CENTER OF EXCELLENCE

in

Livestock Diseases & Human Health

2022 Annual Report

UTIA INSTITUTE OF AGRICULTURE THE UNIVERSITY OF TENNESSEE

UTCVM INSTITUTE OF AGRICULTURE THE UNIVERSITY OF TENNESSEE

THE UNIVERSITY OF TENNESSEE KNOXVILLE

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College of Veterinary Medicine

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About the Institute

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

The College of Veterinary Medicine (CVM) is one of only 29 fully accredited veterinary colleges in the nation. The central mission of the College is educating Doctor of Veterinary Medicine (DVM) students seeking a career in one of many aspects of the profession ranging from clinical practice to research. The College also serves the public in providing referral medicine services to pet owners, zoos, and the livestock industry through the UTCVM Veterinary Medical Center. In addition, the College protects public health, enhances medical knowledge through research and education of graduate students, and generates economic benefits to the state and nation. Outreach programs engage an array of citizens and their animals in learning programs that explore the human-animal bond and promote wellbeing.

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

UT AgResearch has been the central incubator and economic engine that develops "Real. Life. Solutions." so farmers and agricultural industries can supply affordable and wholesome products to the citizens of Tennessee and the world for almost 140 years. Its dedicated workforce of 145 research faculty, 365 staff members, and 270 graduate students maintains a diverse and balanced program supporting Tennessee's $80 billion economy built on agriculture and forestry industries. Ten field locations, known as AgResearch and Education Centers, capture the state's diverse environment and serve as outdoor laboratories where scientists can demonstrate innovative developments for stakeholders and clients to see first-hand the research results that can benefit their operations

UT Extension is often called "every citizen's front door to the University of Tennessee" because it maintains an office and staff of educators in each of the state's 95 counties. UT Extension Agents deliver research-based education designed to improve the lives and livelihoods of each citizen by enhancing agricultural production, building stronger families, and strengthening communities. These educational programs are accomplished by partnering with local, state, and national agencies to conduct hands-on learning events, certification programs, field research, local demonstrations, and assistance in agriculture, natural resources, community economic development, family and consumer sciences, and 4-H youth development. UT Extension agents are continually trained on the most current research-based information by faculty in each of the UTIA departments who specialize in the translation of science into application, inform the work of UT AgResearch faculty, and conduct translational research themselves.

ADMINISTRATION

Dr. David E. Anderson

Associate Dean for Research and Graduate Studies

Dr. Stephen A. Kania

Former Assistant Dean for Research and Graduate Studies

Dr. Agricola Odoi

Assistant Dean for Research and Graduate Studies

Dr. James P. Thompson

Dean, College of Veterinary Medicine

Dr. Linda C. Martin

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

OUR MISSION

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

Letter from the Dean

I am pleased to present the 2022 annual report for the Center of Excellence in Livestock Diseases and Human Health. This Center of Excellence is based in the College of Veterinary Medicine, UT Institute of Agriculture at the University of Tennessee, Knoxville. The Center is dedicated to the advancement of human and animal health through promotion of translational and interdisciplinary research. This annual report serves to inform our stakeholders of the important work done by faculty, staff, and students engaged in research and discovery for the purpose of finding solutions to complex problems for the betterment of society.

Within this report, you will find a comprehensive overview of the utilization of funds to support the Center's missions:

- Promotion of interdisciplinary activities designed to improve the quality of human life through advances in animal health;
- Expand livestock disease research capabilities;
- Identify animal diseases that affect people and which may serve as models for human disease;
- Develop new strategies for the diagnosis, treatment, and prevention of disease in animals and people.

The 2022 fiscal year represents a transitional year in which our people are returning to their normal research program work after lifting of the restrictions of the COVID-19 pandemic. Laboratories are fully open, and research projects involving animals are being conducted without limitations. National and international research programs and scientific conferences continue to follow various restrictions, with some returning to in-person meetings, some using hybrid formats of in-person and virtual participation, and some continuing to offer virtual options only. Overall, COE faculty published 90 peer-reviewed manuscripts, book chapters, abstracts, and proceedings, which resulted in a strong ratio for scientific publication of 4.1 per COE faculty. As our faculty, staff, and students navigate the ever-changing landscape, we continued to be creative and adaptive to the "new" normal.

Within this report, research and productivity of faculty benefitting from COE funding are highlighted, including faculty who received seed grants and new faculty who received start-up funding; we have also included details of our student scholar programs during FY22. Our faculty have made significant advancements to grow research, particularly in the areas of molecular diagnostics, infectious disease and immunology, vector borne diseases, regenerative and rehabilitative sciences, and prevention and treatment of livestock diseases that affect agricultural productivity. Metrics used to assess annual return on investment show extramural funding and research expenditures remain strong. In FY22, the ratio of research funding to state appropriation for the Center exceeded 3.3:1 – for every $1 invested in the COE, faculty earned $3.30 from external funding sources.

I am proud of the dedication and extraordinary efforts of our faculty, staff, and students. The College is actively recruiting new research engaged faculty who will contribute to the missions of the Center. We hope you enjoy this summary presentation of Center activities and accomplishments.

