



CENTER OF EXCELLENCE

in

Livestock Diseases & Human Health

2018 Annual Report



THIS REPORT IS PRODUCED BY

THE UNIVERSITY OF TENNESSEE
College of Veterinary Medicine

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About the Institute

The **University of Tennessee Institute of Agriculture (UTIA)**, through its colleges, research and education centers, and county extension offices, serves the people of Tennessee and beyond through the discovery, communication, and application of knowledge. UTIA, working with the University of Tennessee, Knoxville, is committed to providing undergraduate, graduate, and professional education programs in a diverse learning environment that prepares students to be leaders in a global society. The institute's delivery of education, discovery, and outreach contributes to the economic, social, and environmental well-being of all Tennesseans and focuses on contemporary problems faced by Tennessee, the nation, and the world.

AgResearch is an integral partner in teaching programs throughout the Institute. AgResearch faculty conduct world-class research programs in a variety of areas including crop breeding and genetics, soil conservation, no-till crop production, cattle reproduction, wood product development, and many others. AgResearch is also a key funding source for graduate assistantships and research that graduate students undertake in their degree programs. The internship program of AgResearch offers undergraduates unparalleled field experience. The unit's 10 branch research facilities serve as field laboratories for faculty and students, while allowing the public to evaluate research trials and experience gardens and arboretums. Technologies developed by UTIA's researchers benefit producers and consumers alike.

The College of Agricultural Sciences and Natural Resources (CASNR) welcomes students from across Tennessee, the nation, and the world. It 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. A new honors research and creative achievements program challenges students to excel. International study tours give graduates an edge in the increasingly connected world of global markets.

The College of Veterinary Medicine (CVM) is one of only 30 veterinary colleges in the nation. The central mission of the College is in education of professional DVM students seeking a career in some aspect of veterinary medicine ranging from clinical practice to research. The college also serves the public in providing referral medical services to pet owners, zoos and the livestock industry through our veterinary medical center; 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 animal-human bond and promote wellbeing.

UT Extension has an office in every county of Tennessee. Educational programs offered by University of Tennessee Extension touch the life of every citizen in Tennessee every day. UT Extension delivers 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, extension provides educational programming and assistance in areas of agriculture, natural resources and resource development, family and consumer sciences, and 4-H youth development.

ADMINISTRATION

Dr. Michael McEntee

Associate Dean for Research

Dr. James P. Thompson

Dean, College of Veterinary Medicine

Dr. Tim Cross

Chancellor, 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

We are pleased to present the 2018 annual report for the Center of Excellence in Livestock Disease and Human Health.

Within this report, you will see highlights of 11 faculty research projects funded by the center in fiscal year 2018. These faculty members have made significant advancements in infectious diseases and host defenses, tissue regeneration, genetics, and carcinogenesis. Center faculty also made significant advancements in the prevention and treatment of infectious and non-infectious livestock diseases that affect agricultural productivity.

The 2018 return on investment, as the ratio of research expenditures to the state appropriation for the center was 3.3:1. Benchmark data can be found on pages 23-24 and include fiscal years 2014-2018.

Center faculty continue to garner national and international recognition for their research and scholarship. During the 2017 calendar year, center faculty published 41 peer-reviewed articles, 2 book chapters, and gave 32 presentations at regional, national, and international meetings.

Despite increased fiscal challenges faced by our center faculty, we are incredibly proud of their efforts and continued successes. 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

Despite the persisting, sluggish funding environment, center faculty continue to make excellent progress in ongoing projects, gaining national and international recognition for their expertise and accomplishments. The details of current center faculty research are provided in the Faculty Reports section (pp. 26-36).

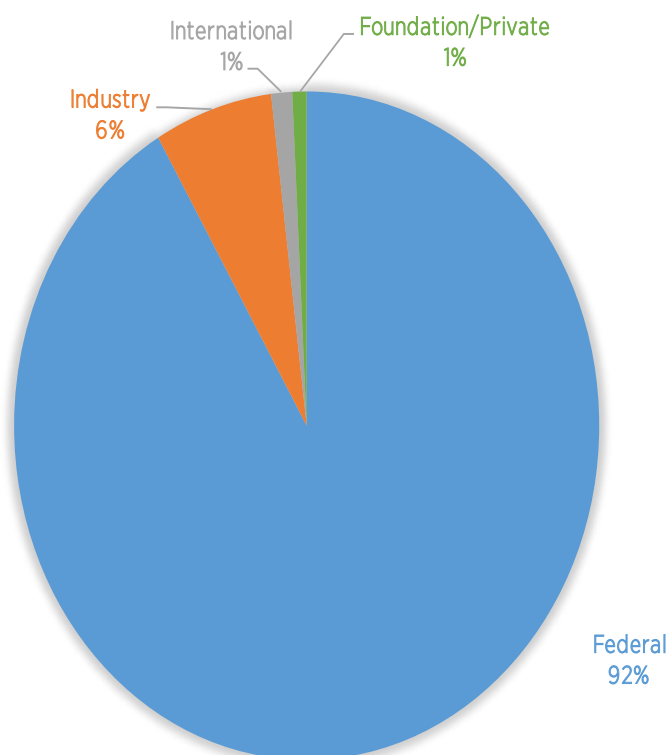
During the 2017 calendar year, the 11 center faculty averaged 3.7 peer-reviewed publications (41 total), 2.9 presentations at prestigious national and international meetings (32 total), and wrote 2 book chapters.

The publications of the 2018 center faculty have been cited by others an average of 10.17 times. These numbers tell us that scientists worldwide have positively evaluated center faculty work and used it to stimulate, validate, and/or support their own work in similar fields. Therefore, citations are indicators of the quality of faculty work. The average h-index for 2018 faculty is 9.8. The h-index is a metric to measure productivity and citation impact of the publications of a scientist. The index is based on the set of the investigator's most cited papers and the number of citations that the investigator has received in other publications. Therefore, this h-index means that center faculty, on average, have publications that have been cited at least 9.8 times.

Particularly noteworthy articles in 2017 were by Drs. Anderson, Dhar, Cui, and Rajasagi. These journals have an average impact factor of 5.42. The impact factor is frequently used as a measure of a journal's importance in its field. The higher the number, the more times articles published in the journal have been cited in a particular year. See Publications and Presentations (pp. 37-42) for more details. In addition, Dr. Kania and his research team have also produced intellectual property and were awarded two new provisional patents in 2017: Patent Number 62550996 Small Molecule Inhibitors of *Staphylococcus pseudintermedius* Sortase and Patent Number 62543676-*Staphylococcus pseudintermedius* Virulence Factor Vaccine.

The return on the state's investment in the center was 3.3:1, calculated as a ratio of expenditures from external funding to center appropriation. This calculation means that for every \$1 of center funds spent, center faculty returned \$3.30 in external funding. External funding totaled \$1,907,070 this year, while expenditures for the year were \$1,647,768. The funding includes a multi-year award for Dr. Naveen Rajasagi, totaling \$448,710, and an award for Dr. Anderson to help finance his work on bone regeneration, totaling \$462,563. Dr. Cui also received an award for \$644,717. Finally, Dr. Kania's study in bacterial mechanisms involved in antimicrobial resistance was recognized by the UT Research Foundation (UTRF), which awarded Dr. Kania \$15,000 in maturation funding to further develop this work. UTRF awards are competitive, and this work is expected to result in federal funding for Dr. Kania and his team. See Research Funded Externally and Research Expenditures on page 11 for the fiscal year 2018 data summary.

Fig 1. Fiscal Year 2018 External Funding by Source



Benchmark	2018 (11 Faculty)	2017 (12 Faculty)
	N ¹	N ²
Publications	43	42
Peer-Reviewed Articles	41	37
Books/Chapters/Other	2	5
Presentations	32	30
International	1	5
National	21	16
State or Local	10	9
Research Monies		
External Funding	\$1,907,070	\$630,580
Research Expenditures	\$1,647,768	\$1,667,760
Return on Investment	3.3:1	3.1:1

¹ Publications and presentations based on the 2017 calendar year; research monies based on the 2018 fiscal year.

² Publications and presentations based on the 2016 calendar year; research monies based on the 2017 fiscal year.

Program Report

Introduction

Since 1984, the center has developed successful programs that affect the understanding, treatment, and prevention of livestock and human diseases. These programs predominately focus on molecular and cellular approaches to research in infectious diseases and host defenses, tissue responses to insult and regeneration, genetics, and carcinogenesis.

The center has developed investigative strengths along innovative, sophisticated, and contemporary lines in two general areas:

- 1) Animal Models and Comparative Medicine, and*
- 2) Mechanisms of Disease, Pathogenesis, and Immunity*

These two areas are highly interrelated, and the center plays a critical and unique role in developing these focused areas of strength in both the University of Tennessee College of Veterinary Medicine (UTCVM) and the Institute of Agriculture. These areas also encompass the “One Health” concept, wherein the interrelated disciplines of animal, human, and environmental health are combined for the betterment of all three.

Personnel



Dr. Michael McEntee has served as the director of the center since October 12, 2012.

Ms. Kim Rutherford oversees submissions of faculty proposals for funds.



Dr. Stephen Kania chaired the Research Advisory Committee responsible for selecting the 2018 funded proposals.

Ms. Amanda Hand produces the annual report.



Funding and Expenditures

Research Funded Externally, Fiscal Year 2018

Investigator	Federal	Industry	International	Foundation/ Private	TOTAL
Anderson, David	\$462,563				\$462,563
Caldwell, Marc	\$14,600				\$14,600
Cekanova, Maria	\$91,126	\$13,612			\$104,738
Cui, Mei-Zhen	\$644,717				\$644,717
Kania, Stephen		\$5,000	\$22,057	\$15,000	\$42,057
Mulon, Pierre-Yves		\$3,169			\$3,169
Myer, Phillip		\$102,649			\$102,649
Rajasagi, Naveen	\$448,710				\$448,710
Whitlock, Brian	\$83,867				\$83,867
TOTALS	\$1,745,583	\$124,430	\$22,057	\$15,000	\$1,907,070

Research Expenditures, Fiscal Year 2018

Investigator	Federal	Industry	International	University	Foundation/ Private	TOTAL
Anderson, David	\$681,704					\$681,704
Caldwell, Marc	\$13,688					\$13,688
Cekanova, Maria	\$61,744	\$8,399				\$70,143
Cui, Mei-Zhen	\$307,060					\$307,060
Kania, Stephen		\$1,890	\$21,703	\$1,833	\$24,315	\$49,741
Mulon, Pierre-Yves		\$3,846				\$3,846
Myer, Phillip		\$74,756			\$5,266	\$80,022
Rajasagi, Naveen	\$362,610					\$362,610
Whitlock, Brian	\$78,950					\$78,950
TOTALS	\$1,505,756	\$88,891	\$21,703	\$1,833	\$29,581	\$1,647,768

Allocation of Funding

The Center of Excellence in Livestock Diseases and Human Health supports investigators and promotes research through a variety of mechanisms. Although it is not a primary source of research funding, the center facilitates established investigators' efforts to maintain and expand their research programs, promotes new investigators' potential to develop competitive research programs, and fosters new collaborative ventures.

Center faculty consist of senior and junior members. Senior members, who are featured in Faculty Reports (pp. 26-36), have research interests in line with center objectives and a history of securing external funding using center funds. Junior members are those who have received seed money, bridge funding, or are new faculty who have received start-up funds. Junior members are expected to actively pursue and eventually secure external funding.

