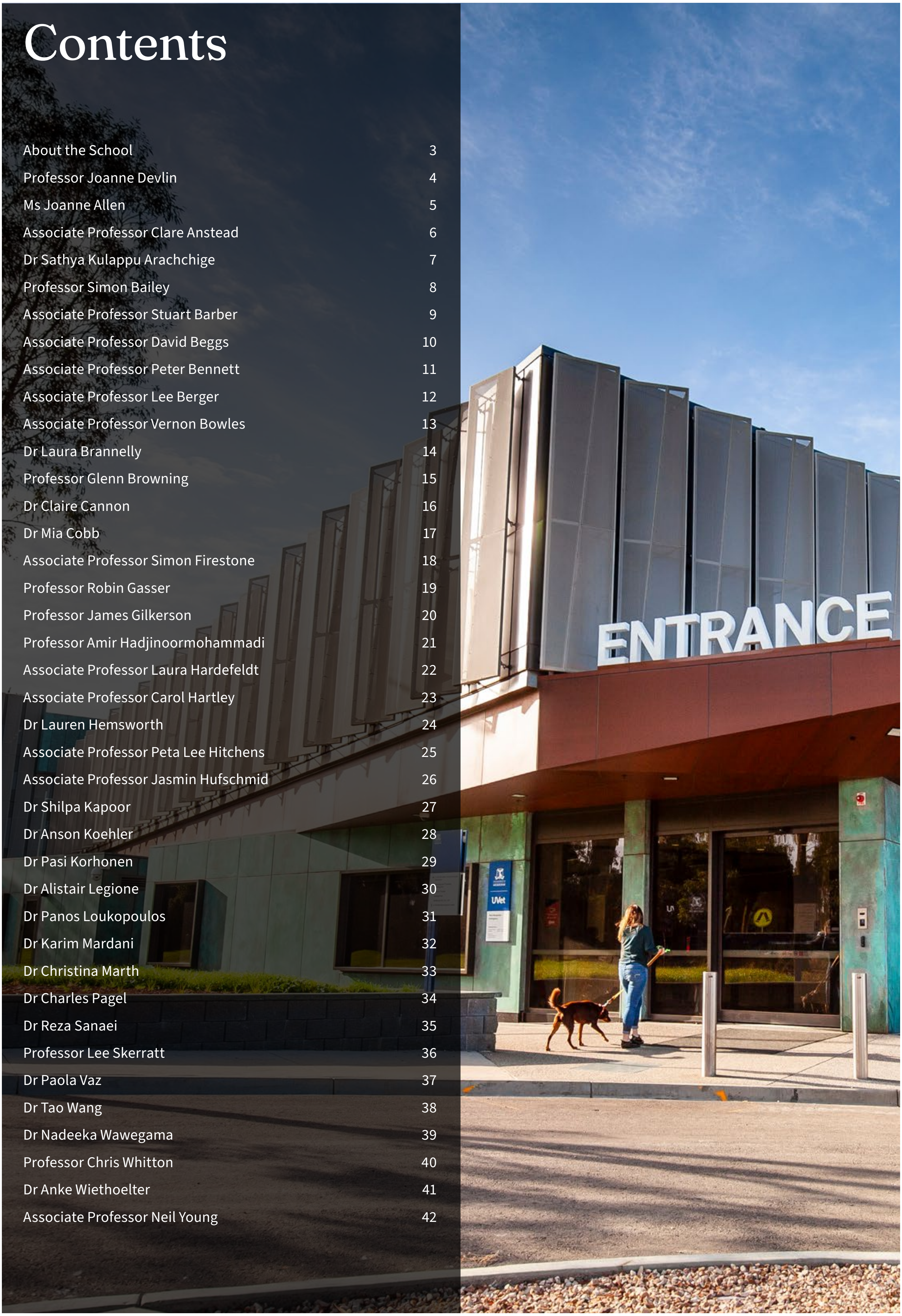
THE UNIVERSITY OF MELBOURNE

Faculty of Science

Melbourne Veterinary School

Research Prospectus

Contents



About the School

Melbourne Veterinary School (MVS) is one of Australia's leading veterinary schools, attracting talented and passionate students and academics.

By recognising and improving understanding of the complex interplay between the health of animals, humans, and our shared environment, we can achieve better outcomes for all. The School works across disciplines to tackle major global issues through world-renowned research, training, professional practice, industry engagement, and public outreach.

MVS staff are internationally recognised as leaders in their field. They are recipients of multiple awards from national and international veterinary and scientific organisations, and consulted by the Australian Veterinary Association, World Health Organization, Food and Agriculture Organization and World Organization for Animal Health on global issues.

The University of Melbourne's Faculty of Science acknowledges the Traditional Owners of the lands on which we work: the Wurundjeri Woi-Wurrung and Bunurong peoples (Burnley, Fishermans Bend, Parkville, Southbank and Werribee campuses), the Yorta Yorta Nation (Dookie and Shepparton campuses), and the Dja Dja Wurrung people (Creswick campus). We pay respect to their Elders, past and present. We also acknowledge and respect that Aboriginal and Torres Strait Islander people are this country's first scientists, with deep and enduring knowledge of the land, waters and skies.

Professor Joanne Devlin

Head of the Melbourne Veterinary School

Professor Joanne Devlin

- Veterinary virology
- Vaccines
- Diagnostics
- Infectious diseases
- Herpesviruses

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I focus on veterinary virology, including studying herpesvirus evolution and developing new vaccines and diagnostics for a range of pathogens impacting animal health.

Viral discovery and evolution

I engage with veterinarians in the field and combine clinical information and samples with laboratory research to study herpesviruses and prevent diseases – particularly infectious laryngotracheitis virus (ILTV) in poultry, but also herpesviruses of other species, including wildlife. This work has revealed the important role of natural recombination in herpesvirus evolution, and contributes to wildlife translocation and conservation efforts by improving screening for herpesvirus infection.

Molecular pathogenesis

I study and manipulate the genomes and molecular biology of ILTV and other veterinary herpesviruses, using traditional and CRISPR/Cas9 assisted homologous recombination techniques. I have used transcriptomics to study a range of herpesvirus infections in vitro and in vivo.

Veterinary vaccines and diagnostics

My applied research focuses on developing and testing novel vaccines and diagnostic tests for herpesviruses and other diseases. For example, I conduct vaccine trials in poultry in specialised facilities under controlled conditions.

Specialised facilities for poultry vaccine trials and other studies.

We work with wildlife veterinarians to better understand herpesvirus infections in Australian wildlife, including macropods such as eastern grey kangaroos.

Ms Joanne Allen

Ms Joanne Allen

- Bacterial genomics
- Diagnostic tests
- Vaccine development
- Bacterial pathogenesis
- Antimicrobial resistance

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Aligned with the mission of the Asia-Pacific Centre for Animal Health, I aim to understand the epidemiology and pathogenesis of infectious diseases of animals and improve strategies for vaccination, diagnosis, and management.

I focus on the molecular epidemiology of bacterial pathogens isolated from a wide variety of animal host species and environments. I have used genotyping tools, whole genome sequencing, and comparative phylogenetic analyses to investigate bacterial populations and outbreaks of disease.

My current research projects include:

- Investigating mortality events of the captive bred Lord Howe Island stick insect (Dryococelus australis)
- Improving diagnosis of strangles, an infectious disease of horses caused by Streptococcus equi equi
- Genomic characterisation of Pasteurella multocida, the agent that causes fowl cholera, associated with avian species in Australia.

In future, I aim to investigate the levels of antimicrobial resistance in Escherichia coli and Staphylococcus species isolated from dogs in Bhutan.

Associate Professor Clare Anstead

Associate Professor Clare Anstead

Insectary at Bio21 Molecular Science & Biotechnology Institute

- Parasitology
- Ectoparasites
- Australian sheep blowfly
- Omics technologies
- Drug discovery

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I contribute genomic and molecular expertise to inform sustainable parasite control strategies for the Australian wool industry.

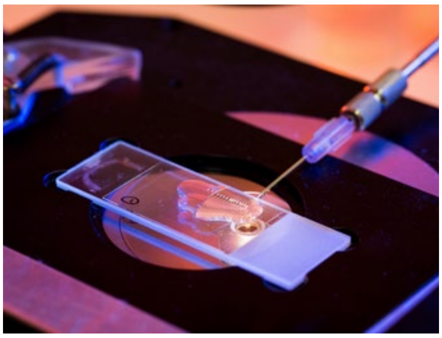
Flystrike (skin wounds) caused by the larvae of the parasitic Australian sheep blowfly, *Lucilia cuprina*, annually costs Australia around $320M. Current management involves insecticides and husbandry protocols including controversial *mulesing* – the surgical removal of wool-bearing skin from a sheep's buttocks. Rampant drug resistance and growing pressure to end mulesing due to animal welfare concerns are driving demand for alternatives.

I aim to forge a world-first pipeline for sustainable parasite control strategies using:

1. Genomics and genetic technologies (RNA interference) to discover novel drug targets
2. Machine learning to prioritise targets and identify candidate drugs, and
3. Larval killing assays to validate these drugs for commercialisation.

This work includes an Australian Research Council-funded Linkage Project. Collaborators include the Walter and Eliza Hall Institute of Medical Research, research partners in the USA and Brazil, and long-term industry partner Australian Wool Innovation. We will deliver new tools to reduce the cost and incidence of blowfly strike, limit dependence on invasive procedures, and support market access for ethically produced wool.

The Australian sheep blowfly (*Lucilia cuprina*).



Embryo microinjection of double-stranded RNA for RNA interference (RNAi).

Blowfly larvae (top: targeted with RNAi; bottom: control).

Dr Sathya Kulappu Arachchige

Dr Sathya Kulappu Arachchige

- Bacteriology
- Metagenomics
- Genomics
- Transcriptomics

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I aim to improve understanding and management of upper respiratory tract infection (URTI) in chickens, which impacts their welfare and is a costly issue for the Australian egg industry.

Investigating pathogens involved in URTI for faster diagnosis and more effective control

URTI in chickens is often complex, involving co-infection with bacteria and DNA and RNA viruses. Antibiotics can provide transient relief but do not eliminate the disease, which has a major impact on chicken welfare. Costs for the egg industry include vaccination, medication, and productivity losses. I study commercial free-ranging layer flocks in Australia to characterise the microbial pathogens present, determine their role in URTI, and identify their route of entry. My research informs URTI mitigation, including whether vaccination is necessary and, if so, with what strain of what pathogen.

