



# CENTER OF EXCELLENCE

in

# Livestock Diseases & Human Health

2021 Annual Report



THIS REPORT IS PRODUCED BY

**THE UNIVERSITY OF TENNESSEE**  
**College of Veterinary Medicine**

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# About the Institute

Through its colleges, county extension offices, Veterinary Medical Center, Veterinary Diagnostic Laboratories, and research and education centers, the **University of Tennessee Institute of Agriculture (UTIA)** serves the people of Tennessee and beyond through discovery, communication, and application of knowledge. The University of Tennessee, Knoxville, is committed to providing undergraduate, graduate, and professional veterinary education programs in a diverse learning environment that prepares students to be leaders in a global society. UTIA's delivery of education, discovery, and outreach contributes to the economic, social, and environmental well-being of all Tennesseans. The Institute's units focus on developing real life solutions to contemporary, emerging, and forecasted problems faced by Tennessee, the nation, and the world.

**The College of Veterinary Medicine (CVM)** is one of only thirty-one veterinary colleges in the nation. The central mission of the College is educating Doctor of Veterinary Medicine (DVM) students seeking a career in one of many aspects of the profession ranging from clinical practice to research. The College also serves the public in providing referral medicine services to pet owners, zoos, and the livestock industry through the UTCVM Veterinary Medical Center. In addition, the College protects public health, enhances medical knowledge through research and education of graduate students, and generates economic benefits to the state and nation. Outreach programs engage an array of citizens and their animals in learning programs that explore the human-animal bond and promote wellbeing.

**The Herbert College of Agriculture** welcomes students from across Tennessee, the nation, and the world. The College offers academic programs in a variety of natural and social science-based disciplines that apply to the food, fiber, and natural resources systems. For students in the College, learning is personal and often hands-on. Student teams provide opportunities for self-directed study, leadership development, and a lot of fun. An honors and creative achievements program challenges students to excel, as do undergraduate research opportunities. International study abroad mini-courses and internships give graduates an edge in the increasingly connected world of global markets.

**UT AgResearch** has been the central incubator and economic engine that develops real life solutions so farmers and agricultural industries can supply affordable and wholesome food to the citizens of Tennessee, the United States, and the world for nearly 140 years. Foods are not restricted to only human foods. Foods include feed, quality fibers, lumber, and bio-based fuels. UT AgResearch accomplishes its missions through the dedicated workforce of 145 faculty members with research appointment, 365 staff members, and 270 graduate students that span eight academic departments within the Herbert College of Agriculture and 10 AgResearch and Education Centers strategically located across Tennessee. AgResearch maintains a diversified and balanced research portfolio aimed at enhancing the \$80 billion economy related to agriculture and forestry industries in Tennessee as evidenced by faculty conducting world-class research programs to address emerging grand challenges in a variety of strategic areas including bioenergy/biomaterials, genomics, synthetic biology, One Health, and digital/smart agriculture. The 10 AgResearch and Education Centers (or Agricultural Experiment Stations) represent the state's diverse climatic and geographical regions and serve as outdoor laboratories where scientists can test their theories under real-world conditions. They also function as classrooms for the University's future scientists and leaders and for the state's producers who can see first-hand research results that can benefit their operations. The research and education centers routinely host the citizens of the state as sites for public field days, 4-H and Extension meetings, open houses, industry meetings and various other educational events.

**UT Extension** has an office in each of the 95 counties in Tennessee. Educational programs offered by UT Extension touch the lives of each citizen in the state every day and deliver research-based programs that improve lives, build stronger families, and strengthen communities. As a partner with local, state, and national agencies, and through its statewide presence, UT Extension provides educational programming, information, and assistance in areas of agriculture, natural resources, community development, family and consumer sciences, and 4-H youth development.

## ADMINISTRATION

**Dr. David E. Anderson**

*Associate Dean for Research and Graduate Studies*

**Dr. Stephen A. Kania**

*Assistant Dean for Research and Graduate Studies*

**Dr. James P. Thompson**

*Dean, College of Veterinary Medicine*

**Dr. Tim L. Cross (Retired)**

*Senior Vice President/Senior Vice Chancellor,  
University of Tennessee Institute of Agriculture*

**Linda C. Martin**

*Interim Senior Vice President/Senior Vice Chancellor  
University of Tennessee Institute of Agriculture*

## OUR MISSION

1. To promote interdisciplinary activities designed to improve the quality of human life through better animal health.
2. To expand livestock disease research capabilities.
3. To identify and characterize animal diseases that are similar to human disease.
4. To develop new strategies for the diagnosis, treatment, and prevention of disease.

# Letter from the Dean

I am pleased to present the 2021 annual report for the Center of Excellence in Livestock Diseases and Human Health. This Center of Excellence, based in the College of Veterinary Medicine, UT Institute of Agriculture at the University of Tennessee, Knoxville, is dedicated to the advancement of human and animal health through promotion of interdisciplinary research. This report serves to inform our stakeholders of the important work done by faculty, staff, and students engaged in finding solutions to complex problems for the betterment of society.

Within this report, you will find a comprehensive overview of the utilization of funds to support the Center's missions: promotion of interdisciplinary activities designed to improve the quality of human life through advances in animal health; expansion of livestock disease research capabilities; identification and characterization of animal diseases that are similar to human disease; and developing new strategies for the diagnosis, treatment, and prevention of disease.



The 2021 fiscal year was certainly over-shadowed by the ongoing COVID-19 global pandemic. The pandemic presented many challenges, and our personnel have worked with diligence and dedication to excel in difficult times. The prevalence of the disease, transmissibility (RO) of the virus, and incidence rate of new infections caused research interruptions at all levels. Laboratories were closed or maintained operations to a limited degree with diminished personnel; research projects involving animals were canceled, postponed, or limited to projects that could be shutdown within a five-day window; and personnel were instructed to work from home to the extent possible without compromising essential operations. This resulted in fewer grant submissions, extramural awards, published peer-reviewed articles, and research presentations. Research programs and scientific conferences adapted, overtime, to remote work, on-site work with limited personnel, remote (ZOOM) laboratory meetings, and virtual seminars and conferences. A positive outcome resulting from the necessity of these transitions has been the development of new skills, new work strategies, and an increased awareness of the interconnectedness of society in our daily work.

Within this report, research and productivity of faculty benefitting from COE funding are highlighted including faculty who received COE seed grants, new faculty who received start-up funding, and details of our student scholars programs during FY21. These faculty members have made significant advancements to grow research strengths including vector borne disease, infectious disease and immunology, regenerative and rehabilitative medicine, and prevention and treatment of livestock diseases that affect agricultural productivity. Metrics used to assess annual return on investment show extramural funding remains strong despite a decrease in total funding through extramural awards. In FY21, the ratio of research funding to state appropriation for the Center exceeded 2.3. The lower ROI ratio for research metrics as compared to previous years is associated with pandemic restrictions on research activities during the first half of the year and extended time required to hire research-intensive faculty and to renovate research laboratories for their use.

Despite increased challenges faced by our Center faculty, we are incredibly proud of their efforts and continued successes. The College has successfully recruited three new faculty with significant research assignments. These new faculty are focused in vector borne and zoonotic disease and have had an immediate, positive impact on research, awards, graduate programs and productivity. We hope you enjoy this summary presentation of Center activities and accomplishments.

**Dr. James P. Thompson, Dean**

UT College of Veterinary Medicine

# Summary of Accomplishments

The Center of Excellence in Livestock Diseases and Human Health continues to serve its mission to promote interdisciplinary activities designed to:

- Improve the quality of human life through the research for betterment of animal health.
- Expand livestock disease research capabilities.
- Identify and characterize animal diseases that are similar to human disease.
- Develop new strategies for the diagnosis, treatment, and prevention of disease.

The Center of Excellence plays a vital role in advancing human and animal health by supporting faculty and students, providing resources to maintain modern research infrastructure, and assisting in the acquisition of state-of-the-art research equipment. Faculty and students with support from the Center of Excellence play a vital role in discovering new knowledge regarding the interrelationships among humans, animals, and the environment. In early 2021, the College of Veterinary Medicine established the Vector Borne Disease Laboratories. This endeavor was made possible by the recruitment of two preeminent researchers in this field, Drs. Hameeda Sultana and Girish Neelakanta. Under their current National Institutes of Health funding, these faculty members study diseases of importance to people and animals.

Dr. Hameeda Sultana's lab focuses on the identification and characterization of novel therapeutic agents and targets for treatment and prevention of pan-flaviviral infections in humans and animals. These diseases include mosquito-borne West Nile virus (WNV), Zika virus (ZIKV), Dengue viruses (Serotypes 1-4), and Tick-borne Langkat (LGTV) and Powassan viruses (POWV) that are related to tick-borne encephalitis viruses (TBEV). Dr. Sultana's program focuses on understanding the molecular mechanisms at the interface of pathogen-vector-vertebrate host interactions. The immediate goal is to identify the factors associated with disease transmission at the pathogen-vector-host interface. Dr. Sultana's research is funded through COE and NIH grants.

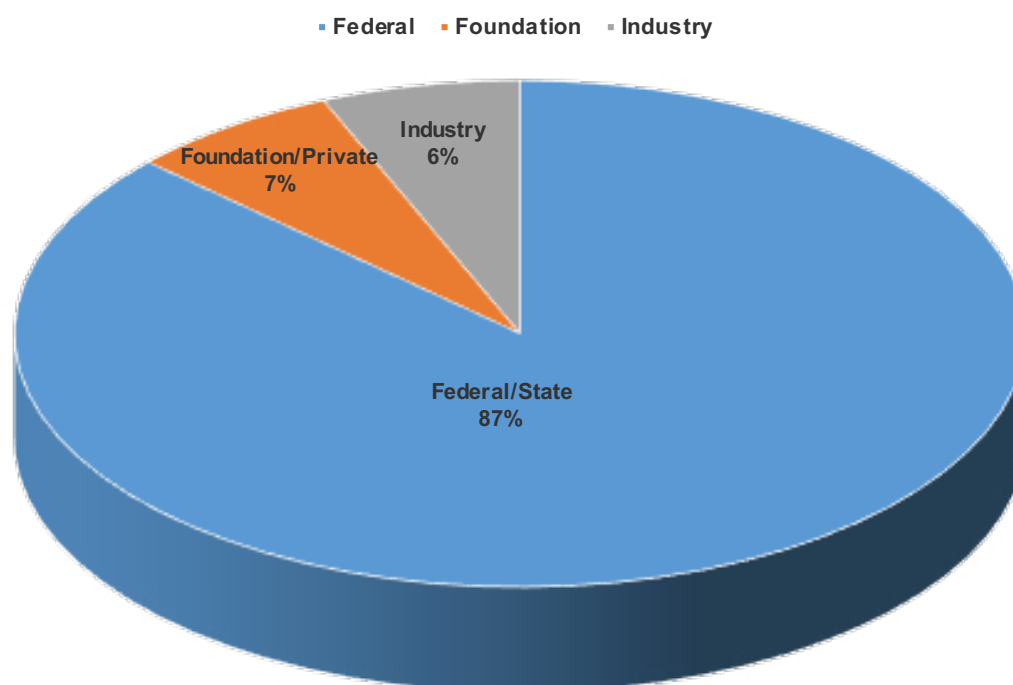
Dr. Girish Neelakanta's lab researches human and animal tick-borne infectious diseases such as anaplasmosis, Lyme disease, relapsing fever, and Rocky Mountain spotted fever. His laboratory uses multidisciplinary approaches to characterize interactions involving vector-host-pathogens at the molecular level. The immediate goal of his lab is to test efficacy of these vaccines in animal models. Dr. Neelakanta's research is funded through COE and NIH grants.

Many scientific conferences were cancelled or provided through virtual platforms as a result of the on-going pandemic. Despite the effects of the pandemic, Center of Excellence faculty remained actively engaged during calendar year 2020 through scientific publications and presentations to local, national, and international audiences. The eighteen 2021 Center of Excellence faculty accounted for 44 peer-reviewed articles; 20 books, book chapters, abstracts, and proceedings; and 43 presentations of their work. Scholarly productivity metrics show that, on average, COE faculty published 2.5 peer-reviewed articles per faculty member; presented 2.5 scientific presentations per faculty member; and published 1.2 book chapters, abstracts, and proceedings per faculty member.

Although research expenditures by Center of Excellence faculty increased slightly in FY21, extramural funding declined. The decline in extramural awards was associated with a long period of transition of research faculty, faculty retirements, and the hiring of new faculty. New faculty required significant laboratory renovations to accommodate the new vector borne disease laboratories, which slowed establishment of this new research program. The pandemic continues to overshadow research efforts, but these effects lessened in the latter half of FY21. Total extramural awards funding in FY21 was \$1,339,883.89, resulting in a FY21 return on the state COE allocation of 2.3:1.



## Sources of External Funding, FY21



Benchmark	2021 (17 Faculty)	2020 (13 Faculty)
	N <sup>1</sup>	N <sup>2</sup>
<b>Publications</b>	<b>64</b>	<b>63</b>
<i>Peer-Reviewed Articles</i>	44	59
<i>Book Chapters/Abstracts/Proceedings</i>	20	4
<b>Presentations/Posters/Abstracts</b>	<b>43</b>	<b>105</b>
<i>International</i>	6	14
<i>National</i>	25	53
<i>State or Local</i>	12	38
<b>Invention Disclosures</b>	<b>3</b>	<b>3</b>
<b>Patent Filings</b>	<b>3</b>	<b>1</b>
<b>Research Funding<sup>3</sup></b>		
<i>External Funding</i>	\$1,339,883.89	\$3,632,232
<i>Internal Funding</i>	\$355,607.00	\$207,077
<i>Total Research Expenditures</i>	\$1,362,190.02	\$1,153,173.32
<b>Return on Investment<sup>4</sup></b>	<b>2.3:1</b>	<b>4.6:1</b>

<sup>1</sup> Publications and presentations for COE faculty during calendar year 2020.

<sup>2</sup> Publications and presentations for COE faculty during calendar year 2019.

<sup>3</sup> Research funding and expenditures for COE faculty during FY21.

<sup>4</sup> Return on investment based on ratio of extramural funding to COE allocation for FY21.

# PROGRAM REPORT

# Introduction

The Center of Excellence (COE) in Livestock Diseases and Human Health was founded in 1984. The Center of Excellence serves a critical role in the Institute of Agriculture and the University of Tennessee, Knoxville to serve the missions of research, education, and service to the state of Tennessee, national, and international communities. Faculty participating in the Center of Excellence programs meet these responsibilities by conducting original research for the purpose of discovering new knowledge and disseminating that knowledge to stakeholders. This includes training undergraduate, professional, and graduate students in the fine arts of evaluation and interpretation of research, so that these students can gain the knowledge and skills to become the next generation of scientists and scholars. Faculty collaborate with scientists throughout the nation and global community to advance science for the betterment of society by prevention, treatment, detection, and prediction of livestock diseases and improvement of human health. Faculty disseminate these discoveries through publications, presentations, and outreach activities with stakeholders including livestock producers, veterinarians, and the public.

Faculty engaged in the COE have research strengths in multiple areas. These scientific programs are enhanced through interdisciplinary and multidisciplinary collaboration in the pursuit of extramurally funded research.