Start-Up Funds

The center provided \$22,500 in start-up funds for 5 junior faculty members to secure additional funding in 2018. Their research areas are described below:



Pierre-Yves Mulon
Large Animal Surgery
\$5,000



Connie Fazio
Small Animal
Radiology
\$5,000



Adrien Hespel
Veterinary Radiology
\$5,000



Kyle Snowden
Small Animal Surgery
and Radiology
\$5,000



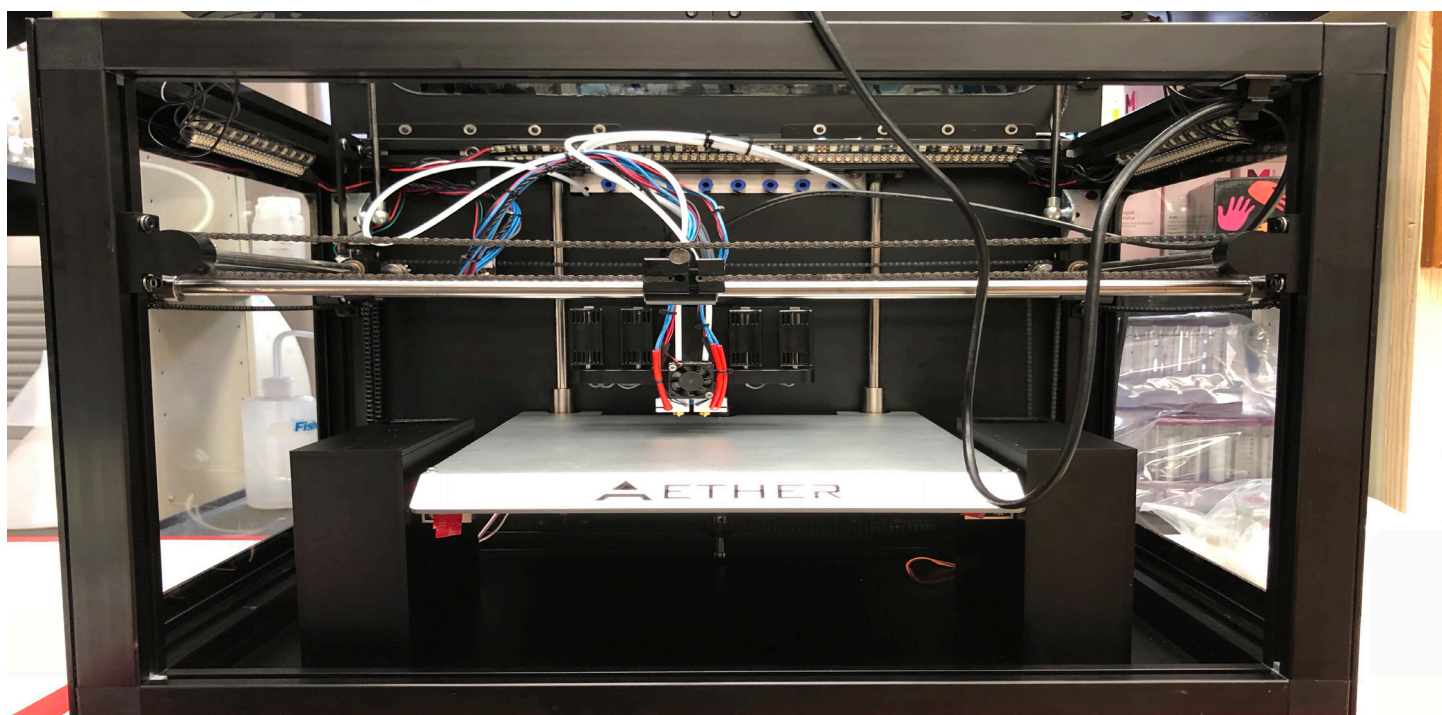
Chika Okafor
Epidemiology of anti-
microbials in animals
\$2,500

Infrastructure and Supplies

The center promotes the research infrastructure of both the UTCVM and the Institute of Agriculture through the purchase and maintenance of essential research equipment. The Research Advisory Committee reviews requests based on three criteria: justification of need, current availability of equipment, and number of investigators who may benefit.

Equipment

In fiscal year 2018, the center funded several purchases to enhance research projects here at UTCVM. For example, a **Tekscan VH4 Walkway System** (\$7,178.50) was purchased for the Large Animal Clinical Sciences Department. The department intends to use the walkway system to collect data for a nerve defect scaffold study. The results of this study will hopefully produce outside federal funding. Moreover, an **Aether 1 Bioprinter** (\$11,788, pictured below) was purchased for Dr. Madhu Dhar's lab, located in the Large Animal Clinical Sciences. This bioprinter will enable Dr. Dhar to produce biomaterial scaffolds to conduct research on regenerative tissue and bone. See a full summary of Dr. Dhar's regenerative medicine research on page 30. Several **Qiagen QIAxcel High Resolution DNA Kits** (\$8,945.26) were purchased. Finally, a **Waters ACQUITY Arc System** (\$14,750) was purchased. The Arc System will allow researchers to get quick test results in an easy-to-read format, enabling them to get their research published in a timely manner.



The Aether 1 Bioprinter located in Dr. Dhar's lab.

Travel

This year, the center sponsored several faculty to travel and present their research both nationally and internationally. In particular, the center funded **Dr. Chika Okafor** (\$1,091.27) and his graduate research assistant, **John Ekakoro** (\$609.17), to present their research on antimicrobial resistance at the **Research Workers in Animal Diseases Conference** in Chicago, Illinois. **Dr. Okafor** (\$1,560.30) also participated in the **5th International One Health Congress** held in Saskatoon, Canada. This congress is design to tackle international issues related to antimicrobial resistance, climate change, food and water safety, and science policy.



The UTCVM Regenerative Medicine team, including two center faculty, Drs. Madhu Dhar and David Anderson.

UT CVM Research Day

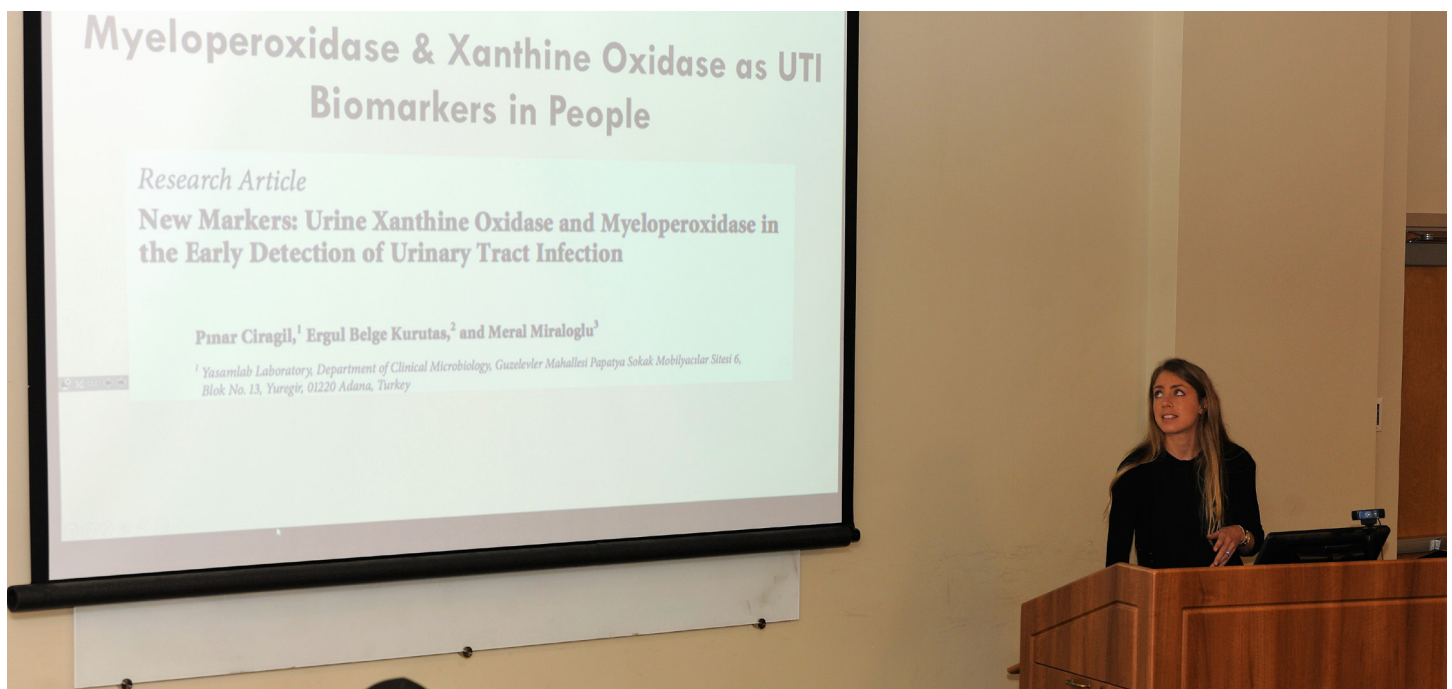
The center was a major sponsor of the University of Tennessee College of Veterinary Medicine Research Day (formerly known as the Comparative and Experimental Medicine and Public Health Research Symposium). This year, thirty-four CEM students and DVM students gave oral presentations. The research day was designed to share research results via a 12-minute presentation, with 3-minutes for questions from the audience. Six faculty members also gave 25-minute talks about their current research endeavors, with 5-minutes for questions from the audience. The faculty members who presented their research are as follows: Dr. Melissa Kennedy, Dr. Pierre-Yves Mulon, Dr. Madhu Dhar, Dr. Naveen Rajasagi, and Dr. Reza Seddighi. The student presenters were scored based on their performance, and the award winners are highlighted below.

2018 UTCVM Research Day Awards

Presentation Award Winners

Graduate Student Category

1st Place – Steven Newby, Comparative & Experimental Medicine
Mentor: Dr. Madhu Dhar
Travel award of \$500.00



Jillian Smith gives a Research Day presentation, titled “Myeloperoxidase and Xanthine Oxidase as Possible Biomarkers for Urinary Tract Infections in Canines,” in the Tickle Seminar Room.

2nd Place – Dr. Jane Woodrow, Comparative & Experimental Medicine
Mentor: Dr. Elizabeth Lennon
Travel award of \$300.00

3rd Place – Dr. BreeAnna Dell, Comparative & Experimental Medicine
Mentor: Dr. Marcy Souza
Travel award of \$200.00

Veterinary Student Category

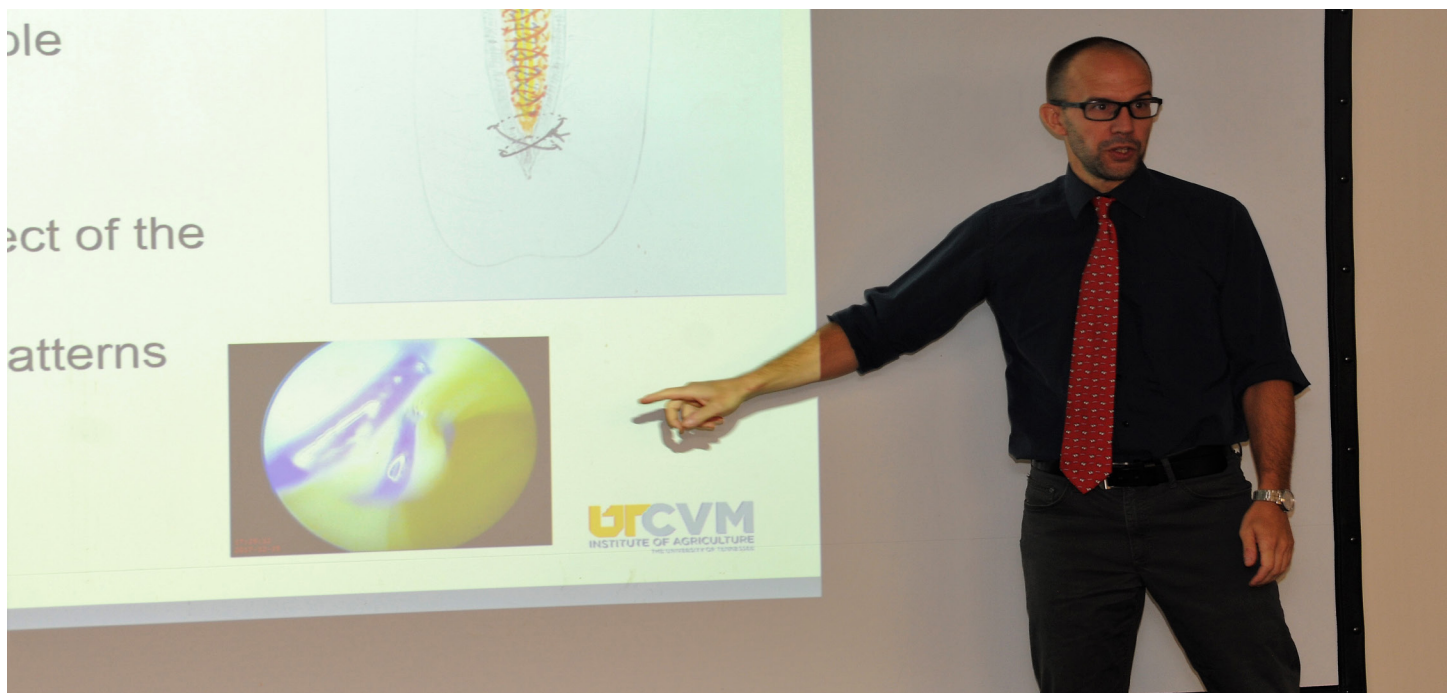
1st Place – Kristen Maxwell, Class of 2021
Mentor: Dr. Elizabeth Lennon
Travel award of \$500.00

2nd Place – Katherine Hedges, Class of 2020
Mentor: Drs. Adesola Odunayo and Katherine Tolbert
Travel award of \$300.00

3rd Place – Calvin Kidd, Class of 2021
Mentor: Drs. Pierre-Yves Mulon and Karen Tobias
Travel award of \$200.00

