CENTER OF EXCELLENCE

in

Livestock Diseases & Human Health

2017 Annual Report

UTIA INSTITUTE OF AGRICULTURE
THE UNIVERSITY OF TENNESSEE

THIS REPORT IS PRODUCED BY

THE UNIVERSITY OF TENNESSEE
College of Veterinary Medicine

Office of the Associate Dean for Research
2407 River Drive, Room A102
Knoxville, Tennessee 37996-4550
865.974.0227

EDITING | Amanda Hand

PHOTOGRAPHY | Greg Hirshoren
Phil Snow

GRAPHIC DESIGN | Joy Chambers
Amanda Hand

WRITING | Amanda Hand

SPECIAL THANKS | Emily Dyke
Catheryn Hance
Heather Means
Kim Rutherford
Melissa Walker
Sandra Harbison

Table of Contents

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 2017 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 2017. These faculty members have made significant advancements in cancer biology, molecular pathophysiology, host defense, regenerative medicine, and disease transmission. Center faculty also made significant advancements in the prevention and treatment of infectious and non-infectious livestock diseases that affect agricultural productivity.

The 2017 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 31-32 and include fiscal years 2013-2017.

Center faculty continue to garner national and international recognition for their research and scholarship. During the 2016 calendar year, center faculty published 42 peer-reviewed articles and gave 30 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. Details of current faculty research are provided in the Faculty Reports section (pages 27-37).

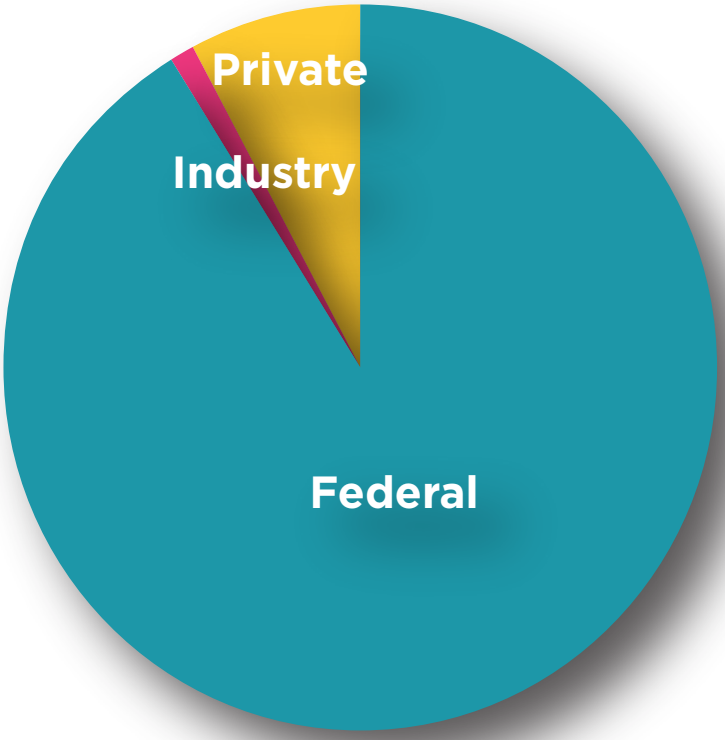
During the 2016 calendar year, the 12 center faculty averaged 3.5 peer-reviewed publication (42 total) and 2.5 presentations at prestigious national and international meetings (30 total). On average, each publication of these 12 center faculty has been cited 10.27 times. These numbers tell us that scientists worldwide have evaluated center faculty work positively and used it to stimulate, validate, and/or support their own work in similar fields.

The average h-index for 2017 faculty is 10. 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, an h-index of 10 means that center faculty, on average, have at least 6 publications that have been cited at least 10 times each.

Particularly noteworthy articles in 2016 were by Drs. Cui, Dhar, Tolbert, and Xu. Drs. Cui and Xu co-authored an article published in The Proceedings of the National Academy of Science. Furthermore, Dr. Dhar's work was published in Frontiers of Veterinary Science, and Dr. Tolbert's article was published in the Journal of Nuclear Medicine. These journals all have an impact factor above 6.1. 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 (pages 38-43) for more details.

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 $3.10 in external funding. External funding totaled $630,580 this year, while expenditures for the year were $1,667,760. The funding includes new, multi-year awards for Dr. Naveen Rajasagi, totaling $448,710, and new 1-year awards for Drs. Elizabeth Lennon, Stephen Kania, Chika Okafor, and Katherine Tolbert, totaling $181,870. Figure 1 depicts the type of external funding received during FY 2017. See Research Funded Externally and Research Expenditures on page 11 for the complete fiscal year 2017 data summary.

Fig. 1 FY 2017 External Funding by Source



Benchmark	2017 (12 Faculty)	2016 (17 Faculty)
	N[1]	N[2]
Publications	**42**	**50**
Peer-Reviewed Articles	37	47
Books/Chapters/Other	5	3
Presentations	**30**	**66**
International	5	16
National	16	36
State or Local	9	14
Research Monies		
External Funding	$630,580	$4,654,148
Research Expenditures	$1,667,760	$2,536,980
Return on Investment	**3.1:1**	**5.1:1**

[1]: Publications and presentations based on 2016 calendar year; research monies based on 2017 fiscar year.
[2]: Publications and presentations based on 2015 calendar year; research monies based on 2016 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, toxicology, host defense, molecular 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. Debra Miller chaired the Research Advisory Committee responsible for selecting the 2017 funded proposals.

Ms. Amanda Hand produces the annual report.

Funding and Expenditures

Research Funded Externally, Fiscal Year 2017

Investigator	Federal	Industry	Foundation/Private	TOTAL
Kania, Stephen			$10,000	**$10,000**
Lennon, Elizabeth	$126,900			**$126,900**
Okafor, Chika		$7,438		**$7,438**
Rajasagi, Naveen	$448,710			**$448,710**
Tolbert, Katherine			$37,532	**$37532**
TOTALS	**$575,610**	**$7,438**	**$47,532**	**$630,580**

Research Expenditures, Fiscal Year 2017

Investigator	Federal	Industry	Inter-national	University	Foundation/ Private	TOTAL
Anderson, David		$32,889		$460,175		**$493,064**
Caldwell, Marc		$8,634				**$8,634**
Cui, Mei-Zhen	$62,303					**$62,303**
Kania, Stephen		$4,974	$20,151	$4,220	$47,100	**$76,445**
Lennon, Elizabeth	$117,992					**$117,992**
Rajasagi, Naveen	$673,182					**$100,557**
Tolbert, Katherine					$25,393	**$25,393**
Xu, Xuemin	$210,747					**$210,747**
TOTALS	**$1,064,224**	**$46,497**	**$20,151**	**$464,395**	**$72,493**	**$1,667,760**

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. 27-37), have research interests in line with center objectives and a strong 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.

Bridge Funds

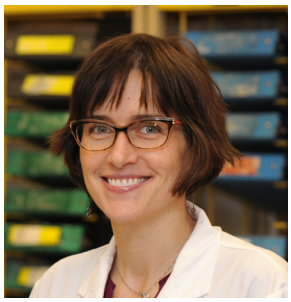
Bridge funds are short-term grants that serve as a bridge at times when scientists are in between major externally-secured awards. Such funds are important and necessary on occasion for any academic researcher, but particularly now because of the national trend of low funding success rates. For example, in 2016, applicants for new R series research grants (allowable direct cost per year at $50,000 to $500,000) at the National Cancer Institute had an 11% overall funding success rate. In other words, for every 100 grant proposals submitted, only about 11 are funded.

During fiscal year 2017, the center provided bridge funding to support **Dr. Xuemin Xu** in order to provide him with critical experimental supplies to further his research efforts, while he also pursued additional external funding.

Start-Up Funds

The center provided $52,500 in start-up funds for 11 junior faculty members to secure additional funding in 2017. Their research areas are described below:

Pierre-Yves Mulon
Large Animal Surgery
$5,000



Amy Hodshon
Canine invertebral disc herniations
$5,000

Cassie Lux
Small Animal Surgery and Radiology
$10,000

Adrien Hespel
Veterinary Radiology
$5,000

Connie Fazio
Small Animal Radiology
$5,000

Kyle Snowden
Small Animal Surgery and Radiology
$5,000

Luca Giori
Biological variation in horses
$5,000

Deanna Schaefer
Camilid hematology and anemia
$5,000

John Schaefer
Avian toxoplasmosis
$2,500

Chika Okafor
Epidemiology of anti-microbials in animals
$5,000

Mee-Ja Sula
Neoplasia in captive panthera species
$5,000

Infrastructure and Supplies

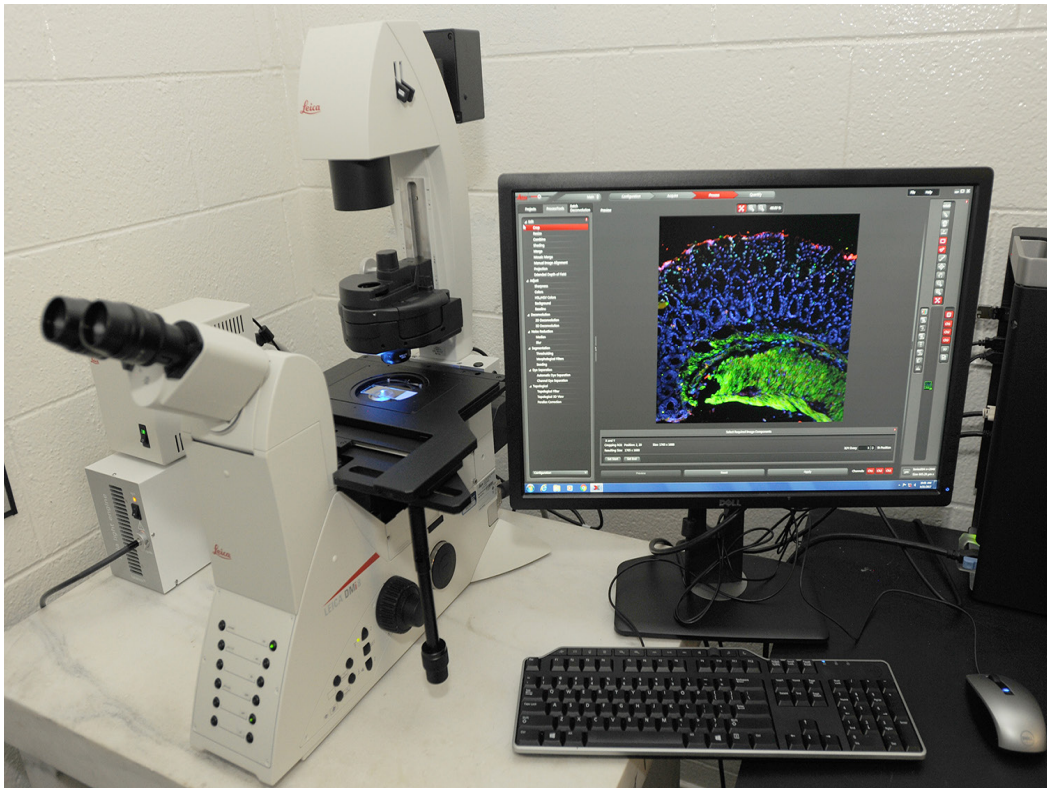
The center promotes the research infrastructure of both the UTCVM and the Institute of Agriculture through the purchase and maintenance of essential research equipment. The Research Advisory Committee reviews requests based on three criteria: justification of need, current availability of equipment,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

