Incorporating Technology into Veterinary Medical Education

38th Annual Report

Veterinary Medical Experiment Station
College of Veterinary Medicine
The University of Georgia
Athens, Georgia 30602

VMES 2014
Science in Service to Animals™
The key to improved animal well-being is animal health.
The key to improved animal health is veterinary research.
The Veterinary Medical Experiment Station (VMES) was established as a budgetary entity by the state legislature in July 1976 following approval by the University of Georgia Board of Regents in 1973.

**MISSION**

*The VMES mission is to coordinate research on animal disease problems of present and potential concern to Georgia’s livestock and poultry industries.*

**OBJECTIVES**

- Improve the health and productivity of domestic livestock, poultry, fish, and other income-producing animals and wildlife through research
- Assist in preventing disease epidemics by providing laboratory resources and highly skilled scientific personnel
- Assist in protecting human health through the control of animal diseases transmissible to man
- Improve the health of companion animals, which serve to enrich the lives of humankind
- Train new scientists in animal health research in order to provide continuity and growth in this vital area of veterinary medicine

*The Veterinary Medical Experiment Station is committed to enhancing animal production, profitability, and well-being by improving animal health.*

*All programs and activities of the Veterinary Medical Experiment Station are conducted without regard to race, color, national origin, age, sex, or handicap.*
discovery and communication, as well as science education are important functions of the University of Georgia College of Veterinary Medicine. In this year’s VMES Annual Review, Drs. James Moore and Scott Brown provide an overview of the College’s Educational Resources Center (ERC), which has played a role in scientific communication through visual presentation of data for more than 35 years. As you will read, the ERC provides cutting-edge technologies for visualization of new information as well as for elucidation of complex concepts in science education.

As in our previous publications, this 38th VMES Annual Report gives a synopsis of peer-reviewed, competitive projects and new faculty start-up projects conducted during fiscal year 2014 (July 1, 2013 – June 30, 2014). Projects supported by VMES funding, which is provided by the State of Georgia, and projects funded with USDA 1433 Formula Funds are reviewed by veterinary scientists for quality of science and focus on relevant health issues or disease problems. The research must be both innovative and translatable to the improvement of animal health. Further information on these projects is available by contacting the VMES office staff by phone, e-mail or website, or directly from the investigators themselves. A list of publications is provided. These peer-reviewed papers represent a selection of VMES-supported work and other scholarly research by the faculty of the College of Veterinary Medicine.

It will become apparent from reading this year’s Annual Report that research in the College of Veterinary Medicine is diverse, but clearly targeted to addressing issues related to animal and human health. As I often emphasize, this diversity is both the strength and challenge of the veterinary profession. Diversity in investigations ranging from the molecular to the whole organism and populations ensures the relevancy of the work to the rapidly changing biomedical and veterinary research environment. The challenge lies in maintaining the focus required for establishing excellence in specific areas. We are succeeding based on a number of metrics, including our continuing growth in competitive, extramural research funding.

We list the names of 23 individuals who received graduate degrees in 2014 after completing a comprehensive training program that includes original research conducted under the mentorship of a College researcher. These students are attracted to our programs for the excellent research experiences and mentoring that they find here. The training of future researchers is of utmost importance to fulfilment of the mission of the Veterinary Medical Experiment Station and to meeting the future animal and public health needs of our state, nation and world.
A summary of the College’s research funding is provided above. Over the past year approximately six research dollars were leveraged for each VMES dollar invested. Expenditures are from all sources including State Appropriations, Extramural Research Funding, and Donations – includes all expenditures and personnel costs.

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<th>Budget Category</th>
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<td>Personnel-Researchers/Techs/Research Staff</td>
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<td>Research Materials &amp; Equipment</td>
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Recall concepts in science courses in high school or college that drove you crazy? We all experienced them, though yours might have been different from ours. A common culprit was the combination of glycolysis, Krebs’ cycle and oxidative phosphorylation. How many ATPs came out of which part? Did this step take place in the cytosol or mitochondria? Where did the carbon atoms go? Or, perhaps it was photosynthesis. Which steps took place in the light and which in the dark? Who was Calvin and what was his cycle all about? Do plants have a support groups called Thylakoids Anonymous? Or, maybe immunology drove you crazy with all of its abbreviations. Fab, Fc, IFN, IgM, HLA, LPS, PHA . . . doesn’t anyone know how to spell anymore? Or, our favorites – just about anything in physics.

Why are these concepts, and others like them, so difficult for students to master? There are several possible reasons, not the least of which is the approach many of us took when we studied. Very few of us actually focused on understanding a concept or, heaven forbid, being able to apply it. As a result, most of us viewed the material as something to be wedged into our short-term memory for an upcoming test. Our approach was ‘memorize it for the test on Tuesday and hope that it doesn’t show up again on the final exam’. When a teacher in a subsequent class asked if we’d previously ‘learned’ this material, we’d raise our hands with trepidation, as if to say: “Define learned”.

What do these concepts, and many like them, have in common that cause students to relegate them to short-term memory? For starters, many of these concepts appear to be complex, particularly those that involve biochemical pathways. However, the most common characteristic is that they are very difficult, if not impossible, to envision. As a novice, how do you envision what is happening inside part of a cell or in a leaf or on the surface of an immune cell? Furthermore, and perhaps more importantly, how do you develop a mental model that accounts for the dynamic nature of these concepts, and how do you do this in the limited time available between the introduction of the material and the test? The easy answer is that you need help, and we’re happy to highlight in this issue that help exists in our College’s Educational Resources Center.

