

Research Projects

Current Research Projects available in the School of
Veterinary Science

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Development of a Digital Farm system to integrate remote sensor data

The project goal is to provide an agritech tool that farmers can use to incorporate sensor and other data into beef cattle management systems. The project will develop tools to capture sensor data to deliver a fully integrated animal, soil and pasture management system. The tool will allow producers to monitor a large number of variables that contribute to pasture and animal production continuously and in real time. Expected outcomes of the project include 1) Comprehensive sensor network (remote satellite; on farm soil, pasture, animal sensors); 2) Validation of sensor inputs against actual pasture, soil, animal measurements; 3) Comparison of predicted animal and pasture productivity (eg pasture biomass, animal live weight gain) against actual measurements

The successful applicant will enroll through the School of Veterinary Science. The successful applicants must have a scholarship or award to support their living allowance.

Contact:

Professor Jon Hill and Professor Kim Bryceson

E-mail: jonathan.hill@uq.edu.au

Pilot study determining the efficacy of two commercial formulations of pergolide to treat Pituitary pars intermedia dysfunction (PPID) in horses

PPID is a common disease afflicting horses (and ponies) throughout the world, with more than 20% of horses older than 15 years affected. Clinical signs of PPID include hypertrichosis, chronic infections; hyper- or anhydrosis and recurrent laminitis. Laminitis is a painful and incurable condition of horses resulting in loss of use, high veterinary and farrier expenses and decreased survival.

Elevated basal plasma adrenocorticotrophic hormone (ACTH) concentration is used to diagnose PPID. The dopamine agonist pergolide mesylate provides the most effective treatment for PPID. Dosages used to successfully control PPID range from 1 to 5 mg of pergolide daily. Treatment success is considered to be resolution of clinical signs and normalization of ACTH concentrations. There are anecdotal reports of high rates of treatment failures in horses and ponies being treated with liquid pergolide products. This may be because of inadequate dose or degraded drug because of inappropriate storage conditions and delays between manufacture and administration.

The proposed pilot study would enrol client owned horses and ponies with PPID. ACTH concentration will be periodically measured after treatment with a liquid and tablet formulations of pergolide. A dose escalation study will be performed until clinical signs and ACTH concentrations improve. The efficacy of liquid and tablet formulations of pergolide will be compared.

This project will only be available if funding is obtained.

Contact:

Dr Allison Stewart

<https://researchers.uq.edu.au/researcher/17455>

E-mail: allison.stewart@uq.edu.au

Comparison of the effects of storage and temperature on the stability of Australian liquid formulations of pergolide

PPID is a common disease afflicting horses (and ponies) throughout the world, with more than 20% of horses older than 15 years affected. Clinical signs of PPID include hypertrichosis, chronic infections; hyper- or anhydrosis and recurrent laminitis. Laminitis is a painful and incurable condition of horses resulting in loss of use, high veterinary and farrier expenses and decreased survival.

The dopamine agonist pergolide mesylate provides the most effective treatment for PPID. Dosages used to successfully

control PPID range from 1 to 5 mg of pergolide daily. Treatment success is considered to be resolution of clinical signs and normalization of ACTH concentrations. There are anecdotal reports of high rates of treatment failures in horses and ponies being treated with liquid pergolide products. This may be because of inadequate dose or degraded drug because of inappropriate storage conditions and delays between manufacture and administration.

Concentrations of pergolide in various commercially available products will be measured after exposure to various temperatures and periods of time using liquid chromatography-mass spectrometry (LC-MS).

This project will only be available if funding is obtained.

Contact:

Dr Allison Stewart

<https://researchers.uq.edu.au/researcher/17455>

E-mail: allison.stewart@uq.edu.au

Targeting the egg – novel strategies towards ovicidal scabies therapeutics.

Skin infestations with the mite *Sarcoptes scabiei* are becoming increasingly prevalent and have been recognised as a primary risk factor for secondary bacterial skin infections in tropical settings worldwide, including Northern Australia's Aboriginal and Torres Strait Islander population. As resistance to current drugs is emerging there is a critical need for new therapies.

The Bacterial Pathogenesis and Scabies Laboratory at QIMR Berghofer investigate how parasitic scabies mites cause disease and how they promote serious downstream infections. Another focus point is the development of new treatments. Most drugs currently in use have limited ovicidal activity, a major reason for treatment failures. Ivermectin and Permethrin are neuro-inhibitors targeting molecules involved in parasite mobility, but they have insufficient effect on the immobile egg stage. Eggs are protected by a dense egg shell, laid into the stratum corneum and separated by desquamation from the serum-containing lower epidermal layers, out of reach of host defence mechanisms and systemically administered drugs. This scenario underlines the importance of topical treatments that specifically target mite eggs.

