

## Midwestern University- Boehringer Ingelheim Veterinary Scholars Program 2019

### Goals of this program:

- Maximize the opportunity for students to further their education and training by learning to conduct laboratory-based biomedical research under the supervision of a faculty mentor
- Encourage veterinary, pre-vet, and animal sciences students to consider careers in biomedical research following graduation

### Key features:

- Fellowship is provided for **10 weeks during the Summer of 2019**
- Stipend of \$4,800, half of which will be paid at the beginning and half at the end of the 10-week program
- Students conduct **hypothesis-driven research** under the guidance of an MWU faculty mentor
- **Weekly Colloquium** where each fellow will present one seminal research article to their Veterinary Scholar colleagues during the Summer
- Full-day program orientation with seminar topics in research methodology and ethics
- **Careers Chats: Scholars will have an opportunity to meet with distinguished visiting speakers** regarding careers in biomedical research
- **An opportunity to attend and present at the NIH-BI Symposium in North Grafton, MA in 2019**

### Requirements:

- Students in the first- and second- year of Veterinary Medical, Pre-Vet, or Animal Science programs are eligible
- Student has to maintain good academic standing leading to and during the summer fellowship
- Time commitment for the fellowship program is expected to be significant, and could average 40 hours of research activity per week, over the length of the 10-week program
- Full participation in activities of the program, and activities stipulated by faculty mentor such as lab meetings etc.
- Student provides final project update, approved by faculty mentor, to Associate Dean for Research by Sep 30, 2019
- Student will present the research findings as an abstract/poster at the MWU Research Day in May of 2020
- Research fellows are not required to have performed past services or to agree to perform future services for the University, as a condition of receiving the research fellowship stipend

### Application Components due on Jan 7, 2019:

1. A letter of interest indicating:
  - Interest in up to three mentors and research projects. These choices must be made from the MWU faculty members and research projects listed in this document.
  - a vision of how this experience may shape/guide the fellow into a career in biomedical research
2. Curriculum Vitae
3. One letter of reference from a faculty member at the student's university who is familiar with the student's interest in research. The student does not have to have prior research experience to qualify for this award.

### Application Review process:

Applications will be reviewed by MWU College of Veterinary Medicine (CVM) Research Committee and ranked based on:

1. Eligibility of student
2. Letter of interest
3. Letter of reference

The highest ranking applicants will be awarded fellowships

**Number of fellowships (tentative): 2 for non-CVM students; 12 for CVM students.**

Important Dates:

- **Application submission deadline Feb 22, 2019**, Email: Nellie Goetz, DVM, PhD, Director of BIVSP, [ngoetz@midwestern.edu](mailto:ngoetz@midwestern.edu) with subject **MWU-BIVSP-2019**
- **Awards Announced no later than Mar 1, 2019**. For additional information, please email [amurth@midwestern.edu](mailto:amurth@midwestern.edu) with subject: MWU-BIVSP-2019

**The student awardees will be guided to a research mentor at MWU whose research project closely aligns with one of the student's choices.**

The student and mentor will then develop a research proposal **by May 1, 2019** to include:

- 3-page research proposal must contain the following sections: Specific Aims, Background and Significance, Innovation, Research Design, Time-line, and Specifics of Student Involvement. Preliminary data are not required,
- Separate sections of literature cited and biosketch of PI (s), both in NIH format
- Applicable vertebrate animals, human subjects, and biosafety descriptions in NIH format (indicate MWU file #)

**Midwestern University**  
**College of Veterinary Medicine Summer Research Fellowship Projects - 2019**

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**College of Veterinary Medicine - Department of Medicine**