Areas of research emphasis with COE faculty include:

- *Infectious disease and immunology*
- *Vector borne and zoonotic diseases*
- *Regenerative and rehabilitative medicine*
- *Translational models for animal and human disease*

COE faculty also engage with Institute, University, and UT system programs to amplify the impact of new knowledge and its application for the betterment of livestock and human health. These programs include:

- *UTIA Genomics Center for the Advancement of Agriculture*
- *One Health Initiative*
- *Tennessee Institute for Regenerative Medicine*

These research programs intertwine for the purpose of supporting agriculture and advancing human and animal health. Resources available to the Center of Excellence are utilized to promote research through startup packages for new faculty; offer seed grants to support faculty research leading to extramural grant submissions; purchase new research equipment to expand research capabilities and improve competitiveness for extramural funding; and maintain modern laboratory facilities. The COE supports student summer research programs and the annual Research Day conference in which results of COE activities are presented to faculty, students, and the community.

## Personnel



**Dr. David E. Anderson**  
*Director of the Center of Excellence*



**Dr. Stephen A. Kania**  
*Director of Center of Excellence student programs*



**Dr. Madhu Dhar**  
*Chair of Research Committee*



**Kim Rutherford**  
*Oversees submissions of faculty proposals for funds*



**Emily Ford**  
*Annual report production*

# Funding and Expenditures

## Research Funding from External and Internal Sources, FY21

Lead Investigator	Federal/State	Industry	University	Foundation/ Private	Total
Dr. David Anderson	\$66,563.00	-	\$137,161.00	-	\$203,724.00
Dr. Ouedessa Kerro Deogo	-	-	\$95,526.00	\$10,433.00	\$105,959.00
Dr. Michelle Dennis	-	\$21,615.00	\$25,000.00	-	\$46,615.00
Dr. Madhu Dhar	-	-	\$9,210.00	-	\$9,210.00
Dr. Alex Esteller-Vico	-	\$63,638.00	\$15,000.00	-	\$78,638.00
Dr. Stephen Kania	-	-	\$15,000.00	-	\$15,000.00
Dr. Andrea Lear	\$10,945.00	-	-	-	\$10,945.00
Dr. Girish Neelakanta	\$585,977.28	-	-	-	\$585,977.28
Dr. Sreekumari Rajeev	-	-	\$24,500.00	\$80,750.00	\$105,250.00
Dr. Joseph Smith	-	-	\$4,210.00	-	\$4,210.00
Dr. Hameeda Sultana	\$499,962.61	-	-	-	\$499,962.61
Dr. Brynn Voy	-	-	\$30,000.00	-	\$30,000.00
<b>TOTALS</b>	<b>\$1,163,447.89</b>	<b>\$85,253.00</b>	<b>\$355,607.00</b>	<b>\$91,183.00</b>	<b>\$1,695,490.89</b>

## Research Expenditures, FY21

Lead Investigator	Federal/State	Industry	University	Foundation/ Private	Total
Dr. David Anderson	\$462,476.91	\$4,293.00	\$137,161.00	\$6,051.50	\$609,982.41
Dr. Michelle Dennis	\$782.23	-	\$95,526.00	-	\$96,308.23
Dr. Madhu Dhar	\$95,228.48	\$3,303.45	\$25,000.00	-	\$123,531.93
Dr. Alex Esteller-Vico	-	-	\$5,000	-	\$5,000
Dr. Stephen Kania	\$6,062.85	\$56,665.37	\$15,000.00	-	\$77,728.22
Dr. Oudessa Kerro Deogo	-	-	\$15,000.00	-	\$15,000.00
Dr. Andrea Lear	\$11,568.75	-	\$	-	\$11,568.00
Dr. Denae Lobato	\$59.63	-	\$	-	\$59.63
Dr. Girish Neelakanta	\$224,656.00	-	\$	-	\$224,656.00
Dr. Sreekumari Rajeev	\$89,250.32	\$3,692.19	\$24,500.00	-	\$117,442.51
Dr. Barry Rouse	275,301.26	\$540.22	\$	-	275,841.48
Dr. Joseph Smith	2,339.26	-	\$4,210.00	-	\$2,339.26
Dr. Hameeda Sultana	119,918.60	-	-	-	\$119,918.60
Dr. Brynn Voy	-	-	\$30,000.00	-	\$30,000
<b>TOTALS</b>	<b>\$1,287,644.29</b>	<b>\$68,494.23</b>	<b>\$129,017.65</b>	<b>\$6,051.50</b>	<b>\$1,709,376.01</b>

# Allocation of Funding

Allocation of funding within the Center of Excellence (COE) in Livestock Diseases and Human Health promotes research for faculty and students in order to advance knowledge in animal and human health. Funding supports a variety of activities including faculty startup packages associated with the recruitment of new faculty and seed grants for faculty to develop necessary data to support extramural grant submissions and foster new collaborative research initiatives. COE funding also works to ensure professional and graduate students are engaged in research with faculty and have the necessary resources to achieve their goals.

Center of Excellence faculty include tenure-track faculty at all stages of career development. Start-up funds are assigned to newly hired tenure-track faculty to ensure they have sufficient resources to establish a research program and develop data and publications that will contribute to their competitiveness as principal investigators on extramural grant submissions.

Other Center of Excellence funds are used to promote faculty research through the COE seed grant program. Seed grants are awarded annually through the Center's call for research proposals, which occurs each spring. The UTCVM research committee reviews each proposal and makes recommendations to the Associate Dean for Research regarding which proposals are best aligned with the objectives of the Center of Excellence and are most likely to contribute to the faculties' ability to successfully compete for extramural funding.

A number of special requests occur during the year with respect to COE faculty needs associated with their laboratories. The Associate Dean for Research addresses these requests on a case-by-case basis. Purchasing new equipment to advance and expand research capabilities of COE faculty and updating laboratories to ensure facilities are modern and sufficient for the recruitment and continued success of COE faculty is also accounted for in the allocation of COE funding.



*Pictured above are renovations taking place earlier in the year for the new Vector Borne Disease Laboratories. In addition to updating the aesthetics of the lab, several new pieces of equipment were purchased. Some of these equipment purchases are highlighted on pages 16-17 of the report.*

# Start-Up Funds

The Center provided \$813,263.51 in start-up funds for 12 junior faculty members to help them establish their research programs in FY21. Each faculty member's start-up funding amount and research interests are described below:



**Dr. Jonathan Abbott**  
*Small Animal Clinical Sciences*  
 \$5,000

**Research Interests:**  
 Feline myocardial disease; congenital cardiac disease; canine heart failure.



**Dr. Mohamed Abouelkhair**  
*Biomedical & Diagnostic Sciences*  
 \$55,000

**Research Interests:**  
 Microbial bioinformatics; development of new molecular assays for detection of existing and emerging infectious disease; immunology.



**Dr. Michelle Dennis**  
*Biomedical & Diagnostic Sciences*  
 \$24,000

**Research Interests:**  
 Pathogenesis and diagnosis of natural disease, with special interest in aquatic animals and wildlife



**Dr. Alex Esteller-Vico**  
*Large Animal Clinical Sciences*  
 \$7,000

**Research Interests:**  
 Development of new markers to improve the diagnosis of endocrine diseases.



**Dr. Ashley Hartley**  
*Small Animal Clinical Sciences*  
 \$7,500

**Research Interests:**  
 Small animal medicine, with particular research focuses in infectious diseases, immunology, and hepatobiliary diseases.



**Dr. Stephanie Kleine**  
*Small Animal Clinical Sciences*  
 \$5,000

**Research Interests:**  
 Chronic pain management, particularly osteoarthritis; non-steroidal anti-inflammatory drug pharmacology; anesthesia and inflammation.



**Dr. Andrea Lear**  
*Large Animal Clinical Sciences*  
 \$12,333

**Research Interests:**  
 Reproductive and placental immunology; infectious disease; neonatology.



**Dr. Denae LoBato**  
*Biomedical & Diagnostic Sciences*  
 \$5,833

**Research Interests:**  
 Co-infections; fungal and mycobacterial infections; wildlife disease.



**Dr. Girish Neelakanta**  
*Biomedical & Diagnostic Sciences*  
 \$195,047.51

**Research Interests:**  
 Vector-borne diseases and molecular aspects of host-pathogen interactions; development of transmission-blocking vaccines; microbiology; infectious diseases; vector biology.



**Dr. Sreekumari Rajeev**  
*Biomedical & Diagnostic Sciences*  
 \$165,500

**Research Interests:**  
 Host pathogen interaction; diagnosis and prevention of Leptospira; infection in animals; diagnostics and vaccines; development for Ehrlichia canis and Anaplasma platys infection in dogs.



**Dr. Joseph Smith**  
*Large Animal Clinical Sciences*  
 \$5,000

**Research Interests:**  
 Pharmacology; small ruminants; ruminant pain management; comparative animal models.



**Dr. Hameeda Sultana**  
*Biomedical & Diagnostic Sciences*  
 \$326,050

**Research Interests:**  
 Arthropod-derived exosomes in mediating flavivirus transmission; vector-borne viral diseases involving flaviviruses; identifying and characterizing novel therapeutic agents or targets to treat pan-flaviviral infections.

# Supplemental Funding

Two faculty, Drs. David Anderson and Barry Rouse, received supplemental funds totaling \$45,000. Distinguished Professor Barry Rouse has received continuous funding from the National Institutes of Health (NIH) since 1978. Dr. Rouse has often simultaneously held more than one NIH Research Project Grant (RO1) award and recently received yet another renewal to continue research exploring the fundamental mechanisms of immunopathology of herpes virus corneal disease. As a result, this NIH RO1 grant, first awarded in 1984, has been renewed repeatedly for well over thirty years, which is a major accomplishment. Currently, Dr. Rouse is awaiting funding decisions on follow-on grants. Dr. Anderson is a well-established senior faculty member with an active laboratory including three graduate students and a research technician. For the past 10 years, Dr. Anderson's research has been funded by multiple federal agencies including the DOD, NIH, and NSF. Faculty profiles for Drs. Anderson and Rouse can be found below:

**Dr. David Anderson, Associate Dean for Research and Graduate Studies at the University of Tennessee College of Veterinary Medicine,** is

most known for his research surrounding tissue regeneration and the use of regenerative technologies to restore form and function to injured structures in the body. Dr. Anderson has had a long collaborative relationship with the Center for Integrative Nanotechnology Sciences at the University of Arkansas at Little Rock. This collaboration has resulted in successful awards totaling over six million dollars from the Department of Defense through the Army military research programs. In 2020, Dr. Anderson was awarded the Zoetis Award for Veterinary Research Excellence and the University of Tennessee Chancellor's Award for Excellence in Advising. Throughout his career, Dr. Anderson has published over 190 peer-reviewed scientific articles and has mentored over 50 graduate students and post-doctoral fellows.



**Dr. David Anderson**  
*Large Animal Clinical Sciences*  
\$20,000

**Dr. Barry Rouse, Lindsay Young Distinguished Professor,** is

internationally renowned in herpesvirus keratitis research and the immunopathology that blinds affected individuals. He has been continuously supported through consecutive NIH grants throughout his 40+-year career. He has contributed substantially to knowledge regarding regulatory T cells in disease and is often invited to speak at national and international conferences and at institutions such as Harvard and Emory. In 2018, he was awarded the AVMA Lifetime Achievement Award for Excellence in Research. Dr. Rouse has trained over 50 graduate students and postdoctoral fellows at The University of Tennessee and has published over 425 peer-reviewed scientific articles throughout his career.



**Dr. Barry Rouse**  
*Biomedical & Diagnostic Sciences*  
\$25,000

# Infrastructure and Supplies

Center of Excellence funds support research infrastructure in the UT College of Veterinary Medicine and the UT Institute of Agriculture and include the purchase of equipment, maintenance of shared essential research equipment, and other needs for support in shared laboratories. Requests for funds are evaluated by the research advisory committee. This committee reviews funding requests and recommends supporting or denying requests based on justification. The committee ensures the request being evaluated does not represent a redundant request relative to existing resources. The committee also considers the number of faculty who are likely to benefit from the resources and equipment of the request.

## Equipment

During FY21, equipment purchases totaled \$195,047.51. This equipment was associated with setting up the new Vector Borne and Zoonotic Disease Laboratories. The new equipment included research computers, incubators, micro-centrifugation units, thermal cyclers, a water purification unit, imaging systems, an environmental chamber, and microinjection systems. The function of these essential units allows for the performance and analysis of Western blots, polymerase chain reactions to detect the presence and identify genetic material, microfluidics for the analysis of particles, a controlled environmental chamber used to incubate ticks during experiments, and a micro-injector used for inoculation of ticks, *Drosophila* embryos, adult flies, mosquitoes, and cells.

## Travel

Travel was restricted during FY21 because of the on-going COVID-19 pandemic. Faculty and students continued to engage in regional, national, and international conferences virtually. One travel award of \$400 was awarded to a post-doctoral research scientist to partially cover registration for an online scientific conference. In addition to this travel award, four travel awards were also awarded to five students. These students' names are Ashley Wilmoth, Anastasia Towe, Blake Andrews, Emily Kent, and Allison Andrews.

*The nCS1 nanoparticle characterization instrument measures individual nanoparticles and rapidly accumulates statistically-reliable distributions of particle sizes with quantitative concentration information. This unique capability separates the nCS1 from any other instrument on the nanoparticle analysis marketplace.*







The microinjection system performs microinjections into the tick body, tick anal pore, *Drosophila* embryos, adult flies, mosquitoes and in vitro grown tick/mosquito cells.



The CFX Opus 96 is a PCR system. A PCR system is used to make millions of copies of an initially small segment of DNA. This allows scientists to amplify DNA enough to study in detail, making it an incredibly valuable piece of equipment in both clinical and research settings.



The ChemiDoc MP Imaging System is a full-feature instrument for imaging and analyzing gels and western blots. It is designed to address multiplex fluorescent western blotting, chemiluminescence detection, general gel documentation applications, and stain-free technology imaging needs.



The environmental chamber is an enclosure used to test the effects of specified environmental conditions on biological items, industrial products, materials, and electronic devices and components

# UTCVM Research Day

The Center was a major sponsor of the University of Tennessee College of Veterinary Medicine Research Day held on September 20, 2021. This event is designed to serve as a venue for students and new investigators to gain experience in showcasing their research while also providing potential collaboration and networking opportunities. This year, Research Day was held both in-person and virtually. Twenty graduate students and 11 veterinary students delivered oral presentations. Eight additional presentations were delivered by residents, post-docs, and faculty member. These presenters included Drs. Sawsan Ammar, Waqas Ahmed, Engin Berber, Austin Bow, Stephanie Dantino, Becky DeBolt, Prachi Namjoshi, and Nathan Squire. Student presentations were scored based on their performance. The winners of Research Day are highlighted below.

## 2021 UTCVM Research Day Awards

### Graduate Student Category

#### 1st Place – Nicole Szafranski, Comparative & Experimental Medicine

*“Investigation of the prevalence of *Toxoplasma gondii* in North American waterfowl”*

*Mentor:* Dr. Rick Gerhold

*Travel award:* \$500.00

#### 2nd Place – Eliza Baker, Comparative & Experimental Medicine

*“Health survey of coyotes from South Carolina and Tennessee”*

*Mentor:* Dr. Rick Gerhold

*Travel award:* \$300.00

#### 3rd Place – Anastasia Towe, Comparative & Experimental Medicine

*“Use of implants for Terbinafine administration to treat and prevent chytridiomycosis in amphibians”*

*Mentor:* Dr. Debra Miller

*Travel award:* \$200.00



A photo taken of the 2021 UTCVM Research Day program.