Dr. James P. Thompson, *Dean*

UT College of Veterinary Medicine

Summary of Accomplishments

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

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

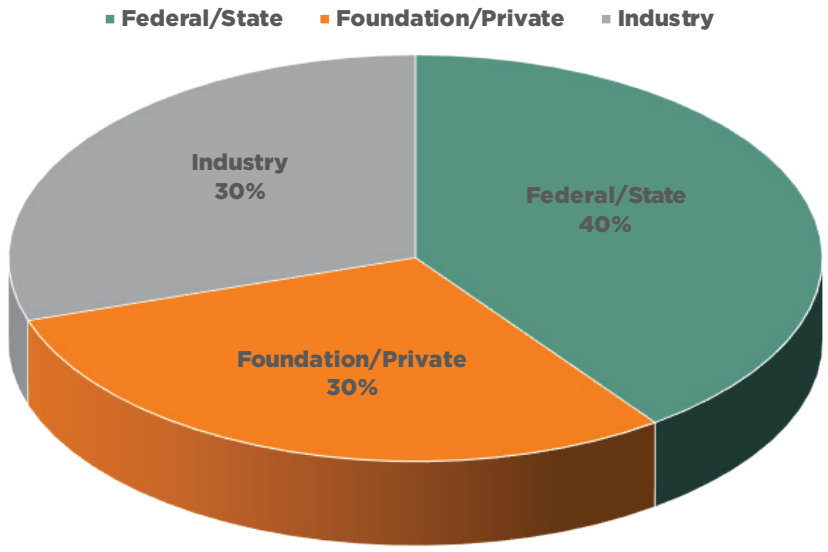
The Center of Excellence plays a vital role in advancing human and animal health by supporting faculty and students, providing resources to maintain research infrastructure, and assisting in the acquisition of state-of-the-art research equipment. Faculty and students receiving support from the Center of Excellence play a vital role in discovering new knowledge regarding the interrelationships among humans, animals, and the environment. Faculty scientists associated with the Center and focused in parasitology, virology, and immunology established a new program in molecular diagnostics. This expansion of the disease diagnostic capabilities will speed identification of disease using more precise and accurate technologies.

In FY22, the Center provided research seed grants to nine faculty. These grants provide necessary funds to support research and develop preliminary data which is used to increase competitiveness for extramural funding. In addition to seed grants, the Center provided start-up support to 13 new faculty to help them establish their laboratories, purchase equipment, support research staff and graduate students, fund preliminary studies, and promote collaboration across UT and the state. Scientific conferences transitioned to post-pandemic formats including in-person, virtual only platforms, and hybrid platforms based on local concerns regarding the on-going pandemic. Despite the continuing effects of the pandemic, Center of Excellence faculty remained actively engaged during calendar year 2021 through scientific publications and presentations to local, national, and international audiences. 2022 Center of Excellence faculty accounted for 75 peer-reviewed journal articles, 15 book chapters, and 73 presentations, of which 34 were presented at national and seven were at international conferences. Scholarly productivity metrics show that COE faculty published an average of 3.4 journal articles per faculty member and an average of 3.3 scientific presentations in the form of oral, poster, and abstract presentations.

Research expenditures by Center of Excellence faculty significantly increased in FY22 and total research funding increased approximately 20%. Extramural funding increases were driven by marked increases in private foundation grant awards and competitive University grant awards. Total extramural and intramural award funding in FY22 was $ 1,798,901.00, resulting in a FY22 return on the state COE allocation of 3.3:1.

Pictured above is a digital rendering of the College's new Teaching and Learning Center. The primary focus of this building is to serve as a simulation center that will foster and educational and interactive environment for the College.

Sources of Internal Funding, FY22



Benchmark	2021 (17 Faculty)	2022 (20 Faculty)
	N[1]	N[2]
Publications	**63**	**90**
Peer-Reviewed Articles	59	75
Book Chapters/Abstracts/Proceedings	4	15
Presentations/Posters/Abstracts	**105**	**73**
International	14	7
National	53	34
State or Local	38	32
Invention Disclosures	**3**	**2**
Patent Filings	**1**	**None**
Research Funding[3]		
External Funding	$1,339,883.89	$1,442,277.00
Internal Funding	$355,607.00	$356,624.00
Total Research Expenditures	$1,362,190.02	$1,692,618.21
Return on Investment[4]	**2.3:1**	**3.3:1**

[1] Publications and presentations for COE faculty during calendar year 2021.
[2] Publications and presentations for COE faculty during calendar year 2022.
[3] Research funding and expenditures for COE faculty during FY22.
[4] Return on investment based on ratio of extramural funding to COE allocation for FY22.

PROGRAM REPORT

Introduction

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

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

Areas of research emphasis by FY22 COE faculty include:

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

The faculty supported by the Center further engage with the mission of the Institute of Agriculture, University, and UT system to amplify the impact of new knowledge and its application for the betterment of livestock and human health. Among others, some of these collaborative programs include:

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

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

Personnel

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

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

Dr. Madhu Dhar
Chair of Research Committee

Morgan Tolbert
Oversees submissions of faculty proposals for funds

Emily Ford
Annual report production

Research Funding

Research Funding from External and Internal Sources, FY22

Lead Investigator	Federal/State	Industry	Foundation/Private	University	Total
Dr. Jonathan Abbott	-	-	-	-	-
Dr. Mohammed Abouelkhair	-	-	-	-	-
Dr. Elizabeth Collar	-	-	-	$24,998	$24,998
Dr. Michelle Dennis	-	-	-	$75,000	$75,000
Dr. Madhu Dhar	$342,340	$24,656	-	$64,194	$431,190
Dr. Cassio Ferrigno	-	-	-	-	-
Dr. Richard Gerhold	$55,000	$11,027	$7,500	$49,500	$123,027
Dr. Chiara Hampton	-	-	-	-	-
Dr. Ashley Hartley	-	-	-	-	-
Dr. Stephen Kania	-	$6,050	-	$39,135	$45,185
Dr. Stephanie Kleine	-	-	-	$6,000	$6,000
Dr. DeNae LoBato	-	-	-	-	
Dr. Girish Neelakanta	-	-	-	-	
Dr. Sreekumari Rajeev	$15,000	-	$100,244	$39,250	$154,494
Dr. Augustin Rius	-	-	-	$13,760	$13,760
Dr. Barry Rouse	-	-	-	$14,787	$14,787
Dr. Joseph Smith	-	-	-	-	-
Dr. Hameeda Sultana	-	-	-	-	-
Dr. Rebecca Trout Fryxell	$220,000	-	-	$15,000	$235,000
Dr. Brian Whitlock	-	-	$660,460	$15,000	$675,460
TOTALS	**$632,340**	**$41,733**	**$768,204**	**$356,624**	**$1,798,901**