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Laboratory principle investigator:	Mark J. Acierno, M.B.A., D.V.M., DACVIM
Project 1, Title:	Potential for <i>e. coli</i> associated with community acquired urinary tract infections to produce biofilm and the effect of biofilm on antimicrobial resistance
Summary:	The purpose of this study is to identify uropathogenic bacteria capable of producing a biofilm from isolates collected from patients with community acquired UTIs as well as assess the degree of antimicrobial resistance the biofilm provided.
Methods acquired during fellowship:	Proper bacterial culture handling techniques; crystal violet assay technique for evaluating bacterial biofilm production – including micro-plate incubation, staining and using spectral absorbance to determine biofilm production; determining minimal bactericidal concentration of an antimicrobial agent for planktonic cells and biofilm cells; reading and evaluating scientific literature; writing scientific abstracts and manuscripts
Project 2, Title:	PCR-Based quantification of microbial DNA in dogs with clinical signs of a UTI but negative urine culture
Summary:	Studies in human medicine have revealed that a significant number of patients with signs consistent with a UTI but fail to demonstrate a positive bacterial culture will have DNA evidence of a bacterial infection in their urine. The purpose of this study is to determine if a number of the 65% of dogs who have signs consistent with a UTI but a negative bacterial culture will also have DNA evidence of a bacterial infection.
Methods acquired during fellowship:	Proper bacterial culture handling techniques; PCR techniques including developing primers - setting, running, staining and interpreting PCR gels; reading and evaluating scientific literature; writing scientific abstracts and manuscripts

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Laboratory principle investigator:	Jared Jaffey, D.V.M., M.S., DACVIM
Project Title:	Immune function and association of vitamin D in shelter dogs
Summary:	The primary goal of this study will be to investigate the impact that being housed in a shelter has on the immune response and vitamin D concentrations in dogs. A secondary goal will be to determine if serum vitamin D concentrations are associated with immune function.
Methods acquired during fellowship:	Study design, recruiting patients, laboratory skills (e.g., whole blood cultures, how to evaluate cytokine concentrations using the Luminex, and flow cytometry to assess granulocyte/monocyte phagocytosis and oxidative burst), organization and analysis of data, manuscript preparation, and presentation of research at a national forum

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## College of Veterinary Medicine - Department of Pathology and Population Medicine

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Laboratory principle investigator: Clemence Chako, B.V.Sc., Ph.D., DACVIM

Project 1, Title: The effect of subclinical hypocalcemia on peripartum incidence of pneumonia in lactating dairy cows.

Summary: Subclinical hypocalcemia (SCH) is linked to important diseases including metritis, abomasal displacement (DA), and subclinical ketosis (SCK). Recently, we have observed an unusually high incidence of pneumonia in adult dairy cows at a local dairy farm. The objectives of this study is to determine an association between SCH and pneumonia.

Methods acquired during fellowship:

1. Blood withdrawal
2. Thoracic ultrasound
3. Blood gas analysis
4. Cell culture
5. ELISA
6. Bronchoalveolar lavage

Project 2, Title: *Cryptosporidium parvum* immune responses

Summary: *Cryptosporidium parvum* is a major cause of diarrhea in calves and humans. We will collect and store peripheral blood mononuclear cells from calves with cryptosporidiosis. We will measure cytokines and other metabolites following culture and stimulation of cells. The objective is to determine immune responses.

Methods acquired during fellowship:

1. Blood withdrawal
2. DNA isolation and PCR
3. Cell culture
4. ELISA

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Laboratory principle investigator: Nellie Goetz, D.V.M., M.P.H.

Project Title: Expression profiles of immune mediators in neonatal kittens in response to vaccination in two different sheltering environments

Summary: We will be exploring the immunologic profiles of neonatal kittens (6 weeks – 3 months of age) in two different sheltering environments to ascertain the effect of the environment and vaccine protocols on the immune system. We will be looking at the expression of pro-inflammatory cytokines (e.g. IL8, TNF-alpha, IL1-beta, and IL6) and T-cell differentiation.

Methods acquired during fellowship: Microsample handling, Multiplate ELISA assays, flow cytometry

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Laboratory principle investigator: Rachael Kreisler, V.M.D., M.S.C.E.

Project Title: Epidemiology of Canine Infectious Respiratory Disease Complex (CIRDC) in a High Volume Open Admission Animal Shelter

Summary: Five years of daily logs detailing clinical signs of upper respiratory disease in individual dogs are available to combine with patient electronic records (including medication records) to describe the epidemiology of canine infectious respiratory disease complex in a high volume open admission shelter in an urban environment. These data can be used to construct survival curves for time to incidence, determine risk factors for CIRDC, response to medication, and describe the quality and duration of clinical signs in the absence and presence of antibiotics.