Educational Resources is a uniquely skilled unit in the College that has existed for more than 35 years. Originally, Educational Resources was staffed by a handful of photographers and an artist or two, whose responsibilities were to create teaching materials using photographs and line drawings. In the 1970’s, Educational Resources added its first medical illustrator and the game changed immediately. To understand the impact of this change, you need to appreciate the unique background and capabilities of medical illustrators.

Some very forward thinkers in the late 1940s at the then Medical College of Georgia established a Masters of Science level training program for medical illustrators, which later was the first program in the nation to be accredited by the Association of Medical Illustrators. Today that medical illustration training program is one...
of only four accredited programs in North America. Not only are students entering these programs highly accomplished as artists, but they also have a proven interest in science in general and medicine in particular. During the training program, the students take gross anatomy and cell biology with medical students, and spend time in the operating room, while receiving advanced training in the latest methods used to create illustrations. As a result, they graduate with a strong understanding of anatomy, physiology and medical practice, and the unique ability to conceptualize complex concepts visually.

Today, Educational Resources has two nationally-recognized medical illustrators, Kip Carter and Brad Gilleland, on its staff, and offers a recently established one-year certificate in Comparative Medical Illustration to newly graduated medical illustrators through the University of Georgia’s Graduate School. Both Kip and Brad serve as adjunct faculty in the medical illustration program at Georgia Regents University in Augusta, and for the past two years have worked with medical illustration students on the master’s projects they need to complete in their training program. One of our current certificate students, Tasha Obrin, worked with Dr. Bridget Garner in the Department of Pathology to create an interactive iBook about liver enzymes in veterinary practice. The resulting iBook won the Award of Excellence in Interactive Media and Best in Show in New Media at the most recent annual meeting of the Association of Medical Illustrators held at the Mayo Clinic. At the same meeting, our other certificate student, Will McAbee, won an Award of Merit in Interactive Textbooks for an iBook he created about the anatomy and radiography of the equine tarsus with Dr. Kurt Selberg. Medical illustrations created to help clarify specific points made in the abstracts are included throughout this report.

Making sense of complex concepts isn’t accomplished only with medical illustrations. Understanding many of these concepts is facilitated by other equally important methods. These include the use of photography and/or videography to help students make sense of structures that can be seen, such as bones and joints, to help make learning anatomy easier or to identify changes that occur with certain disease processes. Chris Herron, the medical photographer/videographer in Educational Resources, does an incredible job of capturing informative images such as these for faculty to incorporate into their teaching materials. Some of these photographs have been incorporated into the abstracts on pages 6-13 of this report.

For the past decade, Educational Resources has had the ability to create 3-dimensional models and animations of structures and processes that can’t be seen, such as cell surface receptors, intracellular organelles and interactions among proteins within the cells. The two people in Educational Resources with expertise in 3-D graphics are Thel Melton and Brad Gilleland. They have utilized their skills in this area to create exceptional teaching materials that depict the anatomy of the equine distal limb, the equine gastrointestinal tract, the canine thorax and abdomen, and most recently the equine thorax. Working with Chris Herron, they
have also combined 3-D models with videos of horses to highlight for students the position of bones and joints beneath the skin. As you will learn later in this story, these videos can 'come alive' even on the printed page.

Clearly, information doesn't always have to be presented using 3-dimensional models. In fact, in many instances a combination of text, graphs and images works extremely well. This is true for the presentation of data shared with others in seminars or publications, and in poster sessions at scientific meetings. As you will see soon, graphs and charts don't need to be static figures. Educational Resources also has the capability of addressing these needs, with Harsh Jain taking the lead on these endeavors. In this regard, Harsh is responsible for printing a large number of posters that graduate students, post-doctoral associates and faculty members to use at national and international meetings, and works with others in the unit to create brochures that highlight specific programs on or off campus.

The most recent addition to Educational Resources' growing list of capabilities is augmented reality. Augmented reality combines 3-D models and animations with photography, videography and computer programming, and has been made possible through collaborations involving two computer science graduate assistants, Rafael Silva and Arya Basu, working under the tutelage of Dr. Kyle Johnsen in the College of Engineering. To see augmented reality in action, first go to the following website where you can watch a short movie showing it work:

http://t.uga.edu/18v

After you've watched the movie, click on the Download the free app link and load the augmented reality player on your iPhone, iPad or Android device. When you open the app, it will activate the camera on your device. Use the camera to view the images on pages 2-13 of this report, and you'll see things spring to life, hovering above the page. This use of augmented reality demonstrates how modern technology can be employed to engage students in science, facilitating their understanding of complex concepts.

The novel teaching resources produced by Educational Resources offer new ways to engage students in complex material, and improve their ability to understand, recall, and apply important details of scientific concepts. Our goal is to test the effectiveness of these approaches, comparing the students' attitudes and understanding of the material to the same measures obtained from students taught using more conventional teaching materials. Ultimately, we hope to help shape the classroom of the future, in which the focus will move from short-term retention of details to deep understanding that enables our students to apply their knowledge to address real-life challenges.
Sepsis – a life-threatening complication of bacterial infections – is a leading cause of death in people worldwide. For example, sepsis strikes approximately 1 in 1,000 adults in developed countries, with mortality rates ranging from 30% to 80%. The situation is equally dire in infants and children, as neonatal sepsis is the third leading cause of neonatal death worldwide, behind only premature delivery and birth-related complications. Sepsis is also an important disease in animals, and widely affects dogs, cats and horses.