Research Expenditures

Research Expenditures, FY22

Lead Investigator	Federal/State	Industry	Foundation/Private	Total
Dr. Jonathan Abbott	$4.066.87	-	-	$4.066.87
Dr. Mohammed Abouelkhair	$47,052.28	-	-	$47,052.28
Dr. Elizabeth Collar	$30,641.72	-	-	$30,641.72
Dr. Michelle Dennis	$2,090.22	$1,725.30	-	$3,815.52
Dr. Madhu Dhar	$85,666.98	$23,185.67	-	$108,852.65
Dr. Cassio Ferrigno	-	-	-	-
Dr. Richard Gerhold	$41,933.23	$63,755.64	$53,557.83	$159,246.70
Dr. Chiara Hampton	$1,873.40	-	-	$1,873.40
Dr. Ashley Hartley	-	$5,519.98	-	$5,519.98
Dr. Stephen Kania	$12,888.37	$33,555.23	$2,210.87	$48,654.47
Dr. Stephanie Kleine	$2,453.58	-	-	$2,453.58
Dr. DeNae LoBato	-	-	-	-
Dr. Girish Neelakanta	$468,605.26	-	-	$468,605.26
Dr. Sreekumari Rajeev	$55,696.33	$19,472.71	-	$75,169.04
Dr. Augustin Rius	$48,588.82	$63,677.87	-	$112,266.69
Dr. Barry Rouse	$181,623.89	$1,275.04	-	$182,898.93
Dr. Joseph Smith	$809.82	-	-	$809.82
Dr. Hameeda Sultana	$311,144.41	-	-	$311,144.41
Dr. Rebecca Trout Fryxell	$64,422.06	$177.37	$2,695.05	$67,294.48
Dr. Brian Whitlock	$10,000.49	$52,251.92	-	$62,252,41
TOTALS	**$1,369,557.73**	**$264,596.73**	**$58,463.75**	**$1,692,618.21**

Allocation of Funding

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

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

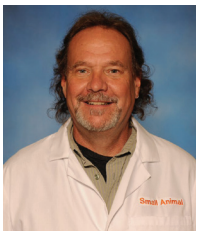
Other Center of Excellence funds are used to promote faculty research through the COE seed grant program. Seed grants are awarded annually through the Center's call for research proposals, which occurs each spring. The UTCVM research committee reviews each proposal and makes recommendations to the College's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

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

Pictured above is a photo of the groundbreaking ceremony for the College's new Teaching and Learning Center. From left to right: Drs. Stephen Kania, Dennis Geiser, Jim Thompson, Bob Denovo, India Lane, Mike McEntee, Juegen Schumacher, David Anderson, and Carla Sommardahl.

Start-Up Funds

The Center provided $597,555 in start-up funds for 13 junior faculty members to help them establish their research programs in FY22. Each faculty member's start-up funding amount and research interests are described below:



Dr. Jonathan Abbott
Small Animal Clinical Sciences
$5,000
Research Interests: Feline myocardial disease; congenital cardiac disease; canine heart failure.

Dr. Mohamed Abouelkhair
Biomedical & Diagnostic Sciences
$65,124
Research Interests: Microbial bioinformatics; development of new molecular assays for detection of existing and emerging infectious disease; immunology.

Dr. Elizabeth Collar
Large Animal Clinical Sciences
$78,750
Research Interests: Race horses; sport horses; and translational musculoskeletal disease with a focus on subchondral bone.

Dr. Michelle Dennis
Biomedical & Diagnostic Sciences
$24,000
Research Interests: Pathogenesis and diagnosis of natural disease, with special interest in aquatic animals and wildlife.

Dr. Cassio Ferrigno
Small Animal Clinical Sciences
$5,000
Research Interests: Limb deformity corrections, complex fractures treatment, orthopedic implant biomechanics, patellar luxation, and cruciate disease.

Dr. Chiara Hampton
Large Animal Clinical Sciences
$5,000
Research Interests: Stress alleviation, tranquilization, sedation, general anesthesia in swine, transfusion medicine and blood typing in swine, and translational research.

Dr. Ashley Hartley
Small Animal Clinical Sciences
$7,500
Research Interests: Small animal medicine, with particular research focuses in infectious diseases, immunology, and hepatobiliary diseases.

Dr. Stephanie Kleine
Small Animal Clinical Sciences
$5,000
Research Interests: Chronic pain management; non-steroidal anti-inflammatory drug pharmacology; anesthesia and inflammation.

Dr. Denae LoBato
Biomedical & Diagnostic Sciences
$5,833
Research Interests: Co-infections; fungal and mycobacterial infections; wildlife disease.

Dr. Girish Neelakanta
Biomedical & Diagnostic Sciences
$172,119
Research Interests: Vector-borne diseases and molecular aspects of host-pathogen interactions; and development of transmission-blocking vaccines.

Dr. Sreekumari Rajeev
Biomedical & Diagnostic Sciences
$68,000
Research Interests: Host pathogen interaction; diagnosis and prevention of *Leptospira*; infectionn in animals; diagnostics and vaccines; development for Ehrlichia canis and Anaplasma platys infection in dogs.

Dr. Joseph Smith
Large Animal Clinical Sciences
$5,000
Research Interests: Pharmacology; small ruminants; ruminant pain management; comparative animal models.

Dr. Hameeda Sultana
Large Animal Clinical Sciences
$172,119
Research Interests: Pharmacology; small ruminants; ruminant pain management; comparative animal models.