The UTCVM 2021 Research Day audience listens as Department of Public Health PhD candidate, Md Marufuzzaman Khan, virtually presents his presentation titled, “Prevalence and predictors of stroke among individuals with prediabetes and diabetes in Florida.”

## Veterinary Student Category

### 1st Place – Abbie Metcalfe, Class of 2024

*“A retrospective review of spinal disease in non-domestic felids”*

*Mentors:* Drs. Andrew Cushing & Michelle Dennis

*Travel award:* \$500.00

### 2nd Place (tied) – Haley Cremerius, Class of 2023

*“Pharmacokinetics and pharmacodynamics of pantoprazole in neonatal calves”*

*Mentor:* Dr. Joe Smith

*Travel award:* \$300.00

### 2nd Place (tied) – Myranda Gorman, Class of 2024

*“Comparing methodologies for the detection of Leptospira in environmental samples”*

*Mentor:* Dr. Sree Rajeev

*Travel award:* \$300.00

## Phi Zeta Award for Excellence in Animal Health Research

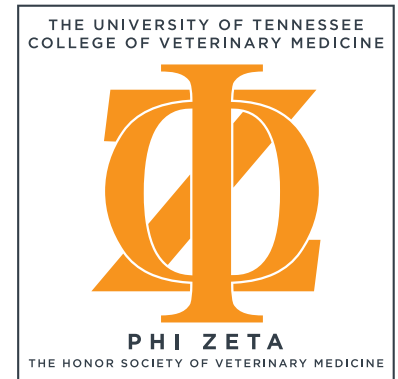
### Julie Bedwani, Class of 2023

*“Establishing a wildlife biobank at the University of Tennessee College of Veterinary Medicine with a pilot study of wildlife pathology”*

tissue-implant interfaces

*Mentors:* Drs. Michelle Dennis & Rick Gerhold

*Cash award:* \$250.00



## Faculty Awards

In addition to the Research Day presentation awards, two faculty members were awarded prestigious awards.



**Dr. Rick Gerhold** was awarded the **Boeringher Ingelheim Faculty Research Mentoring Award**.

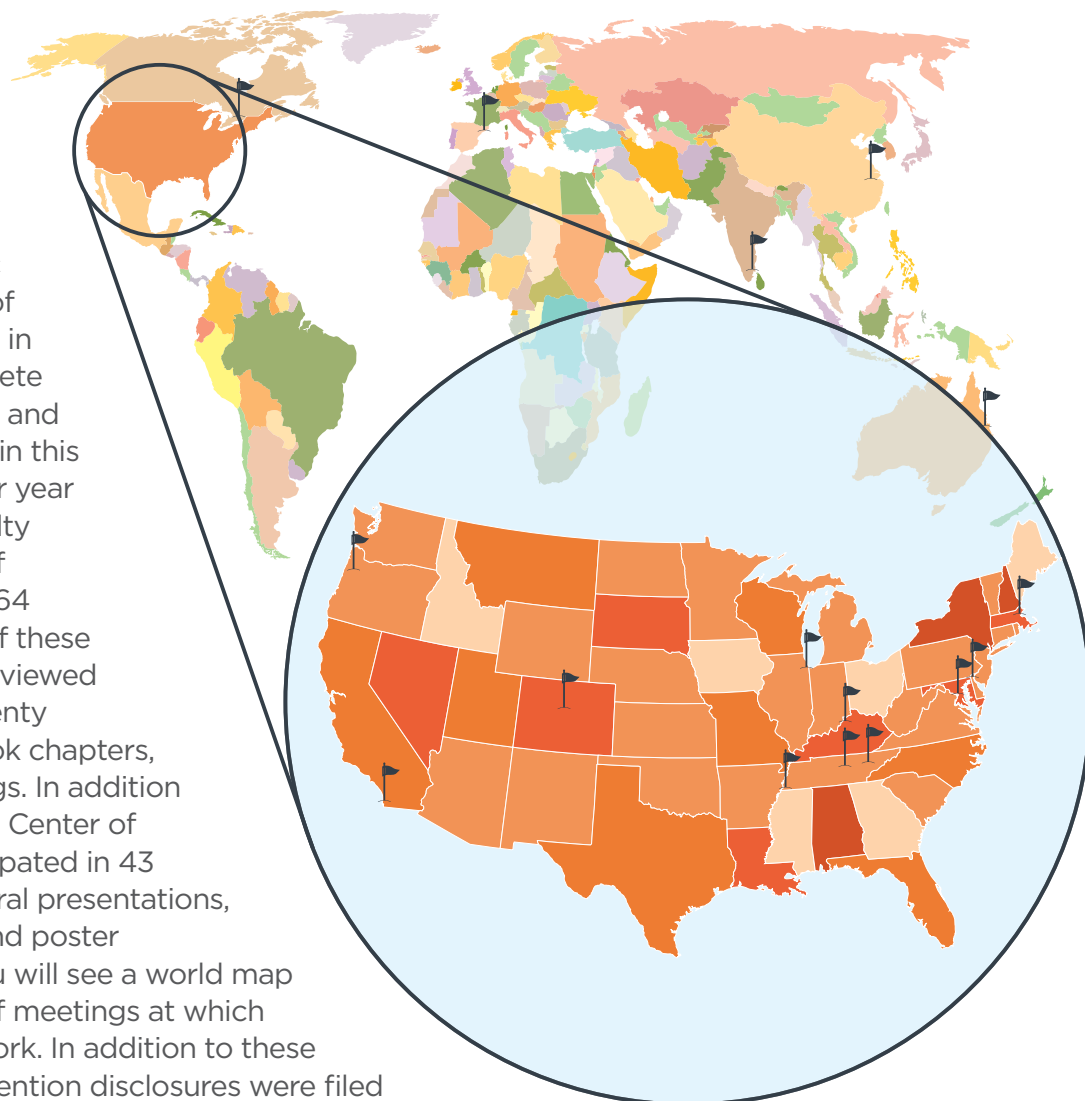
This award recognizes a faculty member who excels in teaching, training, and sharing their knowledge with students pursuing advanced degrees in research at the University of Tennessee College of Veterinary Medicine.



**Dr. Angela Rollins** was awarded the **Zoetis Award for Veterinary Research Excellence**. This award recognizes outstanding research effort, productivity, and the advancement of knowledge in areas relevant to veterinary medicine.

# Dissemination of Research

Center of Excellence faculty are strongly encouraged to disseminate their research discoveries through publications, presentations at scientific meetings, presentations of posters, and participation in scientific panels. A complete list of faculty publications and presentations is included in this annual report for calendar year 2020. The 18 funded faculty members of the Center of Excellence had a total of 64 publications. Forty-four of these publications were peer-reviewed scientific articles, and twenty publications included book chapters, abstracts, and proceedings. In addition to these published works, Center of Excellence Faculty participated in 43 presentations including oral presentations, abstract presentations, and poster presentations. Above, you will see a world map indicating the locations of meetings at which faculty presented their work. In addition to these scholarly works, three invention disclosures were filed with the University of Tennessee Research Foundation in 2020, and three patents were filed.



Inventors	Title	Status
Elizabeth Strand	Veterinary Social Work Certificate Programs	Invention Disclosure
Pierre-Yves Mulon	High Fidelity Bovine Paravertebral Block Simulator	Invention Disclosure
Madhu Dhar, Steven Newby	A Novel Nanocomposite for Bone Tissue Engineering	Invention Disclosure
Joseph Ramos	Electrochemical Detection of Biomarkers Utilizing a Cascade of Redox Chemical Reactions	Patent Filed
David Anderson, Richard Steiner, David Harper	Electrospun Poly-caprolactone Neuralwrap Surface Coated with Graphene Oxide	Patent Filed
David Anderson, Alexandru Biris, Karrer Kadum, Alisha Pedersen	Biodegradable Intraluminal Small Intestinal Anastomotic Guide	Patent Filed

# Popular Press and Media

In addition to faculty speaking engagements at continuing education and research meetings, the UTCVM issues press releases to state, regional, and national media, resulting in numerous television and print features, many of which relate directly to research conducted through the center.

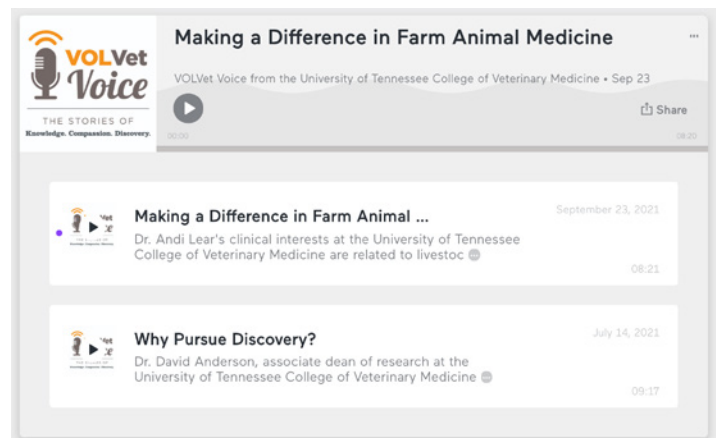
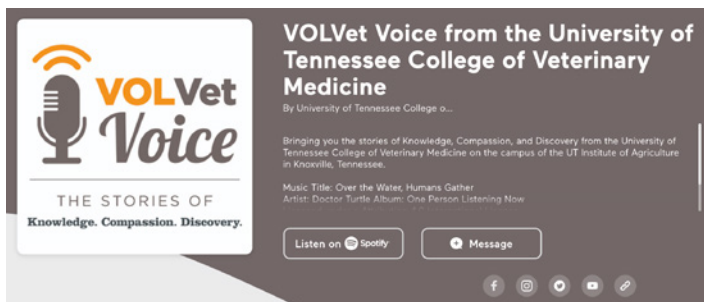
UTCVM has a recurring spot on the local NBC affiliate WBIR Channel 10's "Live at Five at Four" news show. "Live at Five at Four" has an average of 70,000 viewers each day. In addition, the College manages several Facebook pages: official college page (13,746 likes), alumni page (1,418 likes), UT Equine & Farm Animal Hospitals page (2,211 likes), Equine Performance & Rehabilitation Center at UTCVM page (1,294 likes), and a UTCVM-WHO Wellbeing page (127 likes). Page administrators post clinical and research information for users to the Facebook pages, as well as on the College's other social media pages such as Instagram (2,439 followers) and Twitter (4,559 followers). The College's YouTube channel has 1,070 subscribers.

The College produces a bi-monthly VolVet Connect alumni e-newsletter that contains items of note aimed at DVM alumni, including UTCVM research news and continuing education and network opportunities. Each quarter, referring veterinarians within a 250-mile radius receive a printed copy of VOLVet News that provides updates on the Veterinary Medical Center as well as a "Science Behind the Medicine" piece highlighting a particular area of research at the college. VOLVet Vision is an annual magazine that explores the research, teaching, and outreach services of UTCVM.

The University has joined *The Conversation*, an independent source for news articles and informed analysis written by the academic community and edited by journalists for the general public. Our researchers have the opportunity to craft academic research into digestible stories for the public good.

## THE CONVERSATION

Recently, UTCVM has also launched the *VOLVet Voice* Podcast that shares the stories of knowledge, compassion, and discovery from the college that create Real. Life. Solutions. To listen to the podcast, visit <https://anchor.fm/volvetvoice>.



# Summer Student Research

Through the Summer Student Research Program, veterinary students were provided an opportunity to explore careers in research through participation in a hypothesis driven project, group training activities, and attendance at research symposia. The program was designed to stimulate veterinary students' interest in research through hands-on exposure to the research environment. The objectives of the program were for students to learn about study design; identify specific objectives for their project; receive meaningful research experience; develop an understanding of research careers and opportunities; develop a basic understanding of the scientific method; develop skills in one or more research techniques; learn about data interpretation; obtain experience creating and delivering a research presentation; learn about ethical issues involved in research; and receive an introduction to responsible conduct of research and develop camaraderie with other student researchers.

Twenty-one students participated in laboratory and field research and attended weekly professional development seminars where speakers addressed topics such as career opportunities in research, compliance issues in laboratory animal care, data visualization, science writing, scientific presentations, and the grant proposal process. Near the end of the ten-week program, the students presented their research findings to their colleagues and to University of Tennessee College of Veterinary Medicine faculty and staff. Three students presented at the 2021 virtual National Veterinary Student Symposium. All Summer Research Program participants received an opportunity to present their work to a broad audience and earn awards at the University of Tennessee College of Veterinary Medicine (UTCVM) Research Day held on September 20, 2021. Eleven Summer Research Students went on to present at UTCVM's Research Day.

The Center fully funded nineteen student stipends for the Summer Student Research Program. A grant from Boehringer Ingelheim funded two students (Emma Faddoul and Myranda Gorman). Twelve UTCVM veterinary students who gained research experience in the summer program are currently enrolled in the college's DVM/PhD program.

Dr. Stephen Kania, a Center faculty member, coordinated the program alongside Dr. Linda Frank.

To maximize student opportunities, the program is open to both Center and non-Center faculty. During FY21, six Center faculty members participated in the program. The Center continues to encourage the participation of its faculty in mentoring DVM students.