Equipment

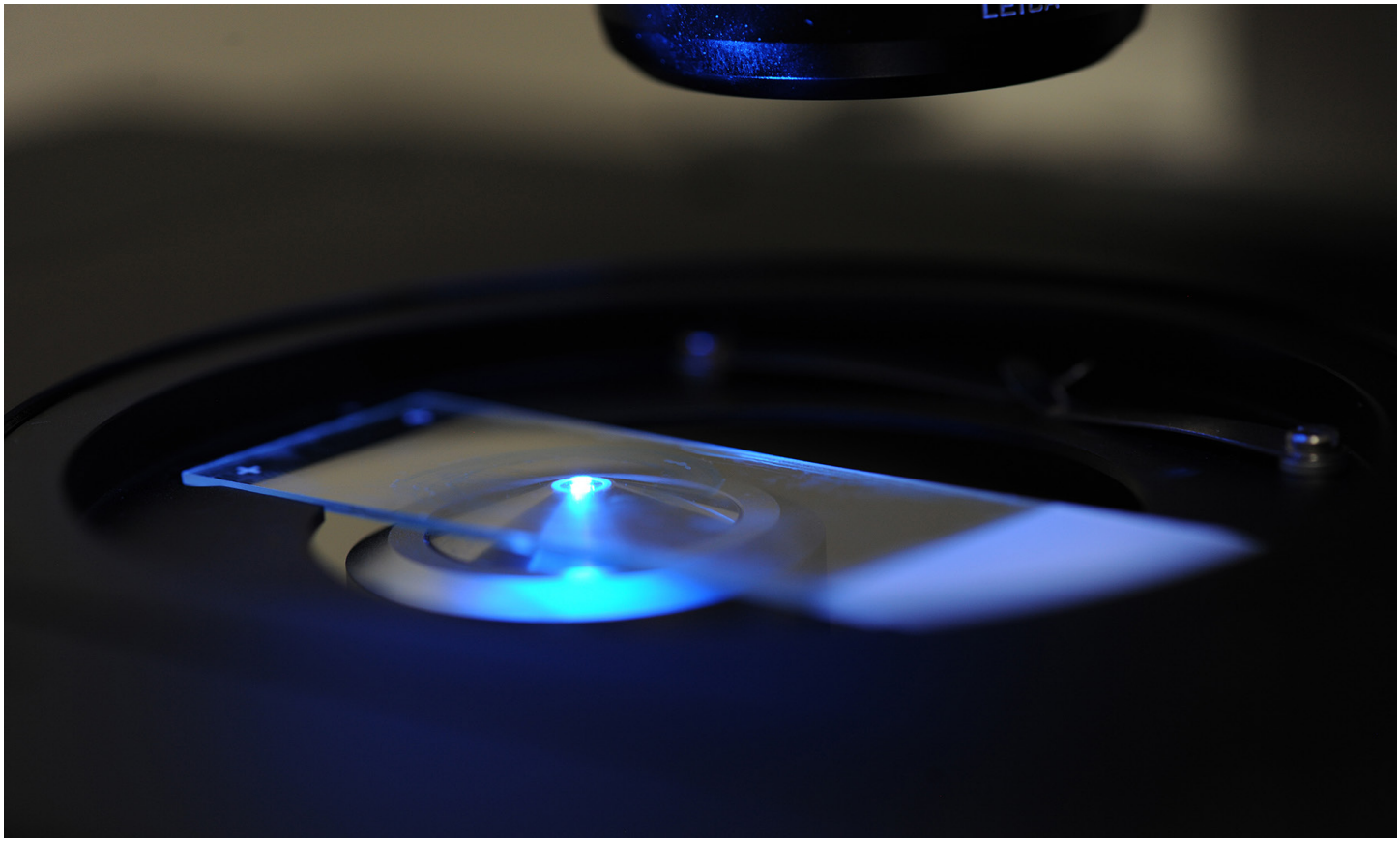
In support of the UTCVM's research enterprise in 2017, the center funded the purchase and installation of a new **Leica DMi8 microscope** ($30,000 towards microscope purchase and $24,789 towards microscope start-up, totaling $54,789), located in Dr. Elizabeth Lennon's intestinal immunology laboratory in Small Animal Clinical Sciences. The Leica DMi8 (pictured below) has several key features, which would prove helpful for faculty working with tissue samples and cellular cultures. One of the attributes of this microscope is its ability to take high-resolution fluorescent images of cells and tissues with the capacity to detect intracellular and cell surface markers. It also has the capability to perform live cell imaging, including imaging of cells in multiwell cell culture dishes. The microscope has the ability to perform z-stack images and deconvolution. Another feature is the closed loop focus drive, which measures and positions the microscope within 20 nm reproducibility over an increased travel range of 12 mm. This accuracy allows for clear 2D and even 3D imaging of cells.
The microscope is equipped with a high-sensitivity Hamamatsu Orca Flash 4.0.

Dr. Lennon's lab also received a necessary update with new **laboratory benches** ($11,475). These benches help house the necessary supplies and equipment in the lab.

In addition, $23,139 was used to maintain a **cell sorter**. Cell sorters



A picture of the new Leica DMi8 microscope



An enhanced view of a slide on the Leica DMi8 microscope

are used to isolate cells according to their properties. The ability to sort cells by type within organs and tissues can often help establish principles suggested by researchers.

Finally, the center funded new **mouse cages** ($24,866) to house the mice used for research purposes and a new **universal testing system** ($68,763). A universal testing system performs static testing, including analyzing the strength, stiffness, and compression limits of various objects and materials.

Travel

The center also funded the travel for **Dr. Agricola Odoi** ($2,103) and **Ronita Adams** ($2,858). In May 2017, Dr. Odoi traveled to New Orleans, LA, for an NIH conference. This conference was to educate researchers on current research funded by the NIH and included seminars on how to complete the NIH grant funding process. Ronita Adams, a PhD student under Dr. Odoi, traveled to New York, NY, to collect a South African visa. Adams spent the early part of 2017 conducting research in South Africa, collecting data necessary for her PhD research.

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, forty-four CEM students, DVM students, and intern/residents gave oral presentations, along with seven poster presentations. The research day was designed to share research results via a 12-minute presentation, with 3-minutes for questions from the audience. The featured guest speaker for the UT CVM Research Day was **Dr. Budhan S. Pukazhenthi**, a research physiologist at the Center for Species Survival at The Smithsonian Conservation Biology Institute (SCBI). Dr. Pukazhenthi gave a talk, entitled "Developing Assisted Reproductive Technologies for the Conservation of Endangered Equids." The event culminated in an awards ceremony with the winners highlighted below.

2017 UTCVM Research Day Awards

2017 Zoetis Award for Veterinary Research Excellence: in recognition of outstanding research effort and productivity

Dr Brian Whitlock
Department of Large Animal Clinical Sciences

Presentation Award Winners

Graduate Student Category

1st Place – Lisa Amelse, Comparative & Experimental Medicine
Mentor: Dr. Brian Whitlock
Travel award of $500.00
2nd Place – Dr. Andrea Lear, Comparative & Experimental Medicine
Mentor: Dr. Marc Caldwell
Travel award of $300.00
3rd Place – Ronita Adams, Comparative & Experimental Medicine
Mentor: Dr. Agricola Odoi
Travel award of $200.00

Pictured: Dr. Budhan S. Pukazhenthi

Gregory Vernon explains his research poster during the poster session at Research Day.

Veterinary Student Category

1st Place – Kathryn Duncan, Class of 2018
Mentor: Dr. Richard Gerhold
Travel award of $500.00
2nd Place – Rachael Wolters, Class of 2020
Mentor: Drs. Stephen Kania and David Bemis
Travel award of $300.00
3rd Place – Alisha Pedersen, Class of 2019
Mentor: Dr. David Anderson
Travel award of $200.00

Intern/Resident Award of Excellence

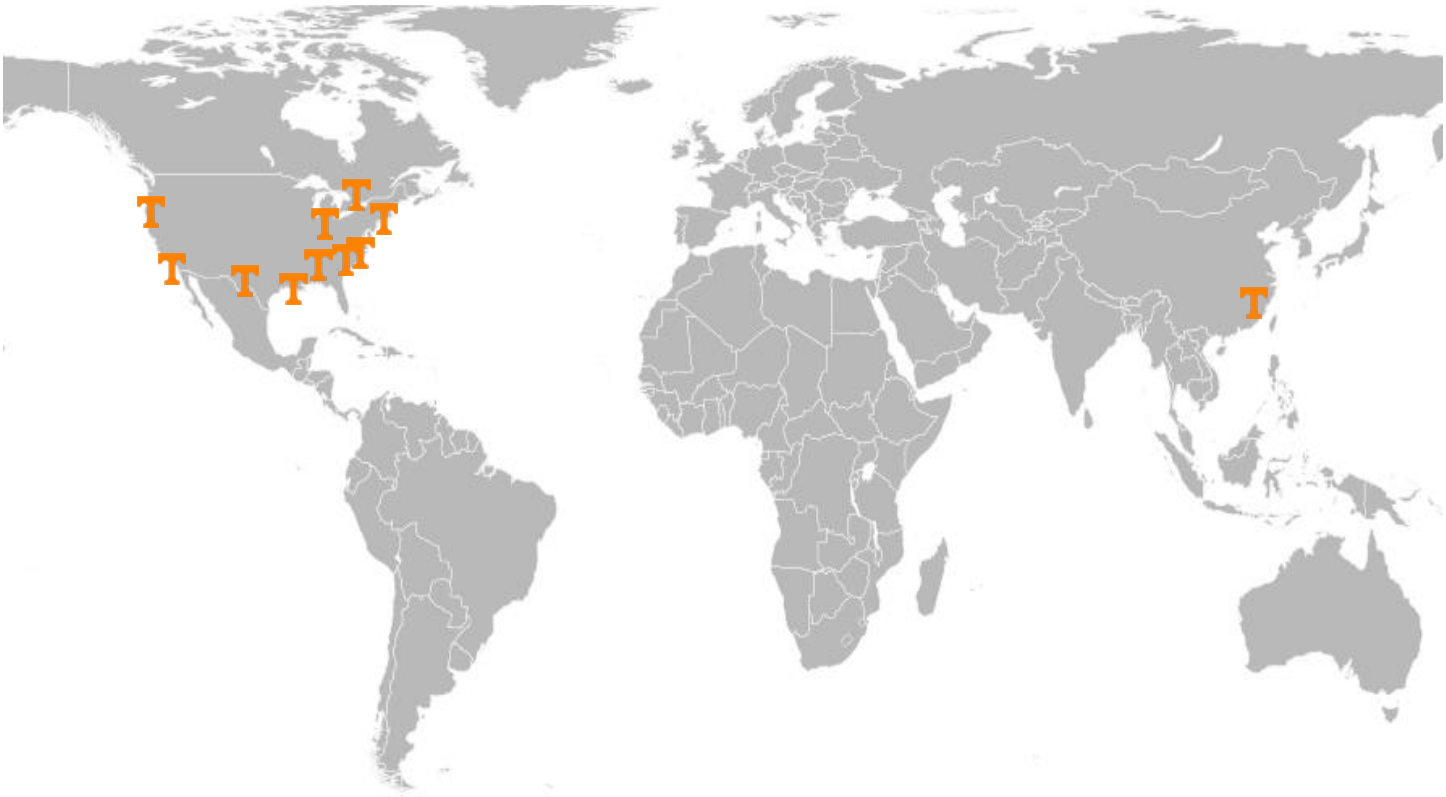
Dr. Christian Latimer with Cassie N. Lux, Sarah Roberts, Marti G. Drum, Cheryl Braswell, and Mee Ja M. Sula.
Dept of Small Animal Clinical Sciences
Travel award of $750.00

Phi Zeta Award for Excellence in Animal Health Research

Dr. Rebecca Hardman, Comparative & Experimental Medicine
Mentor: Dr. Debra Miller
Cash award for $250.00

Dr. Claudia Kirk poses with Katheryn Duncan (Class of 2018) after winning 1st place in the Veterinary Student Category.

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 2016 calendar year can be found in the Publications and Presentations section (pp. 38-43).