Sepsis occurs when the immune response to a bacterial infection is not appropriate. In some cases, the infection becomes very widespread with bacteria travelling free in the bloodstream (sometimes called “blood poisoning”). The immune system fights the infection by releasing products (inflammatory cytokines) that call other immune cells to the site(s) of infection and activate them to kill the bacteria. This inflammatory response is beneficial when it is controlled and confined to a small area, but when it is widespread and over-zealous, the inflammatory response itself can cause a lot of damage and cause septic shock.

In septic shock, the inflammatory response can be so damaging that it causes organ failure and even death. The inflammatory response in sepsis is typically regulated by a variety of chemicals in the blood called hormones, most importantly by the stress hormone cortisol. Cortisol helps counteract the effects of severe infection on the body and helps rein in the inflammatory response. Unfortunately, in up to 50% of septic patients, insufficient cortisol is released and the inflammatory response goes haywire, a syndrome called Critical Illness-Related Corticosteroid Insufficiency (CIRCI). Septic people, horses and foals with CIRCI have dramatically increased mortality compared to septic patients with adequate cortisol. However, tight regulation of cortisol levels in sepsis is key, because excessive cortisol levels can actually suppress the immune system and worsen the infection.

My laboratory’s overarching research objective is to decipher the complex interactions between the immune and endocrine (hormonal) systems during sepsis in neonatal foals and horses, with the fundamental aim of utilizing this knowledge to decrease sepsis- and CIRCI-related mortality in animals and humans. At present, we do not understand exactly how CIRCI develops and how best to treat it. In some studies, replacement of missing cortisol with low doses of hydrocortisone (synthetic cortisol) appears to effectively treat septic shock and improve survival in septic patients with CIRCI. However, we do not fully understand the effects of this low-dose hydrocortisone therapy on the inflammatory response in people or animals.

In this study, we hypothesized that low-dose hydrocortisone therapy would prevent excessive inflammatory responses without impairing the ability of immune cells to eliminate bacteria in adult horses. Low-dose hydrocortisone therapy and placebo were administered to healthy horses, and immune cells were isolated from blood samples to compare inflammatory responses and immune cell function before, during, and after treatment compared to placebo treatment. Cells were exposed to bacteria in the lab to simulate sepsis. The ability of immune cells to eliminate bacteria was maintained or enhanced by low-dose hydrocortisone therapy, and production of potentially damaging inflammatory cytokines was decreased. Low-dose hydrocortisone therapy had anti-inflammatory effects without impairing immune cell function, and might be helpful in treating sepsis and septic shock in adult horses. Further study is needed to determine its efficacy in septic horses with CIRCI, and to investigate these effects in people and other animals.

Principal Investigator: Dr. Kelsey Hart
Although the liver is involved in many conditions affecting reptiles, there are no studies in the scientific literature that correlate diagnostic imaging, hematology and plasma chemistry findings with liver abnormalities. As a result, veterinary clinicians often rely on information extrapolated from birds to diagnose liver disease in reptiles, even though studies in birds correlating liver damage with clinicopathologic findings are also scarce or misleading.

This project is part of a larger study designed to identify reliable and clinically useful ante-mortem indicators of liver disease in Green Iguanas. We correlated the findings of diagnostic imaging (MRI and ultrasonography), cytology (ultrasound-guided fine needle aspirates), serum biochemistry, endoscopic biopsies and histopathology in 8 purpose-bred animals.

The primary goal of this pilot study was to identify a non-invasive method for detecting liver disease in the target species. Ultrasonography and MRI were used due to their superior contrast resolution compared with radiography and CT. Additionally, ultrasound is widely available in private practice and academic institutions and is commonly used to guide collection of samples for cytology.

Eight iguanas underwent MRI and ultrasound examinations under sedation and with the assistance of physical restraint (i.e. eyes covered and arms and legs wrapped together with body). Each iguana had 2 imaging examinations performed, separated by one week. The initial exam was performed to obtain baseline images and the second examination was performed after intraperitoneal administration of CCl₄ in a vehicle.

All images were reviewed by a boarded veterinary radiologist with experience in the identification of changes associated with CCl₄-induced hepatotoxicity via MRI. Quantitative measures of these changes included contrast-to-noise ratios of liver on the T2-weighted images, liver volume on T1-MPRAGE and T1 relaxation of the liver. MRI uses a magnetic field to exploit the behavior of hydrogen atoms in water molecules in tissues in the body. By adjusting certain parameters of the MRI machine, different physical properties of the tissues can evaluated. For example, T2 weighted MRI images are useful for assessing pathologic changes due to the alterations in water dynamics in diseased tissues. T1 weighted images are useful for assessing overall structure and architecture of the organ or body region.

All ultrasound examinations were performed by a boarded veterinary radiologist. Quantitative and qualitative measures of liver size, echogenicity, and presence or absence of abnormal architecture (presence or absence of nodules, irregular margins) and the presence or absence of coelomic fluid were recorded.

