FARM ANIMAL & VETERINARY PUBLIC HEALTH

Introduction

Our population-based work in teaching, research and service aims to address global food security and health issues and provide the greatest possible benefit to the community. We have a critical mass of academics, students and support staff with high level multidisciplinary capacity to provide solutions to problems that range across many animal species, a variety of industries and from local to international in scope. We work extensively with collaborators from other institutions and the private sector in Australia and overseas, with a very large network of collaborators in government, industry, academia and business. We strive to ensure that our work is relevant and meets current and future global community needs.

The work of our group is dependent on funding provided by external competitive research grants requiring high caliber projects with practical outcomes. As future leaders of national and international research and development services we place high value on our post graduate students. A summary of each of their projects is included in this report. There have been many scientific outputs from our work, extensively recorded in peer reviewed publications and conference proceedings and these are also listed in the report.

Our group promotes the traditional disciplines of veterinary microbiology, epidemiology and pathology by developing programs of research in diverse areas including infectious diseases, public health, food security, animal welfare and disease control. A range of the traditional and some emerging farm animal species and industries is included: sheep, cattle, other ruminants, pigs, chickens and aquatic animals and we also have research programs addressing wildlife and companion animal infectious diseases. With such broad strategic interests, the Faculty has significantly invested in our staff and our group will continue to play a key leadership role in ensuring animal health professionals have the skills needed to support and strengthen Australia’s livestock industries, public and animal health.

Veterinary Public Health & Food Safety

The focus of the Veterinary Public Health & Food Safety program within the Faculty is on infectious diseases of livestock, wildlife and companion animals and their ability to cause human infections via direct contact or foodborne exposure.

This program was founded with funding from Meat & Livestock Australia Ltd and it has grown to become the leading Veterinary Public Health & Food Safety program in Australasia. The program is funded by many agencies, including the Australian Research Council, the Commonwealth Department of Agriculture, Meat & Livestock Australia, Australian Pork Limited, the Australian Centre for International Agricultural Research and the Pork CRC.

Research highlights, 2009-2013 include:
- E. coli O157 colonisation and shedding in cattle;
- comprehensive risk factor analysis of E.coli scours in the piggery environment;
- the role of wildlife in emergency disease outbreaks;
- risk assessment and simulation modelling framework for exotic disease prioritisation in the Australian pig industry;
- rabies risk assessment in eastern Indonesia, East Timor, Papua New Guinea and northern Australia;
- the potential spread of rabies in northern Australia;
- brucellosis in West and East Timor;
- companion animal surveillance systems.

During this period 91 papers have been published in the international peer-reviewed literature, including the high-ranking journals PLoS Neglected Tropical Diseases, Emerging Infectious Diseases and Veterinary Research. A total of 29 postgraduate students have been trained. In addition, the Faculty’s postgraduate coursework program in Veterinary Public Health has graduated more than 65 professionals since 2003. To advance the key areas of One Health, emerging infectious diseases and biosecurity strategic links have been developed with the Marie Bashir Institute for Infections and Biosecurity and the New South Wales Centre for Animal and Plant Biosecurity.
Community and Professional Service and Outreach
We regularly provide advice to animal health agencies. Examples include consultancies addressing Arbovirus Surveillance Needs and the National Animal Monitoring Program, and the Technical Merits of Introducing Mandatory Recording for Sheep and Goat Movements, National Accreditation of Laboratory Diagnostic Tests, Disease Spread Minimisation in Access to Farmland for National Infrastructure Engineering Works, and Risks of Disease Spread in Creation of Public Water Storages. Advice and support was also provided to industry organisations (for example, Meat and Livestock Australia), the NSW Department of Primary Industries and the NSW Local Livestock Services (formerly the NSW Livestock Health and Pest Authorities and Rural Lands Protection Boards). The Faculty is well-connected to the aquatic animal industries through participation in the Subcommittee on Aquatic Animal Health which advises government and the Fisheries Research and Development Corporation Scientific Advisory Committee.