My team has developed molecular tools to investigate host gene transcription (RNA-seq) in response to chronic infection with the bacterium Mycoplasma gallisepticum. These tools reveal post-infection changes in immune, metabolic, and cellular pathways in the chicken trachea and show the efficacy of a novel vaccine. We aim to develop a molecular assay to quickly and accurately identify all strains of bacteria and/or viruses involved in URTI cases. A similar approach could be applied in other host species to investigate other economically important disease complexes and inform control strategies.

Happy chickens mean more eggs.

Crusty nostrils of a chicken suffering from upper respiratory tract disease.

Professor Simon Bailey

Professor Simon Bailey

- Equine laminitis and endocrine disease
- Veterinary pharmacology
- Pathophysiology
- Novel anti-inflammatory therapies

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I improve understanding of disease processes and risk factors for inflammatory and endocrine diseases of domestic animals – mainly horses – to develop new preventions and treatments.

Equine metabolic syndrome and laminitis

High insulin concentrations in the blood of ponies and horses can cause the crippling foot condition called laminitis. By studying the physiological links between insulin levels and diet, the gut, the pancreas and other tissues, and the mechanisms of tissue breakdown in the foot, my research group has developed the first antibody-based preventative treatment for laminitis.

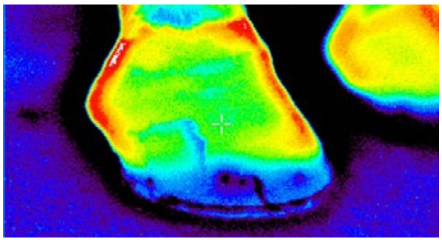
Horse welfare: racehorses and senior horses

I study racehorses in training and have conducted many investigations for the racing industry of the actions, pharmacokinetics and potential toxicity of substances and agents that could affect racing performance and racehorse welfare.

I also study how age-related hormone dysfunction, which affects one in five older horses and ponies, can lead to laminitis, muscle wasting, and diabetes. I aim to develop better countermeasures (dietary and therapeutic) to improve life quality for the growing number of aged horses and ponies.

Novel anti-inflammatory therapies

I evaluate novel, potentially anti-inflammatory agents for veterinary applications, including stem cell applications in arthritis treatment, and new drugs for treating sepsis (often associated with colic) in horses.



Thermographic image of a horse's hoof.

Pony with Cushing's disease showing long hair coat.

Old pony with Cushing's disease.

Associate Professor Stuart Barber

Associate Professor Stuart Barber

- Virtual reality
- Animal production and welfare
- Student experience
- Farm systems

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By collecting 360-degree images and video on farming enterprises and native environments, I assist student understanding of these systems and allow them to virtually tour these before actual visits.

Virtual reality tours

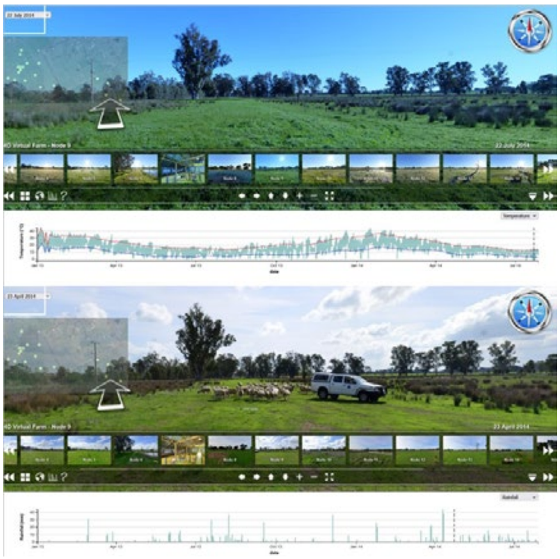
I produce virtual reality tours to allow students to tour areas they may not be able to visit during a standard semester. This includes both agricultural and bush areas at varying times of the year. This broadens the potential for the places a student can visit (virtually or in person) during their study.

Animal health

Working with research and development corporations, I investigate causes of disease and potential solutions to improve animal welfare and production.

Student experience

Working with students, I review what tools or experiences are important to their learning journey and how that impacts on their careers.



The same view in different seasons – from 4DVirtualFarms.

View from Mt Major at Dookie campus.

Still image from a “star lapse” at Dookie campus.

Associate Professor David Beggs

Associate Professor David Beggs

- Animal Welfare
- Cattle Reproduction

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I undertake research to promote the health and welfare of livestock.

I study parasitology, mastitis and antimicrobial resistance in dairy cows, and the welfare of pigs in high containment environments (e.g., laboratories that use a variety of safety measures to limit the spread of infectious diseases and harmful substances).

TEDx Talk - "Do cows think grass tastes good?"

Jersey Heifer.

Dairy Cow.

Associate Professor Peter Bennett

Associate Professor Peter Bennett

- Oncology
- Cancer immunology
- Quality of life
- Novel therapies

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Using existing and emerging therapies, I develop paths to provide small animal cancer patients with better quality of life for longer.

Lymphoma in pets

For Australian cats and dogs, this commonly diagnosed cancer has a major impact on their quality and duration of life. Increased understanding of the beneficial impacts of happy pets on their owners' welfare supports treatment options that extend these relationships. I have collected baseline data on risk factors for disease development and treatment outcomes to compare options for reducing the impact on pets and owners.

Surgery and radiation therapy are mainstays of cancer treatment but carry risks and costs that put them out of reach of many pet owners. Novel treatments involving high intensity focused ultrasound, nanoparticles, or harnessing the immune system to fight cancer can reduce risks and costs and achieve similar or better results. Through collaborations with medical researchers, I am exploring means of making these treatments more accessible to pet owners.

In future, I will explore using Raman spectroscopy of urine samples (an analytical technique where scattered light is used to measure the vibrational energy modes of a sample) to detect and monitor lymphoma in dogs. Finding biomarkers could allow more accurate predictions of treatment responses and outcomes.

A high intensity focused ultrasound probe showing how the beam is focused at the target (oval shape) rather than fan-shaped like a diagnostic probe.

This happy cancer patient illustrates that good quality of life can be achieved amid chemotherapy.

Associate Professor Lee Berger

Associate Professor Lee Berger

- Wildlife health
- Chytridiomycosis
- Amphibians
- Conservation
- Mycology

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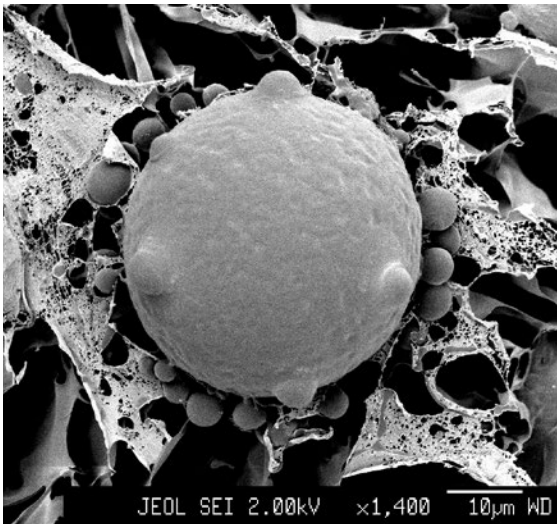
I aim to improve wildlife health and conservation, with a focus on controlling emerging infectious diseases such as amphibian chytridiomycosis. I study disease in a range of Australian wildlife species, and undertake health assessments, surveillance, outbreak investigations and risk analyses.

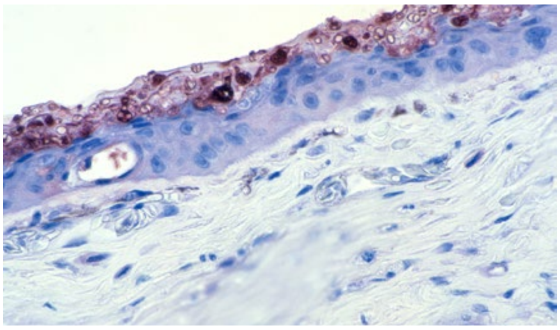
Frog chytrid fungus

This fungus has caused frog extinctions since spreading to Australia in the 1970s. I have worked on mapping its spread and developing diagnostic tests and treatments. I am studying virulence of the frog chytrid and host immunity, to develop new control strategies that will enable threatened frog populations to recover their former abundance and distribution. My research involves collaborations across conservation biology, pathology, immunology, genetics, mycology, biochemistry, and animal breeding.



The frog chytrid fungus at high magnification.

Great barred frog with chytridiomycosis, showing signs of lethargy and shedding skin.



Section of frog skin with red-stained fungus in the outer epidermis.

Associate Professor Vernon Bowles

Associate Professor Vernon Bowles

- Ectoparasites
- Flies
- Lice
- Drug targets
- Vaccines

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I aim to improve the health and wellbeing of sheep. Ectoparasites, such as blowflies and lice, have significant impacts on the Australian sheep and wool industry, and are developing resistance to insecticides. I seek to identify new targets in the parasites that could be the basis for a new insecticide or a vaccine (in the case of blowflies).

Improved control of the sheep blowfly

I am focused on understanding the interaction of fly larvae with the host during the initiation of a flystrike wound. We have identified several genes and associated proteins that are upregulated when the larvae contact the sheep. We are investigating options for inhibiting these proteins to break the lifecycle of the fly and thereby reduce the incidence of flystrike in sheep.

In future, I aim to investigate the precise molecular events that enable the larvae to survive on the host sheep. This may lead to control strategies that focus on altering insect behaviour, as an alternative to insecticides.

Dr Laura Brannelly

Dr Laura Brannelly

- Amphibian declines
- Wildlife disease
- Conservation
- Chytridiomycosis
- Reproductive biology

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I aim to improve frog conservation by exploring how disease impacts breeding biology.

Amphibians around the world are declining, with devastating impacts on biodiversity and environmental health, and downstream effects on human health and wellness. A key cause is a disease called chytridiomycosis, caused by a fungal pathogen.