The focus of this PhD project is to identify egg-specific drug targets, understand their biological roles, identify inhibitors and test them in vitro and in our porcine in vivo model.

Expected outcome: Fundamental knowledge about scabies mite embryogenesis and drug(s) that prevent egg hatching, to be developed as topical agent.

Subject categories:

Parasitology

Veterinary Medicine

Zoology / Animal Science

Molecular Biology

Biochemistry

Bioinformatics

Medical / Clinical Science

Microbiology

Contact:

Dr Katja Fischer

E-mail: Katja.Fischer@qimrberghofer.edu.au

Epidemiological, clinical and clinicopathological factors associated with the development and outcome of colitis in horses

Colitis in horses is a life-threatening syndrome causing severe diarrhoea, which may progress to shock and organ failure. Though multiple causes have been identified, in approximately 50% of cases a definite diagnosis remains elusive. The disease characteristics in the general horse population are ill-defined and risk factors poorly understood. This study aims to identify the risk factors and prevalence of colitis amongst horses in Australia, and to characterise determinants of prognosis and outcome. As a consequence, husbandry and treatment protocols for colitis may be altered to reduce the burden of this disease on Australian horses.

Honours or MPhil project (not yet funded; access to nation-wide data base available until June 2021)

Contact: Dr Carlos Medina-Torres

<http://researchers.uq.edu.au/researcher/16950>

Email: c.medina@uq.edu.au

Determining the prevalence of latent and lytic EHV-1 and EHV-4 infections in horses in South East Queensland

The prevalence of *Equid alphaherpesvirus* 1 and 4 (EHV-1 and -4) infection in the general horse population remains to be determined. The prevalence of latency, and the frequency of recrudescence, as well as the factors that induce it, are poorly characterised. The prevalence of EHV-1 and -4 latency in South-East Queensland (SE-QLD) has not been investigated. The effects of stress of transport and commingling on recrudescence (reactivation) from latent to lytic infections with EHV-1 and -4 remain unclear. Using polymerase chain reaction (PCR) and immunohistochemistry (IHC) on tissue samples and nasal swabs from abattoir specimens, this project will investigate 1) the prevalence of latent infection with EHV-1 & 4 in SE-QLD; 2) the rate of recrudescence after transport and comingling; and, 3) the prevalence of co-infection with EHV-1 & 4.

Contact: Dr Carlos Medina-Torres

<http://researchers.uq.edu.au/researcher/16950>

Email: c.medina@uq.edu.au

Contact patterns associated with pigs' social behaviours and their effects on the health and productivity of pen mates in commercial pig farms

Under natural or unconfined conditions pigs are known to be a socially active and manifest behavioural patterns (e.g. social noising, nose, root and oral manipulation) in an organised social structure. Pigs' social structure and their ability to express some of their natural behaviours changes under confined or intensive production systems. To better understand how direct (e.g. active behaviours through social learning) and indirect (e.g. pigs encountering a wounded or damaged tail) pigs' behaviours impact of on the health and productivity of that pig and other pen mates by social interactions, information is needed on the type and magnitude of contacts between pigs. In this project we aim to: a) describe behaviours, health and productivity parameters of individual pigs housed together in pens with and without environmental enrichment and b) to quantify the effects of removing individual pigs on the social structure, behaviours, health and productivity parameters of individual pigs housed together in pens with and without environmental enrichment. The findings of this project will provide commercial pig producers with recommendation that enhance their decision making process when selecting pigs based on behavioural or social characteristics to improve on herd's genetic pool, health and productivity.

Contact:

Dr John Alawneh

<http://researchers.uq.edu.au/researcher/2636>

Email: j.alawneh@uq.edu.au

Daily bulk milk data as a tool to monitor udder health and optimise productivity in SE Queensland dairy herds

The overall objective of this project is to identify and quantify any correlations found between change in the 'daily' (or more particularly a meaningful short-term average) bulk milk tank data (e.g. milk volume, milk solids, and milk somatic cell counts) of Australian dairy cows and their udder health, reproductive, and productive performance. The expected outcomes are (i) optimised treatment of raw bulk milk tank data and (ii) statistically verified and quantified relationships between (change in) bulk milk tank and any or all of: individual cow milk data, incidence risk of mastitis, calving to conception interval and reproductive performance. The rationale for the project is to provide SE Queensland dairy herd owners or managers with timely information about cows' udder health and to improve cows' reproductive and productive performance from data collected routinely at the farm gate, thereby increasing value to the owner and justifying investment in an intelligent management system incorporating daily bulk and individual cow milk data.