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 2016.

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 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 has also manages a Facebook page, a VolVet Connect alumni e-newsletter, and a quarterly referring DVM newsletter. As of December 2016, the Facebook page had 8,521 "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 (3,779 followers), has a YouTube channel with 447 subscribers and 75,877 views since its inception, and a Pinterest presence with 272 followers. The Instagram account has 1,016 followers.

VolVet Vision is a yearly magazine that explores the research, teaching, and outreach services of UTCVM. This year, the magazine featured an inspirational story about Topper, one of the animals affected by the Gatlinburg fires. Topper came in with severe burns to his paws and no identification. With the help of a microchip and a Facebook post, Topper was finally reunited with his family and recovered from his wounds.

Topper the cat was reuinted with his family after being burned in the Gatlinburg fires earlier this year.

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 the UTCVM. Twenty-two 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. Since 2008, students in this program have co-published 63 peer-reviewed research articles.

The center fully funded 18 student stipends for the Summer Student Research Program. A grant from Merial funded two students (Maggie Daves and Kaitlin Smith), and the Morris Animal Foundation sponsored one student (Rachael Wolters). 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 2017, six senior center faculty and three junior member participated in the program. The center will continue to encourage 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

Amanda Jo Calvird

Cumming, GA • 2nd year
BS, Biology, University of Georgia
Faculty Mentor: Richard Gerhold
Summer Project: Investigating the Parasitic Fauna of Commercial Poultry Litter and Understanding the Implication to Wild Turkey Health
Career Interests: Wildlife and pathology

Maggie Daves

Knoxville, TN • 1st year
BS Animal Ecology, Iowa State University
Faculty Mentor: Katie Tolbert
Summer Project: Famotidine treatment of gastric ulcers in cats
Career Interests: Infectious disease research and wildlife medicine

Alyssa Danielle Dozier

Murfreesboro, TN • 2nd year
BS, Animal Science, University of Tennessee
Faculty Mentor: Richard Gerhold
Summer Project: Evaluating poultry parasites for histomonas
Career Interests: Wildlife research

Simone Marie Godwin

Memphis, TN • 1st year
BA, Anthropology, Washington University • MS, Nutrition Science, University of Memphis
Faculty Mentors: Samantha Collins, Andrea Lear, Chika Okafor
Summer Project: Descriptive epidemiology of antibiotic prescribing and case loads at University of Tennessee College of Veterinary Medicine (2010-2016)
Career Interests: Veterinary public health

Heather Marie Kloft

Oxford, OH • 1st year
BS, Finance, Miami University
Faculty Mentors: Mee-Ja Sula, Edward Ramsay
Summer Project: A Retrospective Review of Neoplasia in Non-domestic Felids
Career Interests: Wildlife Conservation, Zoo Research

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

Kaitlin Anne Moorehead

Palo Alto, CA • 1st year
BS, Biology and Psychology, University of Denver
Faculty Mentor: Reza Seddighi
Summer Project: Total Intravenous Anesthesia with Alfaxalone and Fentanyl in Dogs
Career Interests: Zoological medicine, working at a zoo or exotic animal sanctuary

Daniel Luke Mudd

Shelbyville, TN • 1st year
BS Biology, Trevecca Nazarene University
Faculty Mentors: Marc Caldwell, Samantha Collins
Summer Project: Prevalence of disease in cull cattle
Career Interests: Mixed animal medicine, focusing on food animals

Kendall T Ozminski

Mt. Juliet, TN • 1st year
BS, Animal Science, University of Tennessee-Martin
Faculty Mentor: Debra Miller
Summer Project: Development of a New Method for Quantifying Fungal Zoospore Concentrations
Career Interests: Radiology and exotics

Paxton Ann Parker

Franklin, TN • 1st year
BS, Animal Science, University of Tennessee
Faculty Mentor: Brain Whitlock
Summer Project: Central administration of acute phase protein, ORM, causes pyrexia and suppressed feed intake in sheep
Career Interests: large animal medicine and theriogenolgoy

Alisha Potter Pedersen

Charlotte, NC • 2nd year
BA, Chemistry, BS, Psychology, University of North Carolina-Charlotte
Faculty Mentor: David Anderson
Summer Project: Biodegradable intestinal stent pilot study
Career Interests: Pursuing a PhD and hoping to practice large animal medicine and surgery

Brette Elyse Ratliff

White House, TN • 1st year
BS, Animal Science, University of Tennessee-Martin
Faculty Mentor: Elizabeth Drake
Summer Project: Microbiological evaluation of novel treatments for ear infections in dogs
Career Interests: General practitioner

Rachel Rodriguez

Miami, FL • 1st year
BS, Animal Science, University of Tennessee
Faculty Mentor: Madhu Dhar
Summer Project: We will first test the biocompatibility of fat-derived adult human mesenchymal stem cells in commercially-available Gelfoam (Pfizer) and fibrin glue (Eviseel (Baxter)), and an oral demineralized bone matrix.
Career Interests: Mixed animal medicine

Sara Pallay Root

Glenmoore, PA • 2nd year
BS, Animal Science, University of Connecticut
Faculty Mentor: David Anderson
Summer Project: Evaluation of biomaterial coated screws to enhance bone integration in a small ruminant model
Career Interests: Small animal surgery

Leah Elizabeth Shannon

Anchorage, AK • 1st year
BS, Biology, Texas A&M University
Faculty Mentor: Marcy Souza
Summer Project: Evaluation of Clavamox in egg-laying hens
Career Interests: Small animal surgery

Kaitlin Michelle Siegfried

Piney Flats, TN • 1st year
BS, Animal Science, University of Tennessee
Faculty Mentor: Angela Witzel, Julia Albright
Summer Project: Validation of an activity monitor for use in cats
Career Interests: Small animal and exotics medicine and research

Kaitlin Irene Smith

Loyalton, CA • 1st year
BS, Biochemistry, BA Chemistry, University of Chicago
Faculty Mentor: Silke Hecht
Summer Project: Common Origin of Celiac and Cranial Mesenteric Arteries in Dogs – Incidence and Clinical Significance
Career Interests: To become a board certified radiologist

Katie Siegried examines a cat for a study involving feline activity.

Anastasia Elaine Towe

Jacksonville, FL • 1st year
BS, Animal Science, BA, English Writing, University of Pittsburgh
Faculty Mentor: Debra Miller,
Summer Project: Enumerating fungal zoospores
Career Interests: Zoological medicine.

Julieann Vose

Providence, RI • 1st year
BS, Biological and Animal Science, University of Rhode Island
Faculty Mentor: Adesola Odunayo
Summer Project: Evaluation of the Effect of Continuous and Intermittent Doses of Oral Famotidine in Cats
Career Interests: Internal medicine specialist in an academic or private practice setting

Rachael Mare Wolters

Culleoka, TN • 1st year
BS, Agriculture, University of Tennessee-Martin
Faculty Mentor: David Bemis, Stephen Kania
Summer Project: S. pseudintermedius efflux pump
Career Interests: Pursuing a dual DVM/PhD in order to become a clinical scientist in Comparative and Experimental Medicine.

Tyler Wright

Nashville, TN • 2nd year
BA, English, University of the South-Sewannee
Faculty Mentor: Jon Wall
Summer Project: Fluorescence Emission as a measure of dissolution in mice injected with amyloid fibrils
Career Interests: Bovine field services, reproductive medicine, and internal medicine

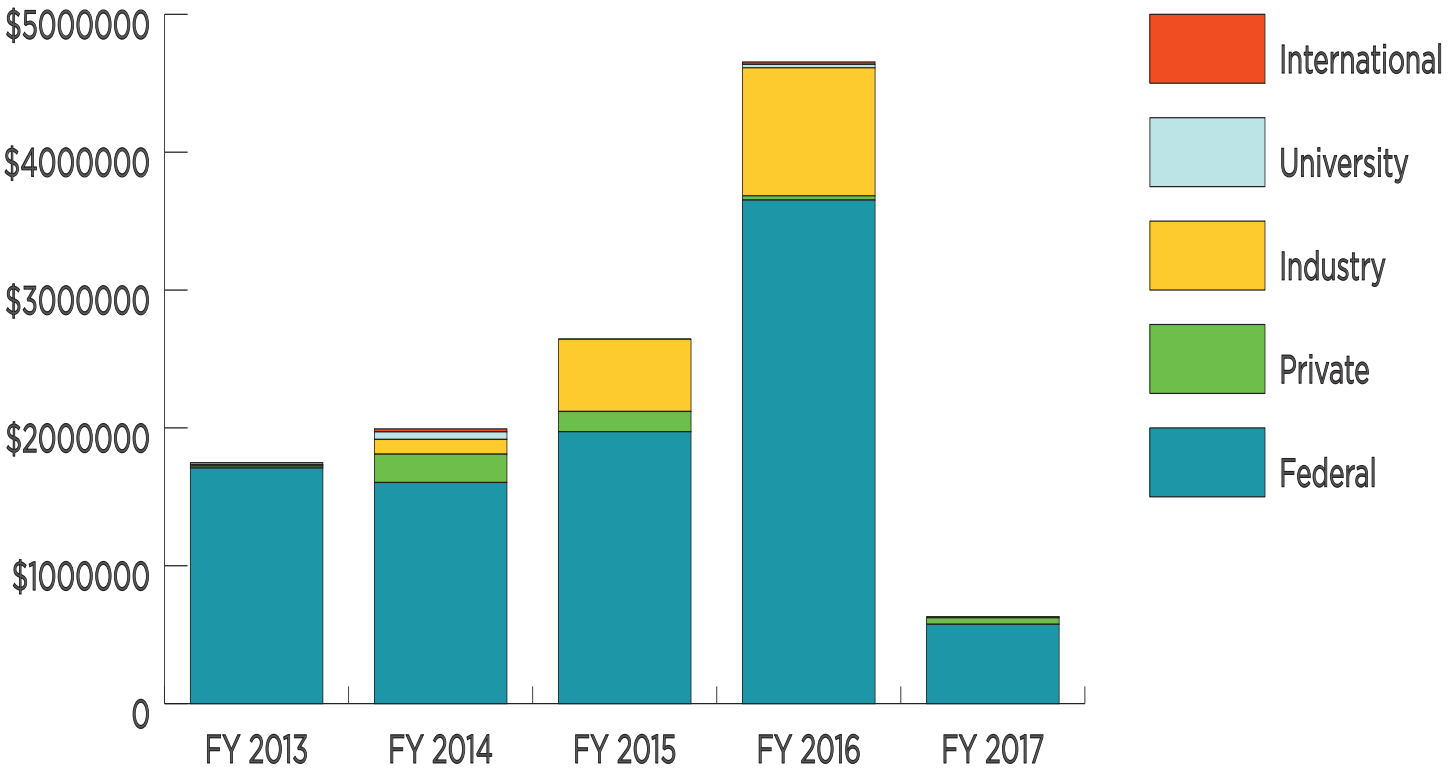
Five-Year Benchmark Data (2013-2017)

Productivity among center faculty has been stable during the last 5-year period. From 2013-2017, center faculty have published 340 articles in peer-reviewed journals and gave 277 presentations at national and international meetings.

Total research funding has gone down from $1,746,627 in 2013 to $630,580 in 2017 (Fig. 2). Figures 2-3 show federal funding from 2013-2017.

Expenditures per faculty member were $138,980 in fiscal year 2017. Over the past 5 years, the mean expenditure amount per faculty member has been $140,145. The 5-year average return on the state's investment in the center is 4.0:1, the ratio of research expenditures to the state's appropriation. For comparison, benchmark data from 2013-2017 are summarized in Figures 2 and 3.