But animals are incredible survivors, and some frogs increase their breeding effort and activity when infected with chytridiomycosis, helping populations survive even with high mortality from this disease. With better understanding of how frogs are responding to this disease, we can improve conservation efforts to support them – for example, by protecting breeding habitat.

Further research directions include understanding how water parameters and contaminants affect disease and exploring non-amphibian hosts of chytridiomycosis that might act as disease reservoirs or pathogen vectors.

Alpine tree frog, Litoria verreauxii alpina.

Growling grass frog, Litoria raniformis.

Professor Glenn Browning

Professor Glenn Browning

- Veterinary microbiology
- Vaccines
- Pathogenesis
- Antimicrobial stewardship

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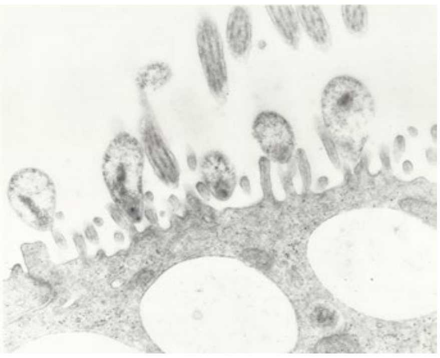
I aim to improve diagnosis, treatment and control of infectious diseases of animals by building understanding of the mechanisms through which bacterial and viral pathogens cause diseases. I also seek to optimise the use of antimicrobial agents in treating bacterial diseases of domestic animals.

Microbial pathogenesis

I identify, and examine the functions of genes and proteins of bacteria and viruses that contribute to animal diseases and pathogen virulence. For example, I investigate the role and function of surface proteins of pathogenic mycoplasmas in their virulence.

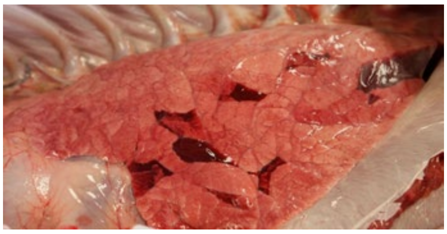


Mycoplasma gallisepticum infecting the trachea.

Vaccine and diagnostic test development

I apply understanding of microbial pathogenesis to identify genes that can be deleted or altered to create avirulent bacteria and viruses, which could be used as vaccines. I am also studying the immune response of chickens infected with Mycoplasma gallisepticum to help develop more effective vaccination.

In addition, we examine whether the proteins that play an important role in virulence could be the basis for better diagnostic tests to detect animals infected with bacterial or viral pathogens.



Mycoplasmal pneumonia in a calf.

Veterinary antimicrobial stewardship

I study the links between treatment of domestic animals and the development of antimicrobial resistance. I analyse the antibiotic prescribing practices of veterinarians and develop and test interventions to reduce inappropriate prescribing. We also build the capacity of animal health practitioners in low and middle-income countries to monitor antimicrobial use and resistance in domestic animals, and develop tools to support antimicrobial stewardship in animal health.

Dr Claire Cannon

Dr Claire Cannon

- Veterinary oncology
- Comparative oncology

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As a veterinary oncologist, I focus on risk factors, treatment, and outcomes for dogs and cats with cancer. As well as helping pets and their owners, this has implications for people with cancer, under a One Health approach.

What would you do if it were your dog?

I am investigating why pet owners ask this question of their veterinary care team, and the perceptions of veterinarians with different levels of experience in dealing with the question. By improving communication between pet owners and veterinary professionals, we aim to improve quality of care for pets and their owners.

Allergic skin disease and cancer risk in dogs

Some dog breeds, such as Staffordshire terriers, commonly develop both allergic skin disease (atopic dermatitis) and a type of skin cancer called mast cell tumour. My research explores whether there is a direct link between these conditions. If such a link exists, improved management of allergic skin disease may reduce the risk of tumour development in affected dogs.

Osteosarcoma is the most common bone tumour in dogs and people. I have evaluated novel treatments for this cancer.

Dr Mia Cobb

Dr Mia Cobb

- Animal welfare
- Dogs
- Interdisciplinary research

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I inform solutions that improve dogs' wellbeing, combining ethics, policy development, and practical implementation to ensure evidence-based welfare standards support both dogs and the people who depend on them.

Understanding how people think about dogs

I examine human attitudes and perceptions that shape dog welfare outcomes, exploring what dog owners believe makes their dogs truly happy. I develop theories of human behaviour change and science communication strategies to effectively translate complex welfare science into meaningful, actionable guidance for diverse audiences.

Understanding how dogs experience their world

Animal welfare measures are traditionally deficit-focused. Using non-invasive techniques, I identify positive welfare indicators in dogs' activity patterns, behaviour and physiology, to develop scientific methods for measuring canine happiness and wellbeing. This includes investigating how environmental factors, choice opportunities, and human-dog interactions influence dogs' lived experiences across different settings.

Shaping an ethical and sustainable future

Through animal-computer interaction research, I help to develop technologies that truly benefit dogs rather than just collecting data. I quantify the economic value of positive animal welfare, providing business cases for welfare investment. I aim to secure funding to establish Australia's first dedicated canine welfare research group, fostering collaboration between veterinary science, psychology, zoology, law, economics, and technology sectors while training the next generation of animal welfare scientists. Philanthropic inquiries are welcome.

Science that looks at the world from a dog's perspective.

Dr Cobb is the Chaser Innovation Research Fellow in Canine Welfare Science thanks to philanthropic support from The Chaser Initiative, named for Chaser the border collie.

Communicating the latest canine welfare science to help dogs live their best lives with us.

Associate Professor Simon Firestone

Associate Professor Simon Firestone

- Veterinary epidemiology
- Public health
- One Health

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I investigate infectious disease outbreaks in animals and humans, and analyse epidemiological and genomic data, to help improve health outcomes.

Rapid decision support in emergency animal disease outbreaks

As part of a national project to improve Australia's biosecurity response to rapidly emerging threats, I am creating a framework to evaluate and improve epidemiological modelling to support decision-making. This work is funded by the Australian Research Data Commons, in partnership with the Centre of Excellence in Biosecurity Risk Analysis, the Department of Agriculture, Fisheries and Forestry, and the Commonwealth Scientific and Industrial Research Organisation (CSIRO).

Diagnostic test evaluation

I provide statistical modelling of imperfect diagnostic test outcomes to estimate test accuracy and disease prevalence, in collaboration with the CSIRO's Australian Centre for Disease Preparedness.

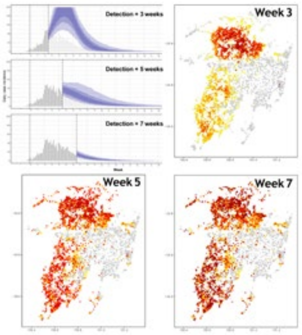
Analysing zoonotic and emergency animal disease outbreaks

I have contributed integrated analyses of genomic and epidemiological data for:

- The COVID-19 pandemic in Victoria
- Animal disease outbreaks overseas
- Modelling potential impacts of Q fever under future outbreak scenarios
- Investigations into zoonotic pathogens in reptiles and other wildlife.

This work includes an Australian Research Council-funded Discovery Project. Collaborators include the Victorian Department of Health, the Peter Doherty Institute, research partners in Vietnam and New Zealand, the Australian Rickettsial Reference Laboratory, Seqirus/CSL and livestock industry partners.

I am also involved in expert panels for the highly pathogenic avian influenza outbreak in Victoria and for the United Nations global network of avian influenza expertise and anticipate further translational research in this space.



Spatial and temporal outbreak projections for informing rapid decision-support.

Air sampling for the causative agent of Q fever on a goat dairy with researchers from the Australian Rickettsial Reference Laboratory.

PhD candidate Michael Muleme feeding a kid goat during an 18-month cohort study assessing exposure periods for Q fever on a goat dairy.

Professor Robin Gasser

Professor Robin Gasser

- Parasitology
- Pathogen genomics and systems biology
- Anthelmintic resistance
- Drug and vaccine discovery
- Neglected tropical and parasitic diseases

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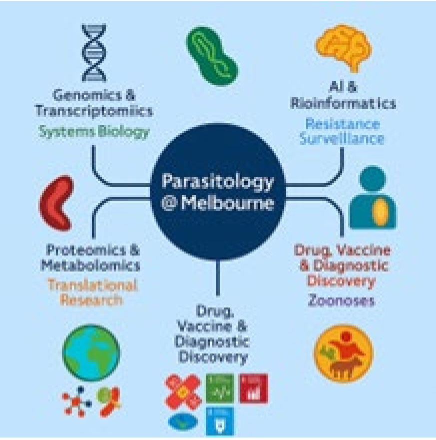
I lead researchers to investigate globally important parasitic diseases of humans and animals and translate our findings to improve screening, biosecurity, resistance detection, and drug stewardship.



Leadership in global health and sustainable development

Our work supports the priorities of the World Health Organisation and the United Nations' Food and Agriculture Organization, particularly controlling *zoonoses* (infectious diseases that can transfer between animals and humans) and tackling resistance to *anthelmintics* (drugs that expel parasitic worms). We contribute to the United Nations Sustainable Development Goals by advancing solutions for parasitic and neglected tropical diseases that impact vulnerable populations.

An integrated approach to understanding parasites and parasitic diseases

With more than 50 staff and students across six research groups, we lead fundamental and applied research in classical and molecular parasitology, and mentor the next generation of scientists and educators. Our research spans protists, roundworms, tapeworms and flukes, enabling the discovery of novel interventions against diseases such as haemonchosis, echinococcosis, schistosomiasis and sparganosis. We develop and apply traditional, omics-based and computational technologies – including single-worm sequencing, deep proteomics and AI-driven analytics – to investigate parasite biology, host-parasite interactions and disease mechanisms.

Translational impact and industry engagement

We deliver translational outcomes that support One Health, public health, and food security in Australia and internationally. Our work has contributed to advanced diagnostic platforms, analytical tools and drug discovery pipelines for parasitic diseases affecting livestock and humans. Our partners include Oz Omics, Melbourne Water, Boehringer Ingelheim and MSD Animal Health.

Professor James Gilkerson

Professor James Gilkerson

Centre for Equine Infectious Diseases. Asia-Pacific Centre for Animal Health.