The preliminary results indicate that ultrasonography and ultrasound-guided cytology (fine needle aspirates) are insensitive for the antemortem diagnosis of CCl₄-induced liver disease in Green Iguanas. MRI data are currently being evaluated.

Principal Investigator: Dr. Ajay Sharma
Co-Investigator: Dr. Shannon Holmes
Contrast media has been successfully used during ultrasonography in the evaluation of normal jejunum in dogs and to diagnose intestinal ischemic injury in people. We hypothesize that contrast-enhanced ultrasonography is a sensitive and specific method of identifying areas of small intestinal ischemic injury in dogs. In our Teaching Hospital, abdominal radiographs and ultrasound frequently are used to identify small intestinal mechanical ileus due to foreign body ingestion and obstruction in canine patients. In these cases, surgical correction is the treatment of choice, and resection and anastomosis of the affected intestine may be necessary, pending evaluation of the affected site during surgery. In this study, we intend to identify 30 canine patients with small intestinal obstruction requiring surgical treatment. Pre-operative videos will be obtained during contrast-enhanced ultrasonographic evaluation of the small intestine at the site of the obstruction. This will be done to assess intestinal perfusion, as evidenced by the degree of contrast uptake. These findings will be compared against those for adjacent, unaffected small intestine. The radiologist’s subjective evaluation of intestinal perfusion will be scored. The stored video clips will be objectively evaluated by placing regions of interest over the affected and unaffected intestinal segments and comparing contrast perfusion parameters. When areas of perfusion deficiency are identified, the segment length will be measured using electronic calipers. Blood concentrations of L-lactate will be measured immediately prior to surgery, as correlations between lactate levels and the presence of intestinal ischemia have been evaluated in laboratory animals and people. Similar clinical studies have not previously been performed in dogs. At surgery, the surgeon will evaluate the small intestine for viability using routine intra-operative methods, and will assign a subjective score; resection and anastomosis will be performed when deemed necessary. In these instances, the resected segment of intestine will be identified with sutures placed at the orad and aborad margins of the perceived non-viable intestine. The resected segment will be examined histopathologically, using established methods for assessing viability/necrosis and the length of the affected area relative to the sutures placed during surgery.

Small intestinal ischemia is a life threatening condition, as affected patients may suffer from necrotic intestine, perforation, and subsequent septic peritonitis. The ultimate aim of the present study is to evaluate contrast-enhanced ultrasonography as a means to more rapidly identify the presence of ischemic small intestine than is currently possible. If the results of this study are positive, they may lead to improvements in the diagnosis and treatment of this condition in dogs.

**Principal Investigator:** Dr. David Jiménez  
**Co-Investigators:** Drs. Ajay Sharma, Mary Ann Radlinsky and Elizabeth Howerth
Rhodococcus equi, a facultative intracellular bacterial pathogen, is the most common cause of severe pneumonia in foals and exerts a major financial impact on the equine industry. The disease is endemic at many horse-breeding farms with up to 60% of the foals being infected with R. equi. Costs associated with diagnosis, veterinary care, long-term therapy, and mortality is exorbitant, and foals that recover from the disease are less likely to race as adults.

Although several antimicrobial agents are active against R. equi in vitro, many are ineffective in vivo, likely due to poor cellular uptake and low intracellular concentrations. The combination of a macrolide (erythromycin, clarithromycin or azithromycin) with rifampin has been the mainstay of therapy for affected foals for nearly 30 years with, until recently, only one report of resistance in the literature. During the last decade, control of R. equi infections at farms endemic for R. equi has relied on early detection of disease using thoracic ultrasonography and treatment with a macrolide antimicrobial agent (+ rifampin) before onset of clinical signs. While this approach appears to have decreased mortality due to R. equi pneumonia, it has increased in the number of foals being treated with these drugs. Concurrently, the cumulative incidence of macrolide and rifampin resistance in R. equi isolates has increased, presumably as a result of antimicrobial treatment of subclinically affected foals. We recently found resistant isolates of R. equi in up to 40% of the foals at a farm that has used macrolides and rifampin for years. Unfortunately, foals infected with these resistant isolates of R. equi are significantly more likely to die than foals infected with susceptible isolates.

Resistance to macrolide antimicrobial agents is mediated by one of three mechanisms: (i) rRNA methylation which prevents binding of the macrolide to the bacterial ribosome; (ii) active efflux which pumps the macrolide outside of the bacterial cell; and (iii) enzymatic inactivation of the drug. rRNA methylation and active efflux are the mechanisms responsible for resistance in the majority of bacterial isolates. Most of the genes that confer macrolide resistance are associated with mobile elements and can spread between bacterial strains, species, and ecosystems. Currently, the molecular mechanisms of macrolide resistance in R. equi are unknown. Identification of the mechanism(s) of resistance is the first important step in understanding the ecology and epidemiology of macrolide-resistance on horse farms and in ultimately developing strategies to prevent antimicrobial resistance.