Infrastructure and Supplies

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

Equipment

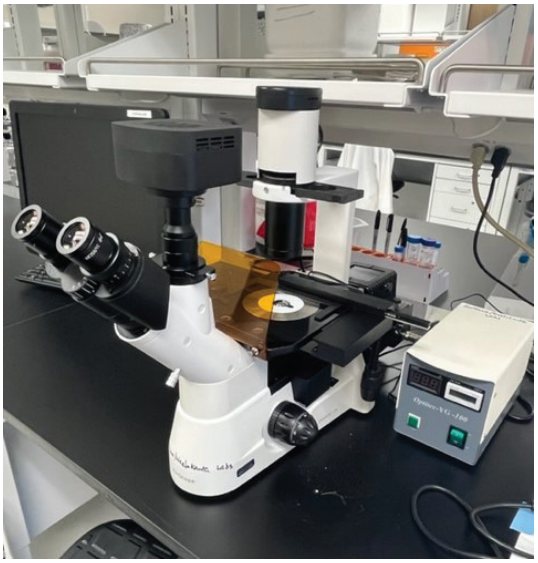
During FY22, equipment purchases totaled $195,047.51. This equipment was associated with a variety of research laboratories, including the vector borne and zoonotic disease laboratories and the regenerative medicine laboratories. The new equipment included a research digital radiography unit, cell imaging microscopes and equipment, two environmental chambers, microbial incubators, a MiniSeq sequencing system, micro-centrifugation units, a water purification unit, stereo microscope imaging systems, a fluorescent microscope, and microinjection systems. The function of these essential units allows for the performance and analysis of western blots, polymerase chain reactions to detect the presence and identify genetic material, microfluidics for the analysis of particles, a controlled environmental chamber used to incubate ticks during experiments, and a micro-injector used for inoculation of ticks, *Drosophila* embryos, adult flies, mosquitoes, and cells.

Travel

Travel was limited during FY22 because of the on-going COVID-19 pandemic. Faculty and students continued to engage in regional, national, and international conferences, which occurred mostly in virtual formats.

This environmental chamber allows for controlled environments to be maintained to optimize viability of ticks.

The Genesys 30 visible spectrophotometer performs spectrophotometry to conduct analysis of liquid and solid samples.



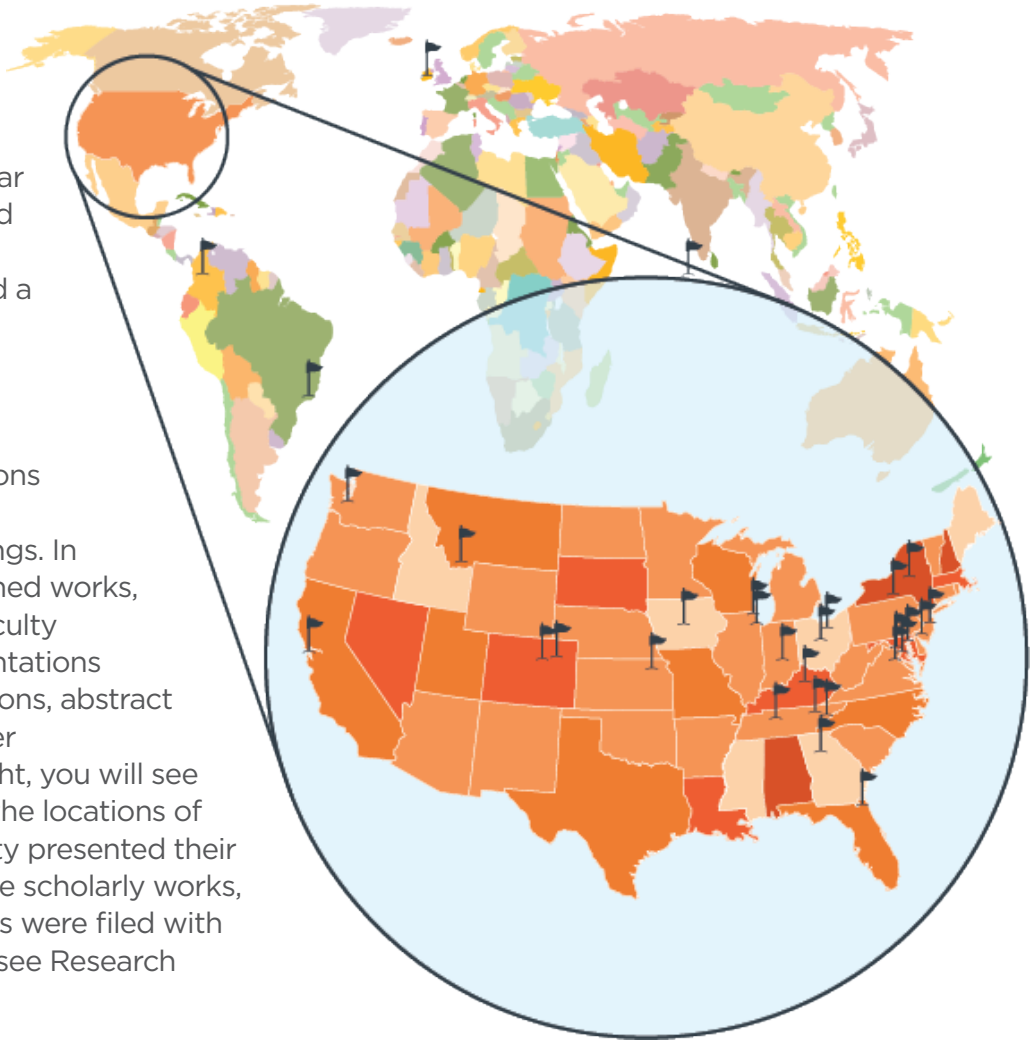
This stero microscope is used for inspection and manipulation of specimens in a low power magnified field with reflected illumination of the specimens.

This Aria Bio-C36 ventilated cabinet allows for biosafety so that laboratory work can be performed safely by personnel.

This NEXT Equine DR x-ray system allows digital radiographs to be taken of the body. This unit is portable and can be moved and used at the research site where the animals are housed.

Dissemination of Research

Center of Excellence faculty are strongly encouraged to disseminate their research discoveries through publications, presentations at scientific meetings, presentations of posters, and participation in scientific panels. A complete list of faculty publications and presentations is included at the end this annual report for calendar year 2021. The 20 funded faculty members of the Center of Excellence had a total of 90 publications. Seventy-five of these publications were peer-reviewed scientific articles, and 15 publications included book chapters, abstracts, and proceedings. In addition to these published works, Center of Excellence Faculty participated in 73 presentations including oral presentations, abstract presentations, and poster presentations. To the right, you will see a world map indicating the locations of meetings at which faculty presented their work. In addition to these scholarly works, two invention disclosures were filed with the University of Tennessee Research Foundation in 2021.