- Veterinary virology
- Veterinary bacteriology
- Antimicrobial stewardship
- Infectious disease
- One Health

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I investigate infectious diseases of animals to improve prevention and treatment. Healthy animals contribute to a healthy environment and consequently, to healthy humans.

I focus on horses and poultry but have also worked on wildlife and companion animals.

In collaboration with medical colleagues in the Peter Doherty Institute and supported by the UK Fleming Fund and the Australian Government, I am improving the use of antimicrobials in animal health, in Australia and in low- and middle-income countries across the Asia-Pacific region.

Future research includes antimicrobial use and stewardship, and respiratory diseases of horses and poultry.

Australian King Parrot.

African elephant.

Foster mare and foals.

Professor Amir Hadjinoormohammadi

Professor Amir Hadjinoormohammadi
Asia Pacific Centre for Animal Health (APCAH)

- Poultry disease
- Avian diseases
- Microbiology
- Molecular Biology
- Diagnostic Pathology

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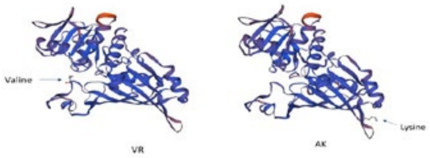
I enhance diagnostic capacity to foster accurate treatment and efficient prevention of animal diseases and improve animal welfare. I focus on understanding molecular pathogenesis of viral and bacterial diseases of poultry to develop novel diagnostic tests and vaccines.



Molecular basis of virulence in Mycoplasma bacteria

My team has used M. synoviae vaccine strain MS-H and its parent strain 7NS as models for avirulent and virulent mycoplasmas respectively, to unravel the molecular basis of virulence (how harmful a disease or virus is). Using a combination of novel and conventional techniques including whole genome sequencing, metabolomics, molecular cloning and transformation, in vitro characterisation, and animal experimentation, we can compare isolates or mutants differing in one nucleotide and have identified several important proteins as virulent factors.

We aim to develop a metagenomic pipeline for holistic characterisation of the causes of upper respiratory infections in free-range layer chickens, using conventional bacteriology (study of bacteria and medicine), virology (study of viruses and viral disease) and serology (study of blood samples) to validate the metagenomic pipeline. We have evaluated the suitability of Oxford Nanopore and Illumina sequencing technologies for this process and developed a provisional pipeline for identifying bacterial and viral DNA. We are optimising methods for characterising viral RNA.

Associate Professor Laura Hardefeldt

Associate Professor Laura Hardefeldt

Asia Pacific Centre for Animal Health (APCAH), Centre for Equine Infectious Disease, National Centre for Antimicrobial Stewardship

- Antimicrobial stewardship
- Antimicrobial use
- One Health
- Veterinary epidemiology

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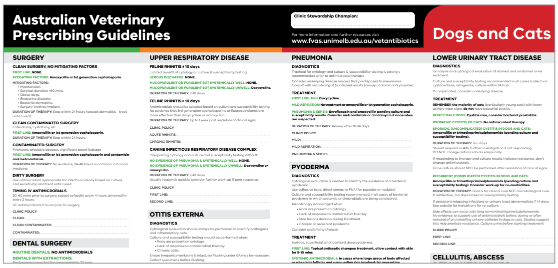
My research in antimicrobial resistance drives advancements in veterinary antimicrobial stewardship (AMS), addressing critical gaps nationally and internationally and empowering veterinarians and stakeholders to positively impact animal and public health.

I work with social scientists, microbiologists, epidemiologists, clinicians, and computer scientists to tackle many challenges of antimicrobial resistance and inappropriate antimicrobial use. We examine drivers of prescribers' behaviour, design interventions for inappropriate prescription, and conduct implementation trials.

The National Centre for Antimicrobial Stewardship supports a One Health approach, collaborating with medical doctors, pharmacists, dentists, and allied health professionals to improve health and welfare for all. We have established the level, and appropriateness, of veterinary antimicrobial use in Australia, and identified many of the enablers of and barriers to improved AMS and areas requiring policy change.

We produced a webpage with evidence-based, practical AMS advice for veterinarians in Australia, and developed antimicrobial use guidelines (used by 200+ veterinary practices nationally). Our research has also led to the relabelling of one antimicrobial substance to improve adherence to recommended guidelines.



Australian Veterinary Prescribing Guidelines

Clinic Stewardship Champion: ....

For more information and further resources visit
www.fvas.unimelb.edu.au/vetantibiotics

Dogs and Cats

SURGERY

CLEAN SURGERY, NO MITIGATING FACTORS
FIRST LINE: **NONE.**
MITIGATING FACTORS: **Amoxycillin or 1st generation cephalosporin.**
MITIGATING FACTORS:
- Hypotension.
- Surgical duration >90 mins.
- Obese dogs.
- Endocrine disorder.
- Bacterial dermatitis.
- Surgery involves implant.

DURATION OF THERAPY: Stop within 24 hours (except dermatitis – treat until cured).

CLEAN CONTAMINATED SURGERY
Enterotomy, cystotomy, etc.
FIRST LINE: **Amoxycillin or 1st generation cephalosporin.**
DURATION OF THERAPY: Stop within 24 hours.

CONTAMINATED SURGERY
Pyometra, prostatic abscess, significant bowel leakage.
FIRST LINE: **Amoxycillin or 1st generation cephalosporin and gentamicin and metronidazole.**
DURATION OF THERAPY: No evidence, 24-48 hours is common in human medicine.

DIRTY SURGERY
Use antimicrobial appropriate for infection (ideally based on culture and sensitivity) and treat until cured.

TIMING IV ANTIMICROBIALS
30-60 mins prior to surgery, repeat cefazolin every 4 hours, amoxycillin every 2 hours.
SC antimicrobials 2 hours prior to surgery.

CLINIC POLICY
CLEAN: ....
CLEAN CONTAMINATED: ....
CONTAMINATED: ....

DENTAL SURGERY
ROUTINE DENTALS: **NO ANTIMICROBIALS**
DENTALS WITH EXTRACTIONS:

UPPER RESPIRATORY DISEASE

FELINE RHINITIS ≤ 10 days
Limited benefit of cytology or culture & susceptibility testing.
SEROUS DISCHARGE: **NONE.**
MUCOPURULENT OR PURULENT BUT SYSTEMICALLY WELL: **NONE.**
MUCOPURULENT OR PURULENT BUT SYSTEMICALLY UNWELL: **Doxycycline.**
DURATION OF THERAPY: 7-10 days.

FELINE RHINITIS > 10 days
Antimicrobials should be selected based on culture and susceptibility testing. No evidence that 3rd generation cephalosporins or fluoroquinolones are more effective than doxycycline or amoxycillin.
DURATION OF THERAPY: Up to 1 week past resolution of clinical signs.

CLINIC POLICY
ACUTE RHINITIS: ....
CHRONIC RHINITIS: ....

CANINE INFECTIOUS RESPIRATORY DISEASE COMPLEX
Interpreting cytology and culture and susceptibility testing difficult.
NO EVIDENCE OF PNEUMONIA & SYSTEMICALLY WELL: **NONE.**
NO EVIDENCE OF PNEUMONIA & SYSTEMICALLY UNWELL: **Doxycycline or amoxycillin.**
DURATION OF THERAPY: 7-10 days.
Usually responds quickly, consider further work-up if poor response.

CLINIC POLICY
FIRST LINE: ....
SECOND LINE: ....

OTITIS EXTERNA

DIAGNOSTICS
Cytological evaluation should always be performed to identify pathogens and inflammatory cells.
Culture and susceptibility testing should be performed when:
- Rods are present on cytology.
- Lack of response to antimicrobial therapy.
- Chronic otitis.

Ensure tympanic membrane is intact, ear flushing under GA may be necessary.
Collect specimens before flushing.

PNEUMONIA

DIAGNOSTICS
Tracheal for cytology and culture & susceptibility testing is strongly recommended prior to antimicrobial therapy.
Consider underlying disease process that predisposed to pneumonia. Consult with microbiologist to interpret results (airway contaminants possible).

TREATMENT
FIRST LINE: Mild: **Doxycycline.**
MILD ASPIRATION: **No treatment or amoxycillin or 1st generation cephalosporin.**
PNEUMONIA & SEPSIS: **Enrofloxacin and amoxycillin pending culture and susceptibility results. Consider metronidazole or clindamycin if anaerobes are suspected.**
DURATION OF THERAPY: Review after 10-14 days.

CLINIC POLICY
MILD: ....
MILD ASPIRATION: ....
PNEUMONIA & SEPSIS: ....

PYODERMA

DIAGNOSTICS
Cytological evaluation is needed to identify the existence of a bacterial pyoderma.
Use adhesive tape, direct smear, or FNA (for pustules or nodules).
Culture and susceptibility testing recommended in all cases of bacterial pyoderma in which systemic antimicrobials are being considered.
Also strongly encouraged when:
- Rods are present on cytology.
- Lack of response to antimicrobial therapy.
- New lesions develop during treatment.
- Chronic or recurrent pyoderma.

Consider underlying disease.

TREATMENT
Surface, superficial, and localised deep pyoderma.
FIRST LINE: **Topical antiseptic shampoo treatment, allow contact with skin for 5-10 mins.**
SYSTEMIC ANTIMICROBIALS: **In cases where large areas of body affected**

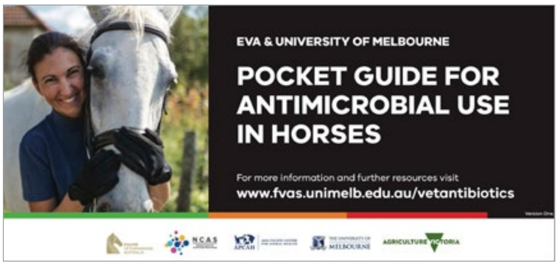
LOWER URINARY TRACT DISEASE

DIAGNOSTICS
Urinalysis and cytological evaluation of stained and unstained urine sediment.
Culture and susceptibility testing recommended in all cases (collect via cystocentesis, refrigerate, culture within 24 hrs).
If complicated, consider underlying disease.