*Piper Gauthier, UTCVM Class of 2023, in a herd of alpacas getting ready for a hose down (photo above) and spinning down blood collections to obtain serum (photo on page 25) while working on her summer project, "Development of an Alpaca Pregnancy Test."*

## Julie Bedwani

*Faculty Mentor:* Dr. Rick Gerhold

*Summer Project:* Pilot Study of TN Wild Waterfowl Pathology

## Kara Brady

*Faculty Mentor:* Dr. Brian Whitlock

*Summer Project:* Effects of Compound 6 on LH and Follicular Development in Cattle

## Channing Cantrell

*Faculty Mentor:* Dr. Pierre-Yves Mulon

*Summer Project:* Efficacy of Free Chlorine Solution in Bacterial Re-Colonization Rates in Caprines

## Haley Cremerius

*Faculty Mentor:* Dr. Joseph Smith

*Summer Project:* Pharmacokinetics and Pharmacodynamics of Pantoprazole in Neonatal Calves

## Mariah Dee

*Faculty Mentors:* Drs. Anastasia Towe and Deb Miller

*Summer Project:* Long-Term Consequences of Sublethal *Batrachochytrium salamandrivorans* Infection in Salamanders

## Kylie Dunham

*Faculty Mentor:* Dr. Tena Ursini

*Summer Project:* Development of Marker Set to Describe 3-D Spinal Motion in Horses Using Motion Capture Analysis

## Emma Faddoul

*Faculty Mentors:* Drs. Stephen Kania and Linda Frank

*Summer Project:* *S. pseudintermedius* Vaccine

## Piper Gauthier

*Faculty Mentors:* Drs. Andrea Lear and Stephen Kania

*Summer Project:* Development of an Alpaca Pregnancy Test

## Samuel Good

*Faculty Mentor:* Dr. Deb Miller

*Summer Project:* Description and Classification of Bacteria Found in GI Tract of Leatherback Hatchlings

## Myranda Gorman

*Faculty Mentor:* Dr. Sree Rajeev

*Summer Project:* Optimization of Environmental Testing Method for *Leptospira*

## Emma Hendrix

*Faculty Mentor:* Dr. Stephanie Kleine

*Summer Project:* Comparison of Carprofen and Grapiprant for Ovariohysterectomies

## Emily Holder

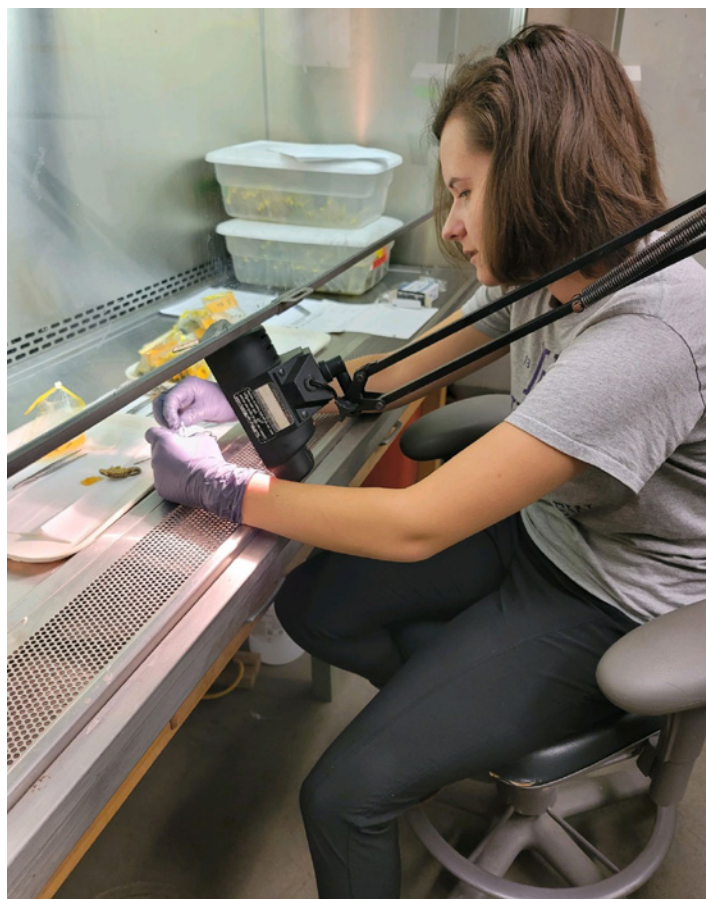
*Faculty Mentors:* Drs. Rebecca Hardman and Deb Miller

*Summer Project:* Blood Smears as a Tool to Inform Hellbender Health

## Rebekah Johnson

*Faculty Mentors:* Drs. Elizabeth Collar and Joseph Smith

*Summer Project:* Pharmacokinetic and Pharmacodynamic Comparison of Epidural and Intramuscular Triamcinolone in Horses



*Mariah Dee, UTCVM Class of 2024, performing a necropsy on a newt while working on her summer project, "Long-Term Consequences of Sublethal *Batrachochytrium salamandrivorans* Infection in Salamanders."*

## Trey Kennedy

*Faculty Mentor:* Dr. Deb Miller

*Summer Project:* Survey of FeLV and FIV in South Texas Ocelots (*Leopardus pardalis*) and Bobcats (*Lynx rufus*)

## Emily Kent

*Faculty Mentor:* Dr. Rick Gerhold

*Summer Project:* Serological Assay to Detect Antibodies to Meningeal Worm (*Parelaphostrongylus tenuis*) in Wild Cervids

## Kaitlyn Libon

*Faculty Mentor:* Dr. Jennifer Weisent

*Summer Project:* Seroprevalence of *Borrelia* spp. in Free Roaming Cats: A GIS Exploration of the Knoxville Region

## Abbie Metcalfe

*Faculty Mentors:* Drs. Andrew Cushing and Michelle Dennis

*Summer Project:* A Retrospective Review of Spinal Disease in Non-Domestic Felids

## Zack Wildman

*Faculty Mentor:* Dr. Rebecca Trout Fryxell

*Summer Project:* Comparative Analyses of Three Diagnostic Assays for Spotted Fever Group Rickettsiosis

## Jenna Vogel

*Faculty Mentor:* Dr. Liza Koster

*Summer Project:* Prognostic Impact of Initial [and Residual] Pulmonary Congestion Assessed by Radiographic Scoring in Dogs Admitted for Worsening Heart Failure Due to Myxomatous Mitral Valve Disease

## Megan White

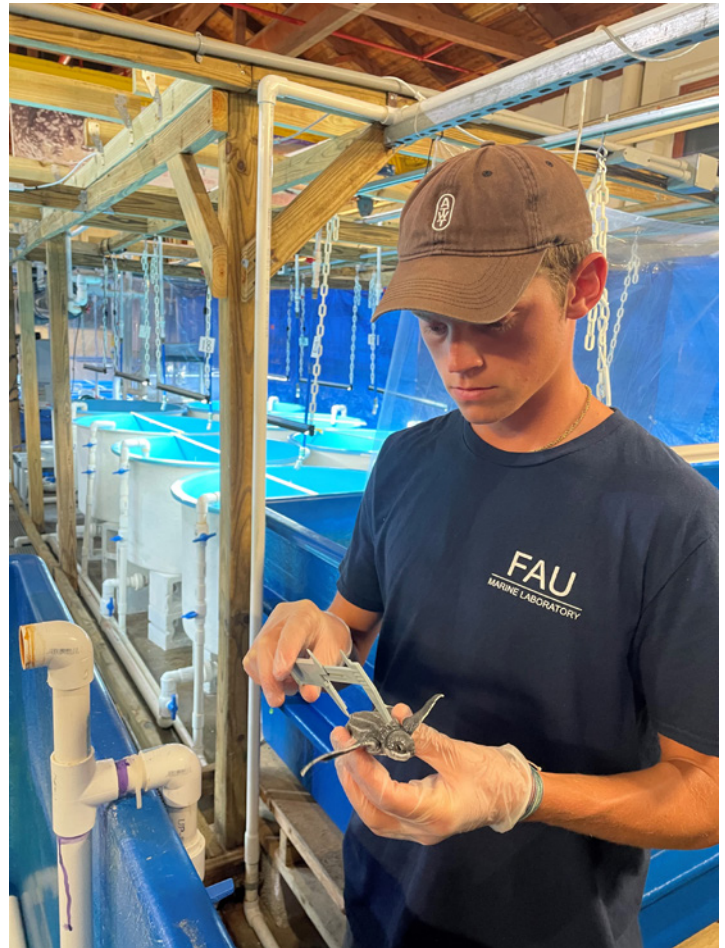
*Faculty Mentor:* Dr. Rick Gerhold

*Summer Project:* In vitro Examination of Novel Therapeutic Compounds to Control *Histomonas meleagridis* and *Trichomonas gallinae*

## Katy Wilkinson

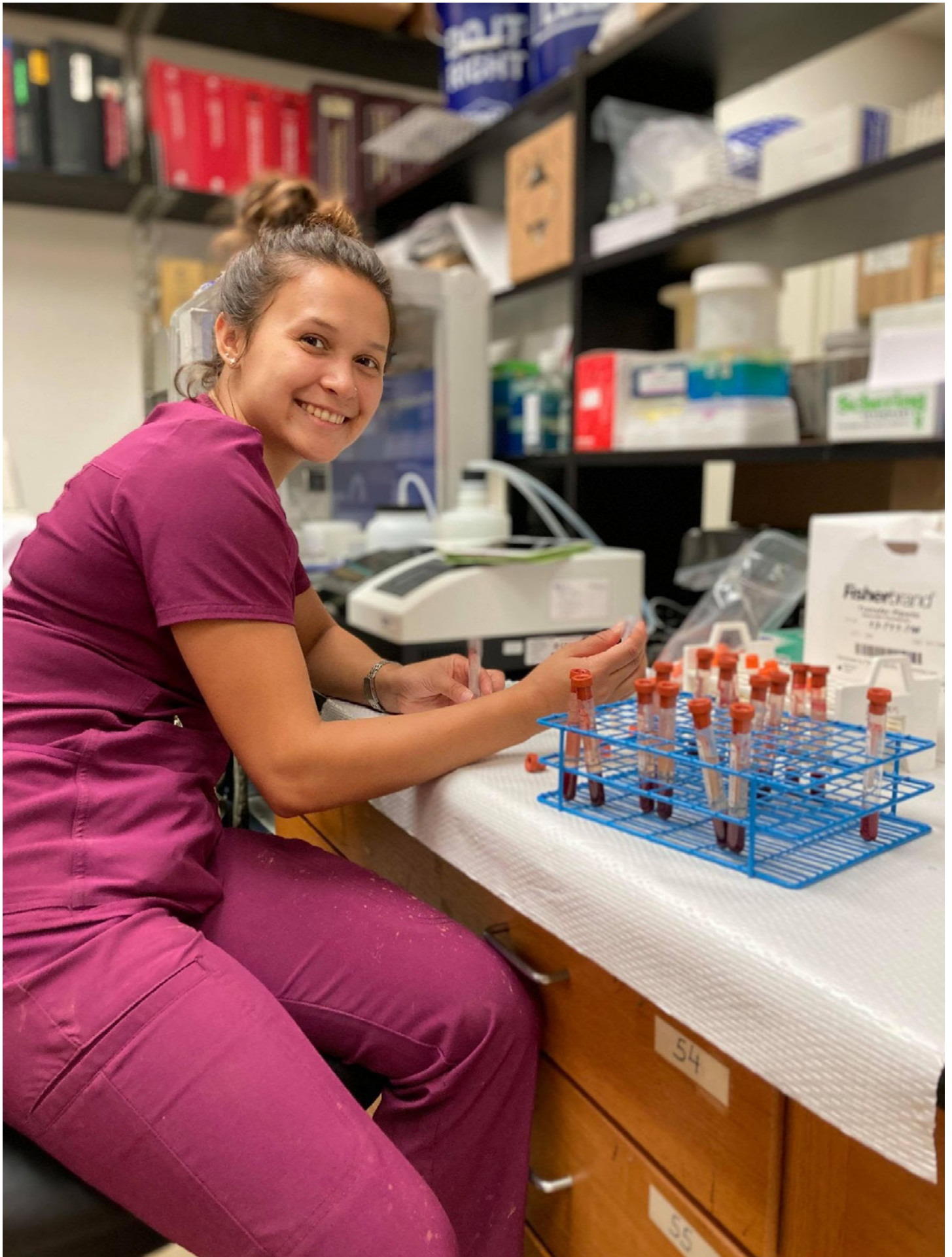
*Faculty Mentors:* Dr. Rick Gerhold and Ashley Hartley

*Summer Project:* Detection of Select Vector Borne Agents of Ticks Collected from East Tennessee Veterinary Clinics



Samuel Good, UTCVM Class of 2024, taking growth measurements of leatherback hatchlings at the Florida Atlantic University Marine Laboratory while working on his summer project, *Description and Classification of Bacteria Found in GI Tract of Leatherback Hatchlings*.





# Three Minute Thesis

On February 25th, 2020, seven participants took the stage at the fourth annual University of Tennessee Three Minute Thesis (3MT) semi-finals. The 3MT event is held as a part of the University of Tennessee's Graduate and Professional Student Appreciation Week. This competition challenges master's and doctoral students to communicate their unique thesis or dissertation to an audience unfamiliar with the subject. Competitors have three minutes to explain their research using only one slide or photo. The College of Veterinary Medicine's Comparative and Experimental Medicine program had one participant, Tania Dawant, in the competition. Tania also became a finalist of the competition. Unfortunately, due to the COVID-19 pandemic, the finals did not take place.



*Tania Dawant (pictured left) with the other two finalists of the fourth annual 3MT competition in February of 2020.*

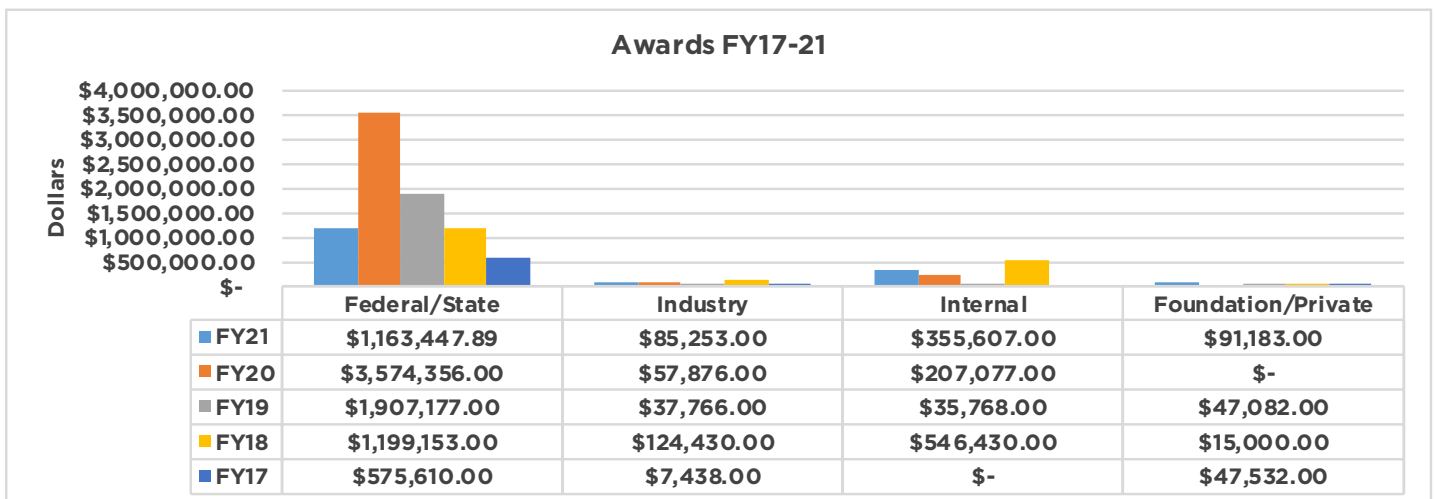


# Five-Year Benchmark Data

Despite the impact of COVID on research activities in CY20 and FY21, scholarly productivity among COE faculty remains strong. Total publications (64 publications by 18 COE faculty) and publications per faculty member (3.6) remained similar to previous years. However, the number of presentations per faculty member (2.4) were fewer than previous years. The lower presentation counts are attributed to conferences being cancelled and restructured to fit virtual attendance and limitations on the ability of faculty to travel – especially internationally.