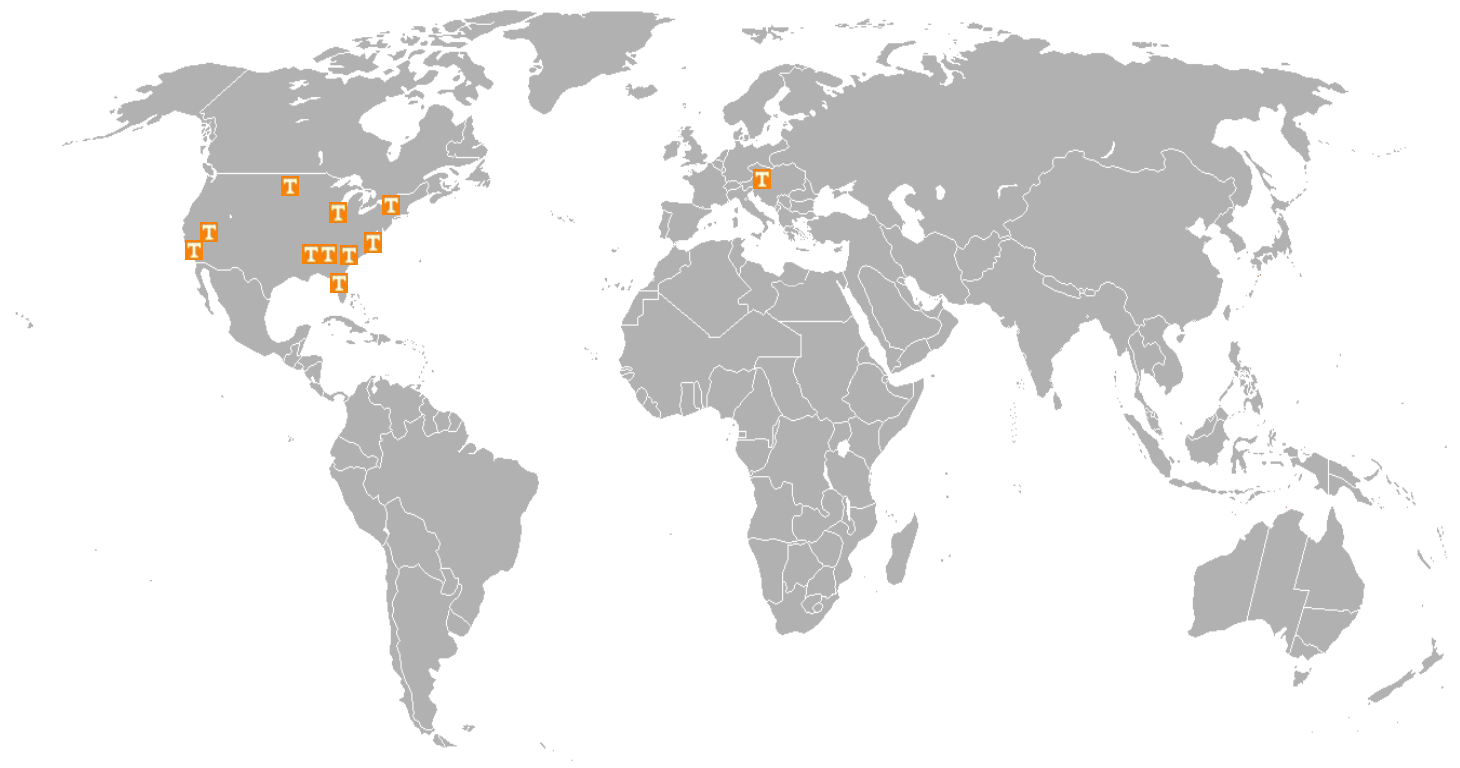
Phi Zeta Award for Excellence in Animal Health Research

Megan Miller, Comparative & Experimental Medicine
Mentor: Dr. Richard Gerhold
Cash award for \$250.00



Dr. Pierre-Yves Mulon gives a Research Day presentation, titled "A Comparison Between Barbed and Non-barbed Absorbable Sutures for Longitudinal Theliotomy Closure in an Ex-Vivo Bovine Model," in Room A335.

Dissemination of Research



Faculty are encouraged to share their research through speaking engagements for professional groups, community groups, and civic groups. A complete list of faculty publications and presentations for the 2017 calendar year can be found in the Publications and Presentations section (pp. 37-42).

Through scientific conferences, Center of Excellence faculty share their research with a worldwide audience. The map above highlights where center faculty research was presented in 2017.

Popular Press and Media

In addition to faculty speaking engagements, 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.

The UTCVM has a recurring, biweekly 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. The college also manages a Facebook page, a VolVet Connect alumni e-newsletter, and a quarterly referring DVM newsletter. As of September 2018, the Facebook page had 11,609 "likes" from individuals. Page administrators post clinical and research information for users. VolVet Connect contains items of note aimed at DVM alumni, including UTCVM research news and continuing education and network opportunities. In each issue of the newsletter for referring veterinarians, a Comparative and Experimental Medicine graduate student's research focus is presented. UTCVM is also on Twitter (2,379 followers), has a YouTube channel with 545 subscribers, and has a Pinterest presence with 285 followers. The Instagram account has 1,439 followers.

VolVet Vision is a yearly magazine that explores the research, teaching, and outreach services of UTCVM. This year, the magazine featured a story about Patches, a turtle at the Knoxville Zoo with a 3D mask to help alleviate infection due to a puncture wound. Patches was treated at UTCVM by Drs. Snowden and Cushing. Interestingly, the story of Patches gained national recognition by being featured in *People Magazine*.



Patches, treated at UTCVM, gained national attention after her 3D mask was featured in People Magazine.

Summer Student Research Program

In an effort to foster interest in careers in biomedical research and enhance appreciation for scientific investigation, inquiry, and the acquisition of new knowledge, the center once again helped provide opportunities for veterinary students to do research at UTCVM. Twenty-four students participated in laboratory and field research and attended weekly professional development seminars, during which guest speakers addressed topics, such as career opportunities in research, compliance issues in laboratory animal care, science writing, and the grant proposal process. They also participated in the UTCVM Research Day. Near the end of the 10-week program, the students presented their research findings to their colleagues and to UTCVM faculty and staff.

The center fully funded 22 student stipends for the Summer Student Research Program. A grant from Boehringer Ingelheim funded two students (Nicole Szafranski and Kellie Wood). Dr. Stephen Kania, a center faculty member, coordinated the program, along with Dr. Linda Frank.

To maximize student participation, the program is open to both center and non-center faculty. During fiscal year 2018, six senior center faculty and three junior members participated in the program. The center will continue to encourage the participation of its faculty interested in mentoring DVM students.



Summer Students get a “behind-the-scenes” tour of the Knoxville Zoo.

Summer Student Research Program

Nicole Corder

Los Angeles, CA • 2nd year
BS in Biological Sciences, University of California,
Merced

Faculty Mentor: Elizabeth Lennon

Summer Project: Inflammatory stimuli trigger BMP7 signaling via smad1/5/8 in mast cells

Career Interests: She wants to work for the government in research on infectious diseases, disease surveillance, and vaccine development.

Naomi Falconnier

Knoxville, TN • 1st year
BS Animal Science, Pre-Vet, University of Tennessee
Knoxville

Faculty Mentor: David Anderson

Summer Project: Elution Characteristics, Antimicrobial Activity, and Biodegradation of Hydrophilic Polyurethanes

Career Interests: She would like to become an anatomic pathologist.

India Gill

Knoxville, TN • 2nd year
BS in Biology; BA in History, Elon University

Faculty Mentor: Jacqueline Whittemore & Diane Mawby

Summer Project: Doppler flow ultrasonic radial blood pressure measurement in privately-owned, conscious dogs.

Career Interests: She wants to become a small animal veterinarian.

Ashley Hand

Chattanooga, TN • 1st year
BS in Animal Science, University of Tennessee
Knoxville

Faculty Mentors: Dan Su & Angela Witzel-Rollins

Summer Project: Impact of feeder toys on

the activity level of dogs

Career Interests: She wants to become either a small animal veterinarian or to work in academia.

Connor Hayes

Knoxville, TN • 1st year
BS in Animal Science, University of Tennessee
Knoxville

Faculty Mentors: Genevieve Bussieres

Summer Project: Complications of Anesthesia in Pot-Bellied Pigs

Career Interests: He would like to work with large animal medicine, exotics, or theriogenology.

Chinyere A McKoy-Nwachukwu

Dumfries, VA • 2nd year
BS, Agriculture, University of Maryland- Eastern
Shore

Faculty Mentor: Richard Gerhold

Summer Project: Examining the fecal parasites of wild turkeys (*Meleagris gallapavo silvestris*) in middle Tennessee

Career Interests: Parasitology research

Katherine Hedges

Nashville, TN • 2nd year
BS in Biology, Lipscomb University

Faculty Mentor: Katie Tolbert & Adesola Odunayo

Summer Project: Investigation of Continuous Rate Infusion of Famotidine in Dogs

Career Interests: She would like to work in small animal emergency and critical care.

Caroline Johnson

Nashville, TN • 1st year
BS in Animal Science, Auburn University

Faculty Mentors: Karen McCormick

Summer Project: Determination of the

effectiveness of the use of an equine rectal palpation simulation model for improving the confidence of veterinary students when palpating live horses

Career Interests: She would like to work in either small animal practice or equine care.

Elizabeth Jones

Memphis, TN • 2nd year

BS Organismal Biology, Auburn University

Faculty Mentor: Reza Seddighi

Summer Project: Sevoflurane Sparing Effects of Midazolam in Domestic Cats

Career Interests: She would like to pursue a career in veterinary neurology and organized medicine.

Calvin Kidd

Fayetteville, TN • 1st year

BS Pre-Professional Biology, University of Tennessee Chattanooga

Faculty Mentor: Karen Tobias & Pierre-Yves Mulon

Summer Project: Comparison of Suture Tensile Properties

Career Interests: He would like to work in mixed animal practice and food animal medicine.

Colby Kiefer

New Orleans, LA • 2nd year

BS in Ecology and Evolutionary Biology, Tulane University

Faculty Mentor: Zenithson Ng

Summer Project: Hair Cortisol Levels In Working Dogs

Career Interests: She would like to pursue small animal general practice with a special interest in surgery and dermatology.

Kristen Maxwell

Nashville, TN • 1st year

BS in Biology, Trinity College

Faculty Mentor: Elizabeth Lennon

Summer Project: Evaluation of fat-soluble vitamin status in dogs and cats with chronic enteropathies

Career Interests: She wants to pursue either an internship or residency.

Kelly Mayfield

Monroeville, NJ • 2nd year

BS in Biology, Rowan University

Faculty Mentor: Steven Adair

Summer Project: Effects of whole body vibration on bone density of horses within a cast

Career Interests: She would like to pursue small animal sports medicine and rehabilitation.

Jeremy McKeever

Ringgold, GA • 2nd year

BA General Education, University of Tennessee Knoxville

Faculty Mentor: Debra Miller

Summer Project: Effects of Incubation Temperature on the Gross and Histologic Appearances of the Gastrointestinal Tract, Heart, Liver, Kidneys, and Lungs of Loggerhead (Caretta caretta) Sea Turtle Hatchlings from Boca Raton, Florida

Career Interests: He wants to work in non-mammal medicine and physiology.

Regan Nebenhaus

Manhasset, NY • 1st year

BS in Pre-Veterinary Medicine & Animal Bio-science, University of Delaware

Faculty Mentor: Linda Frank & Stephen Kania

Summer Project: A transcriptomic approach to determine of the cause of Alopecia X in Pomeranian Dogs

Career Interests: She wants to pursue a career in research and pharmacology.

Ellery Pennington

Fairview, TN • 1st year

BS in Agriculture-Veterinary Medicine, University of Tennessee Martin

Faculty Mentor: Aude Castel

Summer Project: Establishment of reliable measurements of post-operative pain in dogs following surgery (hemilaminectomy) for acute intervertebral disc herniation

Career Interests: She wants to work in either equine rehab, small animal emergency, or theriology.

Owen Schumacher

Seymour, TN • 2nd year

BS Animal Science, University of Tennessee Knoxville

Faculty Mentor: Carla Sommardahl

Summer Project: Validation of point of care blood ammonia meter, PocketChem BA meter, in large animal species

Career Interests: He wants to work in large animal medicine and theriogenology.

Nicole Szafranski

Reston, VA • 2nd year

BS in Zoology, North Carolina State University

Faculty Mentor: Richard Gerhold

Summer Project: Investigation of Haemosporida parasites of Wild Turkeys

Career Interests: She wants to work in either mixed animal medicine or parasitology research.

Alexis Tolbert

Memphis, TN • 1st year

BS Animal Science, University of Tennessee Knoxville

Faculty Mentor: Marc Caldwell & Samantha Collins

Summer Project: The Impact of Three Weaning Methods on the Microbial Diversity of the Nasopharyngeal Cavity in Beef Calves

Career Interests: He would like to pursue work in eurology and surgery.

Anastasia Towe

Jacksonville, FL • 2nd year

BS Biological Science; BA English Writing, University of Pittsburgh

Faculty Mentor: Debra Miller

Summer Project: Investigating pathology of Batrachochytrium salamandrivorans in salamanders

Career Interests: She would like to work in zoological medicine.

Alex Turner

Germantown, TN • 1st year

BS Animal Science, University of Tennessee Knoxville

Faculty Mentor: Richard Gerhold

Summer Project: Fecal parasites from wild turkeys from middle TN

Career Interests: He wants to work in mixed animal practice and surgery.

Ashley Tuttle

Bethpage, TN • 1st year

BS in Agriculture-Animal Science, University of Tennessee Martin

Faculty Mentor: Robert Donnell & Stephen Kania

Summer Project: Malignant catarrhal fever incidence in ruminants in Tennessee

Career Interests: She wants to work in research in food animal health.

Alex Viere

Dallas, TX • 2nd year

BS Biology, Furman University

Faculty Mentor: Andrew Cushing & Linden Craig

Summer Project: A Retrospective Study of Brain Disease in Non-Domestic Felids

Career Interests: He would like to work in conservation, wildlife, and zoo medicine with non-domestic felids.

Kellie Wood

Placentia, CA • 1st year

BS Animal Science, Cal Poly San Luis Obispo

Faculty Mentor: Stephen Kania & David Bemis

Summer Project: Non-immune binding of Staphylococcus pseudintermedius and Staphylococcus schleiferi to IgG of various species

Career Interests: She wishes to work in small animal general practice or shelter medicine.