Inventors	Title	Status
Andrea Lear and **Stephen Kania**	Blood Based Pregnancy Test for Alpacas	Invention Disclosure
Stephen Kania, Elizabeth Fitzpatrick, Scott Strome, and Santosh Kuma	Autoimmune and Inflammatory Disorders in Animals	Invention Disclosure

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.

UTCVM appeared on the local NBC affiliate WBIR Channel 10's "Live at Five at Four" news show three times over the last year. "Live at Five at Four" has an average of 70,000 viewers each day. The College also manages several Facebook pages: official College page (14,448 likes), alumni page (1,451 likes), Charles and Julie Wharton Large Animal Hospital at UT page (2,400 likes), Equine Performance & Rehabilitation Center at UTCVM page (1,400 likes), and a UTCVM-WHO Wellbeing page (127 likes). Page administrators post clinical and research information for users to the Facebook pages, as well as on the College's other social media pages such as Instagram (2,858 followers) and Twitter (4,697 followers). The College's YouTube channel has 1,260 subscribers.

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

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

THE CONVERSATION

UTCVM has also launched the VOLVet Voice Podcast that shares the stories of knowledge, compassion, and discovery from the college that create Real. Life. Solutions.

.

VOLVet Voice

THE STORIES OF
Knowledge. Compassion. Discovery.

Summer Student Research

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

Twenty-five students participated in laboratory and field research and attended professional development seminars where speakers addressed topics such as career opportunities in research, compliance issues in laboratory animal care, data visualization, science writing, scientific presentations, and the grant proposal process. Near the end of the ten-week program, the students presented their research findings to their colleagues and to University of Tennessee College of Veterinary Medicine faculty and staff. Four students (Katelyn Broadway, Taylor Demers, Myranda Gorman, and Allie Andrews) presented at the 2022 National Veterinary Student Symposium held at St. Paul Minnesota. Myranda Gorman received an honorable mention in the veterinary student research category. Her manuscript, which was derived from her research conducted through the 2021 Summer Student Research Program, was listed in the top three in the veterinary student research category. The summer scholars receive an opportunity to present their work to a broad audience and earn awards at the College's annual Research Day on September 19, 2022. This year, three summer student researchers (Taylor Demers, Kendra Rich, and Alex Shanks) placed within the veterinary student presentation category. More information about the awards these students received can be found on pages 24 and 25 of this report.

The Center fully funded nineteen student stipends for the Summer Student Research Program. Four students attended the National veterinary Scholar Symposium. A grant from Boehringer Ingelheim funded three students (Katelyn Broadway, Taylor Demers, and Myranda Gorman). Twelve UTCVM veterinary students who gained research experience in the summer program are currently enrolled in the College's DVM/PhD program. Drs. Stephen Kania and Sreekumari Rajeev, both Center faculty members, coordinated the program.

To maximize student opportunities, the program is open to both Center and non-Center faculty. During FY22, six Center faculty members participated in the program. The Center continues to encourage the participation of its faculty in mentoring DVM students.

Pictured from left to right: Allie Andrews, Dr. Sreekumari Rajeev, Taylor Demers, Myranda Gorman, and Katelyn Broadway.

The COE Summer Student Research Program travels nationally! Four COE Summer Student Research Program students presented at the 2022 National Veterinary Scholars Symposium.

Jaclyn Azelby
Faculty Mentor: Dr. Sreekumari Rajeev
Summer Project: Characterization of *Microbacterium* isolates obtained from companion animals

Kendall Barnes
Faculty Mentor: Dr. David Anderson
Summer Project: Bone cement volume effect on temperature

Kailee Bennett
Faculty Mentor: Dr. Joseph Smith
Summer Project: Pharmacodynamics and pharmacokinetics of pantoprazole in sheep

Amber Bisenieks
Faculty Mentor: Dr. Michelle Dennis
Summer Project: Freshwater mussel mass mortality events

Katelyn Broadway
Faculty Mentors: Dr. Richard Gerhold
Summer Project: Parasites of wild turkeys from Middle Tennessee

Madison Callicott
Faculty Mentor: Dr. Michelle Dennis
Summer Project: Histologic effects of mercury in smallmouth bass (*Micropterus dolomieu*) in the Great Smoky Mountains National Park

Isabelle Correia
Faculty Mentors: Dr. Michelle Dennis
Summer Project: Pathology of endangered Antillean manatees

Katherine Deal
Faculty Mentors: Dr. David Anderson
Summer Project: Osteoblast cell differentiation within equine and bovine scaffolds in the presence of BMP-2

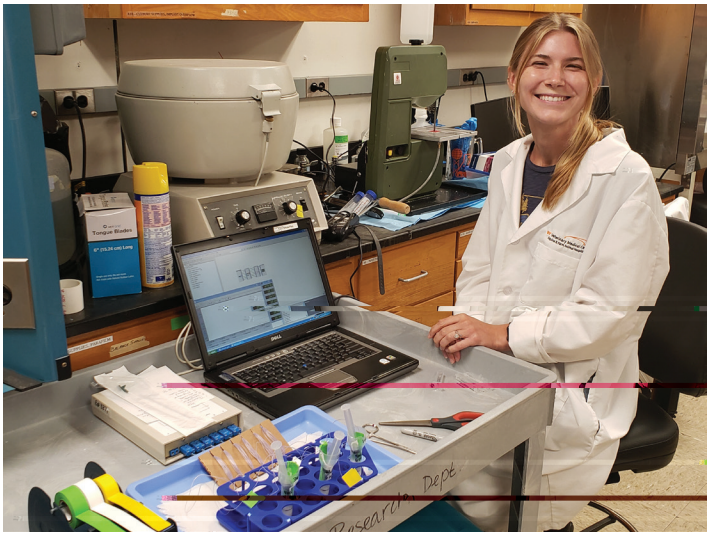
Taylor Demers
Faculty Mentor: Dr. Deb Miller
Summer Project: Parasites in wild-caught *Notophthalmus viridescens* experimentally infected with *Batrachochytrium salamandrivorans*

