PHD RESEARCH STUDENTS

Aspects of the pathogenesis of *Mycobacterium paratuberculosis* infection in sheep

**Mrs Kate Bower (nee Goldsmith)**
Research support: Meat & Livestock Australia
 Supervisors: Professor R Whittington, Dr D Begg, Dr K Bosward

Johne’s disease is characterised by a lengthy incubation period, measured in years. It is well known that cows with severe infections commonly shed the causative organism, *Mycobacterium paratuberculosis*, into their milk, and may also infect their unborn calf *in utero*. The organism can be isolated from extra-intestinal sites in such cases. There is a smaller body of evidence for this in sheep, but infection of tissues outside the gut is recognised in advanced cases in rams and ewes. The means by which the organism reaches sites outside the gut is uncertain, but may involve transfer via blood. The aim of this project is to identify extra-intestinal transfer of the organism during experimental and natural Johne’s disease infections in sheep.

Apoptosis in sheep with *Mycobacterium paratuberculosis* infection

**Ms Sally Browne**
Research support: Meat & Livestock Australia
 Supervisors: Dr K de Silva, Associate Professor D Emery

Johne’s disease is a chronic wasting condition of ruminants caused by *Mycobacterium avium* subsp. *paratuberculosis* (Mptb). Clinical disease is seen only in adult animals. More knowledge regarding the pathogenesis of this disease, including apoptotic responses during the course of infection, is needed to allow advances towards management and control of Johne’s disease. The aim of this project is to develop assays for detection of apoptosis in sheep then define apoptotic responses in sheep with OJD. In initial experiments, Merino sheep aged 7 months were orally dosed with the organism and samples were taken of many tissues. At this very early stage in the development of Johne’s disease, there were no significant differences in the percentage of caspase positive cells when lymph node cells were incubated in the presence of medium alone or Mptb antigen. However, at day 6 with Mptb antigen, cells from gut lymph nodes in animals exposed to the highest dosage tended to have a higher percentage of caspase positive cells than the medium controls. Cells from peripheral lymph nodes incubated with Mptb for 6 days had higher apoptotic activity than the medium only controls, regardless of exposure to Mptb. These results suggest that detecting apoptosis in response to Mptb antigen *in vitro* in lymph node cells may be useful in identifying animals exposed to Mptb. Further studies are being carried out at later time points in the disease.

A study of the biological and financial impact of OJD in affected sheep flocks in NSW

**Mr Russell Bush**
Research support: Meat and Livestock Australia.
 Supervisors: Dr JA Toribio, Dr P Windsor, Dr S Webster
Completed: December 2005

Debate continues regarding the impact on infected farms of Ovine Johne’s disease (OJD), a chronic enteric disease of sheep caused by the bacterium *Mycobacterium paratuberculosis*. Accurate estimation of annual mortality rates and the proportion attributable to OJD could provide an insight into the financial significance of this disease. The study quantified OJD mortalities in 12 flocks across four districts of south-eastern NSW, confirming considerable mortality rates (average 6.2%, range 2.1 to 17.5%) contributed to significant financial loss during the 12-month study period. Industry groups can now be provided with accurate figures on direct OJD losses within the endemic area of NSW. The data can be used to justify vaccination programs, and contribute to the development of cost effective strategies for future control and management. Further work on economic modelling will lead to tools being made available to farmers to enable them to optimise disease control programs.
Identification of risk factors for OJD infection-level in sheep flocks

Mr Navneet Kumar Dhand
Research support: University of Sydney International Postgraduate Research Scholarship, Meat and Livestock Australia.
Supervisors: Dr JA Toribio, Professor R Whittington
Completed: 2007

This project is designed to identify risk factors for the expression of Ovine Johne’s Disease (OJD) in 100 infected flocks through a cross sectional study of 3-4 year old sheep. OJD prevalence estimates will be based on pooled faecal culture. Information about OJD flock history, flock management practices and management of the 3-4 year old cohort will be collected by personal interviews. In addition, soil samples will be collected from the properties for analysis. Statistically significant associations between potential risk factors and OJD infection-level will be identified. The study is particularly focused on identifying risk factors that can be manipulated by farmers to improve on-farm control of OJD.