Ellis Wright

New Rochelle, NY • 1st year

BS in Biology, CUNY Queens College

Faculty Mentor: Pierre-Yves Mulon

Summer Project: The Effect of Plate to Bone Length on Mechanical Properties Using Locking Plate Constructs

Career Interests: He wants to either specialize in surgery or ophthalmology in food animals.

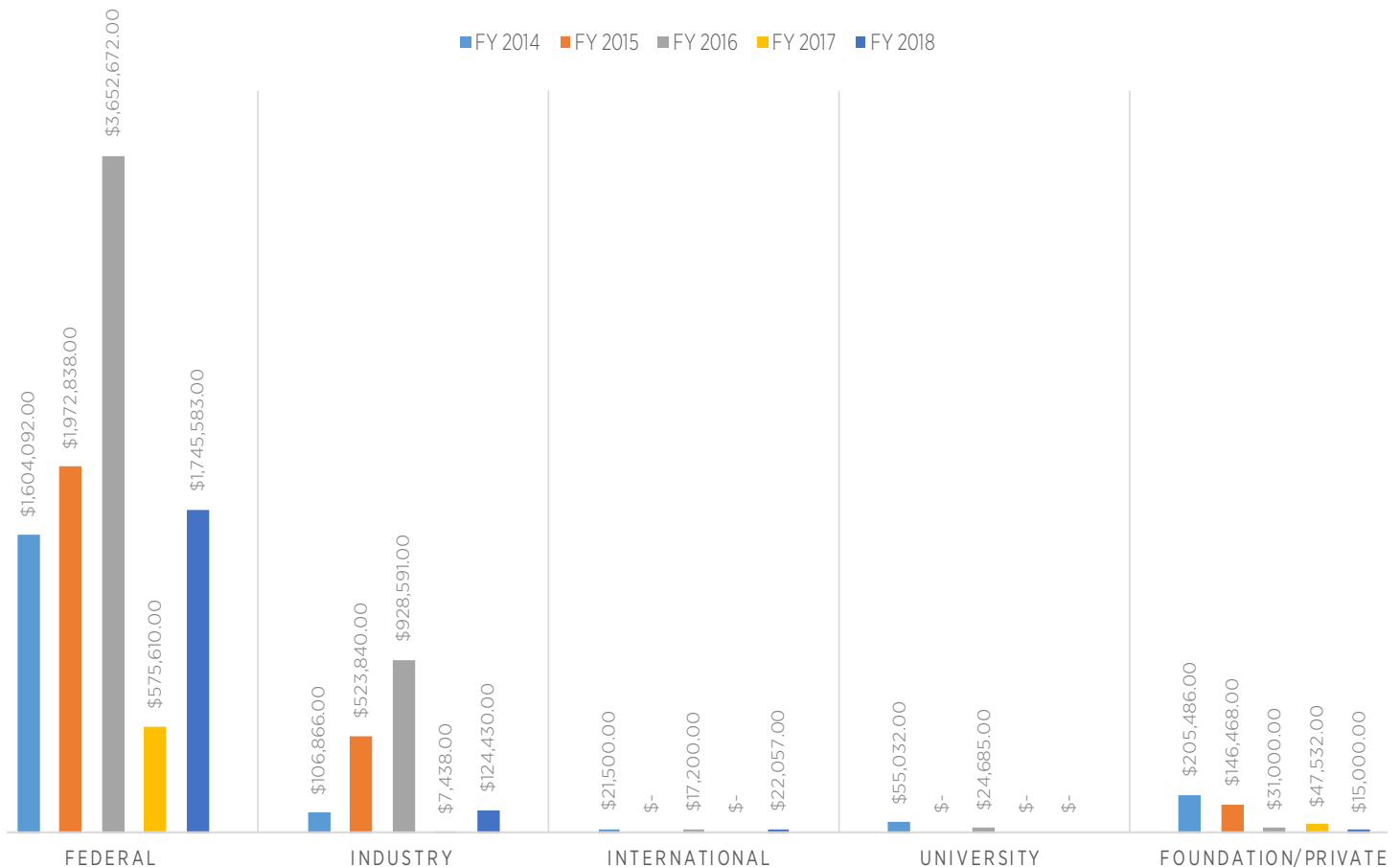
Five-Year Benchmark Data (2014-2018)

Productivity among center faculty has been stable during the last 5-year period. From 2014-2018, center faculty have published 285 articles in peer-reviewed journals and gave 245 presentations at national and international meetings.

Total research funding was down from \$1,992,976 in 2014 to \$1,907,070 in 2018 (Fig. 2). Figure 3 shows the three top grossing external funding categories—federal, industry, and foundation and private organizations—from 2014-2018.

Expenditures per faculty member averaged \$183,085 in fiscal year 2018. Over the past 5 years, the mean expenditure amount per faculty member has been \$142,470. The 5-year average return on the state's investment in the center is 3.7, the ratio of external funding to the state's appropriation. For comparison, benchmark data from 2014-2018 are summarized in Fig 2.

Fig 2. External Funding by Source

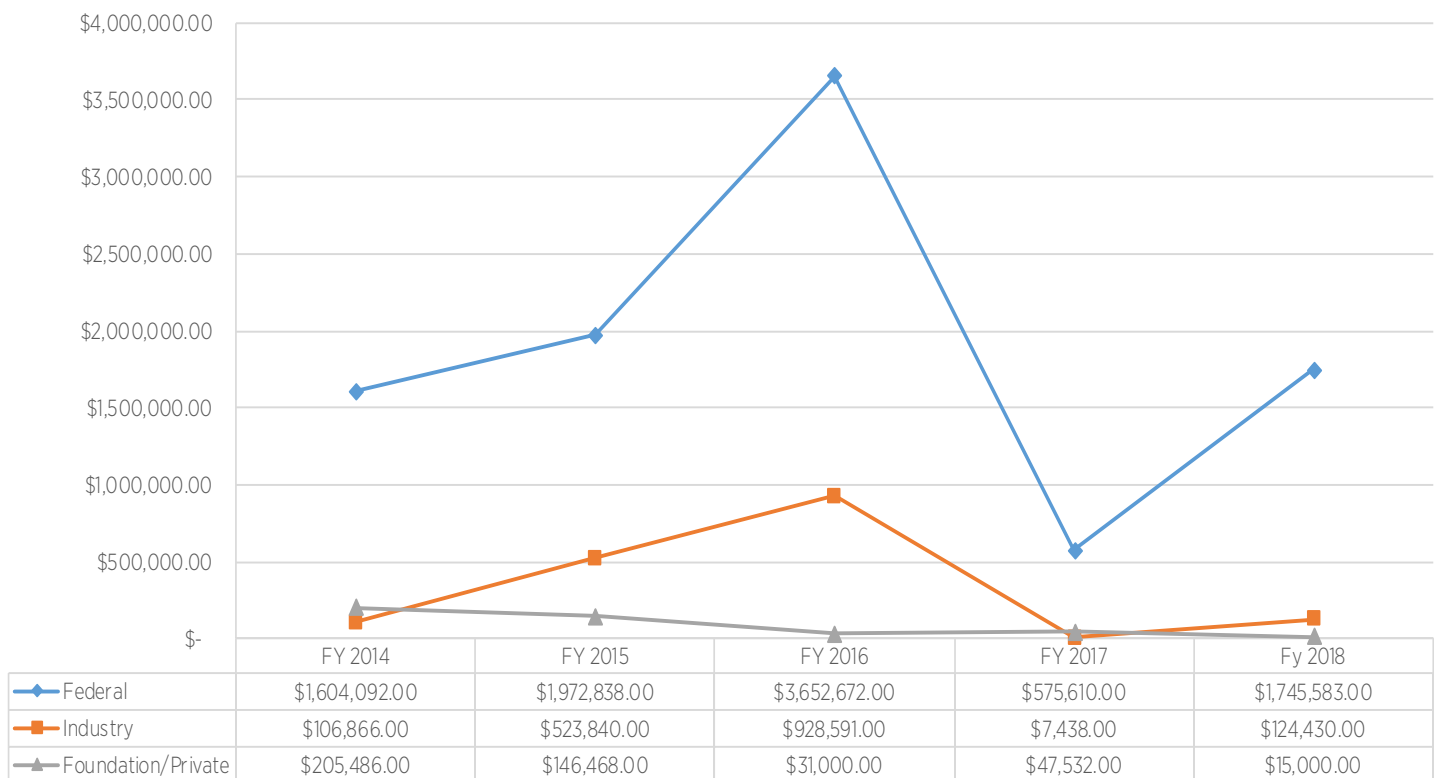


Benchmark Summary (2014-2018)

Center faculty members have worked hard to maintain external funding as biomedical research support has stagnated in recent years. The 2009 economic downturn had a significant impact on federal sponsorship as available funds were directed elsewhere over this period. Our center faculty members have experienced this drop in available funds, which has been further exacerbated by increased competition for fewer dollars; this has been true for all universities.

We do have some cause for hope as the government now appears to be more willing to redirect funds to the National Institutes of Health (NIH) and other federal sponsors of university researchers. Importantly, the NIH has also revised some of their funding models in the last few years to help ensure a greater proportion of their dollars fund more junior investigators. The UTCVM and UTIA will continue to look for new ways to support faculty in obtaining the external sponsorships needed to grow discoveries in the center's mission areas by enhancing opportunities for collaboration, focused investment in research equipment and facilities, and continued technical grant writing assistance.

Fig 3. Top 3 Grossing External Funding Categories (Fiscal Years 2014-2018)



Future Plans: Looking Forward

The Center of Excellence in Livestock Diseases and Human Health (COE) will continue to foster research programs in 2019 through investments in facilities, equipment and faculty support.

This past year saw renewed efforts and investments to renovate and grow research at the Institute of Agriculture and College of Veterinary Medicine (CVM). This includes ongoing searches designed to attract faculty with established research credentials that will sustain federal funding in the areas of infectious disease, host responses and cattle genomics. We have been successful in attracting a new faculty member to CVM with expertise and current funding in equine endocrinology. This individual joins us with a commitment to additional research and collaboration in this rather unique area of study relevant to our COE and synergistic with existing UT faculty interests. He brings with him a treasure trove of biologic samples and established ties to another important research institute that offers significant additional capacity for animal studies. The addition of new faculty focused on achieving a better understanding of infectious organisms and diseases relevant to livestock and/or human medicine will be important to both our research and educational missions in the CVM going forward. The establishment of a genomics center that will focus on health, productivity, and disease resistance in beef cattle will also have the capacity to investigate heritable traits in other species. Building on infectious disease and genomic research that addresses animal production and human health are expected to present significant collaborative opportunities for existing COE faculty and programs, and increased efforts to address critical problems as diverse as climate change and antibiotic resistance. With these new hires we will be offering research startup support packages, to include equipment needs, to accommodate their programs and help ensure their continued success. As new faculty are recruited we have also enlisted the expertise of facility administration, engineers and architects to help us plan for necessary facility renovations in laboratory and other research spaces. As these individuals and programs are established over the next year, we will be considering additional faculty hires that will either further enhance synergistic capacity in these areas or build on existing COE faculty expertise in other areas of research. Center faculty and administration are excited about the future, as we recruit new researchers and expand programs that will address current and future health concerns and increase prosperity for Tennesseans and the world.

Dr. David Anderson

PROFESSOR AND DEPARTMENT HEAD
LARGE ANIMAL CLINICAL SCIENCES

About Dr. Anderson

MS | Kansas State
University

DVM | North Carolina
State University

Supported by: The
University of Arkansas

Collaborators: Dr.
Pierre-Yves Mulon and
Alisha Potter Pedersen

Publications: 7 in 2017

Presentations: 5 in 2017



Polymers to Alleviate Pain Post-Surgery

An intestinal anastomosis is a surgical procedure, where an injured or diseased segment of the intestine is removed, and the two remaining ends of the intestine are reconnected by being sewn together. Through this procedure, the injured or diseased area is removed and proper flow of fluids is reestablished. Anastomosis is often performed on animals suffering from a twisted bowel, an obstructed intestinal flow, or a strangulated bowel. These intestinal issues are often life threatening if left untreated. However, complications from the surgery can also arise, including leakage, obstruction, and abscesses. There have been other techniques developed in lieu of an anastomosis procedure; however, these techniques are often extremely costly. Dr. Anderson and his team have invented a rapidly degradable polymer stent to be inserted during the surgery in order to keep costs down and to alleviate patient complications post-surgery. This polymer will enable the sewn intestine to heal, while still allowing fluids to freely pass through. Because the polymer is biodegradable, it will not have to be removed from the patient later. Dr. Anderson intends to prove the functionality of the polymer stent in order to accrue external funding for clinical trials.

Dr. Marc Caldwell

ASSISTANT PROFESSOR
LARGE ANIMAL CLINICAL SCIENCES



About Dr. Caldwell

MS, DVM, PhD | Auburn University

Supported by: United States Department of Agriculture (USDA) and BioMerieux Hormone in Cattle

Collaborators: Drs. Ky G. Pohler and Andrea S. Lear

Publications: 2 in 2017

Presentations: 2 in 2017

Zapping Out Zika

Beginning in 2016, the Zika virus began ravaging the United States, with at least one positive Zika virus case in all fifty states except Alaska. Of the 1,432 pregnant women infected with Zika, 58 infants developed birth defects after birth; moreover, 7 pregnancies were lost due to birth defects. Zika is able to affect a developing fetus by creating placental inflammation, which inhibits nutrient exchanges between mother and fetus, and by damaging fetal tissues. In order to understand the complications of this virus, animal models are essential, especially in observing the maternal-fetal infection. However, the only animal models currently in use are mice and non-human primates, which are difficult to use and are costly. Dr. Caldwell and his team are using sheep as an animal model to replicate the maternal-fetal Zika infection. He intends to inoculate the pregnant sheep with Zika virus and observe how the virus affects the fetus. Because of the severity of the disease and risk to US citizens, Congress approved 1.1 billion in funding for research investigating the Zika virus. Dr. Caldwell and his team intend to use their findings to garner external funding through the National Institutes of Health or the Center for Disease Control.