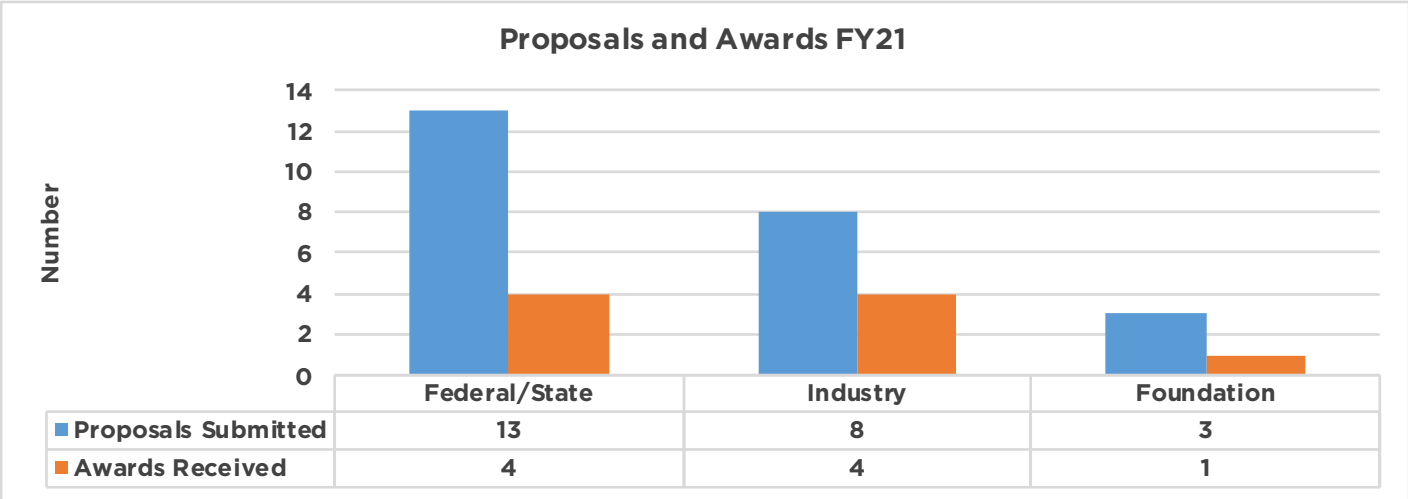
Extramural funding decreased in FY21 as compared to FY20 and returned to amounts similar to those last seen in FY17 and FY18. FY21 COE faculty submitted a total of 24 research grants to federal, state, industry, and foundation sponsors. A total of nine grants were awarded for a total FY21 extramural award value of \$1,339,883.89. Grant proposals were most often submitted to federal agencies (13), with a smaller number of proposals being submitted to industries (8) and foundations (3). Awards most often were secured from federal (4) agencies and industry partners (4). In addition, COE faculty received a total of \$351,397 in internal grants to seed exploratory research. Despite having a lower amount of extramural grant awards, research expenditures increased from the previous year. Increased expenditures were attributable to on-going research from several large research grants awarded in FY20.

Center of Excellence funds continue to support the mentoring of graduate and professional students in research. Currently, FY21 COE faculty are graduate advisors to 10 PhD students and one MS student. The Summer Student Research Experience Program engaged twenty-one veterinary students in laboratory and field research projects. Faculty across multiple disciplines mentored students throughout the Summer Student Research Program.



# Benchmark Summary

Extramural funding decreased in FY21 as compared to FY20, and was similar to that of FY18. Despite the challenges experienced by Center of Excellence faculty during FY21, 24 extramural grant submissions resulted in nine grant funding awards resulting in grant funding success rate of 38%. Grants awarded to COE faculty were funded by federal (4), industry (4) and foundation (1) sponsors and totaled \$1,339,883.89.



# Future Plans: Looking Forward

The Center of Excellence in Livestock Diseases and Human Health (COE) continues to invest in faculty, students, research, and infrastructure to support its mission. The Center is dedicated to continued development of interdisciplinary and multidisciplinary activities designed to promote the quality of human and animal health, expand research capacities for livestock research, explore commonalities between animal diseases and human diseases that have mutual benefit for the advancement of both, and develop new strategies for the diagnosis, treatment, and prevention of disease. Center faculty are engaged in new UTIA (Genomics Center for the Advancement of Agriculture: <https://utiagenomics.tennessee.edu/>) and UT (One Health Initiative: <https://onehealth.tennessee.edu/>) programs. Recently, Center faculty began new collaborations with the UTHSC at Memphis Tennessee Institute for Regenerative Medicine (TennIRM: <https://tennirm.org/>) in programs focused on regenerative medicine.



**ONE HEALTH  
INITIATIVE**



Faculty supported by the Center continue to be productive in submitting proposals and successfully competing for grant awards. The effect of the pandemic likely will be felt for several years in the areas of grant submissions and awards, research expenditures, student programs, publications and presentations, and new discoveries. However, grant award successes speak to the resilience of the faculty, renewed research culture for discovery, and advancing science for the benefit of livestock and human health.

During FY21, several new faculty hires have significant research appointments and start-up support from the Center of Excellence. These faculties represent an important investment in the future of infectious disease research in the Center, College, Institute and University. Of particular merit are Drs. Hameeda Sultana and Girish Neelakanta who are vector borne disease experts who have secured federal funding from the National Institutes of Health. These faculties bring a new focus on developing novel vaccine technologies. Infrastructure enhancements necessary to support their research programs included remodeling two large research laboratories, conversion of part of the laboratory animal facilities to accommodate ABSL-2 research, and purchase of an environmental incubator for ticks. Additionally, modifications were made in the ABSL-3 laboratory to allow for future growth of their zoonotic disease research. These faculty will have key roles in dissemination of new knowledge to stakeholders including scientists, practitioners, producers, and the public.



*Pictured above are Drs. Girish Neelakanta and Hameeda Sultana. Drs. Sultana and Neelakanta lead the all new Vector Borne Disease Laboratories at the University of Tennessee College of Veterinary Medicine.*

During the next five years, we will work toward renovation of additional laboratories in CVM and will continue to develop collaborations with UTIA AgResearch, UTK ORIED, and UTHSC Memphis to expand translational and human health research. This will include discussing strategic plans for future biomedical research facilities and multispecies vivariums aimed to expand translational and animal-intensive research activities.

**FACULTY  
RESEARCH  
SUMMARIES**

# Dr. Madhu Dhar

RESEARCH ASSOCIATE PROFESSOR  
UTCVM LARGE ANIMAL CLINICAL SCIENCES

## About Dr. Dhar

PhD

University of Pune, India

MS

University of Pune, India

### *Supported by:*

Department of Defense,  
National Institute of  
Arthritis and Musculo-  
skeletal and Skin Diseases,  
National Institute of  
Environmental Health  
Sciences, & the Center of  
Excellence in Livestock  
Diseases and Human  
Health

### *Collaborators:*

Drs. David Anderson and  
Robert Donnell

### *Publications:*

5 in 2020

### *Book Chapters:*

1 in 2020

### *Abstracts and Proceedings:*

1 in 2020

### *Presentations:*

6 in 2020



### **COE SEED FUND RESEARCH:**

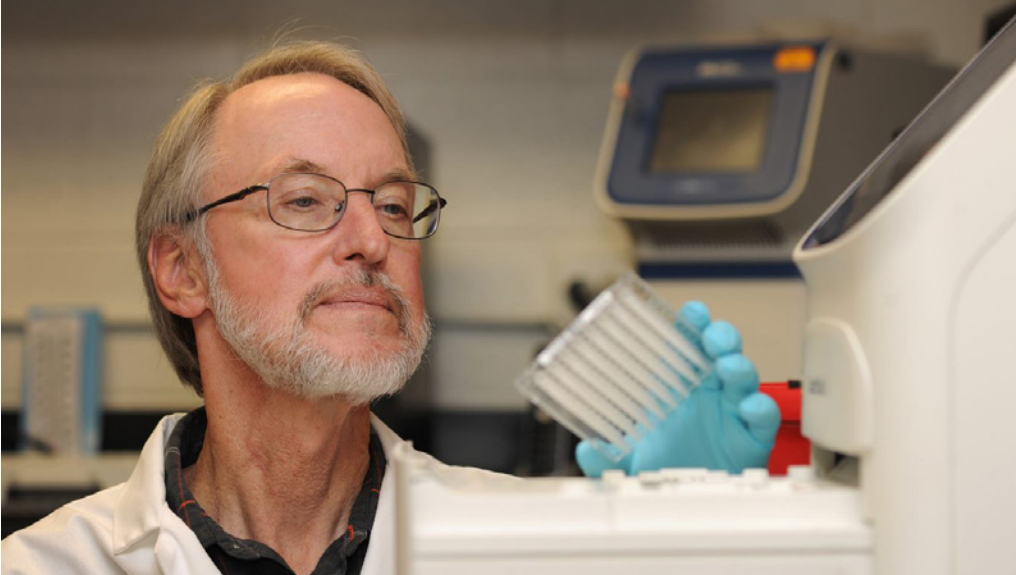
3D printing technologies to design mesenchymal stem cell niches for self-renewal and osteogenic differentiation

Dr. Dhar's research focuses on 3D printing technologies used to design mesenchymal stem cell niches for self-renewal and osteogenic differentiation. With her research group, Dr. Dhar has identified a novel bone tissue engineering strategy that can be translated into an ideal and superior craniomaxillofacial (CMF) bone tissue engineering platform influencing intramembranous ossification (IMO). These findings will lay the groundwork to develop novel and efficacious treatment options for CMF bone defects.



# Dr. Steven Kania

PROFESSOR, ASSISTANT DEAN FOR RESEARCH AND GRADUATE STUDIES  
UTCVM RESEARCH ADMINISTRATION AND BIOMEDICAL AND DIAGNOSTIC SCIENCES



## About Dr. Kania

**MS**

Washington State University

**PhD**

University of Florida

**Supported by:**

Department of Defense,  
American Kennel Club  
Canine Health Foundation,  
Boehringer Ingelheim &  
the Center of Excellence  
in Livestock Diseases and  
Human Health

**Collaborator:**

Drs. Mohamed  
Abouelkhair and  
David Bemis (deceased)

**Publications:**

4 in 2020

**Presentations:**

3 in 2020

**Honors in 2020:**

Landis Scientist in  
Residence Yellowstone  
Forever

**COE SEED FUND RESEARCH:**

Development of a method to study *Staphylococcus schleiferi* molecular epidemiology

Dr. Kania's research is centered around the study of *Staphylococcus schleiferi* infection. In humans, this infection can lead to endocarditis, osteomyelitis, wound infections, and more. In animals, this infection is most common in dogs and cats and can lead to infections in wounded areas or surgical sites. Dr. Kania states that we lack multilocus sequence typing (MLST) capability, which is the most important tool for studying *S. schleiferi* population genetics. The lack of this tool limits the ability to track the clonal spread of virulent strains, understand its zoonotic character, monitor horizontal gene transfer, or develop strategies for treatment and prevention based on conserved elements in predominant strains. Through his research, Dr. Kania seeks to develop a novel MLST scheme as a starting point in the development of a *S. schleiferi* vaccine.

# Dr. Oudessa Kerro Dego

ASSISTANT PROFESSOR  
HERBERT COLLEGE DEPARTMENT OF ANIMAL SCIENCE

## About Dr. Kerro Dego

PhD  
University of Saskatchewan

MSc  
Utrecht University

DVM  
Addis Ababa University

**Supported by:**  
The Center of Excellence  
in Livestock Diseases and  
Human Health

**Collaborators:**  
Dr. Ximin Zeng

**Publications:**  
3 in 2020

**Book Chapters:**  
3 in 2020

**Abstracts and Proceedings:**  
2 in 2020



### COE SEED FUND RESEARCH:

Evaluation of immunogenicity of enterobactin-KLH vaccine: An essential nutrient deprivation-based immunization approach for the control of coliform mastitis in dairy cows

Dr. Kerro Dego's research focuses on further studying a vaccine he and his collaborators have developed to potentially control *E. coli* mastitis. Mastitis is a major economically devastating disease in dairy farming, and *E. coli* is one of the leading causes of bovine mastitis, which leads to reduced yield and poor quality of milk. The vaccine is a novel enterobactin (Ent)-Keyhole limpet hemocyanin (KLH) conjugate vaccine, which targets the essential nutrient (Ent) of *E. coli*. Therefore, this vaccine is promising to control *E. coli* mastitis.

# Dr. Andrea Lear

ASSISTANT PROFESSOR  
UTCVM LARGE ANIMAL CLINICAL SCIENCES



## COE SEED FUND RESEARCH:

Evaluation of neonatal immune cell epigenetic modulation following in-utero infection with bovine viral diarrhea virus

Dr. Lear's research interest focuses on understanding the impact of viral infection and inflammation during pregnancy, including the impacts on neonates born after in-utero viral infection. Broadly, this area of research investigates alteration of maternal-fetal interactions, placental immunology, and neonatal outcomes such as epigenetics associated with maternal viral infection. Dr. Lear utilizes pregnant ruminant models to understand these effects for both livestock and comparative understanding for human health and well-being. Her current COE research is specifically designed to study the impacts of Bovine Viral Diarrhea Virus (BVDV) following fetal infection. More specifically, Dr. Lear's research focuses on characterizing the effect of maternal infection with BVDV on the immune response in neonatal calves with hopes on elucidating a potential explanation for altered immune function, increased morbidity, and decreased animal production.

## About Dr. Lear

PhD  
University of Tennessee

MS  
Colorado State University

DVM  
Auburn University

### *Supported by:*

United States Department of Agriculture, National Institute of Food and Agriculture, & the Center of Excellence in Livestock Diseases and Human Health

### *Collaborator:*

Dr. Jon Beever

### *Publications:*

4 in 2020

### *Book Chapters:*

1 in 2020

### *Abstracts and Proceedings:*

1 in 2020

### *Presentations:*

13 in 2020

### *Honors in 2020:*

Sandra G. Powell Endowed Distinguished Faculty Award for Livestock Wellness and Large Animal Clinician of the Year, Selected by Class of 2020

# Dr. Brynn Voy

PROFESSOR, HERBERT COLLEGE DEPARTMENT OF ANIMAL SCIENCE  
INTERIM DEPARTMENT HEAD, HERBERT COLLEGE DEPARTMENT OF NUTRITION

## About Dr. Voy

PhD  
University of Tennessee

**Supported by:**  
The Center of Excellence  
in Livestock Diseases and  
Human Health

**Collaborators:**  
Drs. Ahmed Bettaied and  
Mee-Ja Sula

**Abstracts and Proceedings:**  
9 in 2020

**Presentations:**  
3 in 2020



### COE SEED FUND RESEARCH:

Fibro-adipogenic precursors: A new target for the prevention of breast myopathies in broiler chickens?

Highly efficient broiler chickens are prone to developing myopathic lesions in breast muscle due to consequences of extremely rapid muscle growth. Lesions consist of adipose and fibrotic infiltration in healthy muscle tissue, and they resemble those seen in various muscle diseases in humans. Dr. Voy's current COE research characterizes fibroadipogenic precursors (FAPs), a muscle-resident stem cell, as a potential contributor to breast muscle myopathies in broilers. In humans, aberrant differentiation of FAPs to adipocytes is an initial step in the development of myopathies, but this relationship has not been explored in broilers. This project utilizes Dr. Voy's experience in adipocyte biology to identify the molecular pathways that control adipogenic differentiation of broiler FAPs. Defining these pathways is important because they may point to new management or dietary strategies to reduce the incidence of breast muscle lesions in broilers.



**PUBLICATIONS  
AND  
PRESENTATIONS**

# Dr. Jonathan Abbott

## PEER-REVIEWED ARTICLES

- Franchini A, Borgarelli M, Crosara S, Haggstrom J, Lahmers S, Menciotti G, Tyrrell W, Rosenthal S, **Abbott J**. 2020. The longitudinal outcome of canine myxomatous mitral valve disease. RESEARCH COMMUNICATIONS OF THE 30th ECVIM-CA ONLINE CONGRESS. J Vet Intern Med, 34: 3058-3166. doi: 10.1111/jvim.15924
- Menciotti G, Franchini A, Jeong H, **Abbott J**, Lahmers S, Borgarelli M. 2020. Prevalence of mitral regurgitation in Cavalier King Charles Spaniels with no or low-grade murmurs. RESEARCH COMMUNICATIONS OF THE 30th ECVIM-CA ONLINE CONGRESS. J Vet Intern Med, 34: 3058-3166. doi: 10.1111/jvim.15924

## PRESENTATIONS

- Abbott J**. 2020. Management of Canine Mitral Valve Disease. Knoxville Veterinary Medical Association. Oral presentation.