The objectives of the proposed research are: 1) to characterize the mechanisms by which R. equi becomes resistant to macrolides; 2) to determine whether macrolide resistance is transferable from resistant to susceptible R. equi and to other bacterial species; and, 3) to determine whether macrolide resistance is associated with greater virulence (i.e. ability to cause disease). Thus far, we have sequenced the genomes of macrolide-resistant and macrolide-susceptible R. equi isolates, and have identified a novel rRNA methylase gene conferring macrolide resistance that appears to be unique to R. equi. It is now possible to develop molecular tests for the rapid detection and identification of macrolide-resistant isolates from samples collected from diseased foals and from the environment. Early identification of macrolide resistant R. equi in infected foals allows immediate selection of the proper antimicrobial agent instead of wasting precious time treating with antimicrobial agents to which the isolate is resistant. These molecular tools can also be used to monitor emergence or disappearance of macrolide resistance in the environment of horse farms in response to various interventions.

Funding agency: Morris Animal Foundation
Principal Investigator: Dr. Steeve Giguère, University of Georgia
Co-Investigators: Dr. Jose Vazquez-Boland, University of Edinburgh, Dr. Noah Cohen, Texas A&M University, Dr. Mary Hondalus, University of Georgia, Dr. Marilyn Roberts, University of Washington
Diabetes mellitus is the leading cause of kidney disease in humans in the US, and more than 26 million American adults are affected by chronic kidney disease. Although the effects of diabetes on the kidneys are poorly understood in companion animals, chronic kidney disease and diabetes are similarly common in veterinary medicine. Consequently, there is a critical need to better understand, treat, and ultimately prevent these devastating diseases. Unfortunately, many of today’s most promising college students do not pursue careers in human or veterinary medicine because their undergraduate science courses fail to fully engage them. As a result, the number of students pursuing careers in basic and applied science is dwindling. Fortunately, the National Institute of Diabetes and Digestive and Kidney Diseases recognizes the need to improve educational experiences and is supporting the development of novel approaches.

In this project, we are developing integrative curricular materials using visually-compelling interactive virtual environments. Specifically, we are using industry-leading graphics and virtual 3-D environment software to create materials that share many facets of today’s popular videogames. To maximize the impact of these curricular materials, we are focusing on two related areas: 1) renal and systemic hemodynamics and 2) glucose homeostasis. These topics not only provide excellent opportunities for students to explore the fundamental aspects of kidney function in health and diabetes, but they also reflect global health concerns in human and veterinary medicine of obesity and type II diabetes. Our novel educational materials will allow students to fully understand the important aspects of cardiovascular and renal structure and function and glucose homeostasis. This approach will provide immersive experiences for students to explore the physiology, pathophysiology, and research approaches to understanding chronic kidney disease, cardiovascular disease, and type II diabetes.

The integrative curricular materials being created in this project have at their core the visual and interactive elements that today’s students enjoy and in which they readily immerse themselves. These new materials will be critically evaluated in the undergraduate physiology course taught in the College’s Department of Physiology & Pharmacology.

**Funding agency:** National Institutes of Health  
**Principal Investigator:** Dr. Scott Brown, College of Veterinary Medicine  
**Co-Investigators:** Dr. James Moore, College of Veterinary Medicine, Dr. Kyle Johnsen, College of Engineering, Dr. Alan Cohen, College of Education
The Tifton Veterinary Diagnostic and Investigational Laboratory recently obtained a five-year grant from the Food and Drug Administration’s Veterinary Laboratory Investigation and Response Network program for infrastructure support. This support will enhance sample analysis and the laboratory’s ability to meet surge capacity issues in the event of animal food or drug-related emergencies. The funding is being used to maintain trained personnel, and support important quality control procedures, such as participation in proficiency testing schemes. In keeping with the goals of the Veterinary Laboratory Investigation and Response Network program, the laboratory will be able to incorporate and support additional diagnostic tests, which will add further insight into investigations performed to detect compounds in foods, organs, urine and feces. These new capabilities of the laboratory also will enhance its ability to strengthen cooperative agreements and collaborations with other diagnostic laboratories in the Veterinary Laboratory Investigation and Response Network program, and thereby provide seamless interactions during emergency-related testing of specimens. With the support from this program, the Tifton Veterinary Diagnostic and Investigational Laboratory is working to develop new diagnostic testing methods, and improve outbreak preparedness and risk assessment related to food-borne pathogens. To that end, the laboratory participated in a nationwide study on the evaluation of *Salmonella* in symptomatic and asymptomatic pets. Due to the availability of this funding, the laboratory is significantly better prepared to detect food-borne pathogens.