TREATMENT
REMEMBER the majority of cats (particularly young cats) with lower urinary tract signs **do not** have bacterial cystitis.
INTACT MALE DOGS: **Cystitis rare, consider bacterial prostatitis.**
IDIOPATHIC CYSTITIS OF CATS: **No antimicrobial therapy.**
SPORADIC (UNCOMPLICATED) CYSTITIS IN DOGS AND CATS: **Amoxycillin or trimethoprim/sulphonamide (pending culture and susceptibility testing).**
DURATION OF THERAPY: 3-5 days.
Should respond in 48h, further investigation if not responding.
DO NOT change antimicrobials empirically.
If responding to therapy and culture results indicate resistance, don't change antimicrobials.
Urine culture should NOT be performed after resolution of clinical signs.
RECURRENT (COMPLICATED) CYSTITIS IN DOGS AND CATS: **Amoxycillin or trimethoprim/sulphonamide (pending culture and susceptibility testing). Consider work-up for co-morbidities.**
DURATION OF THERAPY: Goal is for clinical cure NOT microbiological cure. If reinfection, 3-5 days based on susceptibility testing.
If persistent relapsing infections or urinary tract abnormalities 7-14 days. See website for indications for re-culture.
Side effects can occur with long term trimethoprim/sulphonamide. No evidence to support use of antimicrobials before, during or after removal of an indwelling urinary catheter in dogs or cats. Studies suggest this may promote resistance. Culture urine before starting treatment.

CLINIC POLICY
FIRST LINE: ....
SECOND LINE: ....

CELLULITIS, ABSCESS



EVA & UNIVERSITY OF MELBOURNE

POCKET GUIDE FOR ANTIMICROBIAL USE IN HORSES

For more information and further resources visit
www.fvas.unimelb.edu.au/vetantibiotics

Version One

NOT ALL BUGS NEED DRUGS

vetantibiotics.science.unimelb.edu.au

Guidelines and other resources produced by our research group.

Associate Professor Carol Hartley

Associate Professor Carol Hartley

- Virology
- Host-pathogen interactions
- Virus evolution
- Virus vaccines

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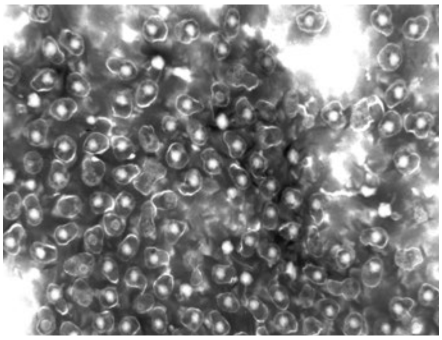
I investigate the mechanisms of viral pathogenesis, virus evolution, and interactions between viruses and hosts' immune systems, and apply this knowledge to develop and improve infection control measures for better animal health outcomes.

Herpesviruses have been co-evolving with their hosts – including humans – for millions of years. Viruses can adapt to a new host environment in small or big steps. Smaller steps might include infection of a vaccinated host after infection of an unvaccinated host. A big step may be a jump to an entirely new host species.

I investigate how herpesviruses evolve and adapt to these changing environments, and how these changes influence virus virulence, pathogenesis and the efficacy of vaccines. I aim to inform vaccination strategies to enable more effective control of these viruses in poultry, horses and wildlife.

I also explore a range of other virus-host systems to improve animal health, or as a model for human infections and diseases, using methodologies including genomics and high performance microscopy.



Purified herpesvirus particles (Asinine herpesvirus-3. Photo courtesy of N.P. Ficorilli).

Dr Lauren Hemsworth

Dr Lauren Hemsworth

- Animal welfare
- Human-animal interactions
- Human-animal relationship
- Animal behaviour
- Behaviour change

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I aim to contribute to animal welfare research and teaching that improves the lives of domesticated animals and those kept in captivity.

My multi-species and multi-industry (farm, zoo and companion animals) research focuses on four key areas:

1. Development and validation of animal welfare indicators (positive and negative), assessment methodologies and tools, as well as animal welfare training programs for animal handlers and companion animal owners.
2. The effects of human-animal relationships and interactions on the welfare of domestic animals and animals kept in captivity (using meerkats as a model species).
3. The effects of the social and physical environment (housing and husbandry practices) on the behaviour and welfare of domestic animals.
4. Attitudes of the community and animal handlers and carers to animal welfare and the impact of public perceptions on the sustainability of animal industries.

Piglets.

Farmer interacting with their cattle.

Associate Professor Peta Lee Hitchens

Associate Professor Peta Lee Hitchens

- Epidemiology
- Risk analysis
- Injury prevention
- Animal welfare
- Human-animal interaction

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I develop evidence-based strategies that reduce health, safety, and welfare issues for horses and the people who work alongside them.

Health and welfare of working and athletic horses

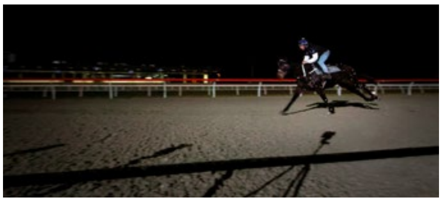
Musculoskeletal injuries in racehorses are the most common cause of death, poor performance and early retirement, and are also the leading cause of serious jockey injuries. Yet prevention is challenging.

My team seeks to identify the causes of these injuries by developing models that explain how bone adapts and changes. We use multidisciplinary approaches that combine biomechanics, pathology, machine learning, diagnostic imaging and epidemiology.

Our research has identified:

- Inexperience of horse and rider as risk factors for jockey falls, injuries and fatalities.
- Fatal injury to the racehorse as the leading cause of substantive jockey injury.
- Limb injuries in racehorses are, for the most part, not accidental.
- Fatal fractures result from the accumulation of bone microdamage.
- The importance of rest in allowing bone repair.
- Changes in racehorse stride characteristics that could enable early injury detection.

My program is expanding to monitor the welfare of racehorses as they retire from racing and transition to secondary careers, and to improve the health and welfare of working horses, donkeys and mules in developing countries.



Monitoring of stride characteristics to detect injuries before they become catastrophic.

Associate Professor Jasmin Hufschmid

Associate Professor Jasmin Hufschmid

One Health Research Group

- Wildlife health
- Conservation medicine
- Ecotoxicology
- One Health

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Collaborating with colleagues and industry in multi-disciplinary teams, my research focuses on applied outcomes for wildlife health issues, ranging from animal welfare to conservation and One Health.

Wombat mange

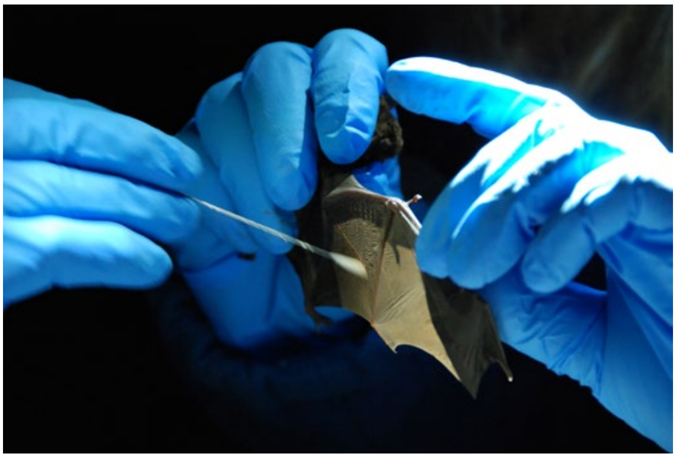
Bare-nosed wombats are commonly affected by sarcoptic mange, a skin disease which is caused by a mite and which can result in severe animal welfare impacts and death. In some cases, local population declines have been seen. Our research studies suitable dose rates and treatment approaches for free-living wombats with mange, using the drug moxidectin. This work is funded by the NSW Parks and Wildlife Service, WIRES and Mange Management.

Toxoplasmosis in marsupials

The parasite that causes toxoplasmosis affects all warm-blooded vertebrates. It was introduced to Australia with domestic cats. The parasite is thought to cause more severe disease in marsupials than placental mammals. However, the impacts on populations are not well understood. Our research studies how much marsupial populations are exposed to this parasite and what the impacts are. We are also developing diagnostic methods that will provide us with a better understanding of the role of this disease in marsupials. Wildlife health surveillance Wildlife are victims of disease, but they are also sources of disease for humans and domestic animals. One Health describes the concept that the health of humans, animals and the environment are closely linked. We are working towards better surveillance of our wildlife species, including specific programs for koalas and little penguins. Surveillance work provides us with information on the causes of illness and death in wildlife species. It also provides an early warning system for new diseases. Systematic wildlife health surveillance is an essential tool for managing wildlife populations for conservation and One Health.

Ecotoxicology

There are approximately 350,000 man-made chemicals in the world - many of which enter our ecosystems and our bodies. We have a very limited understanding of what most of these chemicals do to us in the long term. Our understanding of the impacts on ecosystems including wildlife is even more limited. I am very interested in the growing field of ecotoxicology, especially impacts in wildlife. In the past, I have worked on fluoride toxicity in marsupials, and collaborated on trace metal, plastics POP impacts on water fowl and sea birds. One of our most recent projects is focusing on levels of PFAS in terrestrial wildlife and its impacts. This project is a collaboration with the Australian Centre for Emerging Contaminants.



Testing bent-wing bat for the fungus causing White Nose Syndrome.

Dr Shilpa Kapoor

Dr Shilpa Kapoor

- Parasitology
- Population genetics
- Genomics
- Transcriptomics
- Bioinformatics

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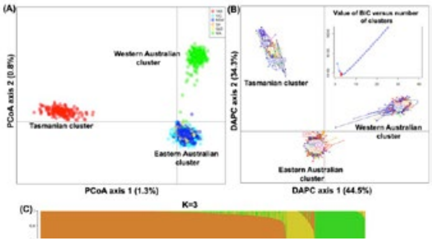
I investigate the population genetics of the parasitic Australian sheep blowfly to develop innovative control strategies that will protect sheep and the wool industry.

The Australian sheep blowfly (*Lucilia cuprina*) lays its eggs on sheep, causing *flystrike* – when fly larvae create a painful open wound by feeding on the sheep's skin – inflicting major economic losses on the wool industry by reducing fleece quality and animal welfare.