Dr. Maria Cekanova

ASSOCIATE PROFESSOR
SMALL ANIMAL CLINICAL SCIENCES

About Dr. Cekanova

MS, RNDr, PhD |
University of Pavol
Jozef Safarik (Slovakia)

Supported by: National
Institutes of Health and
AB Science

Collaborators: Drs. Larry
Marnett, Jashim Uddin,
Shelley Olin, and Wesley
White

Publications: 1 in 2017

Presentations: 3 in 2017



A Collaboration to Curtail Bladder Cancer

The American Cancer Society has named bladder cancer as the fourth most common cancer among men in the United States. An estimated 77,000 new cases of bladder cancer are expected to be diagnosed, with 16,000 of those diagnosed dying from the disease. In order to increase the survival rate, early detection is essential. Bladder cancer can be diagnosed using two methods: undergoing a cytological examination of the cells through a urine sample or by using white light during cystoscopy to observe the bladder wall. Although these diagnostic techniques are somewhat effective, they are unable to detect the early stages of bladder cancer. Because 70-80% of non-muscle-invasive bladder cancer patients will develop cancer recurrence, it is pivotal that the cancer can be seen and fought in the early stages. Therefore, Dr. Cekanova and her team are working to increase the sensitivity of cystoscopy by improving the uptake of optical probes used to visualize the bladder wall and spot tumors. Working in collaboration with Vanderbilt University, Dr. Cekanova, with the help of Dr. Jashim Uddin, has been able to uncover the J1001 compound, an anti-cancer imaging agent, to use in cystoscopy to uncover potential cancer recurrence. In the past, Dr. Cekanova has successfully been able to acquire funding through the National Institutes of Health (NIH). She intends to use the preliminary data obtained through the funds provided by Center of Excellence to procure a NIH grant.

Dr. Mei-Zhen Cui

PROFESSOR
BIOMEDICAL AND DIAGNOSTIC SCIENCES

About Dr. Cui

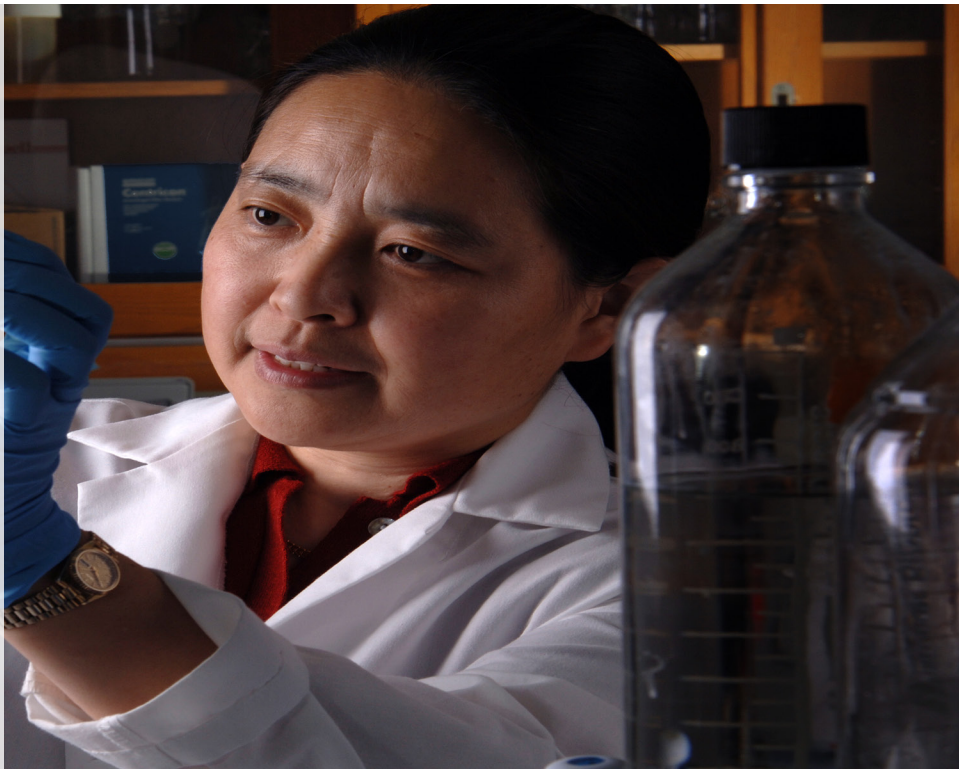
BS, MS | Jilim University
(China)

PhD | Tokyo Institute of
Technology (Japan)

Supported by: National
Institutes of Health

Publications: 4 in 2017

Presentations: 3 in 2017

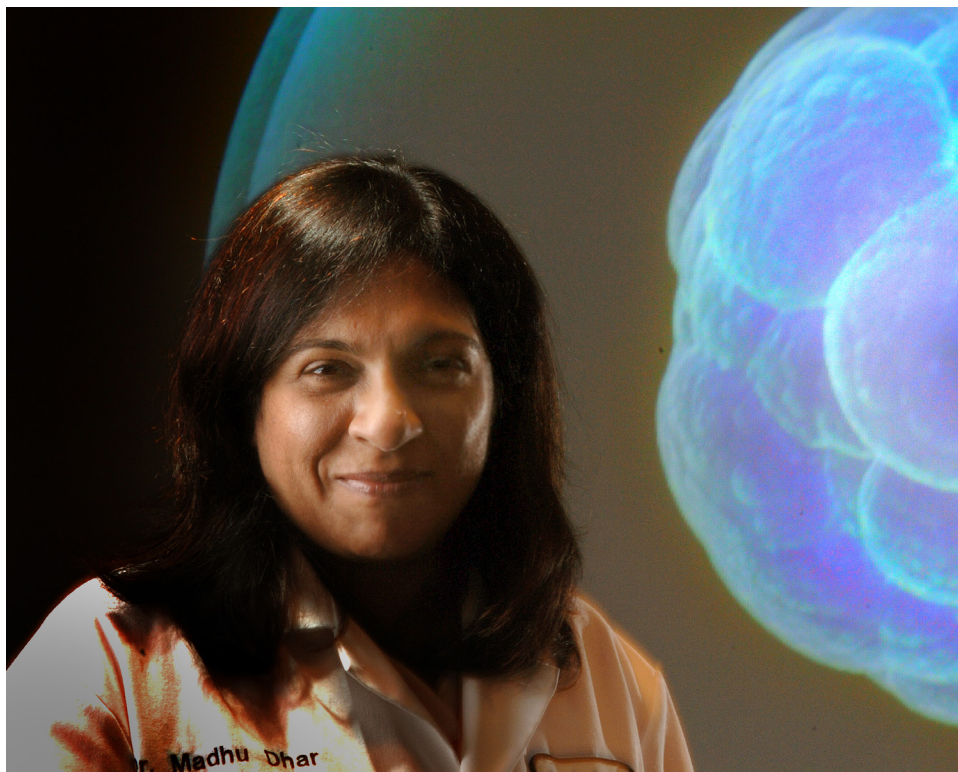


Annihilating Atherosclerosis

In fiscal year 2017, Dr. Cui was able to obtain a grant from the National Institutes of Health based on her work, highlighting how Lysophosphatidic acid (LPA) alters the responses in smooth muscle cells. She has taken her work further by identifying specific LPA receptors and exploring LPA-induced signaling pathways in order to identify ways to treat atherosclerosis. Atherosclerosis develops by accumulating modified lipoproteins in the arterial wall, thus forming foam cells, or lipid-laden macrophages. Dr. Cui and her team have uncovered that LPA prevents bone marrow macrophage migration in mice models. This is significant because macrophage retention in vascular plaques worsens atherosclerotic lesions. Dr. Cui believes that LPA triggers different pathways, which prevent macrophage migration. Ultimately, Dr. Cui intends to use the findings in this current study to submit a new grant proposal to the National Institutes of Health.

Dr. Madhu Dhar

RESEARCH ASSOCIATE PROFESSOR
LARGE ANIMAL CLINICAL SCIENCES



About Dr. Dhar

MS, PhD | University of
Poona (India)

Collaborators: Dr.
Enrique Izaguirre and
Steven Newby

Publications: 2 in 2017

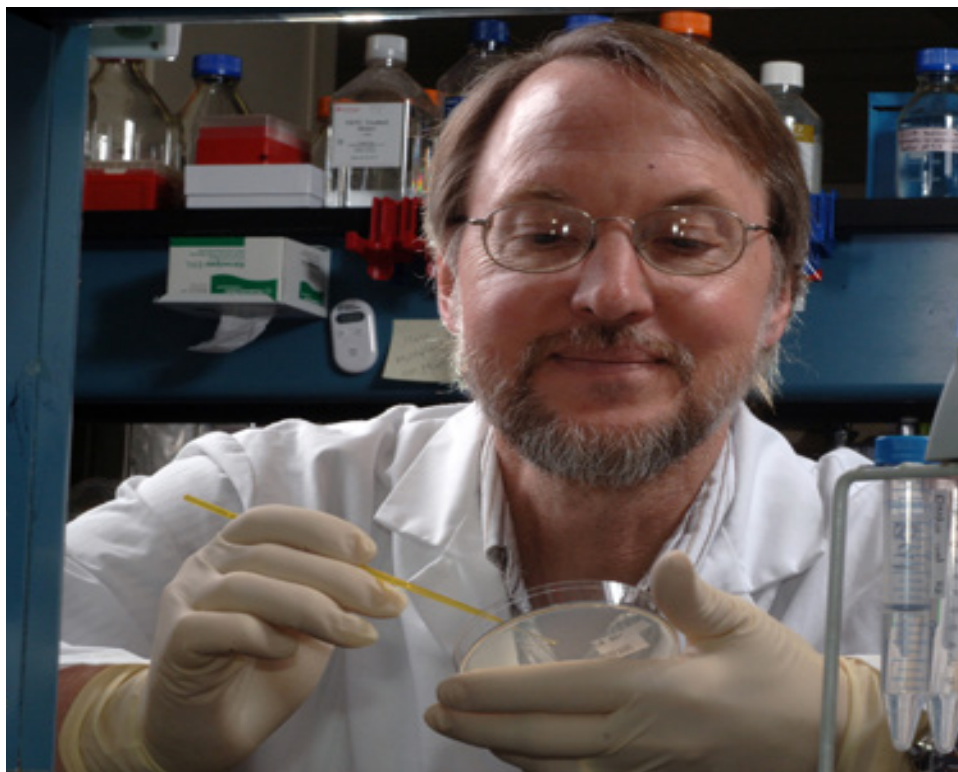
Presentations: 4 in 2017

Creating Bones from Bioprinters

3D technology has exploded in the arena of bone regeneration, with the creation of biodegradable scaffolds infused with mesenchymal stromal cells (MSCs). Conventional methods of using 3D technology for bone regeneration implant a combination of MSCs and osteoinductive and osteoconductive scaffolds. However, these techniques fail to account for the complex shapes of the skeletal structure and to address cell adhesion, migration, proliferation, and vascularization. Dr. Dhar and her team, in collaboration with the University of Tennessee Health Science Center, have developed a specific type of 3D bioprinting, which deposits living cells and biomaterials together to control the modeling of the scaffold. By combining the cells and biomaterials, it allows the scaffold to mirror the shape of the skeletal structure and, thus, securely attach to the injured or damaged bone. Ultimately, Dr. Dhar hopes her research will be incorporated in both veterinary and human medical clinics. She will use the data obtained from the Center of Excellence funding as preliminary funding for a National Institutes of Health grant proposal.

Dr. Stephen Kania

PROFESSOR
BIOMEDICAL AND DIAGNOSTIC SCIENCES



About Dr. Kania

MS | Washington State University

PhD. | University of Florida

Supported by: UT Research Foundation, Boehringer, and Egyptian Cultural & Education Bureau

Collaborators: Dr. David Bemis

Publications: 9 in 2017

Presentations: 4 in 2017

Preventing Canine Pyoderma

Many dogs are infected with *Staphylococcus pseudintermedius* (*S. pseudintermedius*), which is the primary cause of pyoderma, a painful infection that creates lesions and pustules on the skin and can cause hair loss. Unfortunately, *S. pseudintermedius* is difficult to treat because of its resistance to many antimicrobial drugs. In fact, approximately 30% of *S. pseudintermedius* cases tested in the lab were resistant to antimicrobial drugs. To combat this problem, Dr. Kania is creating a new vaccine, combining non-toxic properties found within the virus, such as *S. pseudintermedius* Protein A, staphylococcal immunoglobulin binding protein, adenosine synthase A, coagulase, and leukotoxin S. The vaccine stimulates the canine immune system with pathogen associated molecular patterns, elicits antibodies against *S. pseudintermedius*, and fights off the toxic and immunosuppressive effects of the virus. The proteins within the vaccine have been tested for toxicity to canine B cells. This is a huge step towards alleviating an infected dog's pain and suffering due to pyoderma.