# Dr. Mohamed Abouelkhair

## PEER-REVIEWED ARTICLES

- Abouelkhair MA**, Bemis DA, Giannone RJ, Frank LA, Kania SA. 2020. *Staphylococcus pseudintermedius* 5'-nucleotidase suppresses canine phagocytic activity. Veterinary Microbiology. doi: 10.1016/j.vetmic.2020.108720
- Abouelkhair MA**. 2020. Targeting adenosinergic pathway and adenosine A 2A receptor signaling for the treatment of COVID-19: A hypothesis. Medical hypotheses. doi: 10.1016/j.mehy.2020.110012
- Abouelkhair MA**. Non-SARS-CoV-2 genome sequences identified in clinical samples from COVID-19 infected patients: Evidence for co-infections. PeerJ. doi: 10.7717/peerj.10246

## PRESENTATIONS

- Rifkin R, Grzeskowiak R, **Abouelkhair M**, Murdoch R, Kania S, Anderson, D. 2020. Genomic Analysis of *S. Aureus* Induced Osteomyelitis. Research Day, UTCVM. Oral presentation.
- Rifkin R, Murdoch RW, **Abouelkhair A**, Grzeskowiak RM, Biris AS, Kania SA, Anderson DE. 2020. Genomic Analysis of Post-Operative Hypertrophic Osteomyelitis Induced by *Staphylococcus aureus*. American College of Veterinary Surgeons E-Surgery Summit. E-Poster presentation.

# Dr. David Anderson

## PEER-REVIEWED ARTICLES

- Grzeskowiak RM, Schumacher J, Dhar MS, Harper DP, Mulon PY, **Anderson DE**. Bone and Cartilage Interfaces with Orthopedic Implants: A Literature Review. Frontiers in Surgery, Orthopedic Surgery. doi: 10.3389/fsurg.2020.601244
- PT Hall, SZ Bratcher, C Stubbs, RE Rifkin, RM Grzeskowiak, BJ Burton, CB Greenacre, SM Stephenson, **DE Anderson**, DL Crouch. Fully Implanted Prostheses for Musculoskeletal Limb Reconstruction after Amputation: An In Vivo Feasibility Study. Annals of Biomedical Engineering. doi: 10.1007/s10439-020-02645-3
- Grzeskowiak RM, Freeman LR, Harper DP, **Anderson DE**, Mulon P Y. 2020. Effect of Cyclic Loading on the Stability of Screws Placed in the Locking Plates Used to Bridge Segmental Bone Defects. J Orthop Res. doi: 10.1002/jor.24838
- Graves MT, **Anderson DE**, Denovo RC. 2020. Large Animal Emergency Relief Services—A Model for University Engagement with Private Practitioners and Development of Practice Readiness for Veterinary Students. Frontiers Vet Sci. doi: 10.3389/fvets.2020.00403
- Newby SD, Masi T, Griffin CD, King WJ, Chipman A, Stephenson S, **Anderson DE**, Biris AS, Bourdo SE, Dhar M. 2020. Functionalized Graphene Nanoparticles Induce Human Mesenchymal Stem Cells to Express Distinct Extracellular Matrix Proteins Mediating Osteogenesis. Int J Nanomedicine. doi: 10.2147/IJN.S245801
- Bow A, Jackson B, Griffin C, Howard S, Castro H, Campagna S, Biris AS, **Anderson DE**, Bourdo S, Dhar M. 2020. Multiomics Evaluation of Human Fat-Derived Mesenchymal Stem Cells on an Osteobiologic Nanocomposite. Biores Open Access. doi: 10.1089/biores.2020.0005
- Grzeskowiak RM, Schumacher J, Mulon PY, Steiner RC, Cassone L, **Anderson DE**. 2020. Ex-vivo Mechanical Testing of Novel Laryngeal Clamps Used for Laryngeal Advancement Constructs. Front. Vet. Sci. doi: 10.3389/fvets.2020.00139
- Wofford A, Bow A, Newby S, Brooks S, Rodriguez R, Masi T, Stephenson S, Gotcher J, **Anderson DE**, Campbell J, Dhar M. 2020. Human Fat-Derived Mesenchymal Stem Cells Xenogenically Implanted in a Rat Model Show Enhanced New Bone Formation in Maxillary Alveolar Tooth Defects. Stem Cells International. doi: 10.1155/2020/8142938
- Mulon PY, Zarzosa M, Harper DP, **Anderson DE**. 2020. Assessment of Two Augmentation Techniques on the Mechanical Properties of Titanium Cannulated Bone Screws. Am J Vet Res. doi: 10.2460/ajvr.81.2.116.

Fetrow J, Royster E, Morin D, Molgaard D, Wingert D, Yost J, Overton M, Apley M, Godden D, Cramer G, Sorge U, Scheffers J, Goldsmith T, Chebel R, **Anderson D**, Hanzlicek G, Dwyer KA, Dwyer L. 2020. Development and Implementation of a National Center of Excellence in Dairy Production Medicine Education for Veterinary Students. *J Vet Med Educ*. doi: 10.3138/jvme.1117-161r

## PRESENTATIONS

- Rifkin R, Grzeskowiak R, Abouelkhair M, Murdoch R, Kania S, **Anderson, D**. 2020. Genomic Analysis of *S. Aureus* Induced Osteomyelitis. Research Day, UTCVM. Oral presentation
- Downing K, **Anderson D**. 2020. Effects of local gentamicin delivery on tissue-implant interfaces. UTCVM Research Day. Oral presentation. This presentation won the Phi Zeta Excellence in Research Award.
- Billings C, **Anderson D**. 2020. *In vitro* evaluation of cell proliferation and viability when exposed to a collagen matrix with or without impregnation with gentamicin. UTCVM Research Day. Oral presentation.
- Pedersen A, Mulon PY, **Anderson D**. 2020. *Ex Vivo* Assessment of a Novel Prototype Large Animal Skin Stapler. UTCVM Research Day. Oral presentation.
- Pedersen A, Downing K, Alghazali KM, Bow A, Newby S, Dhar M, Biris A, **Anderson D**. 2020. Osteoinductive Potential of Degradable Polyester Urethanes Impregnated with Nano-Hydroxyapatite, With and Without Decellularized Bone Particles: Rat Subcutaneous Implant Model. UTCVM Research Day. Oral presentation.
- Stubbs C, Hall P, Pedersen A, Grzeskowiak R, Mulon PY, Burton B, Greenacre C, **Anderson D**, Crouch D. 2020. Mechanical Testing of a Synthetic Tendon to Replace the Achilles Tendon in a (NZW) Rabbit Model. Biomedical Engineering Society Virtual Annual Meeting. E-Poster ID #663. Poster presentation.
- Hall P, Stubbs C, Greenacre C, **Anderson D**, Crouch D. 2020. Analyzing Rabbit Locomotor Function During Stance Phase of Hopping Gait. Biomedical Engineering Society Virtual Annual Meeting. E-Poster ID# 656. Poster presentation.
- Grzeskowiak RM, Alghazali KM, Hecht S, Donnell RL, Doherty TJ, Smith CK, **Anderson DE**, Biris AS, Adair HS. 2020. NuCress Scaffold Bone Regeneration in Horses. American College of Veterinary Surgeons E-Surgery Summit. E-Poster presentation.
- Grzeskowiak RM, Freeman LR, Harper DP, **Anderson DE**, Mulon PY. 2020. Effect of Cyclic Loading on Locking Screws. American College of Veterinary Surgeons E-Surgery Summit. E-Podium presentation.
- Rifkin R, Murdoch RW, Abouelkhair A, Grzeskowiak RM, Biris AS, Kania SA, **Anderson DE**. 2020. Genomic Analysis of Post-Operative Hypertrophic Osteomyelitis Induced by *Staphylococcus aureus*. American College of Veterinary Surgeons E-Surgery Summit. E-Poster presentation.
- Rifkin R, **Anderson DE**. 2020. Genomic Analysis of *S. Aureus* Induced Osteomyelitis. American College of Veterinary Surgeons E-Surgery Summit. E-Poster presentation.
- Grzeskowiak RM, Alghazali KM, Hecht S, Donnell RL, Doherty TJ, Smith CK, **Anderson DE**, Biris AS, Adair HS. 2020. NuCress Scaffold Bone Regeneration in Horses. American College of Veterinary Surgeons E-Surgery Summit. E-poster presentation.
- Grzeskowiak RM, **Anderson DE**, Mulon PY. 2020. Effect of Cyclic Loading on Locking Screws. American College of Veterinary Surgeons E-Surgery Summit. E-Podium presentation.
- Downing KA, Billings C, Dhar MS, **Anderson DE**, Newby S, Bow A. 2020. Effects of Local Delivery of Gentamicin on Tissue Interface with a Collagen Scaffold. National Veterinary Scholars Symposium. Poster presentation.
- Newby, SD, Masi T, Griffin C, King W, Stephenson S, Biris AS, **Anderson D**, Bourdo S, Dhar M. 2020. Low Oxygen Graphene as a Platform for Osteogenic Differentiation of Human Mesenchymal Stem Cells. International Society of Stem Cell Research. Poster presentation.
- Wofford D, Bow A, Newby S, Brooks S, Rodriguez R, Masi T, Stephenson S, Gotcher J, **Anderson DE**, Campbell J, Dhar M. 2020. Gelfoam® as a Scaffold for MSCs Implanted in a Bone Defect. UTHSC Dept of Medicine. Poster presentation.

## HONORS

Zoetis Award for Veterinary Research Excellence  
University of Tennessee Chancellor's Award for Excellence in Advising

# Dr. Michelle Dennis

## PEER-REVIEWED ARTICLES

- Diggles BK, Barnes L, Landos M, **Dennis MM**, O'Carroll JPJ. 2020. Sea Lice *Lepeophtheirus spinifer*, *Tuxophorus* sp. and *Caligus* sp. (Copepoda: Caligidae) Infections on Wild-Caught Queenfish *Scomberoides commersonianus* (Pisces: Carangidae) from Northern Australia. *Dis of Aquat Org*. doi: 10.3354/dao03553
- Bolfa P, Cercone M, **Dennis MM**, Conan A, Grevemeyer B, Ducharme NG. 2020. Clinical and Pathological Features in Horses With Advanced Arytenoid Chondritis. *Veterinary Pathology*. doi: 10.1177/0300985820967452
- Dennis MM**, Poppenga R, Conan A, Kill K, Hargrave S, Maroun V, Stewart KM. 2020. Leatherback Sea Turtle (*Dermodochelys coriacea*) Hatch Success and Essential and Nonessential Metals in Eggs and Embryos from Nests in St. Kitts (2015). *Marine Pollution Bulletin*. doi: 10.1016/j.marpolbul.2020.111726



- Atherley NA, **Dennis MM**, Freeman MA. 2020. Two Species of Carcinonemertes Coe, 1902 (Nemertea: Carcinonemertidae) Infesting the Caribbean Spiny Lobster, *Panulirus argus* (Latreille, 1804) (Decapoda: Achelata: Palinuridae), in Saint Kitts, West Indies. *Journal of Crustacean Biology*. doi: 10.1093/jcabi/ruaa060
- Dennis MM**, Becker AAMJ, Freeman MA. 2020. Multifocal Purple Spots is a Nonspecific Lesion Morphology of Caribbean Sea Fans (*Gorgonia* spp.). *Diseases of Aquatic Organisms*. doi: 10.3354/dao03523
- Atherley N, Freeman MA, **Dennis MM**. 2020. Post-Mortem Examination of the Caribbean Spiny Lobster (*Panulirus argus*, Latreille 1804) and Common Pathology in a Fishery of the Lesser Antilles. *Journal of Invertebrate Pathology*. doi: 10.1016/j.jip.2020.107453
- Dorrestein EH, Conan A, Pentzke-Lemus LL, Hartman G, Sample SH, **Dennis MM**. 2020. Prevalence and Progression of Macroscopic Lesions in *Orbicella annularis* and *O. faveolata* on Shallow Fringing Reefs of St. Kitts. *Diseases of Aquatic Organisms*. doi: 10.3354/dao03492

## ABSTRACTS AND PROCEEDINGS

- Mau PA, Bolfa P, Illanes O, **Dennis M**. Fatal Paraquat Toxicity in Dogs. American College of Veterinary Pathologists Annual Meeting. Abstract.

# Dr. Madhu Dhar

## PEER-REVIEWED ARTICLES

- Grzeskowiak RM, Schumacher J, **Dhar MS**, Harper DP, Mulon PY, Anderson DE. Bone and Cartilage Interfaces with Orthopedic Implants: A Literature Review. *Frontiers in Surgery, Orthopedic Surgery*. doi: 10.3389/fsurg.2020.601244
- Priester C, MacDonald A, **Dhar M**, Bow A. 2020. A Potent Biological Agent: Exploring Applications of Mesenchymal Stem Cells, Induced Pluripotent Stem Cells, and Embryonic Stem Cells in Regenerative Medicine. *Stem Cell Reviews and Reports*. doi: 10.3390/ph13110344
- Wofford A, Bow A, Newby S, Brooks S, Rodriguez R, Masi T, Stephenson S, Gotcher J, Anderson DE, Campbell J, **Dhar M**. 2020. Human Fat-Derived Mesenchymal Stem Cells Xenogenically Implanted in a Rat Model Show Enhanced New Bone Formation in Maxillary Alveolar Tooth Defects. *Stem Cells International*. doi: 10.1155/2020/8142938
- Newby SD, Masi T, Griffin CD, King WJ, Chipman A, Stephenson S, Anderson DE, Biris AS, Bourdo SE, **Dhar M**. 2020. Functionalized Graphene Nanoparticles Induce Human Mesenchymal Stem Cells to Express Distinct Extracellular Matrix Proteins Mediating Osteogenesis. *Int J Nanomedicine*. doi: 10.2147/IJN.S245801
- Bow A, Jackson B, Griffin C, Howard S, Castro H, Campagna S, Biris AS, Anderson DE, Bourdo S, **Dhar M**. 2020. Multiomics Evaluation of Human Fat-Derived Mesenchymal Stem Cells on an Osteobiologic Nanocomposite. *Biores Open Access*. doi: 10.1089/biores.2020.0005

## BOOKS AND BOOK CHAPTERS

- Elkhenany HA, Abd Elkodous M, Newby SD, El-Derby AM, **Dhar M**, El-Badri N. Tissue Engineering Modalities and Nanotechnology. In: *Regenerative Medicine and Stem Cell Biology (2020)* (ed. El-Badri N.) Springer Nature Chapter 10. Book Chapter.