In vitro survival and dormancy of Mycobacterium paratuberculosis

Mr Sanjeev Gumber
Research support: University of Sydney International Postgraduate Research Scholarship and Meat and Livestock Australia.
Supervisors: Professor R Whittington, Dr D Taylor
Completed: December 2006

*Mycobacterium paratuberculosis* causes Johne’s disease, an economically significant problem in ruminants in most countries. This organism survives for long periods on pasture and soil, and as the infection is acquired by ingestion, control is difficult. This in-vitro study monitored the survival of the organism (sheep strain) following exposure to different time and temperature combinations. It showed that temperature flux has a more detrimental effect on the survival of *M. paratuberculosis* than peak temperature. Dormancy was also observed in these experiments. Further work will lead to characterisation of gene and protein expression in the organism during growth and induction of dormancy in experimental models. This knowledge will inform our understanding about the survival of the organism in the environment and also in the host during the development of OJD.

Detection of Mycobacterium avium. Subsp. paratuberculosis in sheep faeces by direct Quantitative PCR

Ms Satoko Kawaji
Research support: Endeavour Japan Post Graduate Research Scholarship and Meat and Livestock Australia.
Supervisors: Professor R Whittington, Dr D Taylor

Satoko’s research is focusing on the detection of *Mycobacterium avium* subsp. *paratuberculosis* (MAP) in ovine faeces by direct quantitative PCR. MAP is a causative agent of Johne’s Disease (JD), which is a chronic progressive enteritis of ruminants prevalent worldwide and causes significant economic damage to livestock farming. Although one of the gold standard tests to diagnose JD is isolation of MAP from shedding animals by culture, this organism grows very slowly and often takes several months to form a visible colony on solid media. To develop a new diagnostic method faster and more sensitive than culture, a real-time PCR based test is being validated for use on the detection of MAP DNA in ovine faeces. This tool will be used in basic pathogenic studies in sheep and cattle in the second part of the PhD program.
Comparison of the S and C strains of *Mycobacterium paratuberculosis* at genome and proteome levels

Mr Ian Marsh  
Research support: Meat and Livestock Australia, NSW Department of Primary Industries  
Supervisor: Professor R Whittington  
Completed: March 2006

Johne’s disease (JD), a chronic and incurable disease affecting many ruminant species, is caused by *Mycobacterium avium* subsp. *paratuberculosis* (*M. a. paratuberculosis*). *M. a. paratuberculosis* strains can be divided into two groups known as sheep and cattle strains. The host range for the cattle strain is quite broad but the sheep strain primarily affects sheep. S and C strains have different cultural requirements. Little is known about the differences between S and C strains with respect to mechanisms of host specificity and pathogenicity. A greater understanding of these characteristics at the genome level would greatly assist in the control and management of JD both in Australia and abroad. In this study the genomes of S and C strains were compared using representational difference analysis, genome microarray and proteomic techniques. The differences observed thus far are greater than were previously suspected from existing restriction fragment length polymorphism analysis data, include major genetic deletions, and may be related to phenotype.

Ovine Johne’s disease – investigating mortality rates, disease transmission and control

Ms Helen McGregor  
Research support: Meat & Livestock Australia, NSW Stud Merino Breeders Association, CSL and proprietors of the study properties  
Supervisors: Associate Professor P Windsor, Professor R Whittington  
Completed: 2008

OJD infection in Australian sheep flocks continues to cause significant losses due to mortality but losses in the sub-clinical phase of the disease have not been widely investigated under Australian conditions. Estimates to be made in this study of sub-clinical losses include reduction in wool growth and retardation in growth rates and their relationship with the development of clinical disease. This may provide insight into disease pathogenesis. Obtaining an accurate estimate of crude mortality rates and mortality risk in a flock and the proportion of the mortality attributable to OJD will establish the cost of the disease. Determining the contribution of pasture contamination rates and age of sheep, when first exposed to the disease, to incidence of disease in a flock, mortality rate attributable to OJD, the incubation period and the timing of diagnosis will lead to greater understanding of possible strategies for control and monitoring of diseased flocks. Documentation of the effects of whole flock vaccination on faecal excretion rates and mortalities in a high prevalence infected flock will enhance the knowledge and understanding of the benefits of a whole flock vaccination strategy including effects on adult excretion and cyclical pasture contamination.
Genomic and phenotypic comparison of isolates of *Mycobacterium sp.* that contain IS900-like elements

Mr Martin McLoon  
Research support: Meat and Livestock Australia, NSW Department of Primary Industries  
Supervisor: Professor R Whittington  
Completed: December 2007