Dr. Oudessa Kerro Dego

ASSISTANT PROFESSOR
ANIMAL SCIENCES



About Dr. Kerro Dego

DVM | Addis Ababa
University (Ethiopia)

MS | Utrecht University
(Netherlands)

PhD | University of
Saskatchewan (Canada)

Collaborators: Drs.
Chika Okafor and Doris
D'Souza

Publications: 4 in 2017

Presentations: 7 in 2017

Outsmarting Antibiotic Resistance

In a 2007 United States Department of Agriculture study, investigators found that 80% of dairy cow farms regularly treated their cows with antibiotics. Although antibiotics are important for treating illnesses in cows, specifically mastitis, these drugs can lead to antibiotic resistance. Specific pathogens, like *E. coli*, *Salmonella*, enterococci, and staphylococcus, are potential threats to both animal and human welfare if they become resistant to antibiotics. Dr. Kerro Dego and his team are examining area dairy farms, looking for evidence of antibiotic resistance. In his research, Dr. Kerro Dego collected samples from six conventional dairy farms and three organic dairy farms. He intends to use his preliminary findings to procure a grant from either of the following sources: the United States Department of Agriculture, the National Institutes of Health, or the Food and Drug Administration.

Dr. Pierre-Yves Mulon

ASSISTANT PROFESSOR
LARGE ANIMAL CLINICAL SCIENCES

About Dr. Mulon

DVM | National
Veterinary School Alfort
(France)

DES | University of
Montreal (Canada)

Supported by: Lineus

Collaborators: Dr. David
P. Harper, Dr. Silke
Hecht, Dr. David E.
Anderson, and Richard
Steiner

Book Chapters: 2 in
2017

Presentations: 4 in 2017



Building Strong Bone Implants

After receiving orthopedic surgery, it is imperative that any biomedical implants inserted into the patient are sufficiently integrated into the surrounding bone structure. However, the weakest point for bone-implant interface is osseointegration. Osseointegration causes the loosening of the orthopedic implants and creates significant pain for the patient. It can also require the surgery to be reversed, adding undo stress on the patient. If osseointegration can be strengthened, it would improve the likelihood of sufficient implant integration and enable proper patient healing. Dr. Mulon and his team are examining ways to strengthen the bone-implant interface, specifically looking at graphene as a bonding agent. Graphene is a monolayer of carbon atoms in a compact honeycomb pattern. This design would ultimately strengthen the bond between the implant and bone. Dr. Mulon hopes to use these preliminary studies funded by the Center of Excellence to submit biomaterial grants to multiple federal funding agencies. In addition, he hopes that the incorporation of graphene will lower the costs of orthopedic surgeries and enhance the post-surgery comfort for patients.

Dr. Phillip Myer

ASSISTANT PROFESSOR
ANIMAL SCIENCES



About Dr. Myer

MS, PhD | Purdue University

Supported by: ADM Alliance Nutrition and Ascus Biosciences, Inc.

Collaborators: Drs. Gary E. Bates and Marc Caldwell

Publications: 4 in 2017

Feeding Clover to Counteract Fescue Toxicosis

Tall fescue is a foraging plant utilized on beef cattle pastures throughout the state of Tennessee. It is found on more than 3.5 million acres in Tennessee. Although fescue offers great nutritional value for beef cattle, it is also susceptible to a fungus, *Epichloë coenophiala*, which can lead to fescue toxicosis in cattle. Symptoms of fescue toxicosis include decreased weight gain, decreased reproductive ability, and decreased ability to tolerate heat. Because the illness causes a decrease in cattle productivity, it costs cattle producers over \$2 billion in profit each year. Currently, there has been significant research on the reaction of the fungus on cattle and the symptoms. However, there is a lack of research on the treatment of fescue toxicosis, especially the use of clover and other isoflavones to counteract the symptoms of the illness. Dr. Myer and his team are examining how the red clover interacts and counteracts with the side effects of fescue toxicosis. Dr. Myer has already established a working relationship with PharmaCare Laboratories, Inc. and intends to use this findings to garner future funding from this organization.

Dr. Naveen Rajasagi

RESEARCH ASSISTANT PROFESSOR
BIOMEDICAL AND DIAGNOSTIC SCIENCES

About Dr. Rajasagi

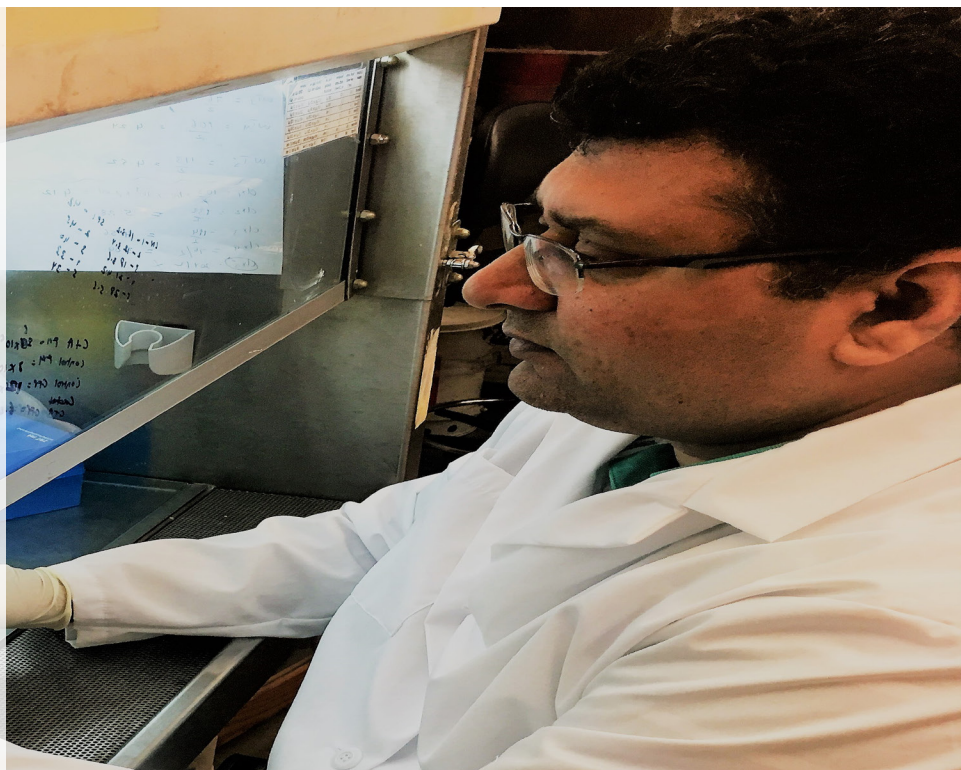
MS | Acharya N. G.
Ranga Agricultural
University (India)

PhD | Louisiana State
University

Supported by: National
Institutes of Health

Collaborators: Dr. Barry
T. Rouse

Publications: 2 in 2017



Hope for Adults Suffering with Herpes

In the United States, more than 50% of adults have experienced infection from the herpes simplex virus 1 (HSV-1). Although many infected individuals do not have symptoms, others experience lesions in the skin, eye, and, in rare cases, the brain, which can be life threatening. Because there is no vaccine for HSV-1, researchers have uncovered other elements to help block the infection. Dr. Rajasagi and his team are evaluating the importance of glucose in mediating CD8 T cell defenses against HSV-1. CD8 cells acquire energy from glucose. Therefore, combating this disease requires a hard look at glucose metabolism. Dr. Rajasagi intends to use the findings to submit a R21 grant proposal to the National Institutes of Health.

Dr. Brian Whitlock

ASSOCIATE PROFESSOR
LARGE ANIMAL CLINICAL SCIENCES

About Dr. Whitlock

MS | Michigan State University

DVM, PhD | Auburn University

Supported by: Kansas State University

Collaborators: Dr. Travis Mullinkis, Dr. J. Lannett Edwards, and Lisa Amelse

Publications: 6 in 2017



Kissing Infertility Goodbye

Infertility is often a challenge for both humans and animals. In regards to food animals, infertility has a severe economic impact for both producers and consumers, which threatens global food security. Kisspeptin and its receptor, Kiss1R, are critical components for reproduction in fish, birds, and mammals. Kisspeptin resides in the hypothalamus, and it contributes to the release of follicle stimulating hormones that contribute to reproduction. Dr. Whitlock and his team believe there may be stressors, such as heat, inflammation, or metabolic stress, contributing to a decline in kisspeptin. Furthermore, Dr. Whitlock believes kisspeptin is reduced due to an increase of heat stress proteins. By utilizing a mouse model, the team can simulate conditions triggering stress in the hypothalamus and observe the reaction to kisspeptin. In the future, Dr. Whitlock intends to use the data collected with the help of the Center of Excellence funding and submit a grant to the United States Department of Agriculture to further his research.

PUBLICATIONS AND PRESENTATIONS

David Anderson

PUBLICATIONS

- Okafor CC, Strickland LG, Jones BM, Kania S, **Anderson DE**, Whitlock BK. Prevalence of *Tritrichomonas* foetus in Tennessee Bulls. *Vet Parasitol*, 2017;243:169-75.
- Bourdo S, Dhar M, Kannarpady G, Biris A, Barnes B, Bow A, **Anderson D**. Polyurethane/nano-Hydroxyapatite Composite Films for Osteogenic Promotion. *J Biomater Sci: Polym Ed*, 2017;29(12):1426-43.
- Alghazali K, Newby SD, Nima Z, Hamzah R, Watanabe F, Bourdo S, Masi TJ, Stephenson SM, **Anderson D**, Dhar MS, Biris A. Functionalized gold nanorod nanocomposite system to modulate differentiation of human mesenchymal stem cells into neural-like progenitors. *Sci Rep*, 2017;7(1):16654, doi:10.1038/s41598-017-16800-9.
- Elkhenany H, Bourdo S, Hecht S, Donnell R, Gerard D, Abdelwahed R, Lafont A, Alghazali K, Watanabe F, Biris AS, **Anderson D**, Dhar M. Graphene nanoparticles as osteoinductive and osteoconductive platform for stem cell and bone regeneration. *Nanomedicine*, 2017;13(7):2117-26.
- Anderson DE**, White B, Nickell J, Hanzlicek G, Blasi D, Fraser B. Assessment of Blood Concentration of Cardiac Troponin I (cTnI) in Healthy Calves and Stocker Calves Effected with Bovine Respiratory Disease Complex. *J Vet Sci Anim Husband*, 2017;5(2): 202. doi:10.15744/2348-9790.5.202.
- Grubb TL, **Anderson DE**. Assessment of clinical application of pulse oximetry in llamas and alpacas. *Vet Med Sci*, 2017;3(3):169-175.
- Anderson DE**, Desrochers A, van Amstel SR. Surgical procedures of the distal limb for treatment of sepsis in cattle. *Vet Clin North Amer Food Animal*, 2017;33(2):329-350.

PRESENTATIONS

- Chiesa OA, Kouneski A, Sklenka S, Rotstein D, **Anderson DE**. Development of a minimally invasive laparoscopic technique for sampling the abdominal lymph node in standing steers. Presented at: Mission Possible: FDA Research Enhancing Public Health—FDA Science Forum; Knoxville, TN; May 31-June 1, 2017.
- Bow AJ, Newby SD, Barnes BK, Bourdo SE, **Anderson DE**, Biris AS, Dhar MS. Evaluation of a novel nanocomposite for osteogenesis. Presented at: TERMIS Americas Annual Conference and Exhibition; Charlotte, NC; December 3-6, 2017.
- Steiner RC, **Anderson DE**, Dhar MS, Biris AS, Bourdo S. Cytotoxicity of Hydrogen Peroxide Gas Sterilization towards Carbon-Based Biomaterials. Poster presented at: TERMIS Americas Annual Conference and Exhibition; Charlotte, NC; December 3-6, 2017.
- Newby SD, Alghazali KM, Nima ZA, Hamzah RN, Watanabe F, Bourdo SE, Masi TJ, Stephenson SS, **Anderson DE**, Biris AS, Dhar MS. Functionalized gold nanorods affect the in vitro neurogenic potential of human mesenchymal stem cells. Presented at: TERMIS Americas Annual Conference and Exhibition; Charlotte, NC; December 3-6, 2017.
- Dhar M, Elkhenany H, Bourdo S, Alghazali K, Biris A, **Anderson D**. A Novel Nanocomposite Containing Graphene as a Platform for Stem cell delivery and Bone Regeneration. Presented at: TERMIS Americas Annual Conference and Exhibition; Charlotte, NC; December 3-6, 2017.

Marc Caldwell

PUBLICATIONS

Eberhart N, Storer J, **Caldwell M**, Saxton A, Krawczel P. Behavioral and physiological changes in dairy steer calves infected with *Mannheimia haemolytica*. *AJVR*, 2017;78(9):1056-64.

Caldwell M, Passler T, Purohit RC, Pascoe D, Wolfe DF. High definition thermal and nuclear scintigraphic imaging assisted diagnosis of lumbosacral discospondylosis in a bucking bull. *JAVMA*, 2017;250(5):464-560.

PRESENTATIONS

Caldwell M. Antibiotic Resistance: Molecular Mechanisms to Clinical Consequences. Invited speaker at: Annual Harvey Rubin Memorial Food Animal Conference; Orlando, FL; March 25, 2017.

Caldwell M. Vaccine Immunology in Cattle. Invited speaker at: Annual Harvey Rubin Memorial Food Animal Conference; Orlando, FL; March 25-26, 2017.