Contact:

Dr John Alawneh

<http://researchers.uq.edu.au/researcher/2636>

Email: j.alawneh@uq.edu.au

Mapping genes for fertility in beef cattle

- The beef industry in northern Australia is comprised primarily of *Bos indicus* breeds and their crosses
- Reproductive rates of Brahman cattle are considerably lower than that of *Bos taurus* cattle
- Genome-wide association studies undertaken by the Beef CRC yielded several candidate regions for fertility traits in Brahman and composite cattle
- This project will investigate these regions more closely using 'fine-mapping' approaches to identify functional polymorphisms that contribute to these traits
- Suitable for a PhD project

Contact:

Dr Russell Lyons & Dr Marina Fortes r.lyons2@uq.edu.au

Optimising live weight to monitor udder health and productivity in SE Queensland dairy herds

Over the last 30 years computer technologies have led to substantial improvements in the quantity and quality of information recorded on individual dairy farms. To date these developments have not yet delivered comprehensive systems that will allow the whole herd system to be monitored and managed. Commercially available walkover weighing scales can identify and record the live weight (LW) of dairy cattle as they enter or exit the dairy for milking. So too can modern milking parlours in relation to cow's milk production. An attractive feature of these systems is that it can be completely integrated into daily farming routine, and data generated can be turned into knowledge, further improving the objectivity of herd decision making.

The overall objective of this project is a) to quantify influence of exercise (specifically, the distance walked each day) on gut fill and its contribution to the variation in daily LW estimates; b) to identify and quantify any correlations found between change in the 'daily' (or more particularly a meaningful short-term average) individual (or bulk) milk and individual (or herd average) live weight data of dairy cows and their udder health and productivity performance; c) to develop algorithms to scan to an individual cow's LW and daily individual (or bulk) milk data to detect deviations from what is 'normal' for that individual cow (or herd) to further improve the objectivity of herd decision making.

The rationale for the project is to provide SE Queensland dairy herd owners or managers with timely information about cows' udder health and to improve cows' reproductive and productive performance from data collected routinely at the farm gate, thereby increasing value to the owner and justifying investment in an intelligent management system incorporating daily bulk and individual cow milk data.

Contact:

Dr John Alawneh

<http://researchers.uq.edu.au/researcher/2636>

Email: j.alawneh@uq.edu.au

PhD projects on nutritional and hormonal control of skeletal growth

We are looking for high achieving individuals to undertake post graduate study in the area of bone biology. These positions are primarily located within the School of Veterinary Science but join a collaborative group of scientists from the School of Agriculture and Food Sciences, the School of Biomedical Science and the Centre of Animal Science within the Queensland Alliance of Agriculture and Food Innovation. Access to equipment and facilities is available in all schools so that the student has access to the best facilities. The School of Veterinary Science is in its 76th year of operation and is one of eight schools within the UQ Faculty of Science. The School has almost 670 undergraduate and 85 Research Higher Degree students. The School of Veterinary Science has superb new facilities at the UQ Gatton Campus, providing the teaching, research and clinical infrastructure and resources to further develop its strong reputation as a leading provider of veterinary training, research and clinical care. The location of the positions will be determined by the project emphasis but it is anticipated that significant time will need to be spent on the Gatton campus with its excellent facilities. The Schools and their staff have a wide network of collaboration with industry and other research organisations. Being located in the sub-tropics and the Asia-Pacific region creates unique opportunities for research.

The Role

Our research aims to investigate mechanisms of bone growth and skeletal elongation in animals. The project is funded by Meat and Livestock Australia and has a good operational budget for the PG student to complete their work. This project will predominantly involve laboratory techniques including gene expression, immunohistochemistry, histomorphometry and hormone analysis to examine the factors that drive bone elongation during growth under a number of different nutritional treatments in cattle. The concepts have application to all animal species, including humans, and the skills acquired will position the person to move into research careers in medical science, veterinary science or agriculture. The project would not need to involve field work, but there is the opportunity to be involved in cattle field trials and sample collection if interested in this aspect of the research. The balance of laboratory and field work could be determined based on the skills and interest of successful candidates.