Fig. 2 External Funding by Source (FY 2013-2017)



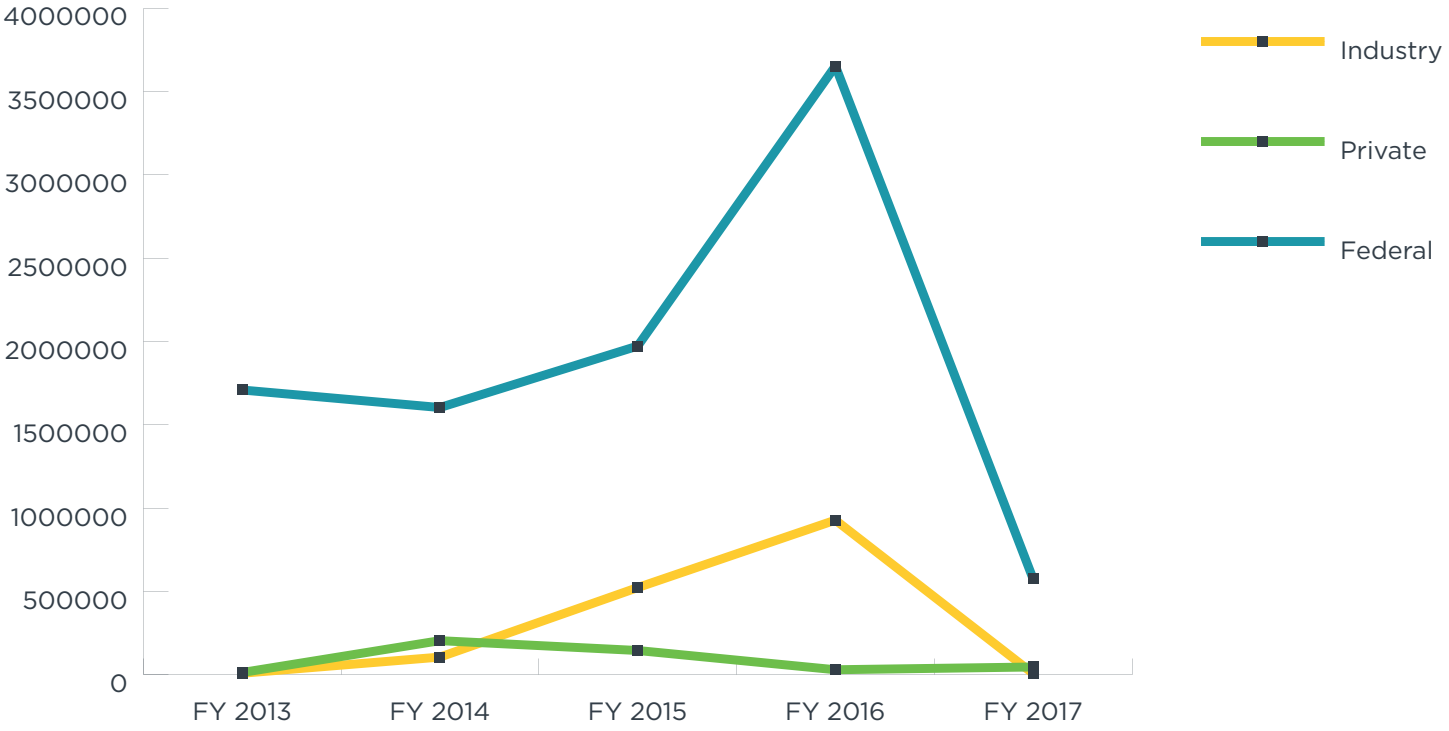
Benchmark Summary (2013-2017)

Center faculty members have worked hard to maintain external funding during this difficult economic period and related constriction of research sponsorship from all quarters, in particular the National Institutes of Health (NIH).

Biomedical research support has stagnated in recent years, with the economic downturn and lack of an effective federal commitment to sustain or increase funding. Our center faculty has experienced this with increased competition for fewer dollars, resulting in a significant reduction in external funding over the past few years; this has been true for all universities.

We do have some cause for hope with several federal grants awarded to center faculty members during fiscal year 2017 and, in particular, our newer faculty members, which may signal renewed growth of external funding coming into our center. The UTCVM will continue to look for new ways to support faculty in obtaining the external sponsorships needed to grow discovery 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 Three External Funding Categories (FY 2013-2017)



Future Plans: Looking Forward

The Center of Excellence in Livestock Diseases and Human Health will continue to foster research programs in 2018 through investments in facilities, equipment, and faculty support. With some transition in research faculty appointments in the College of Veterinary Medicine, we will be taking the opportunity to reassign and revitalize research laboratory space. As a result, several of our current and past Center faculty will be relocating to laboratories that are more conducive to their individual and collaborative research efforts, including Drs. Anderson, Caldwell, Dhar, Tolbert, and Whitlock. With this shift, and as existing laboratory spaces are vacated, out-of-date equipment, materials and supplies can be disposed of and valuable pieces of existing equipment relocated to better serve the needs of these research programs. With elimination of older, nonfunctional pieces of equipment, the Center will also look to update and replace these items. At the same time, floorplans, infrastructure (i.e. emergency power supply lines), and fixed equipment/furnishings will be improved, with faculty input, to maximize space usage and research efficiency. This rearrangement of College research laboratories will not only enhance facilities for existing faculty, it will yield renovated laboratory space available for new faculty hires and programs, including those serving our professional (DVM) students.

Looking to the future, the CVM administration has identified new faculty hires as a high priority to grow our research efforts and improve our graduate and DVM student training programs. To this end, the College has identified infectious disease/immunology and veterinary endocrinology as areas where new faculty hires would bolster existing programs and add important biomedical expertise for our training and outreach programs. National searches were recently launched by the College to fill these positions. To strengthen and promote collaboration between Colleges on the UTIA campus and between UTIA and UT Knoxville campuses, we have also considered the interests and input from other relevant departments, including Microbiology. The UTIA Priorities planning process (initiated in 2015) has also provided guidance for new faculty hires, identifying microbiology and genomics as key opportunities to grow existing and new programs on our campus. As salary lines are identified by our administration, the Center will play a central role in providing critical support for these new hires that will allow them to successfully establish their relevant research programs here at UT, including access to renovated research laboratory space. Looking forward, the Center is positioned to welcome new faculty to the University who will help drive forward innovative avenues of research relevant to livestock and human health, as well as increase collaboration opportunities and strengthen existing Center faculty programs.

Faculty Reports

Dr. David Anderson

PROFESSOR AND DEPARTMENT HEAD
LARGE ANIMAL CLINICAL SCIENCES

Touching a Nerve

Many animals and people suffer from peripheral nerve damage due to physical damage, contact with toxins, or exposure to disease. Peripheral nerve damage disrupts the transmission of nerve impulses and causes uncontrollable motor movements and abnormal sensory sensations. Recently, carbon-based scaffolding has been discovered as an alternative method for joining damaged tissue together. Expounding upon this technology, Dr. Anderson and his team wish to assess the capability of graphene-based scaffold designs to regenerate facial tissue with peripheral nerve damage. His previous research (funded by the COE) showed rapid proliferation and differentiation of PC12 cells in vitro when cultured on a carbon-based scaffold material composed of graphene.

In the future, he will continue his testing on rats by implanting 3D carbon-based scaffolds, along with expanding funding opportunities through collaborations with the Department of Defense. Ultimately, Dr. Anderson's research aims to create nerve scaffolding to aid in Army Trauma and to utilize the success in this study to aid neural based therapies, like spinal and central nerve restoration.

About Dr. Anderson:

- MS | Kansas State University
- DVM | North Carolina State University
- Supported by Boehringer Ingelheim Vetmedica, Inc. and Silverglide
- 2 Publications in 2016

Collaborators: Madhu Dhar and Richard Steiner

Dr. Marc Caldwell

ASSISTANT PROFESSOR
LARGE ANIMAL CLINICAL SCIENCES

About Dr. Caldwell:

- MS, DVM, PhD | Auburn University
- Supported by Advanced Animal Diagnostics, Inc.
- 1 Peer -Reviewed Publication in 2016
- 2 Presentations in 2016

Collaborators: Andrea Lear and Ky G. Pohler

Breaking Through the Placental Wall

With 2016 headlines declaring the dangers of Zika virus, a mosquito-carried virus that infects the mother and creates physical deformities in the fetus, Dr. Caldwell and his research team wondered about the molecules that communicate information between mother and fetus. They observed that exosomes are capable of breaking the placental wall and travel freely between mother and fetus, transmitting information between both parties.

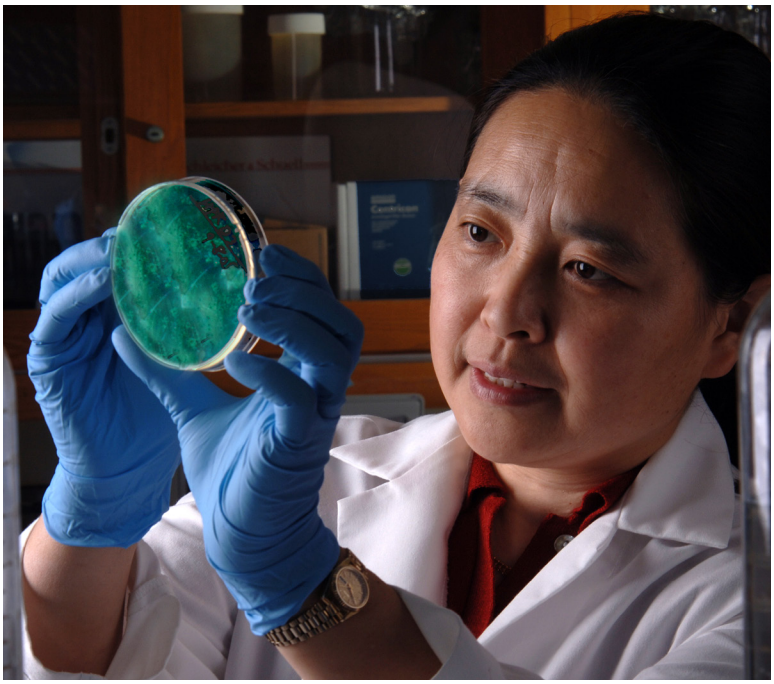
Using sheep as models, ewes were given an infection during gestation and exosomes were monitored to see how they communicated between the mother and fetus in utero. Specifically, his team is extracting data to determine how exosomes move in and out of cells in utero. Furthermore, his team is examining the elements inside of these exosomes, which communicate with the fetus.

Because of the common link between sheep and human placentae, Dr. Caldwell expects his research to easily translate to human neonatal care, specifically helping to answer how disease is transmitted from mother to fetus.

Dr. Mei-Zhen Cui

PROFESSOR
BIOMEDICAL AND DIAGNOSITC SCIENCES

Keeping the Blood Flowing



Nearly 30-40% of coronary artery patients treated with angioplasty or bypass surgery eventually have restenosis, or narrowing of the blood vessels. This means that the same veins and arteries previously treated are now highly prone to another blockage because of restenosis. This narrowing normally happens because of an accumulation of smooth muscle cells. The Cyr61 protein was recently discovered to help increase smooth muscle cell accumulation and migration in the body. In her preliminary data, Dr. Cui discovered that knockdown of Cyr61 blocked 60% of smooth muscle cell migration, thereby keeping the blood vessels stable and free flowing. Using a mouse model, Dr. Cui is reducing the Cyr61 protein to treat restenosis in human heart patients.

In the future, she wants to discover how Cyr61 leads to smooth muscle cell migration and accumulation. She also hopes her research will lead to further funding through the National Institutes of Health (NIH).