Methods acquired during fellowship: Project design, data collection, data visualization, statistical analysis, epidemiology, manuscript preparation

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Laboratory principle investigator:	Brina Lopez, D.V.M., Ph.D.
Project Title:	Optimized Methods for the <i>Ex Vivo</i> Generation of Bovine Monocyte-Derived Dendritic Cells (MoDC) Under Serum-Free Conditions
Summary:	MoDC are vital in the transition between the innate and adaptive immune response to infection. This study involves optimizing a protocol for generating bovine MoDC in the absence of immune modulating factors. This methodology will allow accurate assessment of MoDC immunologic characteristics and will support future studies.
Methods acquired during fellowship:	This project will provide invaluable training in multiple laboratory techniques including project design, cell culture procedures, assay development and optimization, and data analysis.

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Laboratory principle investigator: Ashlesh K. Murthy, M.D., Ph.D.

Project Title: Protective Immunity and Pathogenesis of Mucosal Bacterial Infections

Summary: Mucosal surfaces are the largest portal of entry of pathogens into the body. Host immune responses combat infections; however, they also cause collateral inflammatory damage. My laboratory is currently focused on understanding the role of CD8 T cells in immunopathogenesis of chlamydial infection in the female reproductive tract.

Methods acquired during fellowship: Animal modeling of disease, ELISA, ELISPOT, flow cytometry, flow assisted cell sorting, immunofluorescent microscopy, cell culture

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Laboratory principle investigator: Shankar Thangamani, D.V.M., Ph.D.

Project Title: Investigating the role of gut metabolites in the colonization of bacterial and fungal pathogens

Summary: Opportunistic pathogens in the gastrointestinal tract including *Candida albicans*, *Clostridium difficile*, *Clostridium perfringens* and *Enterococcus* causes life-threatening infections in humans and animals. Our laboratory is primarily interested in understanding the role of gut metabolites in the GI colonization of enteric pathogens to develop novel therapies.

Methods acquired during fellowship: *In vitro* bacterial and fungal growth assays, biofilm and hyphal assays

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Laboratory principle investigator:	Kathryn Wycislo, D.V.M., Ph.D., DACVP
Project 1, Title:	Validation of a handheld hematocrit reader for use in companion animals
Summary:	A commercially-available veterinary handheld hematocrit reader will undergo independent instrument validation, in accordance with the American Society of Veterinary Clinical Pathology QALS Committee Quality Control Guidelines.
Methods acquired during fellowship:	Instrument validation testing (linearity, replication, recovery, method comparison, and interference studies), hematocrit/PCV, specimen handling, statistical analysis, poster/manuscript preparation
Project 2, Title:	Retrospective characterization of the spectrum of <i>Coccidioides</i> spp. infection in animals presented to a veterinary teaching hospital
Summary:	Qualitative and quantitative data from veterinary patients diagnosed with <i>Coccidioides</i> will be gathered, analyzed, and summarized to provide a better understanding of the clinical, clinicopathologic, and histologic findings observed in both companion and non-companion animals.
Methods acquired during fellowship:	Data accrual and analysis, medical software operation, statistical analysis, familiarity of <i>Coccidioides</i> spp. pathogenesis/lesions/diagnosis, poster/manuscript preparation

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Laboratory principle investigator:	Kathryn Wycislo, D.V.M., Ph.D., DACVP
Project 3, Title:	Investigating the effects of TLR agonists on gene and protein expression in osteosarcoma cell lines
Summary:	Immortalized osteosarcoma cell lines of murine and canine origin will be assessed for changes in known metastasis-associated proteins in response to TLR agonist therapy.
Methods acquired during fellowship:	Cell culture techniques, protein and RNA collection, qPCR, western blot, statistical analysis, poster/manuscript preparation

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## College of Veterinary Medicine - Department of Surgery