Principal Investigator: Dr. Sreekumari Rajeev  
Co-Investigator: Dr. Murray Hines
Brown, Cathy. Characterization of Proteinuric Renal Disease in Miniature Schnauzers. Gray Lady Foundation. $5,150.00
Brown, Corrie. Acquisition of Goods and Services. USDA. $11,867.00
Brown, Corrie. Acquisition of Goods and Services. USDA. $16,077.00
Brown, Corrie. Animal Health Technical Assistance. USDA. $46,750
Brown, Corrie. Epidemiological and Ecological Factors Influencing Viral Transmission from Backyard Poultry to Wild Resident Birds. Georgia Ornithological Society. $4,760.00
Brown, Corrie. Interactions of Vaccine and Virulent Newcastle Disease Virus Isolates Focusing on Pathogenesis and Epidemiology. USDA. $12,091.00
Brown, Scott. Engaging Students in Diabetic Kidney Disease: An Interactive Inquiry Approach. NIH. $107,944
Budsberg, Steven. Analgesic Efficacy of S-006-8 in Dogs with Chemically Induced Synovitis. Piedmont Pharmaceuticals LLC. $221,415.00
Carmichael, Paige. Promoting Cultural Diversity in the Veterinary Workforce. USDA-NIFA. $4,962.00
Chen, Shiyou. Dedicator of Cytokinesis 2 in Smooth Muscle Phenotypic Modulation. NIH. $445,725.00
Chen, Shiyou. Response to gene to complement 32 in atherosclerosis. American Heart Assoc. - National Center. $48,340.00
Chen, Shiyou. SMAD2 and Smooth Muscle Differentiation from Neural Crest Cells. NIH. $18,984.00
Chen, Shiyou. Smooth Muscle Differentiation and Maturation. NIH. $383,130.00
Creevy, Kate E. The Domestic Dog as a Model System for Aging Research. NIH. $2,360.00
Dickerson, Harry. B and T lymphocyte Repertoires in Channel Catfish-Memory Cells and Vaccines. USDA. $499,999
Dickerson, Harry. Emerging and Re-Emerging Infectious Disease Residency/PHD Program. Industry Sponsored. $90,000
Dickerson, Harry. The University of Georgia Veterinary Scholars Program: A Research Training Experience for Veterinary Medical Students. Industry Sponsored. $20,000.00
Divers, Stephen. Intravenous Lidocaine and Fentanyl Effects. Various-Corp Grants. $8,980.00
Fischer, John. Relationships Involving Wildlife, Livestock, and Poultry; Exotic Arthropod Surveillance; and National Feral Swine Mapping system. USDA. $605,300.00
Franklin, Samuel. Comparison of Ultrasound, MRI, and Arthroscopy for Detecting Meniscal Damage. Industry Sponsored. $26,079.00
He, Biao. Mechanism of a Poxvirus Replication. Univ. of Alabama. National Heart Foundation. $178,628.00
He, Biao. Developing a Novel RSV Vaccine Based on Mumps Virus. NIH. $371,250.00
He, Biao. A Novel Approach to Mycobacterium Tuberculosis Vaccine Development. NIH. $222,750.00
He, Biao. Mucosal Protection against HIV Generated by PIV5 Priming and VLP. NIH. $186,250.00
Hines, Murray E. 2014 NAHLN Member Laboratory Agreement. USDA. $55,000.00
Hines, Murray E. Comparative Pharmacokinetics of Danofloxacin and Enrofloxacin in Adult Horses. Industry Sponsored. $28,482.00
Hines, Murray E. Acquiers of Goods and Services. USDA. $11,867.00
Hines, Murray E. Acquisition of Goods and Services. USDA. $4,716.00
Hines, Murray E. Protection of Replikins Synthetic Vaccines in a Study Using H7 Low Pathogenic Avian Influenza. Industry Sponsored. $59,907.00
Hines, Murray E. Development of an Auto transporter-based Vaccine to Protect against Melioidosis and Glanders. U.S. DOD. $441,589.00
Jackwood, Mark. Acquisition of Goods and Services. USDA. $4,716.00
Jordan, Brian. Evaluation of Protection against GA08 IBV Challenged Leghorn Chickens Vaccinated with MA5 and 4/91. Industry Sponsored. $114,504.00
Jordan, Brian. Novel Bivalent Multifunctional Ligands towards Alzheimer's disease. NIH via sub-award under Virginia Commonwealth University. $6,935.00
Jordan, Brian. Acquiers of Goods and Services. USDA. $166,000.00
Jordan, Brian. Protectotype Experiment: Evaluating Protection from Ciliostasis in MA5 and DE072 Vaccinated Broiler Chickens Challenged with the GA 11 Variant Type of IBV. Industry Sponsored. $227,998
Kaplan, Ray. A Novel Approach to Mycobacterium Tuberculosis Vaccine Development. NIH. $222,750.00
Kaplan, Ray. Developing a Novel RSV Vaccine Based on Mumps Virus. NIH. $371,250.00
Lafontaine, Eric. Development of an Auto transporter-based Vaccine to Protect against Melioidosis and Glanders. U.S. DOD. $441,589.00
Lafontaine, Eric. Protection of Replikins Synthetic Vaccines in a Study Using H7 Low Pathogenic Avian Influenza. Industry Sponsored. $59,907.00
Lafontaine, Eric. Testing of Replikins Synthetic Vaccines in a Study Using H7 Low Pathogenic Avian Influenza. Industry Sponsored. $59,907.00
Lafontaine, Eric. Novel Bivalent Multifunctional Ligands towards Alzheimer's disease. NIH via sub-award under Virginia Commonwealth University. $6,935.00
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Lafontaine, Eric. Developing an Auto transporter-based Vaccine to Protect against Melioidosis and Glanders. U.S. DOD. $441,589.00
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Lafontaine, Eric. Developing a Novel RSV Vaccine Based on Mumps Virus. NIH. $371,250.00
Lafontaine, Eric. A Novel Approach to Mycobacterium Tuberculosis Vaccine Development. NIH. $222,750.00