Erin Elminowski
Faculty Mentor: Dr. Julia Albright
Summer Project: Efficacy of white noise as a part of an anxiolytic and analgesic protocol to treat post-operative pain following hemilaminectomy in dogs

Piper Gauthier
Faculty Mentor: Dr. Andrea Lear
Summer Project: Development of a blood-based ELISA pregnancy test for alpacas using PAGs

Celia Gelpey
Faculty Mentors: Mohamed Abouelkhair
Summer Project: Development of reverse transcription loop-mediated isothermal amplification (RT-LAMP) assay for rapid detection of canine distemper virus

Myranda Gorman
Faculty Mentors: Dr. Sreekumari Rajeev
Summer Project: Testing virulence of a Leptospira strain in hamsters: A preliminary study



Kendall Barnes, UTCVM Class of 2025 conducting research pertinent to her project titled, "Bone cement volume effect on temperature."

Anna Hauck
Faculty Mentor: Dr. Nora Springer
Summer Project: Identifying novel biomarkers of canine lymphoma outcome

Rebekah Johnson
Faculty Mentor: Dr. Elizabeth Collar
Summer Project: Pharmacokynetics and pharmacodynamics of intravenous and oral esomeprazole in sheep

Megan Kinsella
Faculty Mentor: Dr. Deb Miller
Summer Project: Assessment of sea turtle health

Monica Lee
Faculty Mentors: Dr. Richard Gerhold
Summer Project: Fecal float and examination of tissue samples for parasites of black bears (*Ursus americanus*)

Ally Mayhew
Faculty Mentor: Dr. Julie Sheldon
Summer Project: Hematology and plasma chemistry comparisons among juvenile American black bears (*Ursus Americanus*) undergoing rehabilitation

Kendra Rich
Faculty Mentor: Dr. Rebecca Hardman
Summer Project: Health assessments of wild-caught gopher tortoises

Tamara Roba
Faculty Mentor: Dr. Sreekumari Rajeev
Summer Project: Is *Leptospira* infection prevalent in cattle in Tennessee?

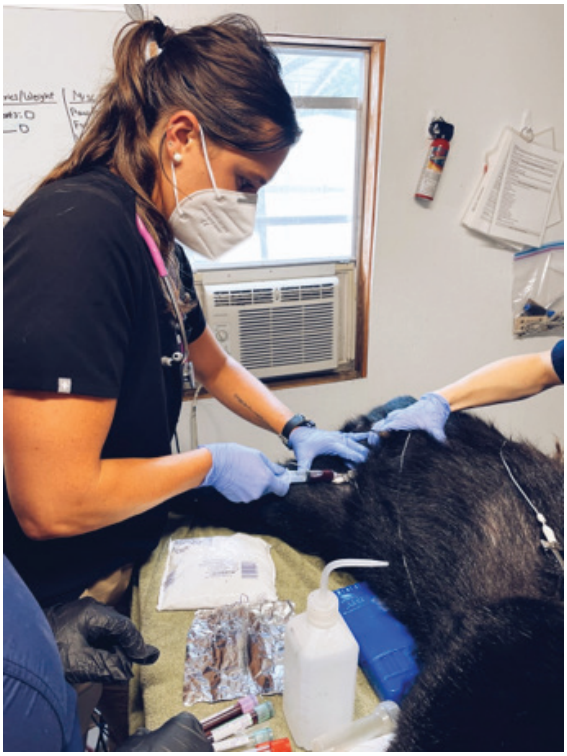
Cambrie Schumacher
Faculty Mentors: Dr. Stephanie Kleine
Summer Project: Evaluating the use of Galliprant as an analgesic for felines undergoing ovariohysterectomy

Alex Shanks
Faculty Mentor: Dr. Chiara Hampton
Summer Project: The quest of effective oral sedation: A tale of 10 pigs

Emily Sutherland
Faculty Mentor: Dr. Darryl Millis
Summer Project: The detection of sound waves within joints and its correlation with joint disease

Hannah Sylaidis
Faculty Mentor: Dr. Brian Whitlock
Summer Project: The effects of endotoxin-induced inflammation on expression of lutenizing hormone-ß in the anterior pituitary of ruminents

Molly Werder
Faculty Mentors: Dr. Darryl Millis
Summer Project: The detection of sound waves within joints and its correlation with joint disease



Ally Mayhew, UTCVM Class of 2024, collecting samples from an American black bear for her project titled, "Hematology and plasma chemistry comparisons among juvenile American black bears (*Ursus Americanus*) *undergoing rehabilitation."*

UTCVM Research Day

The Center was a major sponsor of the University of Tennessee College of Veterinary Medicine Research Day held on September 19, 2022. This event is designed to serve as a venue for students and new investigators to gain experience in showcasing their research while also providing potential collaboration and networking opportunities. This year, Research Day was held both in-person and virtually. Twenty-six of the College's comparative and experimental graduate students and 19 of the College's professional veterinary students delivered oral presentations. Four presentations were delivered by College post-docs. Post-doc presenters included Drs. Waqas Ahmed, Liana Nunes Barbosa, Prachi Namjoshi, and Mahesh Puthuyotti Poyil. Residents presented three presentations, and those presenters included Drs. Catherine Burlison, Leah Moody, and Juliet Ross. In addition, three residents who are also earning their PhD through the College's comparative and experimental medicine graduate program presented. These presenters included Drs. Morgan Adkins, Caroline Griffin, and Nicole Szafranski. One faculty member, Dr. Tim Chamberlain, who is obtaining his PhD through the College's comparative and experimental medicine graduate program, presented as well. Student presentations were scored based on their performance. The winners of Research Day awards are highlighted below.