About Dr. Cui:

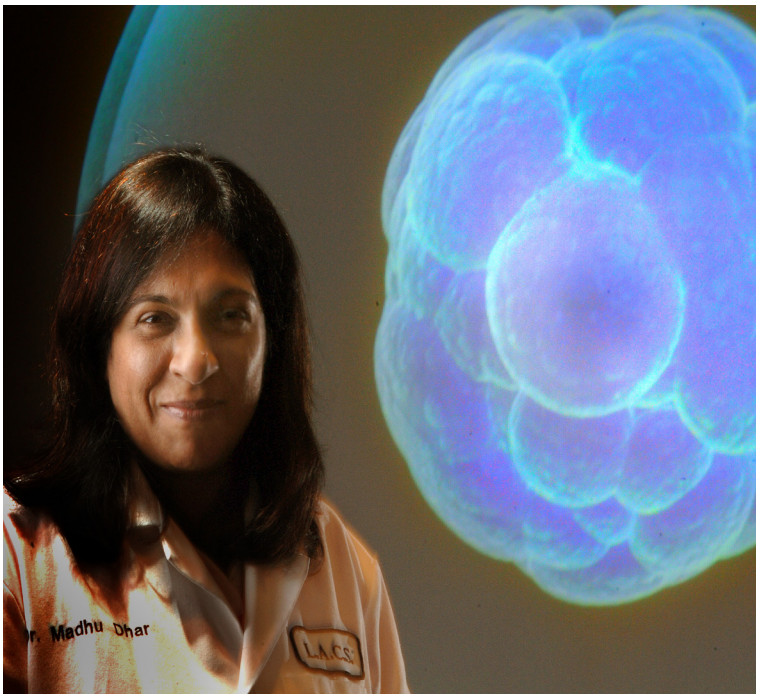
- **BS, MS | Jilin University (China)**
- **PhD | Tokyo Insitute of Technology (Japan)**
- **Supported by National Institutes of Health**
- **3 Peer-Reviewed Publications in 2016**
- **5 Presentations in 2016**

Collaborator: Robert Donnell

Dr. Madhu Dhar

RESEARCH ASSOCIATE PROFESSOR
LARGE ANIMAL CLINICAL SCIENCES

Grow Me a Bone!



About Dr. Dhar:

- MS, PhD | University of Poona (India)
- 3 Peer-Reviewed Publications in 2016
- 1 Book Chapter in 2016

Collaborators: Tom Masi and Steven Newby

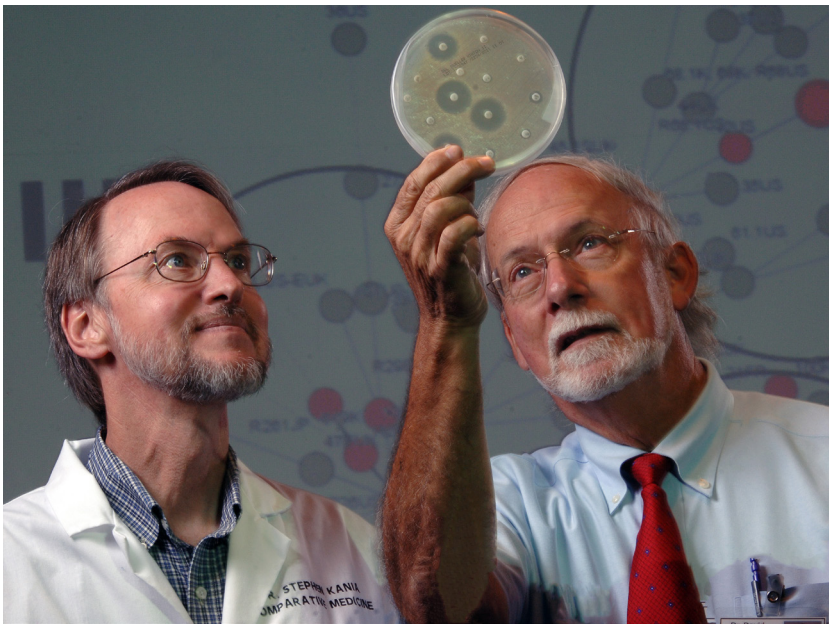
Although bone is naturally able to regenerate, repairing bone defects is challenging for both human and veterinary orthopedic surgeons. Through preliminary data, stem cell research appears to solve many bone tissue regenerative issues. With this in mind, Dr. Dhar and her research team are examining animal stem cells extracted from fat tissue and bone matter to create bone, cartilage, and nerve tissue and observe how these cells work to repair and regenerate damaged tissue. In her lab, these extracted stem cells are placed in a culture dish along with a chemical agent, which reacts with the cells and creates either bone, cartilage, or nerve tissue. As the newly formed tissue cells begin to populate, they are placed inside rat and goat animal models, using scaffolds produced by a lab at the University of Arkansas to hold the cells in place as they adhere to and repair the damaged tissue.

Future endeavors in Dr. Dhar's research include the use of 3D printing via a three-step process: first capturing a CT scan of the damaged tissue, then using 3D biomaterial printing to duplicate the tissue, and finally placing the printed biomaterial inside the animal. This pioneering research in biomedical 3D printing is possible through a collaboration with UT Memphis Medical School. Ultimately, Dr. Dhar hopes that her work with animal stem cell regeneration will eventually translate to human stem cell research, and she has already begun a collaborative work with surgical specialists at UT Medical Center.

Drs. Stephen Kania and David Bemis

PROFESSOR
BIOMEDICAL AND DIAGNOSTIC SCIENCES

PROFESSOR
BIOMEDICAL AND DIAGNOSTIC SCIENCES



About Dr. Kania:

- MS | Washington State University
- PhD | University of Florida
- Supported by Morris Animal Foundation, Egyption Cultureal and Education Bureau, Oklahoma State University Foundation, East Tennessee Clinical Research, Pennsylvania Game Commission, and Merial Limited LLC
- 4 Peer-Reviewed Publications in 2016
- 8 Presentations in 2016

About Dr. Bemis:

- PhD | Cornell University
- Supported by Point of Care Diagnostics, LLC
- 5 Peer-Reviewed Publications in 2016
- 1 Presentation in 2016

Getting Under the Dog's Skin

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. Although there are vaccinations for other staphylococcal infections, such as *Staphylococcus aureas*, the two diseases differ at the protein level, and vaccines used for *S. aureas* cannot be transposed in cases of *S. pseudintermedius*. Therefore, Drs. Stephen Kania and David Bermis have created a new vaccine combining *S. pseudintermedius* with a non-toxic form on Protein A, enabling dogs to build immunity to the disease. The vaccine stimulates the canine immune system with pathogen associated molecular patterns, elicits antibodies against *S. pseudintermedius*, and neutralizes Protein A. 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. Elizabeth Lennon

ASSISTANT PROFESSOR
SMALL ANIMAL CLINICAL SCIENCES

About Dr. Lennon:

- DVM, PhD | North Carolina State University
- Supported by National Institutes of Health
- 1 Presentation in 2016

Collaborators: Maria Cekanova and Katie Tolbert

Under the Microscope

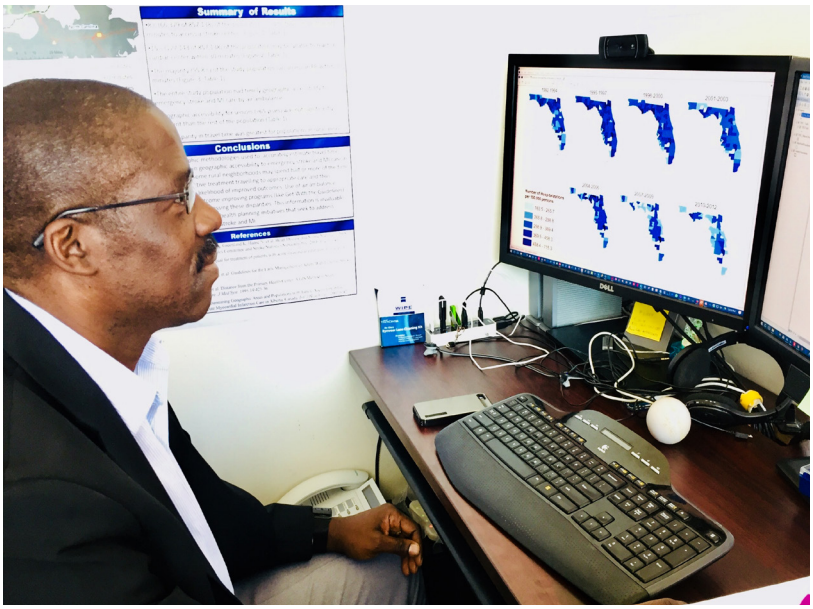
A Leica DMi8 is an inverted florescent microscope with the capability of providing excellent, publication-quality images. Florescent images improve believability and understanding, which enable potential funders and scientific manuscripts to picture the data in a more comprehensive and sophisticated manner. By allowing funders and scientific journals to visualize data through florescent images, UTCVM would increase external funding and expand research publication. Until recently, UTCVM employees were required to travel to UT main campus or UT Medical Center to obtain florescent images, which impeded research progression and increased cost. Previously, it would cost each investigator $60 per hour for confocal microscopy.

Thanks to Dr. Lennon's efforts, a Leica DMi8 has been purchased for the Small Animal Clinical Sciences Department and is available for all UTCVM faculty to use. This microscope will enable UTCVM to grow monetarily through grants and grow in notoriety through increased publications.

Dr. Agricola Odoi

ASSOCIATE PROFESSOR
BIOMEDICAL AND DIAGNOSTIC SCIENCES

No Horsing Around When It Comes to Staph



About Dr. Odoi:

- DVM | Makerere University (Uganda)
- MS | University of Nairobi (Kenya)
- PhD | University of Guelph (Canada)
- 3 Publications in 2016
- 3 Presentations in 2016

Antimicrobial resistant and multidrug resistant staphylococcal infections are on the rise in both humans and animals. Moreover, geographical "hot-spots," or regions consisting of high infection rates, are emerging in both human and animal populations. Because staphylococcal infections are zoonotic, meaning can transfer between animals and humans, it is important that the scientific community understand the epidemiology of the infection. Through his research, Dr. Odoi is investigating the various factors of the infection in order to identify risk factors that spread the infection and possible methods of containment. Dr. Odoi is specifically studying the spread of staphylococcal infections in horses from Kentucky and South Africa. Collaborating with the University of Kentucky and the University of Pretoria (South Africa) veterinary diagnostic labs, Dr. Odoi is able to track the progression of the infection and methods to keep the horses and, ultimately, humans healthy.

Dr. Chika Okafor

ASSISTANT PROFESSOR
BIOMEDICAL AND DIAGNOSTIC SCIENCES

Herding for Antimicrobials

Recently, the Food and Drug Administration (FDA) and Center for Disease Control (CDC) have called for proposals to support the collection of data on antimicrobial use in agriculture. Furthermore, the US Department of Agriculture (USDA) published an action plan to target antimicrobial use in food-producing animals.

Heeding the call from these and other organizations, Dr. Okafor and his team are researching antimicrobial use and practices within various Tennessee cattle producers. In conducting his research, Dr. Okafor wishes to determine the most common drivers for using antimicrobials and the most commonly used type of antimicrobial in cattle. Moreover, he wants to identify common perceptions of Tennessee cattle producers regarding implementing antimicrobials in their cattle. Dr. Okafor's efforts will ultimately improve production, animal health, and public health.