Ovine Johne’s disease (OJD) is an important economic concern of Australian agriculture. The early diagnosis and implementation of control measures on properties with infected stock is the most effective way in preventing further spread of the disease. Presently a diagnosis of OJD relies on culture of the causal agent, *Mycobacterium paratuberculosis*, highlighting a mycobactin dependent phenotype in conjunction with PCR for the insertion sequence IS900. Detection of IS900 is included as a confirmatory test, and in some cases, the sole test because it has been shown to be unique to *M. paratuberculosis*. However, environmental mycobacterial isolates have been discovered which cause a cross reaction in the PCR for IS900 creating a false positive result and indicating the existence of IS900-like insertion sequences. To prevent false positive results a post PCR test was developed. To ensure the validity of this IS900 PCR-REA there is a need to characterise the mycobacterial isolates that possess an IS900-like insertion sequence at both a phenotypic and genotypic level, as well as the individual IS900-like insertion sequences. This analysis will allow a better understanding of the threat they pose to OJD diagnosis and their taxonomic position within the *Mycobacterium* genus.

Genetic and proteomic differentiation of stages of *Mycobacterium paratuberculosis* infection

Mrs Ling Zhong  
Research support: Meat & Livestock Australia  
Supervisors: Professor R Whittington, Dr D Taylor, Dr L Di Fiore

Johne’s disease is a chronic disease affecting ruminants and other hosts. It is caused by *Mycobacterium paratuberculosis*. The events leading to clinical disease are complex and poorly understood but obvious signs of disease are seen only in adult animals. The genome sequence of the causative organism was recently published and this has triggered a dramatic interest in genomics and proteomics to elucidate mechanisms of disease. During this study a range of genomic and proteomic techniques will be applied to study the early stages of infection of sheep with this organism, and to contrast findings with those occurring later in the disease process. This information will be used to design improved diagnostic tests and disease control strategies.

The sheep/ *Haemonchus contortus* relationship

Ms Kate McMaster  
Research support: Meat and Livestock Australia.  
Supervisors: Associate Professor N Sangster, Dr K Bosward

*Haemonchus contortus* is one of the most economically important parasites in the Australian sheep industry. In recent years resistance to parasitic drugs has forced both sheep producers and researchers to look for alternative means of parasite control. A better understanding of the host parasite relationship is an essential step in discovering improved control measures. The balance of the host parasite relationship shifts depending on the status of the host, for example age or reproductive status, and how the parasite responds. Studying the development of the protective immune response of the sheep when infected with *Haemonchus* will enable a better understanding of the host-parasite relationship and should provide the means to measure the development and mechanisms of immunity and resilience to infection. This will indicate whether we can predict or modulate the response towards protection or test the host’s “resistance status” for selection purposes. It is hoped that this investigation will provide producers with another tool to manage parasitic infections without resorting to anthelmintic treatment.
Investigation of various aspects of ovine footrot control by specific vaccination

Mrs Vidya Bhardwaj

Research support: Australian Wool Innovation
Supervisors: Dr O Dhungyel, Professor R Whittington

A research team based at the University of Sydney has been established to achieve eradication of ovine footrot by specific vaccination. Ovine footrot is caused by many different serotypes of the bacteria *Dichelobacter nodosus*. Effective immunity is provided by vaccinating against 2 serotypes only at a time. To achieve eradication of disease, a flock is serotyped and a specific vaccination used to eradicate that serotype.

Currently, a small percentage of sheep in a flock fails to respond to the vaccination. Our studies will investigate if this failure to respond is due to the host immune status or due to the nature of the footrot vaccination. Footrot is manifested either as a benign form or a more virulent one in a herd. A study of the protein structure of virulent bacteria is expected to show significant differences from the benign strains. This can then serve as a diagnostic tool to predict the severity of an outbreak. Evaluations of various sample sizes will show the smallest number of animals that are required for sampling to give a statistically significant result.

Topical anaesthesia in livestock- reducing pain and stress and enhancing wound healing and production

Ms Sabrina Lomax

Research support: Jean Walker Fellowship Fund (APA equivalent), Australian Research Council Linkage grant, Animal Ethics Pty Ltd, Bayer® Australia.
Supervisors: Associate Professor Peter Windsor, Associate Professor Peter Wynn, Dr. Meredith Sheil

Livestock husbandry procedures including mulesing, castration, tail-docking and dehorning cause considerable pain and suffering, yet are routinely conducted in Australia without the employment of anaesthesia or analgesia. While these procedures may be justifiable for animal health and management reasons, there is growing consumer concern, both nationally and internationally, regarding the infliction of pain on animals. This has the potential to significantly impact Australia’s exports as consumers move to select alternative products or those from more welfare conscious markets. This could not be more evident than in the current mulesing debate that has put the Australian wool market under intense scrutiny by international importers. The growing pressure to select wool from un-mulesed sheep has led to an industry push to phase out the procedure by 2010 should a viable solution not be found.