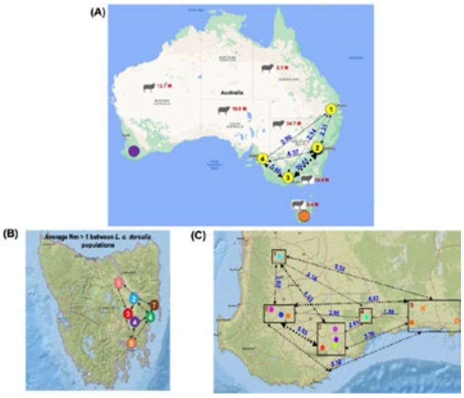
By uncovering how sheep blowflies adapt, spread, and develop resistance, I aim to inform smarter, targeted, chemical-free control strategies, protecting Australia's wool industry, improving sheep welfare, and supporting sustainable farming.

Using advanced genetic sequencing and big-data analysis, I investigate the population structure and genetic diversity of *L. cuprina* across Australia. I contribute to chromosome-level reference genomes and transcriptomes for *Lucilia* species, driving advances in comparative genomics, parasitism biology, insecticide resistance, and novel drug and vaccine targets.

Big data analysis.



Clustering analysis of *Lucilia cuprina* populations.



Gene flow patterns of *Lucilia cuprina* in Australia.

Dr Anson Koehler

Dr Anson Koehler

Melbourne Centre for Cities, Melbourne Biodiversity Institute

- Wildlife Parasitology
- One Health
- Phylogenetics
- Zoonotic helminths

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I use molecular analyses to identify parasites in animals and humans, uncovering emerging pathogens and *zoonoses* – infectious diseases that can jump between animals and humans – and investigate host-pathogen-environment interactions to inform disease control and strengthen biosecurity.

Monitoring parasites in Melbourne's water catchments

In partnership with Melbourne Water and funded by the Australian Research Council, I lead a project assessing the risk of waterborne parasites from wildlife entering protected catchments. Using DNA tests, we detect potentially zoonotic *Cryptosporidium, Giardia*, *Blastocystis*, *Enterocytozoon* and helminths in native and feral animals living in the catchments. Recent collaborations with the Microbiological Diagnostic Unit Public Health Laboratory at the Peter Doherty Institute have applied genomic techniques to better understand *Cryptosporidium* and *Giardia* in humans.

Tackling liver fluke disease (fascioliasis) in livestock

Caused by the parasitic fluke (flatworm) *Fasciola hepatica*, fascioliasis is costly to Australia's livestock industry. Drug resistance and gaps in knowledge about the freshwater snails that host and transmit the parasite hinder control. In collaboration with the Young Lab, I use advanced molecular tools to (i) map the distribution of *Austropeplea* snails and their parasites, (ii) sequence their genomes, and (iii) study host-parasite interactions. These insights will support more sustainable strategies to prevent and control fascioliasis.

Zoonotic cases

In collaboration with an international network of parasitologists specialising in diagnostics, morphology, and histology, I provide molecular diagnostics and phylogenetic ('family tree' or evolutionary) analyses for complex human parasitic infections in Australia and abroad. We have helped to identify and report several rare cases involving parasitic worms in humans – often linked to wildlife – including *Breinlia* species in the eye, *Ophidascaris robertsi* in the brain, and *Haycocknema perplexum* in muscle tissue.

Wildlife cases

In partnership with Healesville Sanctuary, I have undertaken molecular diagnostics and phylogenetic investigations of parasites affecting endangered Australian fauna, including the Leadbeater's possum and the helmeted honeyeater.

Eastern grey kangaroos, hosts to many of the parasites I work on.

Dr Pasi Korhonen

Dr Pasi Korhonen

- Computer science
- Bioinformatics
- Statistics
- Molecular biology
- Parasitology

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I improve understanding of parasitic worms that infect humans and animals by applying computational and machine-learning methods to multi-omics data.

Omics are branches of science – such as genomics, transcriptomics, and proteomics – that analyse entire sets of biological molecules – such as DNA, RNA, or proteins – and how they translate into the structure, function, and dynamics of an organism or group of organisms.

My main research areas include parasite genomes, single-cell and spatial transcriptomics, and drug and drug target discovery to tackle parasites in their hosts.

Dr Alistair Legione

Dr Alistair Legione

- Animal infectious diseases
- Pathogen genomics
- Wildlife disease detection
- Rapid diagnostics

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I improve the health and welfare of wildlife, companion animals, and livestock, by investigating viral and bacterial pathogens using genomic sequencing and developing molecular diagnostics.

I improve the diagnosis of animal diseases using genomic sequencing and by developing improved molecular tools. My work focuses on bacterial and viral infectious diseases affecting koalas, possums, macropods, reptiles, native birds, poultry, cattle, horses, dogs and cats.

I collaborate with Zoos Victoria, WIRES, DEECA, the Peter Doherty Institute, the Grampians Public Health Unit and many other partners.

Pathogen genomics

Pathogen genomics helps to characterise organisms and determine their diversity, the genes that enable them to cause disease, and their relationships to other pathogens. This work supports the tracking of infectious diseases in space and time and contributes to the development of novel vaccines and diagnostic methods.

Diagnostic development

I develop traditional molecular detection methods such as PCR, as well as rapid diagnostic tests such as LAMPs (loop-mediated isothermal amplification), which can detect pathogens in as little as 30 minutes. These tools support disease detection in wildlife and clinical care settings where access to advanced diagnostic equipment is limited.

Metagenomics and microbiomes

Metagenomics involves sequencing all DNA in an environment, such as a faecal or gut sample. I research the metagenomes of animal species to identify the bacteria they carry and how these differ between populations based on geography, disease presentation or treatment. This work enables identification of disease-causing agents and antimicrobial resistance markers in wildlife and livestock.

Leghorn male hepatoma cells infected with laryngotracheitis virus, which has been sequenced using Nanopore and Illumina methods.

A colormetric LAMP assay, where yellow/orange tubes indicate the presence of the target pathogen and red tubes are negative.

Collection of environmental avian samples for pathogen surveillance using next generation sequencing methods

Dr Panos Loukopoulos

Dr Panos Loukopoulos

- Veterinary pathology
- Comparative oncology
- Veterinary diagnostic investigation
- Osteosarcoma

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As a veterinarian and veterinary pathologist, I focus on diagnosing veterinary disease, identifying and describing novel disease entities or presentations, and investigating the pathogenesis of diseases by combining conventional autopsy and histopathology with genomic approaches and study of molecules involved in metabolism.

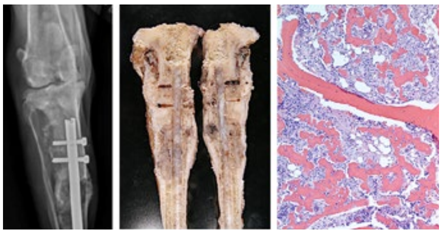
Veterinary pathology

I provide clinical teaching for veterinary students while servicing a range of stakeholders. I have completed thousands of diagnostic investigations including autopsies and histopathologic examination of a wide range of domestic and wildlife species.

Ongoing projects include:

- Using polyacrylamide gel to treat equine osteoarthritis
- Studying metabolites in canine osteosarcoma
- Investigating tissue distribution of Koala retrovirus by employing RNA in situ hybridisation
- Analysing autopsy reports to determine causes of mortality and morbidity of koalas
- Examining upper respiratory tract pathogens in poultry
- Researching novel aspects of spontaneous animal disease, including gastric parasites of dolphins, neoplasia (abnormal growth of cells or tissues) in lagomorphs, and microchip-induced neoplasia in marsupials.

Autopsy of a whale.



Canine osteosarcoma associated with an orthopaedic device.

Dr Karim Mardani

Dr Karim Mardani

- Molecular virology
- Avian diseases
- Epidemiology

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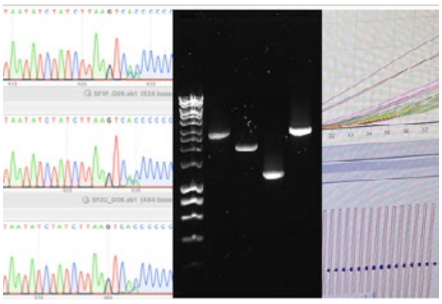
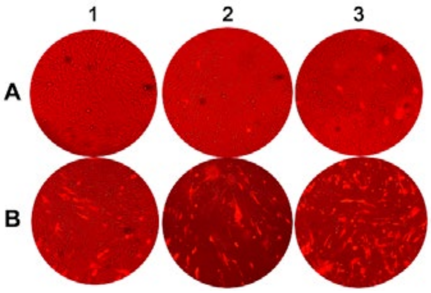
I aim to prevent and control infectious bronchitis (IB) in chickens, which is caused by strains of a highly contagious coronavirus, and generates major economic losses for the global poultry industry.

Characterisation and genotyping of IB virus (IBV)

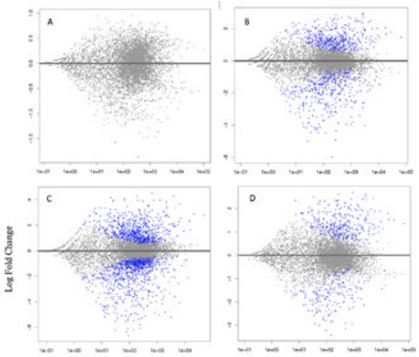
I use Golden Gate Assembly and Circular Polymerase Extension Reaction in reverse genetics to study IBV genome replication, gene transcription, pathogenicity and virulence, and virus-host interactions. Reverse genetics can also be used for developing recombinant vaccines. RNA sequencing and comparative transcriptome analysis of publicly available gene expression data also enable investigation of the gene regulation process in host cells after infection by a virus, building understanding of pathogenesis and pathogen–host interaction.



Infectious bronchitis virus (IBV) characterisation.



IBV transfection experiment using BHK cells.



MA plots produced using DESeq2 for differential gene expression analysis.

Dr Christina Marth

Dr Christina Marth

- Veterinary reproduction
- Transcriptome and microbiome analyses
- Reproductive immunology
- Uterine physiology and pathology

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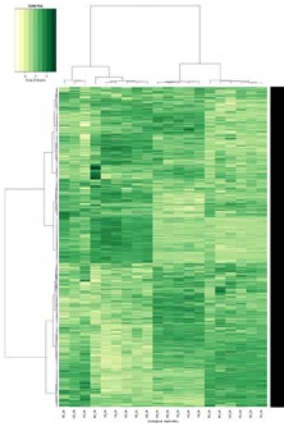
To improve breeding management of domestic animals, I investigate the gene expression and microbial environment of the reproductive tract to find biomarkers for uterine pathologies.