Maria Cekanova

PUBLICATIONS

Smolensky D, Rathore K, Bourn J, **Cekanova M**. Inhibition of the PI3K/AKT pathway sensitizes oral squamous cell carcinoma cells to anthracycline-based chemotherapy in vitro. *J Cell Biochem*, 2017;118(9):2615-24.

PRESENTATIONS

Bourn J, **Cekanova M**. Evaluation of novel imaging agent for detection of bladder cancer. Presented at: The 3rd Annual Women in STEM Research Symposium, Knoxville, TN, March 21, 2017.

Cekanova M. Animal models for validation of novel imaging and therapeutic agents for detection and treatment of cancer. Invited speaker at: Roswell Park Cancer Institute, Buffalo, NY, September 1, 2017.

Bourn J, **Cekanova M**. Detection of receptor tyrosine kinase inhibitors-induced COX-2 in bladder cancer. Presented at: The 11th Annual CEM Symposium, Knoxville, TN, October 3, 2017.

Mei-Zhen Cui

PUBLICATIONS

Dou Q, Hao F, Sun L, Xu X, **Cui M-Z**. CREB and SRF mediate LPA-induced CCN1 expression in vascular smooth muscle cells. *Can J Physiol Pharmacol*, 2017;95(3):275-80.

Hu C, Xu J, Zeng L, Li T, **Cui M-Z**, Xu X. Pen-2 and presenilin are sufficient to catalyze Notch processing. *J Alzheimers Dis*, 2017;56 (4):1263-9.

Dong Y, Wu Y, **Cui M-Z**, Xu X. Lysophosphatidic acid triggers apoptosis in HeLa cells through the upregulation of tumor necrosis factor receptor superfamily member 21. *Mediators Inflamm*, 2017;2754756. doi: 10.1155/2017/2754756.

An D, Hao F, Zhang F, Kong W, Xu X, **Cui M-Z**. CD14 Is a Key Mediator of Both Lysophosphatidic Acid and Lipopolysaccharide Induction of Foam Cell Formation. *J Biol Chem*, 2017;292(35):14391-400.

PRESENTATIONS

Xuemin, Hu C, Zeng L, Li T, Xu J, **Cui M-Z**. Pen2 and PS1 are sufficient to form a functional g-secretase. Presented at: The 13th International conference on Alzheimer's & Parkinson's Disease; Vienna, Austria; March 29-April 2, 2017.

Cui M-Z. LPA, Matricellular protein and vascular disease. Featured speaker at: Arteriosclerosis, Thrombosis and Vascular Biology (ATVB) Annual Meeting, Metabolic Vascular Disease Symposium; Minneapolis,

MN; May 3, 2017.

Cui M-Z. CD14 Is a Key Mediator of Foam Cell Formation induced by Lysophosphatidic Acid and Lipopolysaccharide. Presented at: American Heart Association Scientific Sessions 2017—Session: New Mechanistic Aspects of Atherosclerosis; Anaheim, CA; November 11-15, 2017.

Madhu Dhar

PUBLICATIONS

Elkhenany H, Bourdo S, Hecht S, Donnell R, Gerard D, Abdelwahed R, Lafont A, Alghazali K, Watanabe F, Biris AS, Anderson D, **Dhar M.** Graphene nanoparticles as osteoinductive and osteoconductive platform for stem cell and bone regeneration. *Nanomed: nanotechnol, biol, med*, 2017;13(7):2117-26.

Alghazali KM, Newby SD, Nima ZA, Hamzah RN, Watanabe F, Bourdo SE, Masi TJ, Stephenson SM, Anderson DE, **Dhar MS**, Biris AS. Functionalized gold nanorod nanocomposite system to modulate differentiation of human mesenchymal stem cells into neural-like progenitors. *Nature Sci Rep*, 2017;7(1):16654.

PRESENTATIONS

Bow AJ, Newby SD, Barnes BK, Bourdo SE, Anderson DE, Biris AS, **Dhar MS.** Evaluation of a novel nanocomposite for osteogenesis. Presented at: TERMIS Americas Annual Conference and Exhibition; Charlotte, NC; December 3-6, 2017.

Steiner RC, Anderson DE, **Dhar MS**, Biris AS, Bourdo S. Cytotoxicity of Hydrogen Peroxide Gas Sterilization towards Carbon-Based Biomaterials. Presented at: TERMIS Americas Annual Conference and Exhibition; Charlotte, NC; December 3-6, 2017.

Newby SD, Alghazali KM, Nima ZA, Hamzah RN, Watanabe F, Bourdo SE, Masi TJ, Stephenson SS, Anderson DE, Biris AS, **Dhar MS.** Functionalized gold nanorods affect the in vitro neurogenic potential of human mesenchymal stem cells. Presented at: TERMIS Americas Annual Conference and Exhibition; Charlotte, NC; December 3-6, 2017.

Dhar M, Elkhenany H, Bourdo S, Alghazali K, Biris A, Anderson D. A Novel Nanocomposite Containing Graphene as a Platform for Stem cell delivery and Bone Regeneration. Presented at: TERMIS Americas Annual Conference and Exhibition; Charlotte, NC; December 3-6, 2017.

Stephen Kania

PUBLICATIONS

Gould EN, Giannone R, **Kania SA**, Tolbert MK. 2017 Cysteine protease 30 (CP30) contributes to adhesion and cytopathogenicity in feline *Tritrichomonas foetus*. *Vet Parasitol*, 2017;244:114-22.

Videla R, Solymán SM, Brahmabhatt A, Sadeghi L, Bemis DA, **Kania SA.** 2017. Clonal Complexes and Antimicrobial Susceptibility Profiles of *Staphylococcus pseudintermedius* Isolates from Dogs in the United States. *Microb Drug Resist*, 2017;doi: 10.1089/mdr.2016.0250.

Wipf JRK, Riley MC, **Kania SA**, Bemis DA, Andreis S, Schwendener S, Perreten V. New Macrolide-Lincosamide-Streptogramin B Resistance Gene *erm*(48) on the Novel Plasmid pJW2311 in *Staphylococcus xylosum*. *Antimicrob Agents Chemother*, 2017;61(7):e00066-17. doi: 10.1128/AAC.00066-17.

Balachandran M, Riley MC, Bemis DA, **Kania SA.** Complete Genome Sequence of *Staphylococcus aureus* Strain Wood 46. *Genome Announc*, 2017;5(13):e00087-17. doi: 10.1128/genomeA.00087-17.

Compton ST, **Kania SA**, Robertson AE, Lawhon SD, Jenkins SG, Westblade LF, Bemis DA. Evaluation of Pyrrolidonyl Arylamidase Activity in *Staphylococcus delphini*. *J Clin Microbiol*, 2017;55(3):859-64.

Abouelkhair MA, Riley MC, Bemis DA, **Kania SA.** Complete Genome Sequence of *Staphylococcus pseudintermedius* Type Strain LMG 22219. *Genome Announc*, 2017;5(7):e01651-16. doi: 10.1128/

genomeA.01651-16.

Gould EN, Corbeil LB, **Kania SA**, Tolbert MK. Evaluation of surface antigen TF1.17 in feline *Tritrichomonas* foetus isolates. *Vet Parasitol*, 2017;244:144-53.

Balachandran M, Giannone RJ, Bemis DA, **Kania SA**. Molecular Basis of Surface Anchored Protein A Deficiency in the *Staphylococcus aureus* Strain Wood 46. *Plos One*, 2017;<https://doi.org/10.1371/journal.pone.0183913>.

Okafor CC, Strickland LG, Jones BM, **Kania SA**, Anderson DE, Whitlock BK. Prevalence of *Tritrichomonas* foetus in Tennessee bulls. *Vet Parasitol*, 2017;243:169-75.

PRESENTATIONS

Abouelkhair MA, Bemis DA, **Kania SA**. *Staphylococcus pseudintermedius* adenosine synthase inhibits the innate immune response and promotes bacterial survival in canine blood. Presented at: 2nd International Conference on Infection Control and Prevention; Chicago, IL; September 25-26, 2017.

Sewid AH, **Kania SA**, Bemis DA. Identification and characterization of coagulase Protein from *S. pseudintermedius*. Presented at: Kentucky-Tennessee Branch of the American Society for Microbiology Fall 2017 Meeting; Cookeville, TN; November 10-11, 2017.

Abouelkhair MA, **Kania SA**, Bemis DA. *Staphylococcus pseudintermedius* Adenosine Synthase Inhibits the Innate Response and Promotes Bacterial Survival in Canine Blood. Presented at: Kentucky-Tennessee Branch of the American Society for Microbiology Fall 2017 Meeting; Cookeville, TN; November 10-11, 2017.

Abouelkhair MA, **Kania SA**, Bemis DA. *Staphylococcus pseudintermedius* Identification and Characterization of Pantone-Valentine Leucocidin and Gamma-Hemolysin of *Staphylococcus pseudintermedius*. Presented at: Kentucky-Tennessee Branch of the American Society for Microbiology Fall 2017 Meeting; Cookeville, TN; November 10-11, 2017.

Oudessa Kerro Dego

PUBLICATIONS

Kerro Dego O, Almeida RA, Saxton AM, Abdil RD, Ensermu DB, Oliver SP. Bovine intramammary infection associated immunogenic surface proteins of *Streptococcus uberis*. *Microb Pathog*, 2017;115:304-311.

Kerro Dego O, Almeida RA, Prado ME, Headrick SI, Lewis MJ, Young C, Gillespie BE, Siebert LJ, Pighetti GM, Abdil RD, Ensermu DB, Oliver SP. Functionally effective immune responses of dairy cows vaccinated with *Streptococcus uberis* adhesion molecule during the transition period. *Ann Vaccines Immunization*, 2017;3(1):1015.

Pighetti GM, Wojakiewicz L, Headrick SI, **Kerro Dego O**, Lockwood SA, Kattesh HG, Lewis MJ, Young CD, Siebert LJ, Gillespie BE, Prado ME, Almeida RA, Oliver SP. Vaccination with recombinant *Streptococcus uberis* Adhesion Molecule alters immune response to experimental challenge. *Int J Vet Dairy Sci*, 2017. <http://oajournals.clytoaccess.com/sites/default/files/finalll.pdf>

Siebert LJ, Headrick SI, Lewis MJ, Gillespie BE, Young CD, Wojakiewicz L, **Kerro Dego O**, Prado ME, Almeida RA, Oliver SP, Pighetti GM. Genetic variation in CXCR1 haplotypes linked to clearance of *Streptococcus uberis* infection in an experimental challenge model. *Vet Immunol Immunopathol*, 2017;190:45-52.

PRESENTATIONS

Merrill C, Ensermu DB, Abdil RD, Gillespie BE, Vaughn J, Almeida RA, Oliver SP, Headrick SI, Hash K, Walker TB, **Kerro Dego O**. Protective Effects of a new *Staphylococcal* vaccine against mastitis in dairy cows. Presented at: UT Beef and Forage Center Annual Meeting; Knoxville, TN; Dec 19, 2017.

Vaughn J, Abdil RD, Gillespie BE, Merrill C, **Kerro Dego O**. Genetic Diversity of *Staphylococcus aureus* from Cases of Bovine Mastitis. Presented at: UT Beef and Forage Center Annual Meeting; Knoxville, TN; Dec 19, 2017.

Abdi RD, Dunlap JR, Ensermu D, Gillespie BE, Almeida RA, Oliver SP, **Kerro Dego O**. Conserved Immunodominant Surface Proteins of *S. aureus* Isolates from Cases of Bovine Mastitis. Presented at:

- Mastitis Research Workers Annual Meeting; Chicago, IL; November 1-3, 2017.
- Abdi RD, Ensermu D, Vaughn J, Merrill C, Gillespie B, **Kerro Dego O**. Staphylococcus aureus cell surface proteins extraction and evaluation of immunogenicity. Presented at: The 98th Annual Conference of Research Workers in Animal Diseases; Chicago, IL; December 3-5, 2017.
- Merrill C, Ensermu DB, Abdil RD, Gillespie BE, Vaughn J, Almeida RA, Oliver SP, Headrick SI, Hash K, Walker TB, **Kerro Dego O**. Evaluation of the immune response and protection in dairy cows vaccinated with immunodominant Staphylococcal surface proteins. Presented at: The 98th Annual Conference of Research Workers in Animal Diseases; Chicago, IL; December 1-5, 2017.
- Vaughn J, Abdil RD, Gillespie B, Merrill C, **Kerro Dego O**. Genetic diversity and enterotoxin production profiles of Staphylococcus aureus strains from cases of bovine mastitis. Presented at: The 98th Annual Conference of Research Workers in Animal Diseases; Chicago, IL; December 1-5, 2017.
- Abdi RD, Vaughn J, Merrill C, Cantwell SM, Gillespie BE, Almeida RA, Headrick SI, Pighetti GM, Krawczel P, Keflot J, Bewley JM, Oliver SP, **Kerro Dego O**. Antimicrobial Resistance Patterns of Staphylococcus aureus Isolates from Cases of Bovine Mastitis. Presented at: 56th Meeting of the National Mastitis Council; St. Pete Beach, FL; January 28-31, 2017.