The Person

This role would suit a person with a degree in Science, Veterinary Science, Agriculture, Animal Science or similar disciplines. Candidates need to obtain an Australian Postgraduate Award (APA) or equivalent. Operational funds for the project are assured. Prospective students will be provided with assistance to apply for either an APA or, for international students, an International Postgraduate Research Scholarship (IPRS). For further information on scholarships please refer to <http://www.uq.edu.au/grad-school/scholarships-and-fees>. Candidates should have an excellent GPA (>5.5 on the UQ 7.0 scale) and a First Class Honours degree or equivalent and need to be eligible for an Australian Postgraduate Award (APA) or equivalent. Basic experience in molecular biology, cell biology, biochemistry, endocrinology, and/or histology would be desirable but training would be provided. We are looking for individuals who are high achievers and would join an international team of researchers with experience in molecular biology, cell biology, endocrinology, histology, bone metabolism and animal nutrition.

Contact:

Dr Lisa Kidd

<https://researchers.uq.edu.au/researcher/675>

E-mail: l.kidd@uq.edu.au

The generation of spermatogonial stem cells from equine induced pluripotent stem cells for the correction of genetic diseases and the restoration of fertility in geldings

Project: Colts are gelded (castrated) to make their management easier and to improve performance. While the gelding of colts certainly makes the management of housing, transport and competition easier, and may improve their performance, it poses a significant disadvantage at the end of their careers in that they cannot be used for breeding. We have recently generated induced pluripotent stem cells (iPSCs) from the dermal fibroblasts of a male thoroughbred. In this study, we will differentiate these iPSCs into spermatogonial stem cells (SSCs) that can be used to 'restore' fertility to geldings and that can be genetically manipulated using the CRISPR-Cas9 technology to correct any known genetic mutations linked to disease.

Candidate: Some experience with RNA extraction, RT-PCR and immunocytochemistry/immunohistochemistry is desirable. Experience with cell culture would be a significant advantage but is not essential.

Contact:

Dr Deanne Whitworth

<https://researchers.uq.edu.au/researcher/1183>

E-mail: d.whitworth@uq.edu.au

Determining the presence and persistence of colostral transfer of passive immunity against Hendra virus in foals, and their response to Hendra vaccination.

Hendra virus (HeV) is a uniquely Australian zoonotic virus of horses, posing significant economic, animal welfare, and public health concerns. The virus is transmitted from bats to horses.

An equine vaccine Equivac® HeV is available and antibody titres greater than 1:32 are considered protective. There have been no HeV cases in vaccinated horses. As there is no human vaccine for HeV, the most effective means of preventing human infection is through vaccination of horses. All horses at UQ are vaccinated, with foals vaccinated at 4-6 months of age.

Immunity in the equine neonate is conferred via transfer of passive immunoglobulins through ingestion of colostrum. Maternal antibody titres in foals may offer a short period of protection against HeV. The ideal time to vaccinate foals is unknown. The project will involve bleeding foals at birth and then every month until vaccination. Blood samples will also be collected after vaccination of different aged foals. HeV titres will be measured. PhD level projects may also involve laboratory work in the validation of other diagnostic tests to measure HeV antibody titres.

Contact:

Dr Allison Stewart

<https://researchers.uq.edu.au/researcher/17455>

E-mail: allison.stewart@uq.edu.au

The use of biologics as an alternative approach to improve calves' health and treat intramammary infection in cattle

Neonatal calf health and bovine mastitis is a field of growing interest. Before weaning, at about six weeks of age, the calves remain highly susceptible to disease and environmental stress. Common stress factors under current husbandry conditions (especially in intensive farming systems) include separation from the dam, consumption of low quality milk replacer, transport, group housing, inadequate colostrum intake and the excessive use of antibiotics. Diarrhoea and respiratory illnesses are the two primary causes of calf morbidity and mortality. Diarrhoea usually emerges very early on in life, followed by respiratory illness around four weeks of age. Consequently, farmers sustain significant economic losses due to the investment in antibiotics and stagnation, if not depression, in the growth rate of the calves.

Both contagious and environmental pathogens cause bovine mastitis. In Australia, the estimated cost of lost milk production arising as a result of mastitis is on average AUD\$200/cow/year or approximately, AUD\$130 million per year. There is paucity in the literature on potential regional differences in the risk of mastitis or mastitis-causing pathogens in Australia. Such information is crucial to the successful management of mastitis in Australian dairy cattle herds.

There is significant commercial importance in developing a biological solution that improves on calves' health and targets the bacteria responsible for dairy mastitis. A biological product avoids the issues of antimicrobial use, resistance and residues.

This project aims to produce a possible biological antibacterial solution to improve calves' health and reduce the impact of bovine mastitis problem.