Lafontaine, Eric. Why an Effective Melioidosis/Glanders Vaccine May Not be Possible. DTRA via sub-award under University of Exeter. $214,633.00
Lee, Margie. Detection of NPC Lactobacillus Counts from Feed Samples. Nutrition Physiology Co, LLC. $64,968.00
Mead, Daniel. Vector-Borne Disease Surveillance and Mosquito Diagnostic Support. Chatham County. $64,796
Mead, Daniel. Vector-Borne Disease Surveillance and Mosquito Diagnostic Support. Dekalb County Board of Health. $6,900
Mead, Daniel. Vector-Borne Disease Surveillance and Mosquito Diagnostic Support. SC Dept. of Health & Env. Control. $55,700
Moore, James. Interactive Educational Materials for Veterinary Education and Practice. Zoetis. $120,000.00
Moore, Julie. Immunopathogenesis of Severe Malaria during Pregnancy. NIH. $591,933.00
Moore, Julie. Post-Baccalaureate Training in Infectious Disease Research. NIH. $286,858.00
Moorhead, Andrew. Animal Models of Infectious Diseases. NIH. $1,028,593.00
Moorhead, Andrew. Furnish Brugia Malayi Adult Worms and/or B. Malayi Infective Larvae. NIH. $250,000.00
Moorhead, Andrew. Production and Distribution of Acanthocheilonema Viteae Reagents. NIH. $225,672.00
Nagy, Tamas. A Novel Method to Treat Chronic Pain. NIH via sub-award under Univ. of Minnesota. $14,965.00
Peroni, John. Examination of the Mechanisms by which S-nitrosothiols Relax Airway Smooth Muscle. Case Western Reserve University. $19,334.00
Peroni, John. In vivo use of Mesenchymal Stem Cells (MSC) for Bone Regeneration in Maxillo-Facial Surgery. Azienda Ospedaliera Universitaria Integrata. $87,370
Peroni, John. Morris Animal Foundation Veterinary Scholars Program. Morris Animal Foundation. $4,000.00
Peroni, John. Sanuwave Health Inc. Blood Sterilization Pilot Study. Sanuwave Health, Inc. $11,351.00
Platt, Simon. Evaluation of GammaCore VET for the treatment of seizure activity in canine epilepsy. Electrocore LLC. $22,023.00
Platt, Simon. Pharmacokinetic Evaluation of Generic Levetiracetam Extended Release (XR) in Comparison to Keppra XR (XR) and Standard Release Keppra®. Industry Sponsored. $33,480
Quinn, Fred. Iraq Science Fellowship Program of the U.S. Department of State. U.S. State Dept. $7,450.00
Rajeev, Sreekumari. TVDII. Infrastructure for CVM VET-LRN Veterinary Diagnostic Laboratory Program. Food and Drug Administration. $16,500.00
Rapoport, Gregg. Correlation between In-Hospital and At-Home Heart Rate in Healthy Cats Administered Atenolol at Multiple Oral Doses. American College of Veterinary Internal Medicine Foundation. $8,257.00
Ritchie, Branson. Research Associate in Exotic/Zoo Infectious Disease and Pathology Postgraduate Program. Riverbank Zoo. $23,000.00
Saba, Corey. B-Cell Lymphoma Vaccine, DNA, CD20. Industry Sponsored. $10,206.00
Sakamoto, Kaori. Role of the Respiratory Syncytial Virus Fusion Protein in Airway Mucus Induction. NIH via sub-award under Emory. $17,582.00
Saliki, Jeremiah T. Diagnostic Pathogen Testing. U.S. Navy. $30,000.00
Saliki, Jeremiah T. SIV (Swine Influenza Virus) Surveillance. USDA. $33,175.00
Sanchez, Susan. Georgia Veterinary Scholars Summer Research Program. NIH. $22,565.00
Sanchez, Susan. One Health; Epidemiology of Natural and Deliberate Contaminants (Infectious and Toxicities) in Pets and Pet Food. DHHS Food and Drug Administration. $16,500
Schank, Jesse. The Role of the Neurokinin-1 Receptor and NF kappa B in Alcohol-Induced Behavior. NIH. $248,252.00
Seabaugh, Kathryn. The Effects of Shock Wave Treatment on Platelet Rich Plasma. Neo Vet. $12,438.00
Sellers, Holly. Development of Avian Reovirus Vaccines from Variant Field Isolates Associated with Clinical Tenosynovitis. Merck Company Foundation. $254,400.00
Stallknecht, David. Epizootic Hemorrhagic Disease: Epidemiology and Development of Vaccine for White-Tailed Deer. Kansas State University. $26,128.00
Tripp, Ralph. KPT-335 to Reduce Influenza Infection in Balb/c Mice. Industry Sponsor. $129,543
Tripp, Ralph. NIAID Centers of Excellence for Influenza Research and Surveillance. NIH via sub-award under Emory. $698,194
Tripp, Ralph. Manipulating Natural Host Immunoregulation via IDO during Viral Infection. NIH/NIAID via sub-award under GHSU. $388,593.00
Tripp, Ralph. Phase II: Improved Vaccine Production Technology for Rotavirus Vaccines - Accelerated Proposal. Industry Sponsored. $1,327,570.00
Tripp, Ralph. RSV Nanocapsule Vaccine Engineered with a G Protein Peptide Payload. NIH/NIAID. $563,843.00
UhI, Elizabeth. Codon Usage in Morbilliviruses: Evidence for Evolutionary Conservation and Importance for Adaptation to New Hosts. U.S. DOD. $222,670.00
Ward, Cynthia. Efficacy of Prozinc Insulin in Naïve and Insulin-Established Cats. Industry Sponsored. $44,808
Watford, Wendy. MAPK8-mediated Regulation of Adaptive Immune Responses and Autoimmunity. NIH. $377,190
Wolstenholme, Adrian. Anthelmintics: From Discovery of New Drugs to Modes of Action and Resistance. NIH. $5,000
Wolstenholme, Adrian. Modulation of Levamisole Receptors: Pharmacological Diversity of Clade III NACHRS. NIH via sub-award under Iowa State University. $24,000.00
Ye, Xiaoqin. Molecular Mechanism of LPA3-Mediated Uterine Receptivity. NIH/NICHD. $299,470.00
Selected Publications