Transcriptome analyses

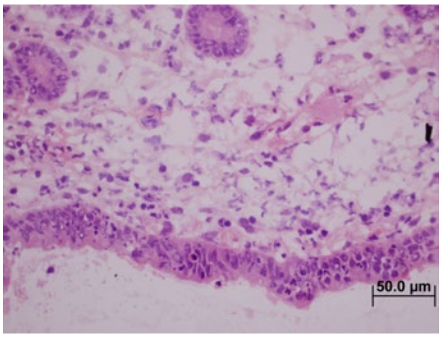
The ribonucleic acid (RNA) molecules in living cells include messenger (m) RNA – which transcribes and carries coded instructions from the DNA to the protein-making 'machinery' of the cell in the process of gene expression – and various non-coding RNAs. The *transcriptome* is the complete set of RNA molecules in a cell or population of cells at a specific time. Unlike the more stable genome, the transcriptome changes with development, disease, or environmental conditions. I use transcriptome analyses to investigate how gene expression in the reproductive tract changes in response to inflammatory triggers such as infection, breeding, and giving birth.



Heatmap depicting all genes expressed at significantly different levels between experimental groups. Each row is one gene.

Microbiome analyses

A *microbiome* is the community of microorganisms that share a habitat – the soft, moist, inner lining or *mucosa* of the uterus, for example. I have used microbiome analyses to investigate interactions between microbes and mucosal surfaces in uterine pathologies in dogs, cattle and horses, which can reduce fertility. I aim to inform evidence-based practice in veterinary reproductive medicine that will reduce the financial and emotional costs of breeding management of domestic animals.



Large numbers of inflammatory cells appear in the uterus within three hours after exposure to bacteria.

Heat stress and fertility

I have also investigated the correlation of increases in temperature and humidity with early embryonic death after embryo transfer. In future, I aim to use similar molecular techniques and *in vitro* models to investigate the impact of heat stress on fertility.

Molecular analyses can detect changes in gene expression that occur rapidly in the body.

Dr Charles Pagel

Dr Charles Pagel

- Protease-activated receptors
- Muscle cells and myogenesis
- Bone development, turnover and repair
- Muscle disease, injury and repair
- Periodontal disease

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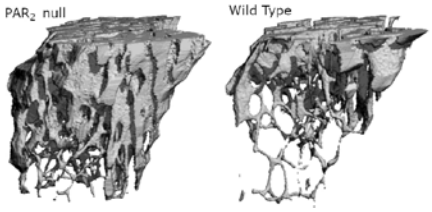
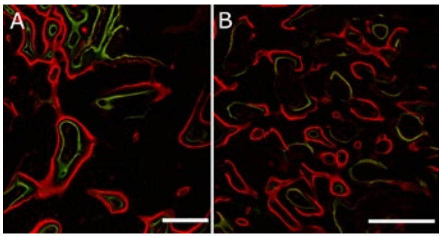
I aim to improve understanding of the development, growth and regeneration of the musculoskeletal system.

I use in vitro and in vivo models to understand the formation and pathological conditions of skeletal muscle, bone and cartilage tissue. I have studied bone loss and formation in high yielding dairy cattle during pregnancy and lactation, the in vitro growth and differentiation of muscle cells from commercially relevant species, the structural basis for bone injury in racehorses, and the osteointegration of titanium implants into bone.



MicroCT analysis of bones of dystrophic mice without (PAR2 null) or with (Wild type) a functional PAR2 gene.



Dynamic labelling of mineralising bone surfaces with fluorescent labels to measure the rates of bone matrix apposition.

Protease-activated receptors

A major focus of my work is protease-activated receptors in a variety of contexts including muscle-bone interaction, skeletal muscle inflammation and injury in Duchenne muscular dystrophy, bone loss associated with periodontal disease, and the interaction of bone cells with metastatic prostate cancer cells.

Osteopontin

Another focus is the multifunctional protein osteopontin in skeletal muscle. I have shown that osteopontin is expressed by muscle precursor cells and damaged muscle fibres after muscle injury and that it helps recruit immune cells to the injured site, promoting the clearance of cellular debris and facilitating the inflammatory response for tissue repair.

Dr Reza Sanaei

Dr Reza Sanaei

- Translational research
- Tissue engineering
- Biomaterials
- Histology
- Orthopaedics

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I develop and evaluate various implants and biomaterials through application of innovative in vivo, in vitro, and in silico models, closing the gap between fundamental and clinical research while reducing reliance on animals in translational biomedical research.

Smarter research models to reduce animal use

Animal testing in medical research raises ethical and scientific concerns. I develop advanced laboratory (in vitro) and computer-based (in silico) models, and refine animal models to make biomedical research more ethical, efficient, and predictive of clinical outcomes.

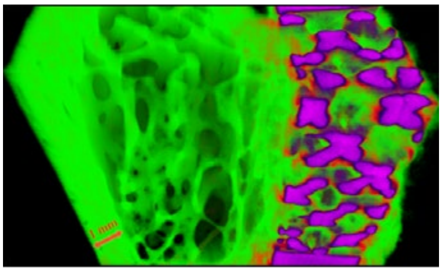
Bridging fundamental and clinical research

New biomaterials and surgical innovations often stall before reaching the clinic. I collaborate with surgeons, veterinarians and researchers to translate basic discoveries into practical, evidence-based solutions that can be applied safely and effectively in real-world healthcare settings.

The impact of human-induced environmental changes on wildlife

I collaborate with Zoos Victoria (Healesville Sanctuary) to study how human-driven environmental changes affect the dental health and jaw function of Australian wombats, focusing on abnormal tooth wear and occlusion that threaten their welfare and survival.

Current orthopaedic implants often fail to integrate properly with bone, causing pain and revision surgeries. I work with clinicians and engineers to design and test improved implants and biomaterials that promote healing and function, benefitting both human and veterinary patients.



This image shows a 3D reconstruction of an implant after 24 weeks in the body. The green areas represent bone tissue that has grown into the metallic lattice structure. By optimising the 3D design of surgical implants, implant integration with the body can be significantly improved.

Professor Lee Skerratt

Professor Lee Skerratt
Melbourne Biodiversity Institute

- Wildlife health
- Epidemiology
- Chytridiomycosis
- Conservation
- Emerging infectious diseases

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I aim to develop novel solutions to wildlife diseases that impact biodiversity and/or spillover to humans and domestic animals.

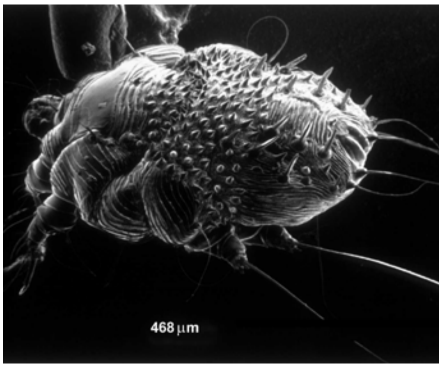
Wildlife health

I use interdisciplinary approaches to tackle a broad range of infectious diseases, including chytridiomycosis in amphibians, sarcoptic mange in wombats, bat lyssavirus, and Buruli ulcer in possums. I seek to understand host resistance, disease co-factors, immunogenetics, drug efficacy, risk analysis, and pathogen virulence.

A major current focus is a genome-wide association study for chytridiomycosis to inform selective breeding for resistant corroboree frogs. Future work includes developing synthetic biology approaches to improve disease resistance in frogs.

Sarcoptic mange is a severe welfare issue in wombats.

The southern corroboree frog is critically endangered due to chytridiomycosis.



The mite (Sarcoptes scabiei) that causes mange.

Dr Paola Vaz

Dr Paola Vaz

- Virology
- Coinfection
- Host-pathogen dynamics
- Wildlife
- Genomics

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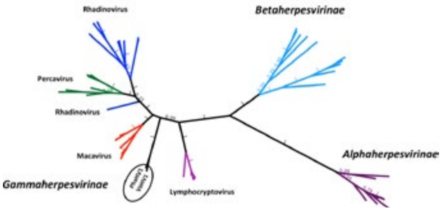
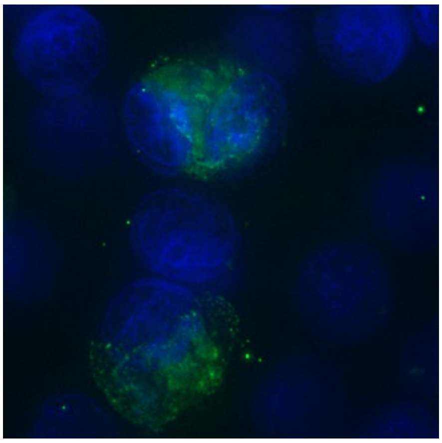
I investigate interactions between common viral and bacterial pathogens in avian and mammalian culture systems, and in their natural hosts, to improve wildlife population health.

Real-world models of infectious diseases

Understanding multi-pathogen interactions is crucial as many pathogens in animals establish chronic or life-long infections, creating opportunities for concurrent infections. I study coinfections of herpesviruses and bacterial co-pathogens and viral mechanisms of evolution, such as genomic recombination and the impact of host-switching events. I examine the epidemiology, genomics and evolutionary relationships between marsupial herpesviruses and other herpesviruses and describe the clinical significance of infection.



Phylogenetic relationships between koala and wombat herpesviruses and other representative herpesviruses, showing the formation of the new gammaherpesvirus genus 'Manticavirus'.



Internalised bacteria within mammalian cells.

Dr Tao Wang

Dr Tao Wang

- Veterinary Parasitology
- Molecular Parasitology

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I use molecular analyses and bioinformatic tools – computational methods and software for understanding large and complex biological datasets – I improve understanding of socio-economically important parasites.