This is a large project with multiple research components that are interlinked. Three PhD students are required for the initial stage of this project. Successful candidates will be supported to apply for relevant scholarships.

Contact:

Dr John Alawneh

<http://researchers.uq.edu.au/researcher/2636>

Email: j.alawneh@uq.edu.au

Investigating insulin and glucose dynamics in horses with Equine Metabolic Syndrome receiving phenylbutazone

Insulin dysregulation is the hallmark of Equine Metabolic Syndrome (EMS), a common medical condition characterized by a predisposition toward laminitis, a painful and stressful condition. Although the pathophysiology of EMS is still unclear, it has been shown that infusing insulin can trigger the development of laminitis in healthy horses establishing a link between hyperinsulinemia and laminitis. Phenylbutazone is the most commonly prescribed compound for the treatment of chronic laminitis. As a nonsteroidal anti-inflammatory drug, phenylbutazone blocks up to 90% of prostaglandin E₂ (PGE₂) production. In several species, it has been shown that suppression of PGE₂ production increases insulin secretion both directly and through incretin stimulation suggesting that phenylbutazone treatment could result in hyperinsulinemia and therefore exacerbate laminitis. Phenylbutazone treatment in healthy horses has been associated with hypoglycemia; however, its effects on insulin and glucose dynamics in horses with insulin dysregulation are yet to be determined. Thus, the proposed research is required to clarify whether an alternative treatment is needed for treating laminitis.

The documentation of phenylbutazone-induced hyperinsulinemia will justify the use of alternative methods of analgesia for the management of equine laminitis. If no effect is documented, the study will describe a peculiarity of the equine species and justify the current use of phenylbutazone in veterinary practice.

Contact:

Dr François-René Bertin

<https://researchers.uq.edu.au/researcher/15835>

E-mail: f.bertin@uq.edu.au

Effect of transport on adrenocorticotrophic hormone of healthy aged horses

Pituitary pars intermedia dysfunction (PPID) is a common disease of older horses affecting more than 20% of horses older than 15 years of age in Southern Queensland. This condition is caused by neurodegeneration of the inhibitory dopaminergic hypothalamic neurons resulting in adenomatous hyperplasia of the pars intermedia and increased adrenocorticotrophic hormone (ACTH) secretion.

Measuring increased concentrations of ACTH, either basal or after stimulation by thyrotropin-releasing hormone (TRH), is the most common method to diagnose PPID; however, as part of the hypothalamic pituitary adrenal axis, ACTH, is also involved in the response to stress. Therefore, in stressed horses, ACTH can be physiologically increased, and such an increase would be indistinguishable from ACTH increases caused by PPID, leading to erroneous diagnoses.

In a recent study, we have shown that ACTH was an unstable hormone that required rapid analysis justifying referral and therefore, transport of horses for endocrine investigation to referral centres. Transport is a known source of stress for horses but the effects of stress of transport on ACTH concentrations is unclear and thus makes interpretation of the results of diagnostic testing of horses after transport difficult.

Since horses often have to travel to veterinary hospitals for endocrine testing, improving our knowledge of the effect of transportation on subsequent measurement of endogenous and TRH stimulated ACTH concentrations will determine if such testing can be accurately performed upon admission or if it must be performed after a period of acclimatisation. This project would potentially result in decreased duration of hospitalisation for endocrine testing and decreased cost to owners as well as the possibility of a more sensitive outpatient diagnostic testing protocol. This study will thus improve the clarity on endocrine testing of horses after transport and will have a significant effect on the health and welfare of older horses worldwide.

Contact:

Dr François-René Bertin,

<https://researchers.uq.edu.au/researcher/15835>

E-mail: f.bertin@uq.edu.au

Animal welfare and ethics

Prospective students are welcome to contact Clive Phillips about possible projects within the Centre for Animal Welfare and Ethics. Current main areas of interest are the effects of transport on sheep behaviour, attitudes to transport and slaughter, the development of welfare indices for captive animals and the teaching of animal ethics to university students.

The Centre for Animal Welfare and Ethics is working in China and other Asian countries to examine the best ways to improve the welfare of livestock, especially in the pig and poultry industries. Opportunities exist for students to join the project and work on both farming systems and transport and slaughter of livestock. Students should have an interest and preferably training in animal welfare, and either the social sciences or animal behaviour and physiology.

Contact:

Prof. Clive Phillips

<https://researchers.uq.edu.au/researcher/1292>

E-mail: c.phillips@uq.edu.au