THE UNIVERSITY OF ARIZONA
College of Veterinary Medicine

Mechanisms underlying stress-induced maternal effects in a passerine bird

Project Description: The influence of the mother on an offspring's phenotype is one of the most ubiquitous and important sources of organismal variation. From plants to vertebrates, females affect offspring traits by transferring nutrients, hormones and antibodies to the growing embryo. These resources go beyond the necessary requirements for embryo growth and maturation, they also provide a preview of environmental conditions and often induce adaptive changes in offspring phenotype as the amount and kind of resources transferred reflect the female's current experience. Yet, the evolution of adaptive maternal effects often seems remarkable as females often modify offspring phenotype and behavior to precisely match current ecological conditions. However, with the discovery that stress-induced maternal programming has lifelong effects on offspring phenotype in humans and many lab model species, it suggests the possibility that adaptive maternal effects do not need to evolve anew in each species, but instead may utilize conserved stress-induced pathways to induce the species-specific traits that are most adaptive under stressful conditions. Maternal signals of stress alter gene expression via DNA methylation and other epigenetic modifications which ultimately influences the distribution of glucocorticoid receptors in the brain and metabolic organs such as the liver. Early developmental conditions often also have permanent effects on investment in costly organs, particularly the brain. These effects may be key to understanding how adaptive maternal effects evolve and can also provide insight into the evolution of inflexible behavioral traits, such as animal personality. Our lab is testing these ideas by comparing how exposure to maternal stress during oogenesis influences brain morphology, hypothalamic-pituitary-adrenal axis programming and behavior in a passerine species, the zebra finch.

Project Details: We will work with the student to determine a question of interest within the above framework. Students will gain experience with avian handling to take basic morphology and physiological measurements as well as behavioral and cognitive tests.

Renee Duckworth, PhD

Professor
Ecology and Evolutionary Biology
THE UNIVERSITY OF ARIZONA

Faculty Profile

THE UNIVERSITY OF ARIZONA
College of Veterinary Medicine

Human-animal relationships

Project Description: Join an engaging and insightful research study exploring the dynamics of human-animal relationships. Help us better understand the factors that influence why and when people form or end bonds with their animal companions, such as adopting a shelter pet or returning an animal to a shelter.

Project Details: In our lab, students will explore human-animal relationships, focusing on why people bond with or separate from animal companions. Research questions include understanding why people adopt shelter animals and what circumstances lead to the dissolution of these bonds. Students will design and administer surveys, conduct and transcribe qualitative interviews, and analyze data to identify patterns. They may also help develop experiments to test the impact of adoption strategies. Expected outcomes include identifying factors that foster lasting bonds or lead to returns, contributing to publications, and presenting findings. This work directly supports understanding and improving animal welfare.

Martin Reimann, PhD

Associate Professor
Eller College of Management
THE UNIVERSITY OF ARIZONA

Faculty Profile

THE UNIVERSITY OF ARIZONA
College of Veterinary Medicine

Cognitive Research in Domestic Dogs

Project Description: Our research group studies dog behavior and cognition and had diverse ongoing projects on this topic. One major area of work involves the study of cognitive aging in dogs, and dog models of Alzheimer's disease. Other ongoing work investigates the genetic bases of individual differences in service dogs, and the relationship between individual differences in cognitive and behavioral traits and service dog success.

Project Details: Students would assist with behavioral data collection using standardized measures and would gain exposure to animal handling, data management, behavioral coding, and some elements of data analysis.

** Students will work in collaboration with the laboratory of Dr. Emily Bray**

Evan MacLean, PhD

Associate Professor
Director, Arizona Canine Cognition Center
College of Veterinary Medicine
THE UNIVERSITY OF ARIZONA

Faculty Profile

THE UNIVERSITY OF ARIZONA
College of Veterinary Medicine

Cross-species conversations: The role of pet talk in the lives of older adults

Project Description: The relationship between pet ownership and human wellbeing is complex. Recent studies suggest that the impact of pet ownership on human wellbeing varies individually and contextually, thereby calling for more personalized approaches. Specifically, there is a need for more sophisticated methods such as ecological momentary assessment (EMA), that can capture the complexity of day-to-day interactions among people and their pets. Students will be working with data collected through the Cognitive Assessment in Realistic Environments (C.A.R.E.) study, which researches cognition and Alzheimer's disease risk in older adults. The Electronically Activated Recorder (EAR) is an application which intermittently samples snippets of ambient sounds throughout an individual's daily life.