## ABSTRACTS AND PROCEEDINGS

- MacDonald AF, Bow A, Masi T, **Dhar M**. Evaluation of Osteoblastic Gene Expression in Human Mesenchymal Stem Cells. *FASEB J*. Abstract. doi: 10.1096/fasebj.2020.34.s1.02820

## PRESENTATIONS

- Dhar M**. 2020. The Importance of Animal Models in Research: From Metabolic Syndrome to Tissue Regeneration. International Laboratory Animal Technician Week. Oral presentation.
- Downing KA, Billings C, **Dhar MS**, Anderson DE, Newby S, Bow A. 2020. Effects of Local Delivery of Gentamicin on Tissue Interface with a Collagen Scaffold. National Veterinary Scholars Symposium. Poster presentation.
- Newby, SD, Masi T, Griffin C, King W, Stephenson S, Biris AS, Anderson D, Bourdo S, **Dhar M**. 2020. Low Oxygen Graphene as a Platform for Osteogenic Differentiation of Human Mesenchymal Stem Cells. International Society of Stem Cell Research. Poster presentation.
- MacDonald AF, Trotter R, Bow A, Masi T, Bourdo S, **Dhar M**. 2020. Evaluation of Osteoblast Differentiation Signaling Pathways as Human Mesenchymal Stem Cells Undergo Osteogenesis in Presence of Low Oxygen form of Graphene Nanoparticles. International Society of Stem Cell Research Virtual. Poster presentation.
- Wofford D, Bow A, Newby S, Brooks S, Rodriguez R, Masi T, Stephenson S, Gotcher J, Anderson DE, Campbell J, **Dhar M**. 2020. Gelfoam® as a Scaffold for MSCs Implanted in a Bone Defect. UTHSC Dept of Medicine. Poster presentation.
- Pedersen A, Downing K, Alghazali KM, Bow A, Newby S, **Dhar M**, Biris A, Anderson D. 2020. Osteoinductive Potential of Degradable Polyester Urethanes Impregnated with Nano-Hydroxyapatite, With and Without Decellularized Bone Particles: Rat Subcutaneous Implant Model. UTCVM Research Day. Oral presentation

# Dr. Alex Esteller-Vico

## PEER-REVIEWED ARTICLES

- El-Sheikh Ali H, Boakari YL, Loux SC, Dini P, Scoggin KE, **Esteller-Vico A**, Ball BA. 2020. Transcriptomic Analysis Reveals the Key Regulators and Molecular Mechanisms Underlying Myometrial Activation During Equine Placentitis. *Biol Reprod*. doi: 10.1093/biolre/ioaa020
- El-Sheikh Ali H, Legacki EL, Scoggin KE, Loux SC, Dini P, **Esteller-Vico A**, Conley AJ, Stanley SD, Ball Ba. 2020. Steroid Synthesis and Metabolism in the Equine Placenta During Placentitis. *Reproduction*. doi: 10.1530/REP-19-0420
- Boakari YL, El-Sheikh Ali H, Dini P, Loux S, Fernandes CB, **Esteller-Vico A**, Scoggin K, Lawrence L, Ball B. 2020. Effect of Oral Urea Supplementation on the Endometrial Transcriptome of Mares. *Anim Reprod Sci*. doi: 10.1016/j.anireprosci.2020.106464
- Boakari YL, El-Sheikh Ali H, Dini P, Loux S, Fernandes CB, Scoggin K, **Esteller-Vico A**, Lawrence L, Ball B. 2020. Elevated Blood Urea Nitrogen Alters the Transcriptome of Equine Embryos. *Reprod Fertil Dev*. doi: 10.1071/RD20088

## PRESENTATIONS

- Esteller-Vico A**. 2020. Evaluation of Changes in Gene Expression on the Equine Endometrium During Early Pregnancy Compared to Non-Pregnant Mares During Diestrus. Society for the Study of Reproduction Annual Meeting. Oral presentation.

# Dr. Ashley Hartley

## PEER-REVIEWED ARTICLES

- Hartley AN, Marr HS, Birkenheuer AJ. 2020. *Cytauxzoon felis* Cytochrome *b* Gene Mutation Associated with Atovaquone and Azithromycin Treatment. *Journal of Veterinary Internal Medicine*. doi: 10.1111/jvim.15935.

## PRESENTATIONS

- Hartley A, Barfield D, Cox B. 2020. Gallbladder Mucoceles. Royal Veterinary College Veterinary Clinical Podcasts. <https://www.rvc.ac.uk/small-animal-referrals/news-events/clinical-podcasts/113-gallbladder-mucoceles>. Podcast presentation.

# Dr. Steven Kania

## PEER-REVIEWED ARTICLES

- McEntire M, Ramsay EC, **Kania S**, Prestia P, Anis E, Cushing A, Wilkes RP, Edward C. 2020. Tiger (*panthera tigris*) and Domestic Cat (*felis catus*) Immune Responses to Canarypox-Vectored Canine Distemper Vaccination. *J Zoo Wildl Med*. doi: 10.1638/2019-0049
- Abouelkhair MA, Bemis DA, Giannone RJ, Frank LA, **Kania SA**. 2020. *Staphylococcus pseudintermedius* 5'-nucleotidase suppresses canine phagocytic activity. *Veterinary Microbiology*. doi: 10.1016/j.vetmic.2020.108720
- Perreten V, **Kania S**, Bemis D. 2020. *Staphylococcus ursi* sp. nov., a New Member of the '*Staphylococcus intermedius* Group' Isolated from Healthy Black Bears. *Int. J. Syst.* doi: 10.1099/ijsem.0.004324
- Coppinger BA, **Kania S**, Lucas JR, Sieving KE, Freeberg TM. 2020. Experimental Manipulation of Mixed-Species Flocks Reveals Heterospecific Audience Effects on Calling. *Animal Behavior*. doi: 10.1016/j.anbehav.2020.07.006

## PRESENTATIONS

- Rifkin R, Grzeskowiak R, Abouelkhair M, Murdoch R, **Kania S**, Anderson, D. 2020. Genomic Analysis of *S. Aureus* Induced Osteomyelitis. Research Day, UTCVM. Oral presentation.
- Rifkin R, Murdoch RW, Abouelkhair A, Grzeskowiak RM, Biris AS, **Kania SA**, Anderson DE. 2020. Genomic Analysis of Post-Operative Hypertrophic Osteomyelitis Induced by *Staphylococcus aureus*. American College of Veterinary Surgeons E-Surgery Summit. E-Poster presentation.
- Coppinger B, **Kania S**, Lucas J, Sieving TF. 2020. Experimental Manipulation of Mixed-Species Flocks Reveals Heterospecific Audience Effects on Calling Behavior. 6th International Ecosummit in Queensland, Australia. Oral presentation.

## HONORS

- Landis Scientist in Residence Yellowstone Forever

# Dr. Oudessa Kerro Dego

## PEER-REVIEWED ARTICLES

- Amenu K, Agga GE, Kumbe A, Shibiru A, Desta H, Tiki W, **Kerro Dego O**, Wieland B, Grace, D, Alonso S. 2020. Community-Tailored Training to Improve the Knowledge, Attitudes, and Practices of Women Regarding Hygienic Milk Production and Handling in the Borana Pastoral Area of Southern Ethiopia. *Journal of Dairy Science*. doi: 10.3168/jds.2020-18292
- Kerro Dego O**, Pacha PA, Gillespie BE, Pighetti GM. 2020. Experimental *Staphylococcus aureus* Mastitis Infection Model by Teat Dipping in Bacterial Culture Suspension in Dairy Cows. *MDPI Animals*. doi: 10.3390/ani10050751
- Vaughn JM, Abdi RD, Gillespie BE, **Kerro Dego O**. 2020. Genetic Diversity and Virulence Characteristics of *Staphylococcus aureus* Isolates from Cases of Bovine Mastitis. *Microb Pathog*. doi: 10.1016/j.micpath.2020.104171

## BOOKS AND BOOK CHAPTERS

- Kerro Dego, O**. Bovine Mastitis Part I, IntechOpen. Book Chapter. doi: 10.5772/intechopen.93483
- Kerro Dego, O**. Control and Prevention of Mastitis: Part Two. IntechOpen. Book Chapter. doi: 10.5772/intechopen.93484
- Kerro Dego, O**. Current Status of Antimicrobial Resistance and Prospect for New Vaccines against Major Bacterial Bovine Mastitis Pathogens. IntechOpen. Book Chapter. doi: 10.5772/intechopen.94227

## ABSTRACTS AND PROCEEDINGS

- Gelalcha BD, Ensermu DB, Vancuren M, Gillespie BE, Agga GE, D'Souza DH, Okafor CC, **Kerro Dego O**. 2020. Prevalence and Detection of Antimicrobial-Resistant Bacteria in Dairy Cattle Farm Environments in East Tennessee. Conference of Research Workers on Animal Disease (CRWAD), Virtual Conference. Abstract.
- VanCuren M, Gillespie BE, Gelalcha BD, **Kerro Dego O**. 2020. Antimicrobial Resistant Zoonotic Bacteria in Dairy Farms in East Tennessee. The Exhibition of Undergraduate Research and Creative Achievement (EURēCA) Symposium. Abstract.

# Dr. Stephanie Kleine

## PEER-REVIEWED ARTICLES

- Budsberg SC, **Kleine SA**, Norton MM, Sandberg GS, Papich MG. 2020. Comparison of the Effects on Lameness of Orally Administered Acetaminophen-Codeine and Carprofen in Dogs with Experimentally Induced Synovitis. *Am J Vet Res*. doi: 10.2460/ajvr.81.8.627
- Kleine SA**, Gogal RM, Krunkosky TM, Sanderson SL, George C, Norton M, Budsberg SC. 2020. Resistin Concentrations in Serum and Synovial Fluid from Normal and Cruciate Deficient Dogs with Osteoarthritis. *Vet Surg*. doi: 10.1111/vsu.13450
- Trenholme HN, Barletta M, Quandt JE, Reed RA, **Kleine SA**, Hofmeister EH. 2020. Arterial Oxygenation in Anesthetized Horses Placed in a 5-Degree Reverse Trendelenburg Position. *Res Vet Sci*. doi: 10.1016/j.rvsc.2020.10.005

# Dr. Andrea Lear

## PEER-REVIEWED ARTICLES

- Graves M, Lee AL, Caldwell M, Schneider L, Cox S, Krawczel P, **Lear AS**. 2020. Evaluation of the Pharmacokinetics and Efficacy of Transdermal Flunixin for Pain Mitigation Following Castration in Goats. *Translational Animal Science*. doi: 10.1093/tas/txaa198
- Gill T, Ader D, Srean P, Hok L, Cheat S, **Lear AS**. 2020. Living Fences for Improved Smallholder Livestock Systems in Cambodia. *Forests, Trees and Livelihoods*. doi: 10.1080/14728028.2020.1827049
- Ohlheiser A, Ahola J, Baier F, Callan R, **Lear AS**, Byers S, Edwards-Callaway L. 2020. Evaluation of Intramuscular Injection of Oxytetracycline for Use as an Experimental Model to Induce Pain and Assess the Efficacy of Pain Mitigation Strategies in Dairy Cows. 2020. *Am J Vet Res*. doi: 10.2460/ajvr.81.6.471
- Browning R, Hayes E, **Lear AS**. 2020. Spontaneous Appearance and Transmission of Polydactyly in Dexter Cattle. *Case Rep Vet Med*. doi: 10.1155/2020/6407847

## BOOKS AND BOOK CHAPTERS

- Lear AS**, Callan RJ. Sporadic Bovine Encephalomyelitis. *The Merck Veterinary Manual*. 12th edition. 2020. Whitehouse Station, N.J., Merck & Co., Inc. Book Chapter.

## ABSTRACTS AND PROCEEDINGS

Kent E, Okafor C, Caldwell M, Walker T, Whitlock B, **Lear AS**. 2020. Control of Salmonella Dublin in a Bovine Dairy Herd. 2020. Conference of Research Workers on Animal Disease (CRWAD), Virtual Conference. Abstract.

## PRESENTATIONS

- Lee A, Graves M, Turner A, **Lear AS**, Cox S, Caldwell M, and Krawczel P. 2020. Transdermal Flunixin Meglumine Allowed Goats to Change Postures More Easily but Did Not Alleviate All Pain after Castration. International Society for Applied Ethology. Poster presentation.
- Fecteau K, Giori L, Eiler H, **Lear AS**, Videla R. 2020. Blood Serum Steroid and Thyroid Hormone Concentrations in Healthy Llamas. World Buiatrics Congress. Oral presentation.
- Lear AS**, Wright M, Needleman A, Schaffer J, Videla R. 2020. Clinical Trial to Determine Efficacy of Copper Oxide Wire Particle Administration to Decrease Gastrointestinal Nematode Concentrations in Adult Alpacas. American Association of Bovine Practitioners Annual Conference. Oral presentation.
- Lear AS**. 2020. Assessing Fetal Viability. American Association of Bovine Practitioners Annual Conference. Oral presentation.
- Lear AS**. 2020. Practical Fluid Therapy. American Association of Bovine Practitioners Annual Conference. Oral presentation.
- Lear AS**. 2020. Internal Medicine in Ambulatory Practice. Colorado Veterinary Medicine Association Annual Conference. Oral presentation.
- Lear AS**. 2020. Approach to the Acute Abdomen. Colorado Veterinary Medicine Association Annual Conference. Oral presentation.
- Lear AS**. 2020. Practical Fluid Therapy. Colorado Veterinary Medicine Association Annual Conference. Oral presentation.
- Lear AS**. 2020. Assessing Fetal Wellbeing. Colorado Veterinary Medicine Association Annual Conference. Oral presentation.
- Lear AS**. 2020. Field-Based Abortion Investigation. Colorado Veterinary Medicine Association Annual Conference. Oral presentation.
- Lear AS**. 2020. Vaccination for Reproductive Success. Colorado Veterinary Medicine Association Annual Conference. Oral presentation.
- Lear AS**. 2020. Managing the Peri-Parturient Small Ruminant. Tennessee Cattlemen's Association Convention. Oral presentation.
- Lear AS**. 2020. Current Therapies for Internal Parasites in Small Ruminants. Tennessee Cattlemen's Association Convention. Oral presentation.

## HONORS

Sandra G. Powell Endowed Distinguished Faculty Award for Livestock Wellness  
Large Animal Clinician of the Year, Selected by the University of Tennessee College of Veterinary Medicine Class of 2020

# Dr. Sreekumari Rajeev

## PEER-REVIEWED ARTICLES

Rajeev S, Toka FN, Shiohara K. 2020. Potential Use of a Canine Whole Blood Culture System to Evaluate the Immune Response to *Leptospira*. *Comparative Immunology, Microbiology and Infectious Diseases*. doi: 10.1016/j.cimid.2020.101546

## PRESENTATIONS

- Rajeev S. 2020. Challenges in Controlling Leptospirosis. A One Health Paradigm International Webinar on COVID-19 and its Aftermath with Special Reference to Zoonotic Diseases. Oral presentation.
- Rajeev S. 2020. *Leptospira* Infection in Small Animals: Selection of Diagnostic Tests. The 2nd Annual Veterinary Diagnostic Conference. Oral presentation.