International aid projects and food security
We have been very successful in obtaining Australian Centre for International Agricultural Research (ACIAR) funding to conduct research projects that inform the regional development of the livestock and fisheries and aquaculture industries to address rural poverty in less developed countries in south-east Asia. Major projects in cattle and buffalo health and production are current in Laos and Cambodia and have informed regional Foot and Mouth Disease (FMD) control programs and identified limits to production imposed by parasites of economic significance. Our staff are involved also in projects in Indonesia, China and Pakistan and new projects are being developed in eastern Africa. We have a major fisheries program in Indonesia.

Livestock Welfare
Since 2007, in response to growing demand from consumers for improved welfare in livestock husbandry, including pain management during mulesing in the sheep industry, we conducted a very successful ARC Linkage funded research program in partnership with Animal Ethics Pty Ltd and Bayer Animal Health Australia that was completed in 2012. Two new projects have commenced in 2013 funded by Australian Wool Innovation for sheep welfare and Meat and Livestock Australia for northern beef welfare. This research continues to develop practical solutions for delivery of analgesia for improved animal welfare during routine husbandry procedures involving surgery including evaluating the application of pain management strategies for mulesing, castration, tail docking, dehorning and ear notching. ‘Team Pain’ has published eight peer reviewed papers and over 20 conference proceedings since its inception.

Endemic diseases in cattle and sheep

Major research program in Johne’s Disease
In the most concerted effort yet to come to grips with a complex and frustrating disease, the Faculty has joined with Meat and Livestock Australia (MLA) to undertake intensive research into Johne’s Disease (JD), a devastating and ultimately fatal disease of ruminants already entrenched in south eastern Australia. MLA provided a large grant to support research focused on the early diagnosis of infection in sheep. This was extended in 2011 and now addresses bovine Johne’s disease. This complemented other grants to enable a comprehensive on-farm and laboratory-based research program. As this is such a complex and difficult disease, quarantine restrictions have failed to halt its spread, industry has been polarised in its views on control options and the newly released vaccine does not fully prevent infection in sheep. The lack of basic knowledge about the disease is hindering the design of improved tests, treatment and vaccines. The MLA grant has enabled a team of four leading post doctoral scientists and additional research students to be established to study the basics of Johne’s infection. The latest genomics and proteomics technology were applied to the problem, and over three years discoveries were made leading to new tests capable of detecting the infection much sooner. In 2013 two of our new diagnostic tests were finalised: a new culture medium and procedure for culture of Mycobacterium paratuberculosis, and a new rapid faecal DNA test for this organism. These methods were fully validated through our laboratory epidemiology research program and are now available in animal health diagnostic laboratories throughout Australia.
In addition, our group manages a number of projects that continue to evaluate disease control options for ovine JD and in particular, monitoring the efficacy of Gudair™ vaccine in Australian sheep flocks. Introduction of the vaccine in 2002 had a major impact on reducing mortality from the disease but our research has identified that the disease persists in many infected flocks, with important disease control policy implications that continue to cause concern in many parts of the Australian wool industry. We have been very active in assisting progress in this JD vaccine debate, with our 12 peer reviewed publications (currently) on Gudair™ vaccine efficacy proving very useful in addressing the misinformation that has developed around OJD control.

**Vaccination program for virulent footrot in sheep**

Footrot is a disease with serious animal welfare concerns, and also causes substantial production losses. We have completed research funded by Australian Wool Innovation to validate specific vaccination to control and eradicate footrot in Southern Australia. The project was very successful and has been extended by the Departments of Primary Industries in South Australia and Tasmania in programs to vaccinate tens of thousands of sheep. Currently we are exploring opportunities for commercial manufacture of the vaccine.

We will start an exciting new research project in 2013 to develop new diagnostic tests for footrot, thanks to a substantial gift from Merino producer Mr Peter Wrigley that will fund a new PhD scholar. The latest molecular and genomic tools will be used to produce a rapid and accurate test for use in the vaccination program.