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Laboratory principle investigator:	Stephanie Shaver, D.V.M., DACVS-SA
Project Title:	Accuracy of fluid cytology for diagnosis of sepsis and effect of practitioner experience
Summary:	Evaluation of students, inexperienced clinicians, and experienced clinicians in evaluating fluid cytology to diagnose septic effusion. We hypothesize that there will be a significant difference in diagnostic accuracy based on years of training and years in practice.
Methods acquired during fellowship:	Familiarity with the appearance of septic and non-septic cytology, microscopy experience, data collection, manuscript preparation

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## College of Graduate Studies - Department of Anatomy

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Laboratory principle investigator:	Ari Grossman, Ph.D.
Project Title:	Dissection of the distal limb of the Giraffe
Summary:	Captive giraffes suffer pathologies of the distal limbs. Dissections of Giraffe distal limbs detailing these pathologies are lacking. This project is an in-depth dissection of the distal limb of a captive Giraffe with pathologies of the distal joints. Pathological tissue will also be examined histologically.
Methods acquired during fellowship:	Detailed dissection, histology sectioning, pathology

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Laboratory principle investigator:	Kathleen M. Muldoon, Ph.D.
Project Title:	Investigating Environmental Change in Madagascar
Summary:	Madagascar suffered significant ecological transformation in the last 10,000 years with the extinction of diverse megafauna. Long-term dietary information from carnivores provide a unique opportunity to investigate the cause and consequences of these extinctions. Interns will work hands-on with osteological material collected from southeastern Madagascar.
Methods acquired during fellowship:	Students will learn how to design a research project, prepare skeletal samples, identify mammals from their remains, and interpret osteological remains. Opportunities are available for students to develop their own research using project data. No special skills are required except enthusiasm, patience, and attention to detail.

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Laboratory principle investigator:	Heather Smith, Ph.D., M.A.
Project Title:	Adaptations to cursoriality in the forelimb of the African wild dog ( <i>Lycaon pictus</i> )
Summary:	The endangered African wild dog ( <i>Lycaon pictus</i> ) is unique among canids in relying upon exhaustive predation. Forelimb musculature of <i>Lycaon pictus</i> will be dissected, described, and photodocumented for the first time. Comparative descriptions will be made to determine specific muscular adaptations that facilitate the African wild dog's unique cursorial habits.
Methods acquired during fellowship:	Dissection/surgical skills, Anatomy, Morphometrics, CT-scanning

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### **College of Graduate Studies - Department of Biochemistry**

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Laboratory principle investigator:	Chongwoo A. Kim, Ph.D.
Project Title:	Structure and function of Polycomb group proteins
Summary:	We aim to understand the molecular function of the Polycomb group (PcG) family of epigenetic regulators. We will determine the mechanism of assembly of multi-protein PcG complexes, its effect on histone modifications, then utilize this information to manipulate the gene expression program to treat disease.
Methods acquired during fellowship:	Protein purification, binding affinity measurements, histone modification assays

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## College of Graduate Studies - Department of Biomedical Sciences

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Laboratory principle investigator:	Lori Buhlman, Ph.D.
Project Title:	Assessing the ability of methylene blue to attenuate climbing deficits and H <sub>2</sub> O <sub>2</sub> levels in a <i>Drosophila</i> model of Parkinson's disease
Summary:	H <sub>2</sub> O <sub>2</sub> levels are increased and climbing behavior is decreased in parkin loss-of-function flies. We hypothesize that methylene blue can reduce H <sub>2</sub> O <sub>2</sub> levels and improve climbing behavior. We will assess H <sub>2</sub> O <sub>2</sub> levels and climbing in flies exposed to methylene blue, which has been shown to promote electron transport during mitochondrial respiration.
Methods acquired during fellowship:	<i>Drosophila</i> climbing protocol, immunofluorescence, confocal microscopy and digital image processing

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## College of Graduate Studies - Department of Pharmacology

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Laboratory principle investigator:	Gerald Call, Ph.D.
Project Title:	Determining the effect and role of the microbiome in a <i>Drosophila</i> Parkinson's disease model
Summary:	My lab works with a fruit fly model of Parkinson's disease. These flies have decreased motor functions like climbing. We have recently found that altering the microbiome of these flies improves their climbing ability. This project will identify how and why the microbiome produces this benefit.
Methods acquired during fellowship:	Microbiology techniques (bacterial isolation, culture, identification, etc.), molecular biology techniques (PCR, gel electrophoresis, DNA sequencing, etc.), fruit fly techniques (handling, husbandry, behavioral (climbing) assays, etc.)