Project Details: Students will be trained to code and process these recordings by noting aspects such as each participant's location, activity, emotional expression, and interaction partner(s). Part of this baseline coding will involve flagging instances of 'pet talk,' which will subsequently be analyzed to quantify verbal communication between people and their pets.

** Students will work in collaboration with the laboratory of Dr. Evan MacLean**

Emily Bray, PhD, CAAB

Assistant Professor
College of Veterinary Medicine
THE UNIVERSITY OF ARIZONA

Faculty Profile

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College of Veterinary Medicine

Comparative and Evolutionary Analysis of Vertebrate Genes

Project Description: Students will work as part of an ongoing, international project which provides standardized gene nomenclature for vertebrate species. Standardized gene nomenclature is used to ensure that researchers and clinicians can unambiguously identify and communicate about genes commonly used in human health, veterinary medicine and agricultural production. Research students will work collaboratively to identify vertebrate gene sets of interest to the group, compare them to genes from other vertebrate species, and provide gene nomenclature to public, online resources. This research combines elements of genetics, molecular biology, genomics, comparative biology and evolutionary biology, although no advanced training in these fields is required.

Project Details: This work is computer based but requires no programming skills. Students will be reviewing information in databases and published literature to provide curated information about genes. They will learn about resources that they can also use for their own studies.

Fiona McCarthy, PhD

Professor
Animal and Comparative Biomedical Sciences
THE UNIVERSITY OF ARIZONA

Faculty profile

THE UNIVERSITY OF ARIZONA
College of Veterinary Medicine

Impact of Maternal Health on Fetal Outcomes

Project Description: The incidence of equine metabolic syndrome (EMS) in broodmares is suspected to be rising as testing for EMS is not financially feasible and individualized management programs are unpractical in large broodmare operations. However, there is a gap in knowledge of the effect mare maternal EMS has on foal health and metabolic outcomes. We hypothesize that EMS increases the risk of placental dysfunction, which is associated with negative foal metabolic and health outcomes. Our overall approach is to compare histopathology and transcriptomic changes on placentas from Arabian mares with and without EMS to foal health outcomes during the first year of life. We will test our hypothesis by (1) quantifying placental histopathologic changes present from mares with and without EMS, and (2) comparing adverse metabolic and health outcomes between foals during their first year of life born from mares with and without EMS.

Project Details: Student will assist in field data collection including performing oral sugar tests and foal health measurements. Student will also be responsible for data entry and will work with PI in statistical analysis of the data.

Elaine Norton, DVM, MS, PhD, DACVIM-LA

Assistant Professor,
Animal and Comparative Biomedical Sciences
College of Veterinary Medicine
THE UNIVERSITY OF ARIZONA

Faculty Profile

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College of Veterinary Medicine

Disease diagnostics in crustaceans using histopathology & molecular tools

Project Description: Infectious diseases caused by viruses, bacteria, and fungi continue to pose threat to growth, profitability and sustainability of shrimp farming worldwide. As the shrimp industry expands and farming becomes more and more intensive, disease outbreaks will be inevitable, and new disease will continue to emerge. In recent years, the emergence of a microsporidia, Ecytonucleospora hepatopenaei (EHP) has caused major economic losses worldwide and the disease is now a bottleneck in the growth and sustainability of farmed shrimp worldwide. This project involves comparing different stains for the detection of EHP using histopathology and identify a stain that would enable a rapid and sensitive detection of the parasite. In addition, the project also involves developing a fluorescent in situ hybridization method for the detection of EHP.

Project Details: Methods to be used in the lab: 1. Histopathology: Grossing, tissue processing, embedding, microtomy and tissue section staining. 2. Reading tissue section for identifying diseases. 2. In situ hybridization for detecting crustacean pathogen using pathogen-specific labelled probe. Outcomes: 1. Disease identification using histopathology and molecular tools. 2. Comparison of different stains in identifying microsporidia infecting crustaceans.

Arun K Dhar, PhD

Professor
Animal and Comparative Biomedical Sciences
THE UNIVERSITY OF ARIZONA

Faculty Profile

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College of Veterinary Medicine

Behavioral Ecology of Plant-Animal Interactions

Project Description: Pollinators including bees, butterflies, and hummingbirds are monitored for floral preference.

Project Details: Measurement of floral preference Analysis of floral constancy.

