian Animal Health Laboratory. In addition to providing research and diagnostic referral services to the Australian industry, the reference laboratory provides technical advice, protocols and reagents to laboratories throughout the world, thereby ensuring international diagnostic capability. This is required under international guidelines in trade in aquatic animal products, administered by the OIE. The OIE Reference Laboratory for EHNV represents an important contribution by Australia to the international community.

EHNV reference laboratory functions were identified as one of a number of high priority issues for funding under the Federal Government’s “Building a National Approach to Animal and Plant Health” program. The OIE Reference Laboratory for EHNV has provided reagents, protocols and diagnostic referral services to fish health laboratories in Australia and other countries for more than 10 years. Research on protocols for improved viral detection and differentiation from related viruses has been ongoing, and has been published in high quality journals. However, many of the original reagents were prepared in 1989-1992 and stocks of quality-controlled batches were almost exhausted. Furthermore, new protocols had recently been developed using modern tools of molecular biology but standardized DNA reagents were not available. The aim of this project was therefore to provide quality-controlled viral, tissue, antibody and DNA reagents and protocols to detect EHNV and to differentiate it from related viruses including BIV. A further aim was to develop and assess new storage conditions, guidelines for reconstitution and shelf life for these reagents.

Reagents and protocols for the detection of EHNV using the latest technology in ELISA, immunohistochemistry and molecular biology have been prepared, evaluated at an independent laboratory and are now available to laboratories in Australia and internationally. EHNV is a very serious pathogen. Consequently the reagents have been prepared using a new approach which will facilitate easy shipment in a stable form with no biosecurity risk. This is important in the current era of bioterrorism.

**Source of Funding**
Fisheries Research and Development Corporation

**Project timeframe**
March 2003 – August 2004
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

Summary
In 1995 and 1998 there were major epizootics in pilchards which spread from South Australia around the southern coastline of Australia until the entire geographic range of pilchards in Australian waters was affected. A herpesvirus was identified as the cause. There was a loss of 60% of pilchard biomass, devastation of the pilchard fishery and secondary effects on piscivorous birds such as penguins which failed to breed. The Joint Pilchard Scientific Working Group (JPSWG) was established under the Consultative Committee on Exotic Animal Diseases. The working group set priorities and coordinated research on the virus. Development of molecular diagnostic techniques was given highest priority as these will enable epidemiological studies to determine whether the virus is dormant in the pilchard population and whether or not it is coming in to the country through imported pilchard bait.

The aim of this study is to validate molecular diagnostic tests for pilchard herpesvirus and to put them to use in elucidating the biology of the virus, including a survey of wild pilchards. Sequencing of the viral genome will continue, in order to design more specific tools and also to compare the virus obtained in 1995 with that collected in 1998. Objectives include:

- To improve the polymerase chain reaction and in situ hybridization diagnostic assays which are based on limited sequence data by generation of further viral genome sequence data from the available stocks of virus
- To independently establish the sensitivity and specificity of the diagnostic assays at other laboratories
- To investigate basic aspects of the virus and the disease: tissue distribution of virus in infected fish, and the correlation between disease in fish and the presence of virus
- To survey wild pilchard populations to determine whether the virus is still currently detectable and causing disease
- To compare the herpesvirus strains from 1995 and 1998, and to compare, at the molecular level, this herpesvirus and this disease with two other similar herpesvirus fish diseases which have been reported elsewhere in the world

Source of Funding  Fisheries Research and Development Corporation

Project timeframe  December 2002 – December 2005
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
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 receipt 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
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
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
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

Summary:
Livestock are an important contributor to the social and economic wellbeing of resource-poor smallholder families in low-income countries. They provide tangible household benefits as a ready source of income, as well as benefits that are less tangible including the generation of employment, and the supply of inputs and services for crop production. Work from Africa suggests that livestock of all types on average make up 70% of farm investment and 40% of farm-generated income to smallholder families.

To date, most of the research and development work with smallholder farmers and their livestock in low-income countries has been conducted using traditional scientific methods. These methods have a strong focus of output-production such as the identification of new or improved knowledge or the development of a tangible solution to an identified problem. This is generally followed by a relatively linear sequence of problem identification, resolution and communication, and involved smallholder farmers as participants rather than partners in the research process. This project represents a substantial shift from traditional methodologies. Rather than focusing on the production of outputs, we are specifically seeking to build the capacity of farmers to improve the management, profitability and long-term sustainability of their livestock production systems through continuous improvement in their creativity, decisions, processes, practices and performance. Our work is focused on chicken and pig production systems, which play a key role in household income and nutrition for smallholder families in the Philippines.

LLIP Mission
‘Enhancing the wellbeing of smallholder families in western Leyte by increasing the capacity of farmers to continuously improve their pig and chicken production systems to achieve an average of 5% improvements in profit (gross margin), environment (specific KPIs), and energy efficiency (specific KPIs), this year and in the future’.

LLIP Objectives
1. To increase the capacity of participating producers to improve the management, profitability and long-term sustainability of their livestock systems through continuous improvement in their creativity, decisions, processes, practices and performance
2. To improve the contribution of livestock, in a measurable and sustainable way, to the social and economic wellbeing of smallholder families in western Leyte.

Source of Funding
Australian Centre for International Agricultural Research (ACIAR)

Project timeframe
February 2000 – December 2005
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 UK
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