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## College of Graduate Studies - Department of Physiology

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Laboratory principle investigator:	Layla Al-Nakkash, Ph.D.
Project Title:	Understanding the effect of genistein (bioactive component in Soy) supplementation and exercise on intestinal epithelial tissue in murine models of diabetes, CF or endometriosis
Summary:	The overall lab goal is to assess how dietary modifications (specifically genistein supplementation) influence gut function in mouse models mimicking clinical diseases.
Methods acquired during fellowship:	Western blot, PCR

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Laboratory principle investigator:	Ann Revill, Ph.D.
Project Title:	Modulation of Hypoglossal Motoneurons
Summary:	Interrogating the cellular and synaptic components that make up a neural circuit is key to elucidate how these components generate behaviour. To address these research questions, we employ a rhythmic slice preparation. Students can expect to work on their own research project investigating neurochemicals that modulate neural excitability and their subsequent influence on neuronal behaviour in this network.
Methods acquired during fellowship:	electrophysiology, neuroanatomy

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Laboratory principle investigator:	Tobias Riede, D.V.M., Ph.D.
Project 1, Title:	Development of the Larynx
Summary:	Causes of laryngeal deformations are unknown but hypothesized to include both genetic and epigenetic factors. Knowledge of the postnatal development of the larynx is of importance in understanding how congenital anomalies appear clinically. You will use a rodent model and investigate laryngeal shape at different ages.
Methods acquired during fellowship:	Tissue dissection, micro-computed tomography, 3D reconstruction, statistical analysis of morphological shape
Project 2, Title:	Integrating Breathing and Laryngeal Movements
Summary:	The integration of breathing and laryngeal movements is essential for normal respiratory function and other behaviors. Failure to maintain breath support or appropriate breathing rhythm without adaptive changes in larynx movements, have dramatic effects on respiratory function. You will use a rodent model and investigate integration of two movements.
Methods acquired during fellowship:	Behavioral observation, electromyography, data analysis

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Laboratory principle investigator:	John VandenBrooks, Ph.D.
Project 1, Title:	Elucidating the Role of <i>Rhipicephalus sanguineus</i> (the Brown dog tick) as a Vector for Rocky Mountain Spotted Fever (RMSF) Transmission in Arizona and Mexico
Summary:	<i>Rhipicephalus sanguineus</i> has recently been identified as a vector for the rickettsial disease RMSF in human/canine populations in Arizona/Mexico. Although, the brown dog tick is endemic throughout North America, it does not transmit RMSF elsewhere. Therefore, we focus on understanding the mechanisms behind its role as a unique vector in these regions.
Methods acquired during fellowship:	Polymerase Chain Reaction (PCR), Immuno-fluorescence assay (IFA) analysis, scanning electron microscopy (SEM), seroprevalence, blood draws and analysis, DNA isolation, epidemiology, phylogenetics, bacterial genomics and tick genetics, morphometrics, mobile clinic work, one health research approach
Project 2, Title:	The Effect of Varying Oxygen Levels on Animal Physiology, Development, and Thermal Tolerance
Summary:	Oxygen is the most important atmospheric component for all terrestrial aerobic organisms. Our lab uses several animal models including insects, lizards, and quails to test how variation in atmospheric oxygen availability affects body size (i.e. giant insects from the Paleozoic), respiratory systems, ontogenetic development, and thermal tolerance (i.e. the OCLTT hypothesis).
Methods acquired during fellowship:	oxygen regulation, respirometry, confocal microscopy, animal rearing methods, light microscopy, microdissection, flight mechanics, thermal tolerance assays, metabolic rate manipulation, microinjections, embryology and development, paleophysiology

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