Daniel Papaj, PhD

Professor
Ecology and Evolutionary Biology
THE UNIVERSITY OF ARIZONA

Faculty Profile

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College of Veterinary Medicine

U of A SERVES - the Service Dog and Veteran Experiences Study

Project Description: The student will contribute to our ongoing NIH-funded multi-site national randomized control trial (SERvice dog and Veteran Experiences Study, SERVES) examining the effectiveness of trained psychiatric service dogs as a complementary intervention for military veterans with PTSD. In this project, we are recruiting 150 veterans living with PTSD who have applied for and been approved to receive a trained psychiatric service dog. Veterans who participate are randomly assigned to remain on the waitlist (control group) or receive their service dog early (experimental group). We follow veterans in both groups for 15 months, measuring their mental and physical health, suicidality, and other PTSD symptoms to determine whether veterans may experience reductions in their PTSD symptoms because of being paired with a trained service dog.

Project Details: The VSSRP student's primary role in the lab will be to assist with our ongoing data collection for project SERVES. We collect many kinds of data on both the veteran and the dog, including online surveys, ecological momentary assessment (EMA), and biosamples to measure stress (i.e, cortisol from saliva and fecal samples). Specific tasks include packing participant boxes with study materials to send to veterans, as well as unpacking boxes, and labeling and processing biosamples when participants return them to the lab. In addition, students will work individually and with other team members on tasks such as data entry/verification, recruitment efforts (e.g., sending mailers to potential participants), device processing and preparation, as well as social media engagement. More generally, students will engage in team meetings to discuss ongoing research and will meet weekly with their assigned mentor to help guide their learning and support the development of their independent research project.

Maggie O'Haire, PhD

Associate Dean for Research
Professor
College of Veterinary Medicine
THE UNIVERSITY OF ARIZONA

Faculty Profile

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College of Veterinary Medicine

Repurposing 4-aminopyridine and erythropoietin to promote the regeneration and functional recovery of peripheral nerve, skin, and bone after injury

Project Description: Our project primarily focuses on investigating the regenerative effects of two FDA-approved medicines: 4-aminopyridine (4-AP) and erythropoietin (EPO) on peripheral nerve, skin, and bone injuries. We have successfully transitioned from pre-clinical to clinical trials concerning peripheral nerve and skin trauma. We are examining the cellular and molecular mechanisms of 4-AP and EPO using both in vivo (mice) and in vitro (e.g., human osteoblasts, keratinocytes, fibroblasts, Schwann cells, and macrophages) studies. The gene and protein expressions of targeted molecules will be analyzed through immunofluorescence, western blotting, quantitative reverse transcription PCR (qRT-PCR), and various functional cell culture studies. Our goal is to repurpose 4-AP and EPO for the treatment of musculoskeletal injuries and conduct clinical trials at the University of Arizona.

Project Details: Students will have the opportunity to learn and perform various animal surgeries, including those related to peripheral nerves, muscle injuries, skin injuries, and bone fractures. Additionally, they will engage in in-vitro cell culture studies involving human osteoblasts, keratinocytes, fibroblasts, Schwann cells, and macrophages. Students may also conduct molecular studies, gaining familiarity with animal functional studies and techniques such as immunofluorescence, western blotting, and qRT-PCR. Furthermore, students will learn to analyze and summarize data using different software tools like ImageJ and GraphPad Prism. Overall, students will gain a comprehensive understanding of setting up experiments, performing them, and analyzing and summarizing preclinical studies.

Prem Kumar Govindappa, PhD

Assistant Research Professor
Orthopedics
THE UNIVERSITY OF ARIZONA

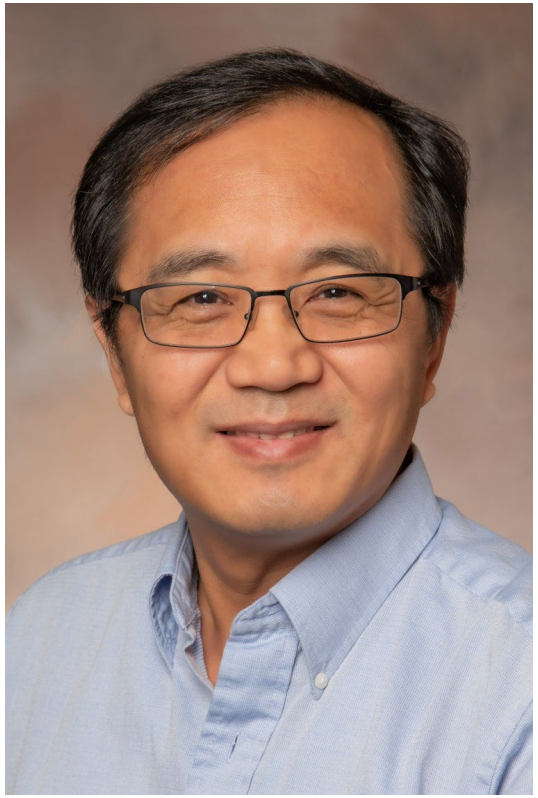
Faculty Profile

THE UNIVERSITY OF ARIZONA
College of Veterinary Medicine

Development of inhibitors for human diseases

Project Description: The project will involve in protein expression and purification, high throughput screening assay development and characterization of candidate inhibitors.