Diagnostic Laboratories


Infectious Diseases


Sage LK, Fox JM, Tompkins SM, and RA Tripp. Subsisting H1N1 Influenza Memory Responses are Insufficient to Protect from Pandemic H1N1 Influenza Infection Challenge in C57BL/6 Mice. J. Gen. Virol., 94(8), 1701-11., 2013.


Shollender BER, M, Bui CT, Paterson Y, Nyhoff L, and DA Harn. HIV-1 Vaccine-Specific Responses Induced by Listeria Vector Vaccines are Maintained in Mice Subsequently Infected with a Model Helminth Parasite, Schistosoma Mansoni. Vaccine., 31(48), 5651-8., 2013.


Tomkins SM. Experimental Infection of European Starlings (Sturnus vulgaris) and House Sparrows (Passer domesticus) with Pandemic 2009 H1N1, and Swine H1N1 and H3N2 Triple Reassortant Influenza Viruses. J. Wildl., Diseases., 49(2), 437-40., 2013.


Large Animal Medicine


**Pathology**


**Physiology & Pharmacology**


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Population Health

Diezhang W, Alali WQ, Harrison MA, and CL Hofacre. Salmonellosis in Broiler Carcass Bone Marrow and Neck Skin: Potential Sources for Ground Chicken Contamination. International Association for Food Protection. (pp. T1-04, pg. 26), 2013.
Franca MS. Co-infection of Mallards with Low-Virulence Newcastle Disease Virus and Low-Pathogenic Avian Influenza Virus. Avian Pathology., 43(1), 8., 2014.
Franca MS. Ulcerative Enteritis-like Disease Associated with Clostridium Sordellii in Quail. Avian Diseases., 57(3), 4., 2013.
Palomares RA. Analysis of mRNA Expression for Genes Associated with Regulatory T Lymphocytes (CD25, FoxP3, CTLA4, and IDO) after Experimental Infection with Bovine Viral Diarrhea Virus of Low or High Virulence in Beef Calves. Comparative Immunology, Microbiology & Infectious Diseases., 2013.


Sengers J, Hancock DW, Jones AL, Tankersley TB, Lacy RC et al. Poor Quality Forages Pose Life-Threatening Risk to Georgia Cow Herds. UGA Extension. (vol. TP102, pp. 3), 2014.


Stallknecht DE and AW Park. Apparent Increase of Reported and Confirmed Hemorrhagic Disease in the Midwest and Northeastern United States., 2014.


Small Animal Medicine


2014 Fiscal Year CVM Graduates

Barnabei, Jamie. Doctor of Veterinary Medicine/Master of Public Health (DVM-MPH), Spring 2014
Buskirk, Sean. Doctor of Philosophy – Infectious Diseases, Spring 2014
Cazzini, Paola. Master of Science – Veterinary & Biomedical Sciences, Spring 2014
Collicutt, Nancy. Master of Science – Veterinary & Biomedical Sciences, Spring 2014
Copeland, Jennifer. Master of Science – Veterinary & Biomedical Sciences, Spring 2014
Coulson, Kari. Doctor of Veterinary Medicine/Doctor of Philosophy (DVM-PhD), Spring 2014
Edwards, Thomas. Master of Science – Veterinary & Biomedical Sciences, Spring 2014
Gresham, Cory. Doctor of Veterinary Medicine/Doctor of Philosophy (DVM-PhD) – Forestry & Natural Recourses (Toxicology), Fall 2013
Hammond, Sherri. Doctor of Philosophy – Neuroscience, Spring 2014
Hartley, Ashley. Doctor of Veterinary Medicine/Doctor of Philosophy (DVM-PhD), Spring 2014
Jeffers, Anna. Doctor of Veterinary Medicine/Master of Public Health (DVM-MPH), Spring 2014
Keralapurath, Madhusudhanan. Doctor of Philosophy – Toxicology, Spring 2014
Lin, Zhoumeng. Doctor of Philosophy – Toxicology, Fall 2013
Malinak, Chad. Master of Avian Medicine, Fall 2013
Mason, Caleb. Master of Science – Veterinary & Biomedical Sciences, Fall 2013
Myers, Elise. Master of Avian Medicine, Fall 2013
Rogers, Ashley. Master of Science – Veterinary & Biomedical Sciences, Summer 2013
Sage, Leo. DVM-PhD Dual Degree Candidate, Doctor of Philosophy – Infectious Diseases, Fall 2013
Tillman, Glenn. Doctor of Philosophy – Infectious Diseases, Fall 2013
Talundzic, Eldin. Doctor of Philosophy – Infectious Diseases, Summer 2013
Turner, Tiffany. Doctor of Philosophy – Infectious Diseases, Fall 2013
Wang, Yun-Ting. Master of Avian Medicine, Fall 2013
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The key to improved animal well-being is animal health.
The key to improved animal health is veterinary research.