About Dr. Okafor:

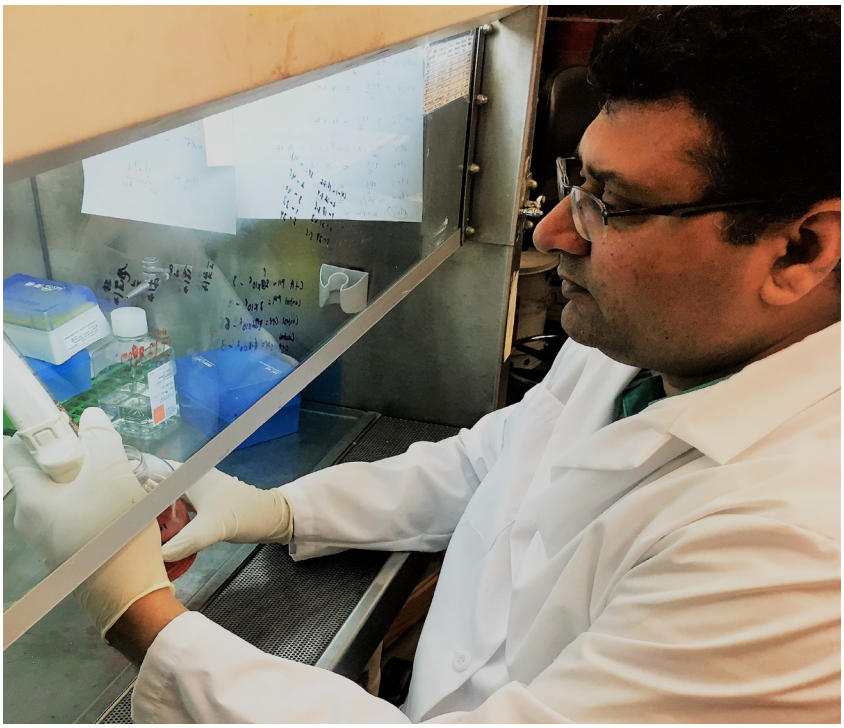
- **DVM | University of Nigeria (Nigeria)**
- **MS, PhD | Michigan State University**
- **Supported by Hill's Pet Nutrition, Inc.**
- **3 Presentations in 2016**

Collaborators: Marc Caldwell and Elizabeth Strand

Dr. Naveen Rajasagi

RESEARCH ASSISTANT PROFESSOR
BIOMEDICAL AND DIAGNOSTIC SCIENCES

Using Science to Regain Sight



Stromal keratitis, caused by the herpes simplex virus infection, is one of the leading causes of infectious blindness in the United States. Recurring cases of stromal disease can have devastating effects on people, ranging from permanent scarring and vision impairment to requiring a corneal transplant. Although acute keratitis is controllable with antivirals, 20% of severe cases are more difficult to control, requiring prolonged treatment with potentially toxic anti-inflammatory drugs and corticosteroids.

About Dr. Rajasagi:

- BS, MS | Acharya N. G. Ranga Agricultural University
- PhD | Louisiana State University
- Sponsored by National Eye Institute
- 2 Publications in 2016

Collaborators: Barry Rouse

Using the primary ocular infection model in mice, Dr. Rajasagi and his team are investigating methods to contain chronic and severe cases of stromal keratitis by using statins, which are usually used for lowering cholesterol and cardiovascular disease. Along with lowering cholesterol, statins also have anti-inflammatory properties and have been used to aid in autoimmune diseases. By incorporating statins in his research, Dr. Rajasagi hopes to lower the inflammatory reactions associated with stromal keratitis. In the future, Dr. Rajasagi's research may lead to therapies that could effectively control or even eliminate stromal keratitis and lead to better quality of life for those infected.

Dr. Katherine Tolbert

ASSISTANT PROFESSOR
SMALL ANIMAL CLINICAL SCIENCES

About Dr. Tolbert:

- BS | Berry College
- DVM | University of Georgia
- DACVIM, PhD | North Carolina State University
- Sponsored by Winn Feline Foundation, ACVIM Veterinary Pharmacology, and Morris Animal Foundation
- 14 Publications in 2016
- 2 Book Chapters in 2016
- 1 Presentation in 2016

Collaborators: Emily Gould

Taking the Bovine Tf by the Horns

Bovine *Tritrichomonas foetus* (Tf) is a flagellated protozoa that causes reproductive failure in cattle and results in significant economic loss for the cattle industry. Because bulls are "silent," or asymptomatic, carriers of the infection, it is difficult to detect and diagnose, especially within a large herd.

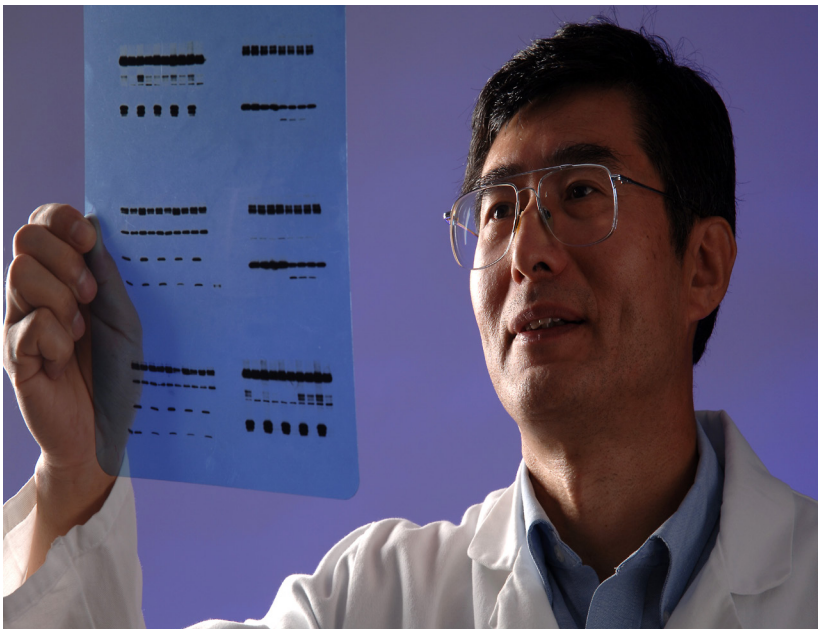
To combat this devastating protozoa, Dr. Tolbert and her team have created an on-site test to easily and quickly diagnose bovine Tf in bulls and prevent the transmission of the infection throughout the herd. To create this test, Dr. Tolbert honed in on a specific aspect of the bovine Tf protozoa, namely Epitope 1.15 and 1.17. Epitope 1.15 and 1.17, surface antigens found in bovine Tf, are easily identified, revealing the presence of bovine Tf.

Interestingly, the pathogenesis of bovine Tf closely resembles *Trichomonas vaginalis* in humans. Preventative strategies have become imperative to decrease the spread of *T. vaginalis* in women, and Dr. Tolbert intends to use her bovine Tf test to also decrease the protozoa in cattle.

Dr. Xu Xuemin

PROFESSOR
BIOMEDICAL AND DIAGNOSTIC SCIENCES

Remembering Alzheimer's Disease



Oxidative stress, or a disturbance in the balance between the production of reactive oxygen species (free radicals) and antioxidant defenses, is at the forefront of Alzheimer's disease research. It appears that oxidized lipids in the central nervous system are risk factors for Alzheimer's disease.

About Dr. Xu:

- MS, PhD | Tokyo Institute of Technology (Japan)
- Sponsored by National Institutes of Health
- 2 Publications in 2016
- 6 Presentations in 2016

The human brain is made up of approximately 60-70% lipids. Among the lipids in the brain, LPA is the most potent bioactive lipid species produced. LPA can induce neuronal apoptsis and thereby participate in neurodegenerative disorders like Alzheimer's disease.

Dr. Xu's preliminary research uncovered that knockdown of DR6 blocked LPA-induced apoptosis. By uncovering how LPA and DR6 relate to each other, along with PSAP, Dr. Xu intends to breakdown the mechanisms causing oxidative stress and help combat the devastating effects of Alzheimer's disease.

PUBLICATIONS AND PRESENTATIONS

David Anderson

PUBLICATIONS

Wolfe D, Caldwell JM, Passler T, Purohit RC, Pascoe D, and **Anderson DE**. High definition thermal imaging assisted diagnosis of lumbosacral spinal nerve impingement in a bull. World Buiatrics Congress, Dublin, Ireland, July 2016, #WBC2016-469.

Coetzee H, Mosher R, **Anderson D**, Gehring R, KuKanich B, White B, and Wang C. Impact of oral meloxicam administered alone or in combination with gabapentin on experimentally-induced lameness in beef calves. World Buiatrics Congress, Dublin, Ireland, July 2016, #WBC2016-1258.

David Bemis

PUBLICATIONS

Corrigan, V.K., A.M. Legendre, L.J. Wheat, R. Mullis, B. Johnson, **D.A. Bemis,** and L. Cepero. Treament of Disseminated and Sinonasal Aspergillosis with Posaconazole in 12 Dogs J. Vet Intern. Med. 2016;30:167-173.

May, E.R., K. A. Conklin, and **D.A. Bemis.** Antibacterial effect of N-acetylcysteine on common canine otitis externa isolates. Vet. Dermatol. 2016;27:188-e47.

Bemis, D.A., B.H. Johnson, M.J. Bryant, R.D. Jones, B. McCleery, C.B. Greenacre, V. Perreten and S.A. Kania. Isolation and identification of Caviibacter abscessus from cervical abscesses in a series of pet Guinea Pigs (Cavia porcellus). J. Vet. Diag. Invest. 2016;28:763-769.

Kennedy, R.C., R.R. Fling, M. Robeson, A.M. Saxton, R. Donnell, J.L. Darcy, **D.A. Bemis,** J. Liu, L. Zhao L. and J. Chen. Temporal Development of Gut Microbiota in Triclocarban Exposed pregnant and Neonatal Rats. Nature Scientific Reports, 6, Article number 33430, 2016;doi:10.1038/srep33430.

Riley, M.C., V. Perreten, **D.A. Bemis,** and S.A. Kania. Complete genome sequences of three important methicillin-resistant clinical isolates of Staphylococcus pseudintermedius. Genome Announc. 2016;4:e01194-16

PRESENTATIONS

Bemis, D.A. (invited panelist), International Society for Companion Animal Infectious Diseases (ISCAID) Staphylococcus intermedius Group (SIG) panel discussion at American College of Veterinary Internal Medicine (ACVIM) Forum 2017, Washington, DC, June 7-10.

Marc Caldwell

PUBLICATIONS

Elkhenary, H, Amelse L, **Caldwell M,** Abdelwahed, R, and Dhar, M. Impact of the source and serial passaging of goat mesenchymal stem cells on osteogenic differentiation potential: implications for bone tissue engineering. *J Anim Sci Biotech*. 2016.

PRESENTATIONS

Collins S, **M Caldwell**, and C Brenham. Microenvironmental sampling techniques of the nasal cavity of cattle and experimental colonization of Mannheimia haemolytica. Paper presented at: Conference of Research Workers in Animal Diseases (CRWAD), Chicago, IL, Dec 4-6, 2016.

Lear AS and **Caldwell M**. Comparison of leukocyte profile determined by point of care analyzer and manual evaluation in calves inoculated with Mannheimia haemolytica and Bovine Viral Diarrhea Virus. Paper presented at: Conference of Research Workers in Animal Diseases (CRWAD), Chicago, IL, Dec 4-6, 2016.

Mei-Zhen Cui

PUBLICATIONS

Hu C, Zeng L, Li T, Meyer MA, **Cui M.-Z,** and Xu X. Nicastrin is required for APP but not Notch processing, while Aph-1 is dispensable for processing of both APP and Notch. *J Neurochem*. 2016;136:1246-1258.

Huang, Y., Wang, Y., Tan L., Sun, L., Petrosino, J., **Cui, M.-Z**., Hao, F., and Zhang, M. Nanospherical arabinogalactan proteins are a key component of the high-strength adhesive secreted by English Ivy. *Proc Natl Acad Sci.* 2016:Jun 7;113(23):E3193-202.

Hao, F., Zhang, F., Wu, D. D., An, D., Shi, J., Li, G., Xu, X., and **Cui, M.-Z.** Lysophosphatidic acid-induced vascular neointimal formation in mouse carotid arteries is mediated by the matricellular protein CCN1/Cyr61. *Am J Physiol Cell Physiol.* 2016 Dec 1;311(6):C975-C984. PMID: 27760754.