Project Details: SDS PAGE, bacterial culture, protein expression in e coli, protein purification using affinity chromatography and column chromatography, various assay platforms including fluorescence and luminescence.



Hongmin Li, PhD

Professor
Pharmacology and Toxicology
THE UNIVERSITY OF ARIZONA

Faculty Profile

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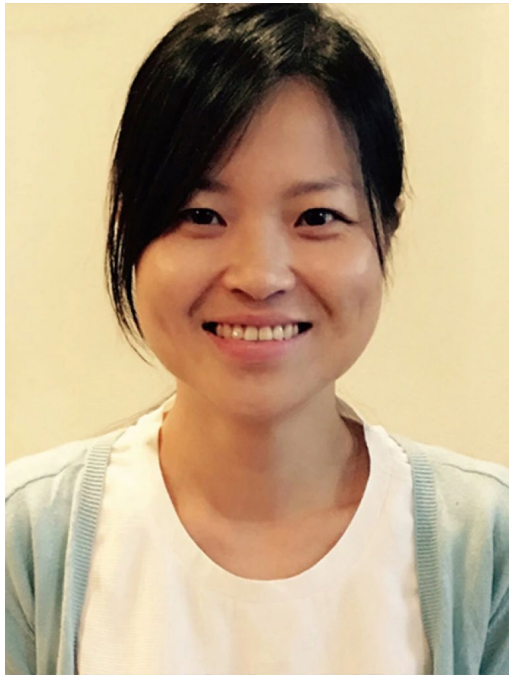
College of
Veterinary Medicine

Role of PBMC-endothelial cells interaction in fetal endothelial dysfunction associated with heat stress-induced fetal growth restriction

Project Description: Exposure to heat waves poses significant health concerns for pregnant women and animals which is associated with adverse pregnancy outcomes such as fetal growth restriction (FGR). This study aims to investigate the mechanisms underlying fetal endothelial dysfunction in FGR which is critical for future therapeutic strategy development. This study have the potential to change the existing paradigm of research on fetal endothelial dysfunction in FGR and promote immune and cardiovascular health in offspring post FGR. Supportive findings from our innovative approach will have transformative implications in perinatal care for human and animals in the current world facing global warming. [This project is especially relevant to the local population in Arizona as heat waves occur frequently during summer months in Arizona and may contribute to adverse pregnancy outcomes in animals and in pregnant women with significant outdoor activities.]

Project Details: We utilize a heat-stress induced FGR model in (sheep) and primary human cells preparations in this study. Results from this project will provide valuable information on mechanisms underlying fetal immune and ECs dysfunction in heat stress associated FGR.



Chi Zhou, PhD

Assistant Professor
Physiology
THE UNIVERSITY OF ARIZONA

Faculty Profile

THE UNIVERSITY OF ARIZONA
College of
Veterinary Medicine

Ferret Brain-Behavior Relationships

Project Description: Our lab is following a cohort of ~12 ferrets over their lifespan and working to link MRI scans with behavioral and other outcomes during normal aging. We have worked closely with UA vets and vet staff on MRI protocols as well their care, enrichment and behavioral observation of the ferrets. Basic medical information has also been collected. We also have brains from previous cohorts and plan to section these for histopathology.

Project Details: This depends on student interest but can include MRI scan assistance, image analysis, behavioral testing and analysis, clinical data analysis and/or histopathology.

Elizabeth Hutchinson, PhD

Assistant Professor
Physiology
THE UNIVERSITY OF ARIZONA

Faculty Profile

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College of
Veterinary Medicine

Glycocalyx oxidative signaling

Project Description: We investigated the heart failure and its pulmonary complications. We are investigating how specific proteoglycans contribute to disease progression.

Project Details: Focus on calcium and redox-dependent signaling.