Our research group aims to develop industry and consumer acceptable methods of pain management in livestock husbandry, as well as introduce novel methods of pain assessment in animals. We have been conducting studies over the past 2 years on the application of a spray-on topical anaesthetic formulation, Tri-Solfen®, to the wounds inflicted by mulesing, castration and tail-docking. We have assessed wound sensitivity using Von Frey Hair stimulation, measuring local involuntary reflexes and central cognition. These responses were graded using a numerical rating scale (NRS). Observation of behavioural responses to pain was also conducted, along with a novel technique to assess wound healing which involved digital photography and computerized surface area measurement.
Studies of the Epidemiology and Risk Factors Involved in the Pathogenesis of Acorn Calf Disease in Australia

Mr Peter White
Research Support: Australian Post Graduate Award, Meat and Livestock Australia
Supervisors: Dr J-A Toribio and Associate Professor P Windsor.

Acorn calf disease is a congenital chondrodystrophy that has recently caused significant losses to many producers in southern NSW and northern Victoria. Affected calves are born with a range of skeletal deformities and are often stillborn or die soon after birth. Australian outbreaks appear to be associated with years of drought. Similar outbreaks have occurred worldwide, but a cause has never been established.

The University of Sydney, in collaboration with state Departments of Primary Industry and the NSW Rural Lands Protections Boards, and with support from Meat and Livestock Australia, will conduct research into identifying the risk factors for Acorn Calf Disease. A survey of rural veterinarians will assist in establishing the distribution of the syndrome, which it is believed is under reported. A case-control study will be undertaken to identify the risk factors for the disease in Australia, with the aim of providing producers advice to reduce the occurrence of Acorn calves.

Improving reproductive performance during seasonal infertility: Identification of “at-risk” sows and the role of oocyte quality.

Mr Michael Bertoldo
Supervisors: Dr C Grupen, Dr T Holyoake, Professor G Evans

Seasonal infertility (SI) is a phenomenon that is reported in the pork production industry in most countries of the world. It is manifested by delayed onset of puberty, increased weaning to oestrus interval and reduced farrowing rate. Of these, reduced farrowing rate through pregnancy loss has the largest economic significance as producers cannot predict or maintain production volume. The proposed research seeks to identify sow and farm-specific risk factors for pregnancy loss during the SI period.

It is proposed that oocyte quality is reduced during SI as a result of reduced follicular steroids. We hypothesize that “at-risk” sows are more susceptible to these adverse environmental conditions, resulting in reduced farrowing rates. The findings from this research will provide a sound database on which to develop intervention strategies for pork producers to manage and house their breeding animals to minimise the risk of pregnancy loss during SI.
Reducing antibiotic usage in pig herds: controlling *Lawsonia intracellularis* by vaccination, housing and hygiene.

**Ms Meg Donahoo**  
Research Support: Australian Research Council Linkage Grant, NSW Department of Primary Industry, Boehringer Ingelheim  
Supervisors: Assoc Prof D Emery, Dr T Holyoake, Dr A Collins.

Proliferative enteritis (PE) is an intestinal disease of pigs caused by the intracellular bacteria *Lawsonia intracellularis*. It is a major profit-limiting disease for pig producers globally and affected herds suffer from reduced growth, diarrhoea and increased mortalities. A new vaccine, Enterisol Ileitis® is now registered for commercial use in Australia as an alternative to antibiotics to control PE in pig herds. The immunology section of this project involves undertaking experiments focussed on improving the efficacy of the Enterisol Ileitis® vaccine under Australian pig management systems and to induce immunity to Australian field isolates of *L. intracellularis*. Approaches include determining the protective efficacy of the vaccine before weaning, identifying immune correlates associated with vaccine protection and determining an optimal medication-free window for vaccination.

Specialised management of gilts and their progeny

**Ms Yvette Miller**  
Research support: Australian Pork Ltd  
Supervisors: Dr T Holyoake, Dr A Collins, Mr R Smits.

The 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. The projects seeks to: provide extensive training in pig health and production to provide for succession in the Australian pig industry; improve the pre-weaning growth performance of gilt progeny using supplemental milk; identify risk factors that explain why gilt progeny perform poorly, relative to sow progeny; and, develop management strategies to control the risk factors and hence improve the performance of grower pigs.