2022 UTCVM Research Day Awards

Graduate Student Category

1st Place (tied) – Dr. Kristin Bowers, Comparative & Experimental Medicine
"Mesenchymal stem cell use in acute tendon injury: In vitro tenogenic potential vs. in vivo dose response"
Mentor: Dr. David Anderson
Travel award: $500.00

1st Place (tied) – Jeronimo Silva, Comparative & Experimental Medicine
"An interdisciplinary approach to assessing freshwater mussel health and mortality in the Clinch River"
Mentors: Drs. Michelle Dennis and Augustin Engman
Travel award: $500.00

3rd Place – Dr. Amy Webb, Comparative & Experimental Medicine
"Cytological investigation of brown pigment lesions in mountain star coral (Orbicella faveolata)"
Mentor: Dr. Michelle Dennis
Travel award: $200.00

Veterinary Student Category

Phi Zeta Award for Excellence in Animal Health Research (1st Place) – Taylor Demers, Class of 2025
"Parasites in wild-caught Notophthalmus viridescens experimentally infected with Batrachochytrium salamandrivorans"
Mentors: Drs. Deb Miller and Wesley Sheley
Award: $400.00 travel award and $250.00 cash award from Phi Zeta

2nd Place – Kendra Rich, Class of 2025
"Gopher tortoise health assessment"
Mentor: Drs. Deb Miller and Rebecca Hardman
Travel award: $300.00

3rd Place – Alex Shanks, Class of 2025
"Pharmacokinetics of oral clonazepam in commercial swine (Sus scrofa)"
Mentor: Dr. Chiara Hampton
Travel award: $200.00

Faculty Awards

Dr. Deb Miller was awarded the **Boeringher Ingelheim Faculty Research Mentoring Award**. This award recognizes a faculty member who excels in teaching, training, and sharing their knowledge with students pursuing advanced degrees in research at the University of Tennessee College of Veterinary Medicine.

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

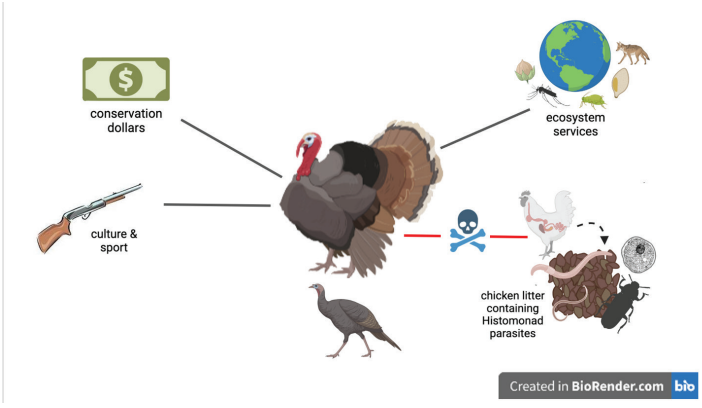
Boehringer Ingelheim

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

zoetis

Three Minute Thesis

On April 6, 2022, fourteen participants presented at the fifth annual University of Tennessee Three Minute Thesis (3MT) competition watch party. The 3MT event is held as a part of the University of Tennessee's Graduate and Professional Student Appreciation Week. This competition challenges master's and doctoral students to communicate their unique thesis or dissertation to an audience unfamiliar with the subject. Competitors have three minutes to explain their research using only one slide or photo. The College of Veterinary Medicine's comparative and experimental medicine graduate program had one participant, Laura Horton, in the competition. Laura's presentation was titled, "Wild turkey conservation in Tennessee." Laura provided an overview of turkey population decline trends and reasons for why the wild turkey population is declining. Laura's presentation mainly focused on the role parasites, specifically the protozoan parasite called *Histomonas meleagridis*, have in the decline of the turkey population.



A photo of Laura Horton's Three Minite Thesis (3MT) Batrachochytrium salamandrivorans *Infection in Salamanders."*

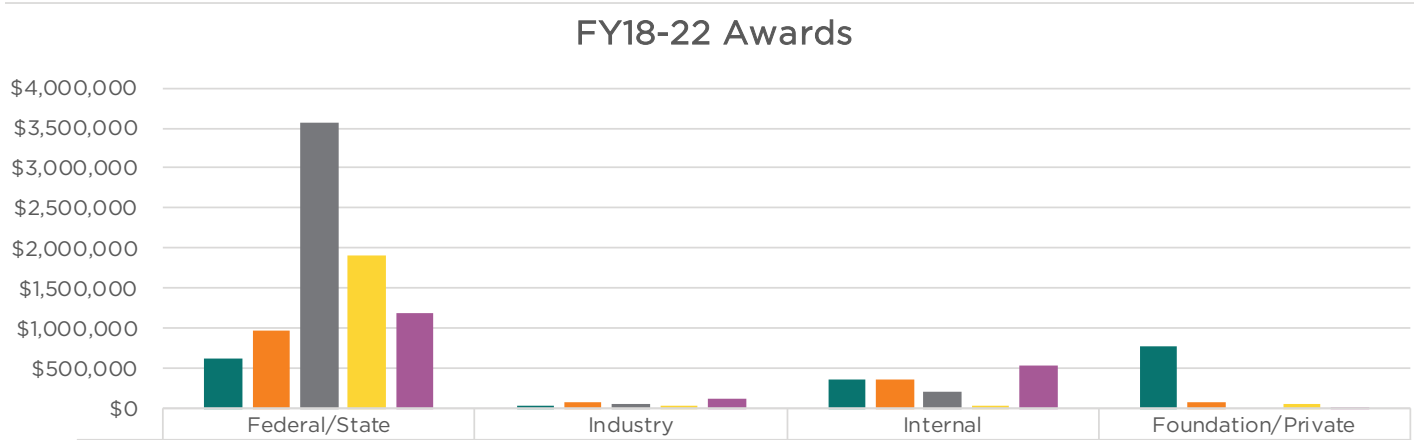
Laura Horton, a comparative and experimental medicine graduate student, holding a wild turkey while conducting her field research.