Andreia Zago Chignalia, PhD, PharmD

Assistant Professor
Physiology
THE UNIVERSITY OF ARIZONA

Faculty Profile

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Veterinary Medicine

Stabilizing properties of muscle-tendon units in-vivo

Project Description: The primary goal of this research is to understand the role of muscle and tendon in stabilizing movement. Current projects focus on surgical instrumentation of sensors onto the lateral gastrocnemius and tibialis cranialis muscle-tendon units in turkeys. After successful surgical instrument, we then measure muscle-tendon function while animal perform standing and walking tasks using motion capture and force measuring techniques. The long-term objective is to use this information to design and build biologically inspired muscle-tendon unit (MTU) actuators. The development of biologically inspired muscle-tendon actuators has particular relevance to human health because these types of unique actuators have the potential to supplement or even replace human limbs. These experimental results will 1) help in developing more effective rehabilitative interventions aimed at replacing limbs lost to disease and/or injury, 2) contribute to the design principles of biologically inspired muscle-tendon actuators aimed at restoring movement, and 3) to understand the significance of the muscle and tendon behavior on movement stability.

Project Details: Student has the opportunity to work directly with PI on surgeries, sensor instrumentation, hands-on experiments, and data analyses. The expecting outcomes are to present results on regional conferences and publish at least one paper as 1st author or co-author, depending on time availability.

Christopher Arellano, PhD

Associate Professor
Orthopedic Surgery
THE UNIVERSITY OF ARIZONA

Faculty Profile

THE UNIVERSITY OF ARIZONA
College of
Veterinary Medicine

Microplastics and PFAS detection and toxicology study

Project Description: A set of biologically interacting molecules (BIMs - including amino acids, peptides, and small globular proteins) will be allowed to interact with environmental toxicants - microplastics and PFAS - in paper microfluidic device and analyzed collectively via machine learning to identify the types of microplastics and PFAS. The same principle will also be applied to organ-on-a-chip device to investigate the toxicological impacts of miroplastics and PFAS to human, toward minimizing animal tests.

Project Details: Basic analytical chemistry skills (e.g., standard curve, absorbance, fluorescence, microscopic imaging, etc.); Mammalian cell culture (desired but not absolutely necessary).

Jeong-Yeol Yoon, PhD

Professor
Orthopedic Surgery
THE UNIVERSITY OF ARIZONA

Faculty Profile

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College of
Veterinary Medicine

Modeling natural processes of sensing and action through studies of the echolocating bat

Project Description: The student will be involved in an ongoing project aimed to understand how the brain sequences motor actions for spatial orientation. This is studied through research on the echolocating bat and its natural hunting behaviors.

Project Details: Collecting behavioral data, animal care and training, data analysis of collected data, maybe some histological analysis of tissue.

Melville Wohlgemuth, PhD

Assistant Professor
Neuroscience
THE UNIVERSITY OF ARIZONA

Faculty Profile

THE UNIVERSITY OF ARIZONA
College of Veterinary Medicine

Ant colonies as complex systems: collective contests and error correction

Project Description: We are interested in understanding the local, individual behaviors of ants that create sophisticated adaptive collective behaviors. In our current projects we study how ants estimate the size of an enemy colony as well as their resource value; how aggression at the individual level translates to individual and collective outcomes; how individual errors affect collective performance; and how communication among individuals can help mitigate errors and maximize collective performance.

Project Details: We primarily use two approaches in this project: lab experiments with captive ant colonies, and individual-based simulations. Students working in the lab over the summer can participate in one or both; for the simulations, some experience with UNIX or command-line interfaces is beneficial (although not required for enthusiastic students). Empirical work often involves video analysis, where we first do the actual experiment, film the behavior or outcomes, then track movements or behaviors on videos. I encourage students to do some of their own data analysis in R (and provide training). Behavioral data are complex/noisy, so high sample sizes are desirable and require patience and attention to detail, especially in manually recording information from video data. Students who work reliably and consistently over the summer should get to a point of being able to develop their own sub-projects to the larger questions and perhaps run experiments or data analyses to answer them.

Anna Dornhaus, PhD
Professor
Ecology and Evolutionary Biology
THE UNIVERSITY OF ARIZONA

Faculty Profile

THE UNIVERSITY OF ARIZONA
College of Veterinary Medicine

Augmented Reality in Veterinary Medicine

Project Description: Students will be working with a number of units to develop Augmented Reality and Mix media educational sessions and test the viability of these educational materials.

Project Details: Students will work with mix media head sets, 360 D cameras, iPads, scanners and 3D printers while working with clinical faculty to create educational modules and test using surveys and qualitative focus group discussions to collect data.

Athena Ganchorre, PhD

Assistant Dean, Strategic Engagement
Student Affairs
College of Veterinary Medicine
THE UNIVERSITY OF ARIZONA

Faculty Profile