PRESENTATIONS

Cui, M.-Z. (Invited speaker) Lysophospholipids and Atherosclerosis. Paper presented at: Scientific Sessions of American Heart Association, New Orleans, LA, Nov 15, 2016.

Cui, M.-Z. (Invited speaker) Lysophosphatidic acid and vascular disease. Paper presented at: Life Science College, Shanxi University, Taiyuan, Shanxi Province, China, Nov. 29, 2016.

Feng Hao, Dong An, Fuqiang Zhang, Xuemin Xu, and **Mei-Zhen Cui** (corresponding author), The matricellular protein CCN1 is a key mediator of smooth muscle cell migration and neointimal formation. Paper presented at: Arteriosclerosis, Thrombosis and Vascular Biology/ Peripheral Vascular Disease, Nashville, TN, May 5-7, 2016.

Chen Hu, Linlin Zeng, Ting Li, Junjie Xu, **Mei-Zhen Cui**, and Xuemin Xu. Pen2 plays a critical role in substrate binding to g-secretase. Paper presented at: Society for Neuroscience (SfN)' 46th annual meeting, San Diego, CA, November 12-17, 2016.

Yunzhou Dong, Yong Wu, Donald McGavin, Xuemin Xu (corresponding author), and **Mei-Zhen Cui** (corresponding author). Lysophosphatidic acid triggers apoptosis in HeLa cells through upregulation of DR6 (TNFRSF21) expression. Paper presented at: Society for Neuroscience (SfN)' 46th annual meeting. San Diego, CA, November 12-17, 2016.

Madhu Dhar

PUBLICATIONS

Elkhenany H, Amelse L, Caldwell M, Abdelwahed R, and **Dhar M**. Impact of the source and serial passaging of goat mesenchymal stem cells on osteogenic differentiation potential: implica-

tions for bone tissue engineering. *J Anim Sci Biotechnol*. 2016;7:16. PMID: 26949532 PMCID: PMC4779249

Cruz Villagrán C, Schumacher J, Donnell R, and **Dhar MS**. A Novel Model for Acute Peripheral Nerve Injury in the Horse and Evaluation of the Effect of Mesenchymal Stromal Cells Applied In Situ on Nerve Regeneration: A Preliminary Study. *Front Vet Sci*. 2016;3:80. PMID: 27695697 PMCID: PMC5023688

Zayed MN, Schumacher J, Misk N, and **Dhar MS**. Effects of pro-inflammatory cytokines on chondrogenesis of equine mesenchymal stromal cells derived from bone marrow or synovial fluid. *Vet J.* 2016;217:26-32. PMID: 27810206

Elkhenany H, Bourdo S, Biris A, Anderson D, and **Dhar M**. Important considerations in the therapeutic application of stem cells in bone healing and regeneration. In: *Stem Cells in Toxicology and Medicine.* 1st ed. Sahu SC, editor. UK: John Wiley and Sons, Ltd.; 2016; 458-480.

Stephen Kania

PUBLICATIONS

Riley MC, Perreten V, Bemis DA, **Kania SA**. Complete Genome Sequences of Three Important Methicillin-Resistant Clinical Isolates of Staphylococcus pseudintermedius. *Genome Announc.* 2016;20;4(5).

Bemis DA, Johnson BH, Bryant MJ, Jones RD, McCleery BV, Greenacre CB, Perreten V, **Kania SA**. Isolation and identification of Caviibacter abscessus from cervical abscesses in a series of pet guinea pigs (Cavia porcellus). *J Vet Diagn Invest.* 2016; 28(6):763-769.

Frank LA, **Kania SA,** Weyant E. RT-qPCR for the diagnosis of dermatophilosis in horses. *Vet Dermatol*. 2016;27(5):431-435.

Eman A. Anis, Linda A. Frank, Raquel Francisco, **Stephen A. Kania**. Identification of canine papilloma virus by PCR in Greyhound dogs. *PEERJ*. 2016;8;4:e2744. eCollection 2016.

PRESENTATIONS

Mohamed A. Abouelkhair, Manasi Balachandran, David Bemis, and **Stephen A. Kania**. Variation of immune response to Staphylococcus pseudintermedius surface-exposed peptides among dogs with pyoderma. Paper presented at: Comparative & Experimental Medicine and Public Health Research Symposium, Knoxville, TN, May 23-24, 2016.

Manasi Balachandran, David Bemis, Jerome Baudry, and **Stephen Kania**. Identification of Staphylococcus pseudintermedius sortase A inhibitors. Paper presented at: Paper presented at: Comparative & Experimental Medicine and Public Health Research Symposium, Knoxville, TN, May 23-24, 2016.

Matthew C. Riley, **Stephen Kania**, and David Bemis. Finished genome sequences of three dominant Staphylococcus pseudintermedius strains reveal differences in virulence and antibiotic resistance. Paper presented at: Comparative & Experimental Medicine and Public Health Research Symposium, Knoxville, TN, May 23-24, 2016.

Chris Millis, **Stephen Kania**, Manasi Balachandran, and David Bemis. Staphylococcus pseudintermedius efflux pump detection and characterization. Paper presented at: Comparative & Experimental Medicine and Public Health Research Symposium, Knoxville, TN, May 23-24, 2016.

Emily N. Gould, Mabre Brand, **Stephen Kania**, and M. Katherine Tolbert. Identification and role of cysteine protease 30 in feline Tritrichomonas foetus: A novel target for preventive and/or therapeutic strategies for feline trichomonosis. Paper presented at: Comparative & Experimental Medicine and Public Health Research Symposium, Knoxville, TN, May 23-24, 2016.

Stephen A. Kania. Research Compliance workshop. Presented at: Data Management, IRB and Animal Use Compliance. UTIA, September 29, 2016.

M. Balachandran, J. Baudry, D. Bemis, and **S.A. Kania**. Cloning and Expression of Staphylococcus pseudintermedius Sortase A gene in Escherichia coli. Paper presented at: American Society

for Microbiology General Meeting. Boston, MA. June 1-5, 2016.

M. A. Abouelkhair, **S. A. Kania**, and D. Bemis. Spa (kkaa) as candidate staphylococcus pseudintermedius vaccine. Paper presented at: Nature conferences, Immune Profiling in Health and Disease, Seattle, WA, October 3-5, 2016.

Elizabeth Lennon

PRESENTATIONS

Lennon EM. Unraveling the Role of the Mast Cell in Inflammatory Bowel Disease. Paper presented at: University of Tennessee Graduate School of Medicine CEM Seminar Series, Knoxville, TN, March 2016.

Agricola Odoi

PUBLICATIONS

Shamarial Roberson, Matthew Dutton, Megan MacDonald, and **Agricola Odoi.** Does place of residence or time of year affect the risk of stroke hospitalization and death? A descriptive spatial and temporal analysis. PLoSONE. 2016;11(1): e0145224. doi:10.1371/journal.pone.0145224.

Daniel Nenene Qekwana, James Wabwire Oguttu, Dries Venter, and **Agricola Odoi**. Disparities in beef tapeworm identification rates in the abattoirs of Gauteng Province, South Africa: a descriptive epidemiologic study. PLoSONE. 2016;11(3): e0151725 http://dx.doi.org/10.1371/journal.pone.0151725

Reza Seddighi, **Agricola Odoi**, and Thomas J Doherty. Effect of dexmedetomidine hydrochloride on tiletamine hydrochloride–zolazepam hydrochloride anesthesia inalpacas. Am J Vet Res. 2016;77(10):1057-1063.

PRESENTATIONS

Ronita Adams, Jackie Smith, Craig Carter, and **Agricola Odoi.** A descriptive epidemiologic study of antimicrobial resistance of Staphylococcus isolated from equine samples submitted to a diagnostic laboratory. Poster presented at: Conference of Research Workers in Animal Diseases (CRWAD), Chicago, IL, Dec 4-6, 2016.

Daniel N. Qekwana, James W. Oguttu, Fortune Sithole, and **Agricola Odoi.** Patterns and predictors of antimicrobial resistance among Staphylococcus spp. from canine clinical cases presented at a veterinary academic hospital in South Africa. Paper presented at: Conference of Research Workers in Animal Diseases (CRWAD), Chicago, IL, Dec 4-6, 2016.

Daniel N. Qekwana, James W. Oguttu, Fortune Sithole, and **Agricola Odoi.** Spatial and antimicrobial susceptibility patterns of Staphylococcus from horses presented at a teaching hospital in South Africa. Paper presented at: Conference of Research Workers in Animal Diseases (CRWAD), Chicago, IL, Dec 4-6, 2016.

Chika Okafor

PRESENTATIONS

Okafor, C.C, Strickland, L.G., Kania, S., Gerhold, R.W., and Whitlock, B.K. Prevalence of Tritrichomonas foetus in Tennessee Beef Bulls. Paper presented at: Canadian Association of Veterinary Epidemiology and Preventive Medicine (CAVEPM), Guelph, Canada, May 16-17, 2016.

Ekakoro, J. E. and **Okafor, C.C.** Investigation of the Determinants of Antimicrobial Use in Livestock

and Companion Animals Among Veterinary Clinicians at The University of Tennessee Veterinary Medical Center. Poster presented at: Canadian Association of Veterinary Epidemiology and Preventive Medicine (CAVEPM), Guelph, Canada, May 16-17, 2016.

McCarty, K., Wilcox, A., Souza, M., Gerhold, R., Omara, R., **Okafor, C.C,** Dell, B., and Masembe, C. Bushmeat Roulette. Poster presented at: The Wildlife Society's Annual Conference, Raleigh, NC, Oct 15-19, 2016.

Naveen Rajasagi

PUBLICATIONS

Rajasagi, NK and Rouse, BT. IL-2 complex treatment amplifies CD8+ T cell mediated immunity following herpes simplex virus-1 infection. Microbes Infect. 2016;16:648-60. PMID: 24956596.

Mari, ER, Rasouli, J, Ciric, B, Moore, JN, Conejo-Garcia, JR, **Rajasagi, N,** Zhang, GX, Rabinovich, GA, and Rostami, A. Galectin-1 is essential for the induction of MOG35-55 -based intravenous tolerance in experimental autoimmune encephalomyelitis. Eur J Immunol. 2016;46:1783-96. PMID: 27151444

Katherine Tolbert

PUBLICATIONS

E. Gould, C. Clements, A. Reed, L. Giori, J.M. Steiner, J.A. Lidbury, J.S. Suchodolski, M. Brand, T. Moyers, L. Emery, and **K. Tolbert.** A Prospective, Placebo-Controlled Pilot Evaluation of Oral Omeprazole on Serum Calcium, Magnesium, Cobalamin, Gastrin Concentrations, and Bone in Cats. JVIM. 2016.

Tolbert MK and Gookin JL. Mechanisms of feline Tritrichomonas foetus pathogenicity with insights from venereal trichomonosis. JVIM. 2016;30:516-26.

Lane M, Larson J, Hecht S, and **Tolbert MK.** Medical management of gastrinoma in a cat. J Feline Med & Surg Open Reports. 2016.

Tolbert MK, Gould E, and Brand M. Cysteine protease inhibitors ameliorate feline Tritrichomonas foetus-induced intestinal epithelial cytopathogenicity. 2016 AJVR;77(8):890-7.

Pasciak AS, Nodit, L, Bourgeois AC, Paxton BE, Coan PN, Clark CT, **Tolbert MK,** Adams JK, Arepally A, and Bradley YC. How sensitive is the upper gastrointestinal tract to Yttrium 90 radioembolization? A histologic and dosimetric analysis in a porcine model. J Nucl Med. 2016.