# Dr. Barry Rouse

## PEER-REVIEWED ARTICLES

- Rouse BT**. Peter Doherty: Role Model and Lifelong Friend. *Viral Immunology*. doi: 10.1089/vim.2020.0004
- Kumar NS, Sharma S, Kumar R, Tripathi BN, Barua, S, Ly H, **Rouse BT**. 2020. Host-Directed Antiviral Therapy. *Clin Microbiol Rev*. doi: 10.1128/cmr.00168-19
- Dubey A, Dahiya S, **Rouse BT**, Sehrawat S. Perspective: Reducing SARS-CoV2 Infectivity and Its Associated Immunopathology. *Front Immunol*. doi: 10.3389/fimmu.2020.581076
- Sehrawat S, **Rouse BT**. 2020. Does the Hygiene Hypothesis Apply to COVID-19 Susceptibility? *Microbes Infect*. doi: 10.1016/j.micinf.2020.07.002
- Varanasi SK, Kumar SV, **Rouse BT**. 2020. Determinants of Tissue-Specific Metabolic Adaptation of T Cells. *Cell Metab*. doi: 10.1016/j.cmet.2020.10.013

Sumbria D, Berber E, Mathayan M, **Rouse BT**. Virus Infections and Host Metabolism-Can We Manage the Interactions? Front Immunol. doi: 10.3389/fimmu.2020.594963

Sumbria D, Berber E, **Rouse BT**. 2020. Supplementing the Diet with Sodium Propionate Suppresses the Severity of Viral Immuno-inflammatory Lesions. J Virol 2021. doi: 10.1128/jvi.02056-20

## BOOKS AND BOOK CHAPTERS

Mueller SM, **Rouse BT**. 2020. Host Defenses to Viruses In Clinical Immunology Principles and Practice, 4th Edition. ed. R. R. Rich, ed. ELSEVIER, China. Book Chapter. doi: 10.1016/B978-0-7234-3691-1.00017-9

# Dr. Joeseeph Smith

## PRESENTATIONS

**Smith JS**, Mochel JP, Seo YJ, Ahrens AP, Griffith RW. 2020. Development of a Caprine Respiratory Disease Induction Model for *Pasteurella multocida* P1063 (type A3). Conference for Research Workers of Animal Disease. Oral presentation.

**Smith J**, Kreuder A, Bricco J, Steffensmeier A, Breuer R, Merkatoris P, Klostermann C, Copeland A, Foote B, O'Leary L, Kirkpatrick J, Schleining J, Vengrin C. 2020. Use of a Live Steer Donation program Improves 4th Year Veterinary Student Learning Outcomes on a Medicine and Surgery Rotation. American College of Veterinary Surgeons Surgery Summit. Oral presentation.

**Smith J**. 2020. Food Animal Pain Management. Advanced Pain Elective (VMC 790) at Oregon State University. Invited speaker. Oral presentation.

**Smith J**. 2020. Food Animal Pain Management: Cases. 2020. Advanced Pain Elective (VMC 790) at Oregon State University. Invited speaker. Oral presentation.

# Dr. Brynn Voy

## ABSTRACTS AND PROCEEDINGS

Winter H, Das S, Mihelic R, Lamour K, **Voy BH**. 2020. Sirtuin Genes are Dynamically Regulated During Adipose Development in Broiler Chicks. Poult. Sci. 96(E-Suppl. 1), Poultry Science Association, Virtual Meeting. Abstract.

Tomkins Y, Chen C, Wilson J, **Voy BH**, Kim W. 2020. The Effects of Maternal Fish Oil Supplementation on Offspring-Broiler Growth Performance, Body Composition and Bone Microstructure at Market Age. Poult. Sci. 96(E-Suppl. 1). Poultry Science Association, Virtual Meeting. Abstract.

Kim M, Jung U, Piacquadio K, Das S, Wilson J, Schneider L, **Voy BH**. 2020. Maternal Fish Oil Alters Adipose Development in the Broiler Chick Embryo. Poult. Sci. 96(E-Suppl. 1), Poultry Science Association, Virtual Meeting. Abstract.

Emami N, Jung U, **Voy BH**, Dridi S. 2020. Radical Response: Effects of Heat Stress-Induced Oxidative Stress on Lipid Metabolism in the Avian Liver. Antioxidants (Basel). Abstract. doi: 10.3390/antiox10010035

Mihelic R, Winter H, Powers J, Das S, Lamour K, Campagna SR, and **Voy BH**. Genes Controlling Polyunsaturated Fatty Acid Synthesis are Developmentally Regulated in Broiler Chicks. British Poultry Science. Abstract. doi: 10.1080/00071668.2020.1759788

Puckett DL, Alquraishi M, Alani D, Chahed S, Donohoe D, **Voy BH**, Whelan J, Bettaieb A. 2020. Zyflamend Induces Apoptosis in Pancreatic Cancer Cells Via Modulation of the JNK Pathway. Cell Commun Signal. Abstract. doi: 10.1186/s12964-020-00609-7

Puckett D, Alquraishi M, Alani DS, Chahed S, Frankel VD, Donohoe D, **Voy BH**, Whelan J, Bettaieb A. 2020. Zyflamend, a Unique Herbal Blend, Induces Cell Death and Inhibits Adipogenesis Through the Coordinated Regulation of PKA and JNK. Adipocyte. Abstract. doi: 10.1080/21623945.2020.1803642

Kim M, Jung U, Das S, Lamour K, **Voy BH**. 2020. Building a Targeted RNA-Seq Panel to Evaluate Muscle Growth and Development. UT Beef and Forage Center Graduate Research and Poster Symposium. Proceeding.

Jung U, Kim M, Das S, **Voy BH**. 2020. Establishing an *in Vitro* Model of Muscle Stem Cells to Study Growth and Development at the Cellular Level. UT Beef and Forage Center Graduate Research and Poster Symposium. Proceeding.

## PRESENTATIONS

**Voy B**. 2020. Fibroadipogenic precursors: a culprit in myopathies? Carter Sports Therapy Lunch and Learn Series. Invited speaker. Oral presentation.

**Voy B**. 2020. Feathered and Fat: Broiler Chicks as a Dual-Purpose Model for Childhood Obesity. Department of Animal and Food Sciences, University of Delaware. Invited speaker. Oral presentation.

**Voy B**. 2020. Feathered and Fat: Broiler Chicks as a Dual-Purpose Model for Childhood Obesity. Department of Food Science Seminar Series. Invited speaker. Oral presentation.

# Research Funded Externally

Lead Investigator	Proposal Title	Sponsor	Amount Awarded
Dr. David Anderson	Muscle-Driven Orthopedic Implants for Musculoskeletal Limb Reconstruction	HHS - NIH - National Institutes of Health	\$30,968.00
	Muscle-Driven Orthopedic Implants for Musculoskeletal Limb Reconstruction	HHS - NIH - National Institutes of Health	\$35,595.00
Dr. Michelle Dennis	Initial Assessment of Hemolymph Analytes as Disease Biomarkers in Freshwater Mussels	Morris Animal Foundation	\$10,433.00
Dr. Madhu Dhar	Optimization of Validation of Ex Vivo Models of Equine Laminitis	Byrock Technologies	\$21,615.00
Dr. Stephen Kania	Rabbit Covid Vaccine Study	GeneOne Life Sciences	\$18,560.00
	Rabbit Covid Vaccine Study	GeneOne Life Sciences	\$40,078.00
	2021 Boehringer Ingelheim Veterinary Scholars Program	Boehringer Ingelheim Animal Health	\$5,000.00
Dr. Andrea Lear	University of Tennessee College of Veterinary Medicine Animal Disease Research Program	USDA - National Institute of Food and Agriculture	\$10,945.00
Dr. Girish Neelakanta	Anaplasma phagocytophilum modulate tick gene expression for its survival and transmission from the vector host	HHS - NIH - National Institutes of Health	\$223,477.28
	Anaplasma phagocytophilum modulate tick gene expression for its survival and transmission from the vector host	HHS - NIH - National Institutes of Health	\$362,500.00
Dr. Hameeda Sultana	Arthropod Exosomes Mediate Vector-Pathogen Reactions	HHS - NIH - National Institutes of Health	\$359,800.00
	Arthropod Exosomes Mediate Vector-Pathogen Reactions	HHS - NIH - National Institutes of Health	\$140,162.61
Dr. Sreekumari Rajeev	Rational Design of Vaccine Candidates to Prevent Canine Leptospirosis	Morris Animal Foundation	\$80,750.00
<b>TOTAL</b>			<b>\$1,339,883.89</b>

# Research Funded Internally

Lead Investigator	Proposal Title	Amount Awarded
Dr. David Anderson	Bridging the Impossible Divide: An Interdisciplinary Approach to Neuromimetic Nanoscaffolds for Regeneration of Peripheral Nerves After Severe Injury	\$137,161.00
Dr. Michelle Dennis	Transdisciplinary Diagnostic Investigation of Freshwater Mussel Mortality in the Clinch River	\$95,526.00
Dr. Madhu Dhar	3D Printing Technologies to Design Mesenchymal Stem Cell Niches for Self-Renewal and Osteogenic Differentiation	\$25,000.00
Dr. Alex Esteller-Vico	Pharmacokinetics of Orally Administered Ponazuril in Cats	\$4,210.00
Dr. Alex Esteller-Vico	The Effects of Sedation on Cortisol and Adrenal Steroid Hormone Concentration in Dogs	\$5,000.00
Dr. Stephen Kania	Development of a Method to Study Staphylococcus schleiferi Molecular Epidemiology	\$15,000.00
Dr. Oudessa Kerro Deogo	Evaluation of Immunogenicity of Enterobactin-KLH Vaccine: An Essential Nutrient Deprivation-Based Immunization Approach for the Control of Coliform Mastitis in Dairy Cows	\$15,000.00
Dr. Sreekumari Rajeev	University of Tennessee Institute of Agriculture One Health Research Initiative See Grant	\$24,500.00
Dr. Joseph Smith	Pharmacokinetics of Orally Administered Ponazuril in Cats	\$4,210.00
Dr. Brynn Voy	Fibro-Adipogenic Precursors: A New Target for the Prevention of Breast Myopathies in Broiler Chickens?	\$30,000.00
<b>TOTAL</b>		<b>\$355,607.00</b>

# Actual and Proposed Budget

	FY21 Actual			FY22 Proposed		
	Matching	Appropri.	Total	Matching	Appropri.	Total
<b>Expenditures</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
<b>Salaries</b>						
Faculty	\$325	\$650	\$975	\$135,000	\$270,000	\$405,000
Other Professional	\$33,641	\$67,282	\$100,922	\$7,331	\$14,663	\$21,994
Clerical/ Supporting	\$18,698	\$37,396	\$56,093	\$50,177	\$100,355	\$150,532
Assistantships	\$11,958	\$23,915	\$35,873	\$76,420	\$152,839	\$229,259
<b>Total Salaries</b>	<b>\$64,621</b>	<b>\$129,243</b>	<b>\$193,864</b>	<b>\$268,928</b>	<b>\$537,857</b>	<b>\$806,785</b>
Longevity (Excluded from Salaries)	\$51	\$102	\$153	\$53	\$105	\$158
Fringe Benefits	\$16,055	\$32,110	\$48,165	\$10,329	\$20,658	\$30,987
<b>Total Personnel</b>	<b>\$80,728</b>	<b>\$161,455</b>	<b>\$242,183</b>	<b>\$279,310</b>	<b>\$558,620</b>	<b>\$837,930</b>
<b>Non-Personnel</b>						
Travel	\$340	\$680	\$1,019	\$2,800	\$5,600	\$8,400
Software	\$13	\$26	\$39	-	-	-
Other Supplies	\$52,813	\$105,625	\$158,438	\$31,688	\$63,377	\$95,065
Equipment	\$83,542	\$167,083	\$250,625	\$385,055	\$770,109	\$1,155,164
Maintenance	\$379	\$757.00	\$1,136	-	-	-
Scholarships	\$10,420	\$20,840	\$31,260	-	-	-
Renovation	-	-	-	\$200,000	\$400,000	\$600,000
<b>Other (Specify):</b>	-	-	-	-	-	-
Printing/Publications/Postage	\$1,174	\$2,348	\$3,522	-	-	\$454
Contract & Special Services	\$14,550	\$29,099	\$43,649	\$119,347	\$238,694	\$358,041
Professional Services/Memberships	\$1,543	\$3,085	\$4,628	-	-	-
Rentals	\$4	\$9	\$13	-	-	-
Insurance	\$321	\$642	\$963	-	-	-
Direct Cost Sharing	\$533	\$1,066	\$1,600	-	-	-
<b>Total Non-Personnel</b>	<b>\$165,630</b>	<b>\$331,261</b>	<b>\$496,892</b>	<b>\$738,890</b>	<b>\$1,477,780</b>	<b>\$2,217,124</b>
<b>GRAND TOTAL</b>	<b>\$246,358</b>	<b>\$492,716.11</b>	<b>\$739,075</b>	<b>\$1,018,200</b>	<b>\$2,036,400</b>	<b>\$3,055,054</b>
<b>Revenue</b>						
New State Appropriation	-	\$528,903	\$528,903	-	\$546,979	\$546,979
Carryover State Appropriation	-	\$1,453,537	\$1,453,537	-	\$1,489,723	\$1,489,723
New Matching Funds	\$264,452	-	\$264,452	\$273,489.50	-	\$273,490
Carryover from Previous Year Matching Funds	\$726,769	-	\$726,769	\$744,862	-	\$744,862
<b>TOTAL REVENUE</b>	<b>\$991,220</b>	<b>\$1,982,440</b>	<b>\$2,973,660</b>	<b>\$1,018,352</b>	<b>\$2,036,702</b>	<b>\$3,055,054</b>



# Requested Budget

	FY23 Requested		
	Matching	Appopr.	Total
<b>Expenditures</b>			
<b>Salaries</b>			
Faculty	\$341	\$683	\$1,024
Other Professional	\$35,323	\$70,646	\$105,969
Clerical/ Supporting	\$19,633	\$39,265	\$58,898
Assistantships	\$12,556	\$25,111	\$37,667
<b>Total Salaries</b>	<b>\$67,852</b>	<b>\$135,705</b>	<b>\$203,557</b>
Longevity (Excluded from Salaries)	\$54	\$107	\$161
Fringe Benefits	\$16,858	\$33,716	\$50,574
<b>Total Personnel</b>	<b>\$150,467</b>	<b>\$300,936</b>	<b>\$451,403</b>
<b>Non-Personnel</b>			
Travel	\$357	\$714	\$1,070
Software	\$14	\$27	\$41
Other Supplies	\$83,941	\$167,881	\$251,822
Equipment	\$87,719	\$175,438	\$263,156
Maintenance	\$398	\$795	\$1,193
Scholarships	\$10,941	\$21,882	\$32,823
Renovation	-	-	-
<b>Other (Specify):</b>	-	-	-
Printing/Publications/Postage	\$1,233	\$2,465	\$3,698
Professional Services/Memberships	\$15,277	\$30,544	\$45,831
Contract & Special Services	\$1,620	\$3,239	\$4,859
Professional Services/Memberships	\$4	\$9	\$14
Rentals	\$337	\$674	\$1,011
Insurance	\$560	\$1,120	\$1,680
Direct Cost Sharing	-	-	\$154
<b>Total Non-Personnel</b>	<b>\$202,400</b>	<b>\$404,800</b>	<b>\$607,200</b>
<b>GRAND TOTAL</b>	<b>\$287,164</b>	<b>574,328</b>	<b>861,492</b>
<b>Revenue</b>			
New State Appropriation	-	\$574,328	\$574,328
Carryover State Appropriation	-	-	-
New Matching Funds	\$287,164	-	\$287,164
Carryover from Previous Year Matching Funds	-	-	-
<b>TOTAL REVENUE</b>	<b>\$287,164</b>	<b>\$574,328</b>	<b>\$861,492</b>



*The University of Tennessee is an EEO/AA/Title VI/Title IX/Section 504/ADA/ADEA institution in the provision of its education and employment programs and services. All qualified applicants will receive equal consideration for employment and admission without regard to race, color, national origin, religion, sex, pregnancy, marital status, sexual orientation, gender identity, age, physical or mental disability, genetic information, veteran status, and parental status.*