Peri-urban regional surveillance for biosecurity for pigs in eastern Australia

**Mrs Nicole Schembri**  
Research support: Australian Biosecurity CRC for Emerging Infectious Disease  
Supervisors: Dr T Holyoake, Dr J-A Toribio.

Exotic diseases such as foot and mouth disease may enter Australia through anthropogenic means, most likely closely associated with large urban centres. Pigs in peri-urban settings may be the initial focus of a disease outbreak. This project involves reviewing current pig keeping legislation, educating producers about awareness of abnormal behaviours and clinical signs of disease, reviewing current extension materials and methods, as well as possible alternative animal identification technologies. The information obtained will be used to locate peri-urban pig producers, identify and track pig movements, and improve producer awareness of disease.
Biotechnology and epidemiology to control nodavirus in barramundi aquaculture

Mrs Kylie Gore  
Research support: Australian Post Graduate Award (Industry), Australian Research Council Linkage Grant, Northern Territory Government, Darwin Aquaculture Centre and Berrimah Veterinary Laboratory  
Supervisors: Professor R Whittington, Mr G Schipp and Dr D Begg

The barramundi aquaculture industry in Australia has been threatened by a significant new viral infection affecting larvae and juveniles of a number of fish species worldwide. Discovered in the last 20 years, nodavirus causes a disease known as viral nervous necrosis (VNN) which can result in mortalities approaching 100% in hatchery-reared larvae. Knowledge of the epidemiology of nodavirus infection in barramundi is currently limited and control of the disease remains elusive. This is further compounded by the lack of sensitive diagnostic tests available. The University of Sydney has teamed up with industry partners in the Northern Territory to investigate VNN and develop sensitive diagnostic assays. With the development of an enzyme-linked immunosorbent assay (ELISA) to detect (i) the presence of nodavirus and (ii) specific antibodies against nodavirus in the serum, nodavirus-free broodstock can then be selected for aquaculture programs. A comprehensive survey of aquaculture facilities will then provide valuable information on epidemiology of the disease and enable development of an integrated disease control strategy.

Application of molecular diagnostic techniques to epidemiological investigations of Viral Nervous Necrosis (VNN) in barramundi aquaculture

Mr Paul Hick  
Research support: Australian Post Graduate Award (Industry), Australian Research Council Linkage Grant, Northern Territory Government, Darwin Aquaculture Centre and Berrimah Veterinary Laboratory  
Supervisors: Professor R Whittington, Dr D Taylor and Dr J Humphrey

A research team based at the University of Sydney with industry partners in the Northern Territory has been established to investigate Viral Nervous Necrosis (VNN), a devastating disease of juvenile fish. Caused by a Betanodavirus, VNN has emerged globally in the previous 20 years in many situations where fish are produced in hatcheries. Within Australia, VNN has proved to be an impediment to the development of the barramundi aquaculture industry as a consequence of unpredictable supply of juvenile fish and concerns regarding the dissemination of the virus into wild fish populations.

Comparison of existing diagnostic techniques to new molecular technologies is expected to provide a refined set of tools for gathering epidemiological information about VNN. Investigation of disease pathogenesis will be facilitated by a series of infection trials. A survey of wild barramundi populations will determine disease prevalence based on the existing disease control zones within the Northern Territory whilst a survey of wild fish populations will establish disease prevalence in a variety of fish species.
Understanding and mitigating domestic pig and wildlife interactions

Miss Hayley Pearson  
Research support and funding: Australian Pork Limited  
Research support: Invasive Animals CRC  
Supervisors: Dr J-A Toribio, Dr S Lapidge

Wildlife has been a source of emergent disease for livestock, causing billions of dollars of economic impact. There are a number of diseases in domestic pigs that were sourced from wild animal hosts. As domestic pigs may come into contact with a range of wildlife species in Australia, this project firstly aims to determine what animal species are most frequently observed in and around piggeries and are of concern to commercial piggery owners in Australia. This will be determined by responses to a postal questionnaire that will be distributed to all commercial piggery producers in Australia via Australian Pork Limited. Further aims of the project include determining whether there are interactions between domestic pigs and wildlife species, whether these wildlife species are carriers of diseases infectious to the pigs, and determining whether the wildlife are the possible source of infection in the pigs. It is expected that this project will significantly contribute to the understanding of how wildlife contribute to the disease load on pig farms. The specific outcomes are expected to be recommendations to producers and the industry as a whole on mitigating risk.