Pasciak AS, Bourgeois AC, Paxton BE, Nodit, L, Coan PN, Kraitchman D, Stinnett SS, Patel VM, Fu Y, Adams JK, **Tolbert MK**, Lux CN, Arepally A, and Bradley YC. Bariatric radioembolization: A pilot study on technical feasibility and safety in a porcine model. J Vasc Interventional Rad. 2016.

Parkinson S and Tolbert MK. Hematochezia in a dog. Clin Brief. July 2016.

Olin S and **Tolbert MK**. Starting off right: Checklists are essential for a good history. Vet Team. September. 2016.

Olin S and **Tolbert MK.** Starting off right: A good gastrointestinal history. Vet Team October. 2016.

Olin S and **Tolbert MK**. Starting off right: A good history to help identify pain. Vet Team BriefNovember/December. 2016.

E Gould and **Tolbert MK.** Top 5 Recommendations for Using Acid Suppressants Effectively. Clinician's Brief. November 2016.

Tolbert MK, Graham A, Odunayo A, Price J, Steiner JM, Newkirk K, and Hecht S. Repeated Famotidine Administration Results in a Diminished Effect on Canine Intragastric pH Over Time. JVIM. 2017;31:117-123.

Howard J, Fisher J, and **Tolbert MK**. Invasive tracheal neoplasia in eight cats: descriptive cases and review of the current literature. JFMS Open Reports. 2017. February 1. Early view.

Lane M, Larson J, Stokes J, and **Tolbert MK.** Continuous radiotelemetric monitoring of intragastric pH in a dog with peptic ulceration. JAVMA. 2017;250:530-533.

Tolbert MK. Gastrointestinal Endoscopy. In: Textbook of Veterinary Internal Medicine. 8th Edition. 2017. 437-440.

Tolbert MK. Feline Trichomonosis. In: Lane IF and Stokes J, eds. Veterinary Medicine. New York: Decision Support in Medicine, LLC. 2017. Accessed at https://www.decisionsupportinmedicine.com.

PRESENTATIONS

Smith P, **Tolbert K,** Gould E, Knych H, and Messenger K. Pharmacokinetics, sedation, and hemodynamic changes following oral transmucosal administration of detomidine gel in cats. Paper presented at: International Veterinary Emergency and Critical Care Symposium, Grapevine, TX, September 2016.

Xuemin Xu

PUBLICATIONS

Hao, F., Zhang, F., Wu, D. D., An, D., Shi, J., Li, G., **Xu, X.,** and Cui, M.-Z., Lysophosphatidic acid-induced vascular neointimal formation in mouse carotid arteries is mediated by the matricellular protein CCN1/Cyr61. Am J Physiol Cell Physiol. 2016;311(6):C975-C984. PMID: 27760754.

Hu, C., Linlin Zeng, Ting Li Zhang, Cui, M.-Z., and **Xu, X.** Nicastrin is required for APP but not Notch processing, while Aph-1 is dispensable for processing of both APP and Notch. J Neurochem. 2016;36,1246-1258.

PRESENTATIONS

Xu, X. Molecular mechanism of Alzheimer's Disease. Paper presented at: Shanxi University, Taiyuan, China, Nov 28, 2016.

Xu, X. Role of PSAP in Amyotrophic lateral sclerosis. Paper presented at: Department of Pathology, Anatomy and Cell Biology, Thomas Jefferson University, October 19, 2016.

Xu, X. Role of Pen-2 in g-secretase activity. Paper presented at: University of Tennessee, Medical Center, August 16, 2016.

Xu, X. Role of PSAP in Neurodegenerative disease. Paper presented at: Jilin University, Changchun China, July, 8, 2016

Chen Hu, Linlin Zeng, Ting Li, Junjie Xu, Mei-Zhen Cui, and **Xuemin Xu.** Pen2 plays a critical role in substrate binding to g-secretase. Paper presented at: Society for Neuroscience (SfN) 46th annual meeting, San Diego, CA, November 12-17, 2016.

Yunzhou Dong, Yong Wu, Donald McGavin, **Xuemin Xu,** and Mei-Zen Cui. Lysophosphatidic acid triggers apoptosis in HeLa cells through upregulation of 17 DR6 (TNFRSF21) expression. Paper presented at: Society for Neuroscience (SfN) 46th annual meeting, San Diego, CA, November 12-17, 2016.

Research Funded Externally

Investigator	Project Title	Funding Agency	Project Period	2017 Receipts	2017 Expenditures
David Anderson	Bone Regeneration	Univ. of Arkansas	7/1/16 - 6/30/17	$0	$460,175
	Prostaglandin E2 (PGE2) Testing	Boehringer-Ingelheim	7/1/16 - 6/30/17	$0	$32,889
Marc Caldwell	Leukocyte profile evaluation in calves with bovine respiratory disease	Advanced Animals Diagnostics, Inc.	7/1/16 -6/30/17	$0	$8,633.75
Mei-Zhen Cui	Novel mechanism mediating LPA-induced smooth muscle cell and vascular responses	National Institutes of Health	6/15/11-5/31/17	$0	$62,303
Stephen Kania	2017 Merial Veterinary Scholars Research Program	Merial Limited	5/1/17-4/30/18	$5,000	$4,974
	UTCEM graduate student sponsorship	Egyptian Cultur-al & Educational Bureau	7/29/15–7/28/19	$7,876	$20,151
	Development of a live animal serological ELI-SA assay for detection and surveillance of Parelaphostrongylus tenuis in cervids	Oklahoma State University Foundation	12/1/15–11/30/16	$0	$14,080
	Development of a live animal serological ELI-SA assay for detection and surveillance of Parelaphostrongylus tenuis in cervids	Tufts University	3/15/16–3/14/17	$0	$4,220
	Immune response to parasite vaccine	East Tennessee Clinical Research	4/1/16–6/30/18	$0	$30,950
	Development of a live animal serological ELI-SA assay for detection and surveillance of Psoroptes mites in elk	Pennsylvania Game Commission	8/1/16-7/31/18	$2,875	$2,070

Investigator	Project Title	Funding Agency	Project Period	2017 Receipts	2017 Expenditures
Elizabeth Lennon	Characterization of the novel protective role of the mast cell in colitis	National Institutes of Health	12/01/2015-5/31/2019	$126,900	$117,992.41
Chika Okafor	Randomized clinical trial to investigate the effectiveness of educational materials and information to pet owners in reducing post-operative obesity in dogs and cats	HIlls Pet Nutrition, Inc.	9/01/2016-4/30/2020	$7,438	$0
Naveen Rjasagi	Controlling Ocular Inflammation With lipid Mediators Derived From Omega-3 Fatty Acids	National Institutes of Health	8/1/14-5/31/17	$0	$100,557
	T regulatory Cells in HSV Immunity and Immunopathology	National Institutes of Health	2/1/2011-1/31/2016	$0	$9,081
	Mechanisms of Herpetic Keratitis	National Institutes of Health	1/1/2012-1/31/2017	$0	$306,264
	Mechanisms of Herpetic Keratitis	National Institutes of Health	2/1/2017-12/31/2020	$448,710	$266,361
Katie Tolbert	Evaluating the effect of prolonged famotidine administration in cats	Winn Feline Foundation	4/21/2017-4/20/2018	$19,668	$13,715.17
	Evidence for the use of acid Suppressants in cats with CKD	American College of Veterinary Med	1/01/16-12/31/16	$0	$11,053.04
	Evaluating the Effect of Probiotic Therapy on Feline Tritichomonas foetus infection	Winn Feline Foundation	4/21/2017-4/20/2018	$17,864	$625.39
Xuemin Xu	Pathogenic role of the novel mitochondrial apoptotic protein PSAP in ALS	National Institutes of Health	9/1/16-8/31/18	$220,500	$210,747
TOTALS				**$630,580**	**$1,667,760**

Actual, Proposed, and Requested Budget

The University of Tennessee College of Veterinary Medicine Center of Excellence for Livestock Diseases

	FY 2016-17 Actual		
	Matching	Appropr.	Total
Expenditures	$177,283	$354,566	$531,849
Salaries			
Faculty			$0
Other Professional	$8,351	$16,701	$25,052
Clerical/ Supporting	$29,946	$59,892	$89,838
Assistantships	$1,510	$3,020	$4,530
Total Salaries	$39,807	$79,613	$119,420
Longevity (Exclude from Salaries)	$100	$200	$300
Fringe Benefits	$8,655	$17,310	$25,965
Total Personnel	**$48,562**	**$97,123**	**$145,685**
Non-Personnel			
Travel	$7,019	$14,038	$21,058
Software	$115	$230	$345
Books & Journals	$6	$11	$17
Other Supplies	$51,271	$102,543	$153,814
Equipment	$44,182	$88,365	$132,547
Maintenance	$885	$1,771	$2,656
Scholarships	$1,841	$3,681	$5,522
Consultants			$0
Renovation			$0
Other (Specify):	$131	$262	$392
Printing, publications, postage	$2,009	$4,017	$6,026
Contract special services	$20,744	$41,488	$62,232
Professional services, memberships	$518	$1,037	$1,555
Total Non-Personnel	**$128,722**	**$257,442**	**$386,164**
GRAND TOTAL	**$177,283**	**$354,566**	**$531,849**
Revenue			
New State Appropriation		$492,214	$492,214
Carryover State Appropriation		$703,759	$703,759
New Matching Funds	$246,107		$246,107
Carryover from Previous Matching Funds	$351,879		$351,879
Total Revenue	**$597,986**	**$1,195,973**	**$1,793,959**

NOTE: Carry Forward of $1,157,913 is budgeted in FY18 and targeted for the following anticipated expenditures: $500K for renovations to research space, including benchtop molecular biology laboratories and animal facilities; $658K for research equipment, technical staffing/services, and operating expenses in support of new research faculty members, a new program being launched in livestock genomics, and improvement of ongoing research efforts.

FY 2017-18 Proposed			FY 2018-19 Requested		
Matching	Appropr.	Total	Matching	Appropr.	Total
$637,982	$1,275,963	$1,913,945	$299,344	$598,687	$898,031
		$0			$0
$8,351	$16,701	$25,052	$14,100	$28,200	$42,300
$32,279	$64,559	$96,838	$50,564	$101,128	$151,691
$1,510	$3,020	$4,530	$2,550	$5,099	$7,649
$42,140	$84,280	$126,420	$67,213	$134,427	$201,640
$100	$200	$300	$169	$338	$507
$8,655	$17,310	$25,965	$14,614	$29,228	$43,842
$50,895	**$101,790**	**$152,685**	**$81,996**	**$163,993**	**$245,989**
$9,567	$19,134	$28,701	$11,852	$23,704	$35,556
$115	$230	$345	$194	$388	$583
$6	$11	$17	$10	$19	$29
$184,605	$369,209	$553,814	$86,573	$173,146	$259,719
$200,000	$400,000	$600,000	$74,602	$149,204	$223,805
$885	$1,771	$2,656	$1,495	$2,990	$4,485
$1,841	$3,681	$5,522	$3,108	$6,216	$9,324
		$0	$0	$0	$0
$166,667	$333,333	$500,000	$0	$0	$0
$131	$262	$392	$221	$442	$662
$2,009	$4,017	$6,026	$3,392	$6,783	$10,175
$20,744	$41,488	$62,232	$35,026	$70,053	$105,079
$518	$1,037	$1,555	$875	$1,750	$2,626
$587,087	**$1,174,173**	**$1,761,261**	**$217,348**	**$434,695**	**$652,042**
$637,982	**$1,275,963**	**$1,913,945**	**$299,344**	**$598,687**	**$898,031**
	$504,021	$504,021		$529,222	$529,222
	$841,407	$841,407		$69,465	$69,465
$252,011		$252,011	$264,611		$264,611
$420,704		$420,704	$34,733		$34,733
$672,714	**$1,345,429**	**$2,018,143**	**$299,344**	**$598,687**	**$898,031**

Real. Life. Solutions.™

11/01/2017