Pierre-Yves Mulon

BOOK CHAPTERS

- Ducharme NG, Desrochers A, **Mulon P-Y**, Nichols S. Surgery of the Bovine (Adult) Respiratory and Cardiovascular Systems. In: Fubini SL, Ducharm NG eds. *Farm Animal Surgery*, 2nd ed. St. Louis, MO: Elsevier; 2017:193-222.
- Desrochers A, Steiner A, Anderson DE, Guard C, Nichols S, Ducharme NG, Nuss K, **Mulon P-Y**, Kraus S, Hill JA. Surgery of the Bovine Musculoskeletal System. In: Fubini SL, Ducharm NG eds. *Farm Animal Surgery*, 2nd ed. St. Louis, MO: Elsevier; 2017:344-438.

PRESENTATIONS

- Mulon P-Y**. Management of septic arthritis and wet lab. Presented at: UTIA Extension Meeting; Murfreesboro, TN; January 13, 2017.
- Mulon P-Y**. Bovine fracture management. Presented at: CVM Annual Conference; Knoxville, TN; January 21, 2017.
- Mulon P-Y**. Surgery of the teat; Fracture management in cattle; Management of orthopedic infection in cattle; Urolithiasis in ruminants. Presented at: Western Veterinary Conference; Las Vegas, NV; March 6, 2017.
- Mulon P-Y**. Urolithiasis in ruminants—a surgeon's perspective; Small Ruminant urolithiasis. Presented at: American College of Veterinary Internal Medicine; National Harbor, MD; June 8-10, 2017.

Phillip Myer

PUBLICATIONS

- Clemmons BA, Mihelic RI, Beckford RC, Powers JB, Melchior EA, McFarlane ZD, Cope ER, Embree MM, Mulliniks RT, Campagna SR, Voy BH, **Myer PR**. Serum Metabolites Associated with Feed Efficiency in Black Angus Steers. *Metabolomics*, 2017;13:147. doi: 10.1007/s11306-017-1282-z.
- Myer PR**, Wells JE, Smith TPL, Kuehn LA, Freetly HC. Analysis of the gut microbiome in beef cattle and its association with feed intake, growth, and efficiency. *J Anim Sci*, 2017;95:3215-24. doi: 10.2527/jas.2016.1059.
- Clemmons BA, Reese ST, Dantas FG, Franco GA, Smith TPL, Adeyosoye OI, Pohler KG, **Myer PR**. Vaginal and uterine bacterial communities in postpartum lactating cows. *Front Microbiol*, 2017;8:1047. doi: 10.3389/fmicb.2017.01047.

McFarlane ZD, **Myer PR**, Cope ER, Evans ND, Bone C, Biss BE, Mulliniks JT. Effect of biochar type and size on in vitro rumen fermentation of orchardgrass hay. *Agric Sci*, 2017;8(4):316-25. doi: 10.4236/as.2017.84023.

Naveen Rajasagi

PUBLICATIONS

Bhela S, Varanasi SK, Jaggi U, Sloan SS, **Rajasagi NK**, Rouse BT. The Plasticity and Stability of Regulatory T Cells during Viral-Induced Inflammatory Lesions. *J Immunol*, 2017;199(4):1342-352.

Rajasagi NK, Bhela S, Varanasi SK, Rouse BT. Aspirin triggered resolvin D1 controls herpes simplex virus induced corneal immunopathology. *J Leukoc Biol*, 2017;102(5):1159-1171.

Brian Whitlock

PUBLICATIONS

Foradori CD, **Whitlock BK**, Daniel JA, Zimmerman AD, Jones MA, Read CC, Steele BP, Smith JT, Clarke IJ, Elsasser TH, Keisler DH, Sartin JL. Kisspeptin stimulates growth hormone release by utilizing neuropeptide Y pathways and is dependent on the presence of ghrelin in the ewe. *Endocrinology*, 2017;158(10):3526-39.

Gray-Edwards HL, Randle AE, Maitland SA, Benatti HR, Hubbard SM, Canning PF, Vogel MB, Brunson BL, Hwang M, Ellis LE, Bradbury AM, Gentry AS, Taylor AR, Wooldridge AA, White DR, Winter RL, **Whitlock BK**, Johnson JA, Holland M, Salibi N, Beyers RJ, Sartin JL, Denney TS, Cox NR, Sena-Estevez M, Martin DR. 2017. Adeno-Associated Virus Gene Therapy in a Sheep Model of Tay-Sachs Disease. *Hum Gene Ther*, 2017;doi: 10.1089/hum.2017.163.

Okafor CC, Strickland LG, Jones BM, Kania S, Anderson DE, **Whitlock BK**. Prevalence of *Tritrichomonas foetus* in Tennessee bulls. *Vet Parasitol*, 2017;243:169-75.

Black RA, **Whitlock BK**, Krawczel PD. Effect of maternal exercise on calf dry matter intake, weight gain, behavior, and cortisol concentrations at disbudding and weaning. *J Dairy Sci*, 2017;100(9):7390-7400.

Green MA, **Whitlock BK**, Edwards JL, Scholljegerdes EJ, Mulliniks JT. Rumen-protected arginine alters blood flow parameters and luteinizing hormone concentration in cyclic beef cows consuming toxic endophyte-infected tall fescue seed. *J Anim Sci*, 2017;95(4):1537-44.

Collins SL, Caldwell M, Hecht S, **Whitlock BK**. Comparison of penetrating and nonpenetrating captive bolt methods in horned goats. *Am J Vet Res*, 2017;78(2):151-7.

Research Funded Externally

Investigator	Project Title	Funding Agency	Project Period	2018 Receipts	2018 Expenditures
David Anderson	Multiscale technology for rapid, enhanced bone regeneration	US Department of Defense	7/1/17-6/30/18	\$462,563	\$681,704
Marc Caldwell	Supporting Early Career Veterinarians in Rural Practice in Tennessee	USDA NIFA	7/1/17-6/30/18	\$14,600	\$3,077
	The Impact of Three Weaning Methods on the Microbial Diversity of the Nasopharyngeal Cavity in Beef Calves	USDA Animal Health	7/1/17-6/30/18	\$0	\$10,611
	Validation of VIDAS® Anti-Müllerian Hormone Assay in Cattle	BioMerieux	6/4/18-6/3/19	\$0	\$0
Maria Cekanova	Detection of COX-2-expressing bladder cancer by fluorocoxib A	National Institutes of Health	8/11/14-7/31/18	\$91,126	\$61,744
	Grading Mast Cell Tumors	AB Science	8/1/14-12/31/18	\$13,612	\$8,399
Mei-Zhen Cui	Novel mechanism mediating LPA-induced smooth muscle cell and vascular responses	National Institutes of Health	7/1/17-3/31/18	\$460,967	\$190,175
	Pathogenic role of the novel mitochondrial apoptotic protein PSAP in ALS	National Institutes of Health	9/1/16-3/31/18	\$183,750	\$116,885
Stephen Kania	2018 Boehringer Veterinary Scholars Research Program	Boehringer	5/1/18-4/30/19	\$5,000	\$1,890
	UTCEM graduate student sponsorship	Egyptian Cultural & Educational Bureau	7/29/15-7/28/19	\$22,057	\$21,703
	Development of a live animal serological ELISA assay for detection and surveillance of Parelaphostrongylus tenuis in cervids	Tufts University	3/15/16-12/31/18	\$0	\$1,833
	Immune response to parasite vaccine	East Tennessee Clinical Research	4/1/16-6/30/18	\$0	\$17,366
	Development of a live animal serological ELISA assay for detection and surveillance of Psoroptes mites in elk	Pennsylvania Game Commission	8/1/16-7/31/18	\$0	\$805

Investigator	Project Title	Funding Agency	Project Period	2018 Receipts	2018 Expenditures
Stephen Kania	Clinical Trial of Virulence Factor Vaccine for Staphylococcus pseudintermedius Canine Pyoderma	Univeristy of Tennessee Research Foundation	1/2/18-10/6/18	\$15,000	\$6,144
Pierre-Yves Mulon	Site Savo Break away device	Lineus	7/1/17-6/30/18	\$3,169	\$3,846
Phillip Myer	Intake and in-field stability of monensin-containing 20 RU pressed tubs (BGT6882) fed to stocker cattle grazing summer pastures	ADM Alliance Nutrition	9/7/16-3/6/17	\$0	\$5,267
	Evaluation of ruminal bacterial and protozoal populations from steers differing in residual feed intake	Ascus Biosciences, Inc.	7/25/16-7/14/18	\$0	\$121
	Effects of native rumen microorganism supplementation on acidosis tolerance of Heifers	Ascus Biosciences, Inc.	11/29/17-11/28/18	\$102,649	\$22,622
	Effects of native rumen microorganism supplementation on acidosis tolerance of Heifers	Ascus Biosciences, Inc.	11/29/17-11/28/18	\$0	\$44,500
	Effects of native rumen microorganism supplementation on acidosis tolerance of Heifers	Ascus Biosciences, Inc.	11/29/17-11/28/18	\$0	\$7,516
Naveen Rjasagi	Mechanisms of Herpetic Keratitis	National Institutes of Health	2/1/17-12/31/20	\$448,710	\$362,610
Brian Whitlock	Is Orosomucoid a Mechanistic Link between Inflammation and Impaired Intake During the Transition Period	USDA	7/1/17-6/30/18	\$83,867	\$78,950
TOTALS				\$1,907,070	\$1,647,768

Actual, Proposed, and Requested Budget

	FY 2017-18 Actual			FY 2018-19 Proposed		
	Matching	Appropri.	Total	Matching	Appropri.	Total
Expenditures	\$188,320	\$376,639	\$564,959	\$258,025	\$516,050	\$774,075
Salaries						
Faculty			\$0			\$0
Other Professional	\$11,060	\$22,121	\$33,181	\$4,169	\$8,338	\$12,507
Clerical/ Supporting	\$36,287	\$72,575	\$108,862	\$64,461	\$128,922	\$193,383
Assistantships	\$1,424	\$2,848	\$4,272	\$4,000	\$8,000	\$12,000
Total Salaries	\$48,772	\$97,543	\$146,315	\$72,630	\$145,260	\$217,890
Longevity (Exclude from Salaries)			\$0			\$0
Fringe Benefits	\$11,232	\$22,465	\$33,697	\$6,947	\$13,894	\$20,841
Total Personnel	\$60,004	\$120,008	\$180,012	\$79,577	\$159,154	\$238,731
Non-Personnel						
Travel	\$5,687	\$11,373	\$17,060	\$5,865	\$11,730	\$17,595
Software	\$175	\$350	\$525			\$0
Books & Journals	\$0	\$0				\$0
Other Supplies	\$80,188	\$160,375	\$240,563	\$234,466	\$468,931	\$703,397
Equipment	\$14,221	\$28,441	\$42,662	\$64,995	\$129,991	\$194,986
Maintenance	\$2,460	\$4,921	\$7,381			\$0
Scholarships	\$0	\$0				\$0
Consultants		\$0				\$0
Renovation			\$0	\$316,667	\$633,333	\$950,000
Other (Specify):						
Gas, rentals, insurance, misc	\$1,965	\$3,929	\$5,894			\$0
Prining, publications, postage	\$3,158	\$6,316	\$9,474			\$0
Contract/special services	\$17,119	\$34,239	\$51,358	\$12,237	\$24,473	\$36,710
Professional services/member-ships	\$3,343	\$6,687	\$10,030			\$0
Total Non-Personnel	\$128,316	\$256,631	\$384,947	\$634,229	\$1,268,459	\$1,902,688
GRAND TOTAL	\$188,320	\$376,639	\$564,959	\$713,806	\$1,427,613	\$2,141,419
Revenue						
New State Appropriation		\$506,284	\$506,284		\$516,050	\$516,050
Carryover State Appropriation		\$841,407	\$841,407		\$971,052	\$971,052
New Matching Funds	\$253,142		\$253,142	\$258,025		\$258,025
Carryover from Previous Matching Funds	\$420,704		\$420,704	\$485,526		\$485,526
TOTAL REVENUE	\$673,846	\$1,347,691	\$2,021,537	\$743,551	\$1,487,102	\$2,230,653

	FY 2019-20 Requested		
	Matching	Appropri.	Total
Expenditures	\$300,671	\$601,342	\$902,013
Salaries			
Faculty			\$0
Other Professional	\$4,377	\$8,755	\$13,132
Clerical/ Supporting	\$67,684	\$135,368	\$203,052
Assistantships	\$4,200	\$8,400	\$12,600
Total Salaries	\$76,262	\$152,523	\$228,785
Longevity (Exclude from Salaries)			\$0
Fringe Benefits	\$7,294	\$14,589	\$21,883
Total Personnel	\$83,556	\$167,112	\$250,668
Non-Personnel			
Travel	\$6,158	\$12,317	\$18,475
Software			
Books & Journals			
Other Supplies	\$81,442	\$162,883	\$244,325
Equipment	\$25,000	\$50,000	\$75,000
Maintenance			
Scholarships			
Consultants			
Renovation	\$91,667	\$183,333	\$275,000
Other (Specify):			
Gas, rentals, insurance, misc			
Printing, publications, postage			
Contract/special services	\$12,849	\$25,697	\$38,546
Professional services/ memberships			\$0
Total Non-Personnel	\$217,115	\$434,230	\$651,345
GRAND TOTAL	\$300,671	\$601,342	\$902,013
Revenue			
New State Appropriation		\$541,851	\$541,853
Carryover State Appropriation		\$59,489	\$59,489
New Matching Funds	\$270,926		\$270,926
Carryover from Previous Matching Funds	\$29,745		\$29,745
Total Revenue	\$300,671	\$601,342	\$902,013



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