Mapping worm development with multi-omics

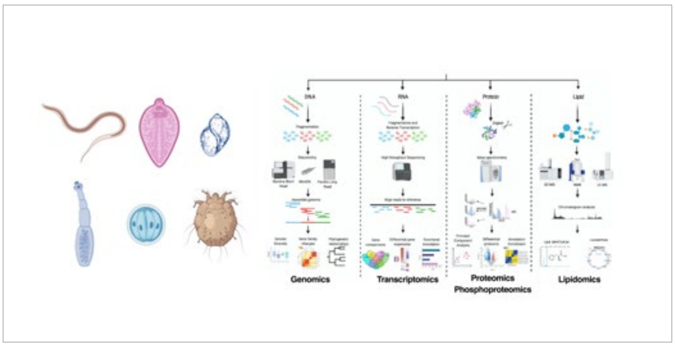
Parasitic worms harm livestock and human health, and their biology remains poorly understood. I use multi-omics approaches – integrating genomics, transcriptomics, proteomics, and lipidomics, or analyses of DNA, RNA, proteins and lipids, respectively – to uncover how these parasites grow and survive. This reveals potential weak points or targets for new treatments.

Identifying drug targets withmass spectrometry

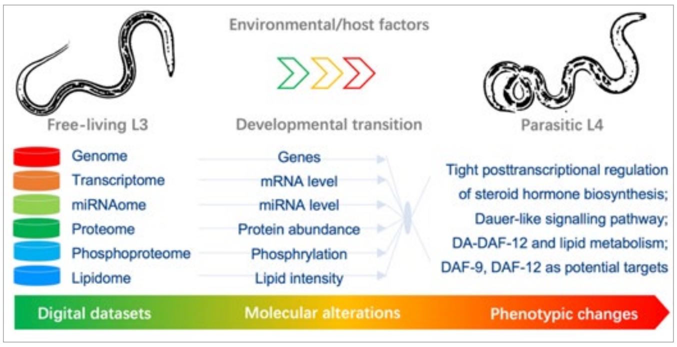
Worms are becoming resistant to current drugs, and limited understanding of drug mechanisms makes counteraction challenging. Using advanced mass spectrometry techniques, including thermal shift profiling and proteome integral solubility alteration (PISA), I identify the proteins that drugs interact with. This knowledge helps improve existing treatments and design new ones.

Creating a single-cell atlas of a major parasite

I am helping to build a high-resolution, single-cell map of *Haemonchus contortus*, the barber's pole worm – a deadly parasite in sheep – to pinpoint critical cell types and genes involved in its development, supporting discovery of novel drug targets, especially for drug-resistant worm strains. Future research will focus on two key areas: (i) mapping gene expression changes to uncover how this worm shifts from a free-living to parasitic stage, and (ii) dissecting tissue-specific responses to novel drug candidates.



Using multi-omics to explore the biology of
socio-economically important parasites.



Mapping worm development with multi-omics.

Dr Nadeeka Wawegama

Dr Nadeeka Wawegama

- Pathogenic mycoplasmas
- Host pathogen interactions
- Vaccine efficacy and safety
- Diagnostic test development

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I aim to find better solutions for controlling and preventing mycoplasma diseases in cattle and poultry to enhance biosecurity, productivity, and animal health and welfare in Australian and global cattle and poultry industries.

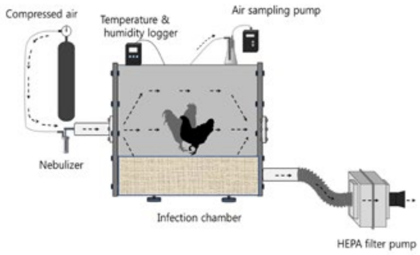
Bacterial virulence factors as vaccine targets

To develop mycoplasma vaccines, I use omics approaches and in vitro cell models to investigate the virulence factors of bovine mycoplasma, including how these bacteria gain access to the host cells, how they spread and cause disease, and which genes are involved in survival and virulence. I also test the safety and efficacy of the resulting commercial vaccines.

Diagnostic test development

I have developed and commercialised a diagnostic test for Mycoplasma bovis (M. bovis) in cattle, which is used globally to control, prevent, and eradicate M. bovis. My test has been used to investigate the epidemiology of M. bovis infection in Australia, Finland, Denmark, Brazil, Sri Lanka, and New Zealand. I am currently collaborating with a commercial diagnostic company to develop a more sensitive diagnostic tool for M. bovis.

Training of researchers from CoVet Lab project, to perform our own M. bovis diagnostic test to use it in M. bovis epidemiological studies in their respective countries.



The purpose-built aerosol infection chamber in APCAH laboratory, Werribee used to mimic natural infection of Mycoplasma spp in production animals (Kanci et al., 2017. Vet microbiology).

Professor Chris Whitton

Professor Chris Whitton

- Equine orthopaedics
- Bone microstructure
- Biomechanics

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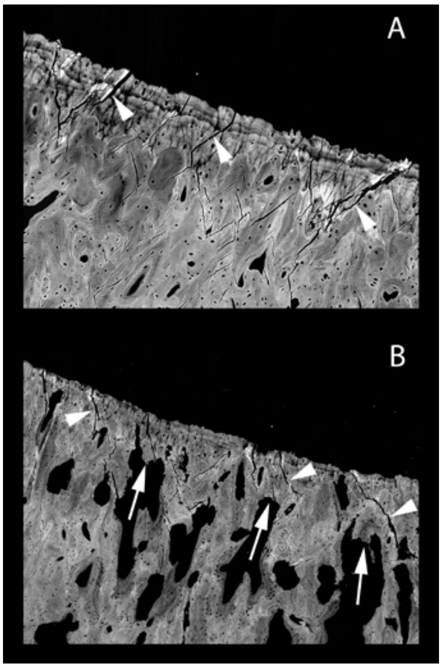
I investigate strategies for predicting and preventing musculoskeletal injury in athletic horses.

My multidisciplinary group combines expertise from biomechanical engineering, epidemiology, bone microstructure analysis, and veterinary clinical expertise to better understand mechanisms and risk factors contributing to musculoskeletal injury in racehorses.

Some of our approaches include:

- Monitoring bone biomarkers to identify horses at risk of injury
- Epidemiological studies of racehorse injury and fatalities
- Developing musculoskeletal models of galloping horses to calculate loads generated in the limbs
- Microstructural analysis of subchondral bone to understand how it may adapt to high-speed galloping and repair microdamage
- Applying inertial sensors to predict limb injury
- Using standing CT to determine injury risk
- Mathematical modelling of bone injury.



Electron microscopy images of bone from the fetlock joint of A: a horse in race training, and B: a horse resting from training showing microdamage (arrowheads) in both, and bone resorption (arrows) in the horse that is resting from training.

A computed tomography (CT) image of the lower limb of a horse.

Dr Anke Wiethoelter

Dr Anke Wiethoelter

- One Health
- Epidemiology
- Wildlife-livestock-human interface
- Emerging infectious diseases
- Evidence-based practice

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I focus on understanding the patterns, causes, and effects of diseases in populations. Acknowledging the interconnectedness of human, animal, and environmental health, I recognise that effective prevention, intervention, and management strategies require a holistic One Health approach that encompasses diverse disciplines and ways of thinking.

I discovered that just 10 diseases, mostly zoonoses, account for nearly half of the globally published knowledge on diseases at the wildlife-livestock interface. Thus, our understanding of ecosystem dynamics for multi-host infectious diseases remains limited. Environmental and social changes have been linked to disease patterns, but further research is needed to understand and prevent emergence of diseases in new host populations, ultimately advancing the well-being of individuals, communities, and ecosystems.

I am engaged in diverse projects investigating epidemiology of infectious diseases shared between wildlife, domestic animals, and humans, including Hendra, brucellosis, Q fever, parasites, and vector-borne diseases. These diseases pose threats to all populations involved, leading to significant economic losses.

A current project focuses on Brucella suis, a zoonotic pathogen endemic in feral pig populations in Australia, which has recently also emerged in dogs. I am investigating the reasons for this emergence, the natural history of infection in dogs, and the risks posed to humans.

Direct contact between a horse and a bat entangled in barbed wire in Queensland, Australia.

Associate Professor Neil Young

Associate Professor Neil Young

- Parasitology
- Malacology
- Genomics
- Genetics
- Drug discovery

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Roundworms and flatworms exploit diverse ecological niches and exhibit remarkable morphological and behavioural adaptations to free-living and parasitic lifestyles. As parasites, they can be found globally and are a significant burden on global health and agriculture. My lab leverages the latest genomic, transcriptomic and proteomic technologies to better understand these parasites and their vectors to inform development of new vaccines and drug treatments.

Parasite genomics and genetics

My primary research focus is molecular parasitology, with an emphasis on understanding the genetics and biology of socio-economically important parasites and their vectors. In biomedical research, genomic resources are well established and widely accessible for common pathogens. Many parasitic diseases lack a similar genomic resource or laboratory models to explore their biology. My lab addresses this bottleneck by using the latest genomics methods to assemble and annotate reference genomes for key parasite species. To do this, I conduct research in the fields of comparative genomics, molecular parasitology, and drug target and vaccine candidate discovery.

Host-parasite interactions

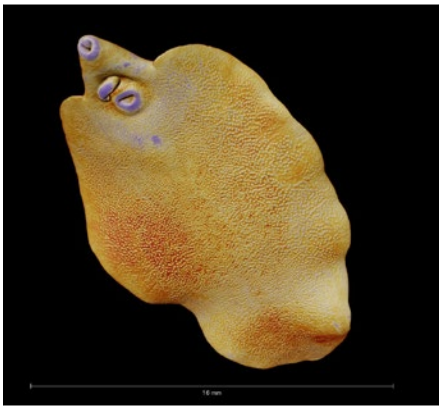
Parasites have intimate relationships with one or more host. By studying host-parasite interactions, my lab aims to understand the mechanisms underlying disease development, transmission, and host response. Such investigations provide valuable insights into conserved and species-specific evolutionary dynamics. My work will lead to the development of effective prevention strategies to combat parasitic infections.

Drug resistance

Many flatworm parasites of livestock are becoming resistant to commercial drugs. My lab uses genetics to understand the mechanisms that underpin the evolution of resistance. The aim of my work is to develop rapid diagnostic tests to ensure producers use suitable drugs to treat parasitic infections.

Collecting samples of parasite eggs from urine in Cameroon for genome sequencing

Australian freshwater snail that is a host for parasites of humans and livestock.



MicroCT image of a liver fluke taken from the bile duct of a sheep.

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