**Aquatic Animal Health**

Aquaculture is the fastest growing protein production industry globally. Capture fisheries (which is in decline) and aquaculture together represent gross value of production equivalent to the Australian wool industry. Leadership in teaching and research in aquatic animal health is on the Faculty’s agenda with a vertically integrated program of study in the BVSc curriculum and a 6 cp unit in the AVBS degree. This provides the background and motivation for students to continue in higher degree research pathways. Aquatic animal epidemiology is included as a unit of study in the Veterinary Public Health Management post graduate program and aquatic disease research was made available for the first time in 2004 to students in the BSc(vet) program, a one year full-time research stream within the BVSc curriculum. Research projects funded by Fisheries Research and Development Corporation (FRDC), ACIAR and the Murray Darling Basin Authority commenced in 2007 and cover topics as diverse as best management practice in shrimp aquaculture through to environmental impacts of fish viruses in threatened species. New diagnostic tests have been developed for nodavirus infection in barramundi aquaculture and these were applied to study epidemiology of the disease. The results have already led to changes in husbandry practices to reduce disease occurrence.

Other new tests to detect emerging viral pathogens which enter Australia with live ornamental fish imports enabled structured surveys. The results have led to review of Australian quarantine policy.

**Environmental immunology and oyster health**

A new research program commenced in 2011 using oysters as a model organism to develop better understanding of how major environmental disturbance affects population health. With the appointment of a new post doctoral fellow in environmental immunology we commenced research on Pacific oyster mortality syndrome (POMS), which has devastated oyster production in France and New Zealand. Fisheries Research and Development Corporation has provided substantial funding to continue this project in 2012, and we are working very closely with the oyster industry in order to develop practical husbandry solutions for this disease. A website was created to provide information to industry as the results of research come to hand. (www.oysterhealthsydney.org)
International reference laboratories
The Faculty has an internationally-recognised role in epidemiology and diagnosis of the notifiable viral disease of finfish, epizootic haematopoietic necrosis virus. The Faculty and the Australian Animal Health Laboratory host the World Organisation for Animal Health (Office International des Epizooties, OIE) Reference Laboratory for EHNV. This Laboratory provides research and a diagnostic referral service to the Australian industry, and ensures international diagnostic capabilities by providing technical advice, protocols and immunological and molecular biological reagents to laboratories worldwide. This supports international trade in aquatic animal products. Diseases such as EHNV present real challenges to both commercial fisheries and to the management of ecosystems worldwide. The Faculty was asked to lead a second international reference laboratory in 2009, for ranavirus. This group of pathogens is one of the causes of global amphibian declines. The reference laboratory will underpin conservation efforts for amphibians.

Capacity building in animal disease diagnosis
Australia faces an imminent shortage of expertise in animal health. In one project we found that 70% of experts in aquatic animal health in Australia are aged more than 50 years. There is a similar situation in terrestrial animal pathology. Furthermore, there is a shortage of people who can train the next generation. The Faculty of Veterinary Science is making an important contribution by establishing this strong program in Farm Animal and Veterinary Public Health to build scientific capacity. In addition, we initiated a NSW training program 'Pathology for Field Veterinarians' and ran successful 12 day courses in 2009, 2010 and 2011 to both improve animal disease diagnosis and the supervision of our final year veterinary students on rotations in Rural Public Practice with the NSW Local Livestock Services (formerly the NSW Livestock Health and Pest Authority) and Department of Primary Industry. (Pictured the 2010 graduating class.)

Rural and regional communities
The benefits of the research and post graduate activity covered in this five year report will accrue directly to rural communities and the wider community. The statistics on agricultural production are impressive: 17% of working Australians are employed directly and indirectly in farming, 50% of these in capital cities; farming contributes 12% of gross domestic product ($72 billion), 24% of goods and services exports ($26 billion), utilises 60% of the Australian landmass, and there have been productivity increases of 3 to 4% annually for 20 years.

We welcome feedback on any aspects of our program in Farm Animal and Veterinary Public Health.

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