Modelling the emergence of avian influenza in the Australian poultry industry

Mr Sam Hamilton  
Research support: Australian Biosecurity CRC for Emerging Infectious Disease, Department of Agriculture, Fisheries and Forestry  
Supervisors: Dr J-A Toribio, Dr G Garner

Highly pathogenic avian influenza (HPAI) poses a serious threat to the Australian poultry industry and potentially also to public health in this country given recent occurrence of human deaths in south-east Asia. Disease modelling, by evaluating the behaviour of this disease under Australian conditions and the effect of alternate control strategies, is recognised as an important tool to support Australia’s preparedness for an incursion of this disease in our poultry population. This project, working with government and industry, will develop a new model of the spread of HPAI within the Australian intensive poultry 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 policy in the event of an outbreak of HPAI.

Remote area syndrome surveillance systems for cattle

Mr Richard Shephard  
Research support: Meat and Livestock Australia, Australian Biosecurity CRC  
Supervisors: Dr JA Toribio, Dr Peter Thomson, Dr Angus Cameron  
Completed: November 2006

Remote extensive cattle grazing regions of Australia are characterised by large herds, long distances between properties and communities, little requirement for veterinary input, sparse veterinary services and inadequate surveillance coverage. This project investigates the potential for syndromic disease information to be captured by lay observers using the disease diagnostic program BOVID, analysed to compare prevalence of symptoms across regions and time periods, and used to determine the relative likelihood of individual disease occurrence. Changes in relative frequencies result in a ‘trigger’, notifying local government veterinary authorities that a given disease syndrome has emerged or changed in frequency, potentially leading to targeted surveillance efforts being focused towards investigation of the syndrome.
Investigating role of wildlife and wild canids in transmission of *Neospora Caninum*

**Ms Jessica King**  
Research support: Invasive Animal Cooperative Research Centre  
Supervisors: Associate Professor P Windsor, Dr J Ellis, Dr P Fleming and Dr D Jenkins

*Neospora caninum* is a cyst-forming coccidian protozoan parasite which was first described as causing fatal neurological disorders in dogs and has since emerged as a major cause of abortion in cattle worldwide. It is estimated to cost the Australian dairy and beef industries up to $30 million per annum. Research in NSW has suggested there is a canine-bovine life cycle involved in bovine neosporosis, with many outbreaks associated with the proximity to bush land, where wild canids are at higher densities. However, data to support the hypothesis that wild canids are a source of infection to cattle is lacking and the possible role of foxes and other carnivores including native animals in bovine neosporosis needs investigation. It is also possible that a sylvatic cycle involving wild canids and wildlife similar to that of hydatidosis prevails in areas where *N caninum* is endemic, with some preliminary studies suggesting infection may be common in some native wildlife, such as possums.

The aim of this study is to gather evidence to test the hypothesis that there is an association between prevalence of *N caninum* in wild canids and other wildlife, and that in cattle. Faecal, tissue and blood samples from target animals will be obtained from localities adjacent to cattle herds where reproductive problems due to *N caninum* have been identified, and examined by diagnostic tests including ELISA or agglutination tests, and PCR’s, in habitats adjacent to farms where endemic bovine neosporosis has been diagnosed. These data will enable spatial epidemiological analysis of the prevalence and distribution of *N caninum* serovars in wild canid and wildlife populations, potentially enabling modeling of neosporosis risk and assisting management of reproductive failure in cattle.

Healthy Dogs Healthy Communities - Approaches to knowledge sharing education to sustain dog health initiatives in remote Indigenous communities

**Ms Sophie Constable**  
Research Support: Australian Postgraduate Award, Australian Research Council Linkage Grant  
Supervisors: Dr RJ Dixon, Dr RM Dixon

Dog poor is poor in many remote Indigenous communities compared to urban and rural averages. The Healthy Dogs Healthy Communities Program aims to explore current dog and community health as well as investigating the effect of dog health and dog health education programs.

This study aims to evaluate the use of education as a health strategy by identifying and analysing factors that lead to a successful culturally relevant, evidenced based, generative curriculum education program in 6 remote Indigenous communities. It is expected that the results of the project will enhance effectiveness and sustainability of future dog health and community health initiatives in remote Indigenous communities.