Five-Year Benchmark Data

Scholarly productivity among Center of Excellence faculty remains strong, and the impact of the COE is affecting a wider array of research activities. Total publications (90 by 20 COE faculty) and publications per faculty member (4.1) increased compared with previous years. However, the number of presentations at conferences (73 presentations), and the number of presentations per faculty member (3.3), were slightly fewer than previous years. The lower presentation counts can be attributed, in part, to changes in conference hosting formats, as well as limitations on the ability of faculty to travel, especially internationally.

Extramural funding was $1,442,277 during FY22 as compared with FY21 when extramural awards totaled $1,339,883.89. FY22 COE faculty submitted a total of 26 research grants to federal, state, industry, and foundation sponsors, a 30% increase from FY21. A total of 10 extramural grants were awarded in FY22 having an extramural award value of $1,442,277. Interestingly, in FY22 there was a significant increase in private foundation funding which is attributed to a large ($660,460) grant awarded to Dr. Brian Whitlock from the Wellcome Leap foundation. Grant proposals were most often submitted to foundations (14) and federal agencies (12), with a smaller number of proposals being submitted to industry partners (3). Awards most often were secured from federal (4) agencies, followed by industry partners (3) and private foundations (3). Despite having a lower number of extramural grant awards, research funding and research expenditures increased from the previous year. Increased expenditures were attributable to on-going research from several large research grants awarded in FY20-21. In addition, COE faculty received a total of $356,624 in non-COE internal grants (CVM, UTIA, UTK) to seed exploratory research. This resulted in a combined research funding award value of $1,798,901 and a return on investment ratio of 3.3:1, meaning that for every $1 invested in the COE, faculty generated $3.30 from extramural funding sources.

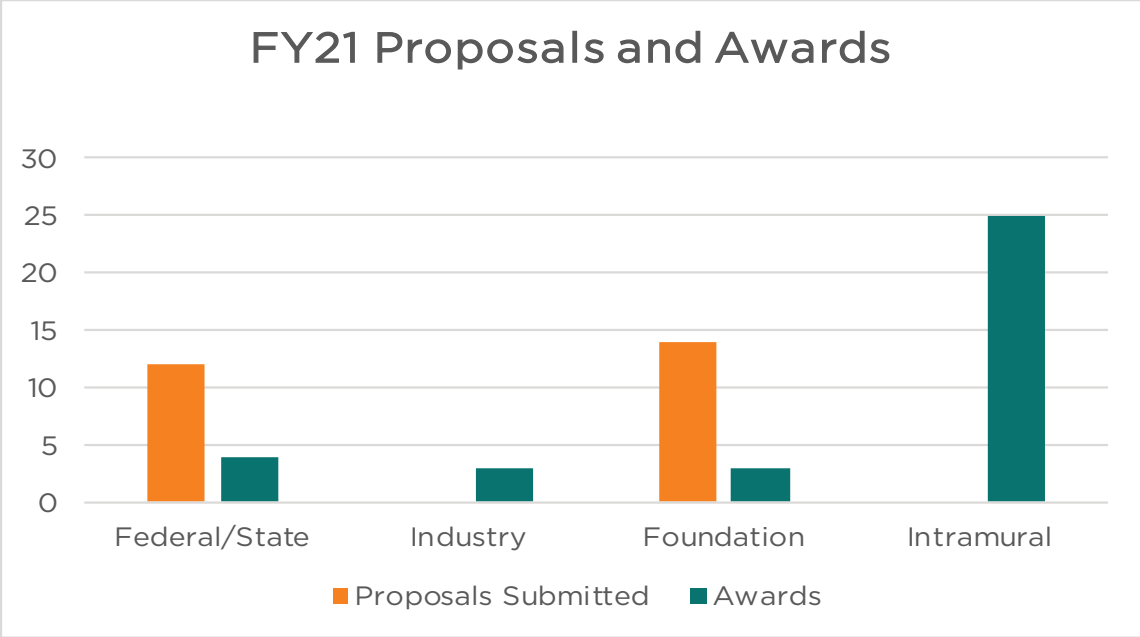
Center of Excellence funds continue to support the mentoring of graduate and professional students in research. Currently, FY22 COE faculty are graduate advisors to PhD students, MS students, and professional students participating in the Summer Student Research Experience Program. Faculty across multiple disciplines mentored students throughout the Summer Student Research Program.



	Federal/State	Industry	Internal	Foundation/Private
FY22	$632,340	$41,733	$356,624.00	$768,204.00
FY21	$976,745.28	$85,253.00	$351,397.00	$80,750.00
FY20	$3,574,356.00	$57,876.00	$207,077.00	$-
FY19	$1,907,177.00	$37,766.00	$35,768.00	$47,082.00
FY18	$1,199,153.00	$124,430.00	$546,430.00	$15,000.00

Benchmark Summary

Extramural funding ($1,442,277.00) was slightly greater in FY22 compared to FY21 ($1,339,883.89). Center of Excellence faculty submitted a total of 51 grant proposals, and 26 of those grant proposals were extramural grant submissions leading to a total of $1,798,901.00 in awards. The extramural grant award success rate was 38%.



Future Plans: Looking Forward

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

ONE HEALTH INITIATIVE

TennIRM
TENNESSEE INSTITUTE OF REGENERATIVE MEDICINE

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

During FY22, several new faculty hires have significant research appointments and start-up support from the Center of Excellence. These faculties represent an important investment in the future of infectious disease research. Infrastructure enhancements have been necessary to support the research programs of these faculty. These faculty will have key roles in dissemination of new knowledge to stakeholders including scientists, practitioners, producers, and the public.

During the next five years, we will work toward renovation of additional laboratories in CVM and will continue to develop collaborations with UTIA AgResearch, UTK ORIED, UTORII and UTHSC Memphis to expand translational and human health research. Additional collaborations among institutions will be important, including ORNL and UTORII. This will include continuing discussions for strategic planning for future biomedical research facilities and multispecies vivaria aimed to expand translational and animal-intensive research activities.

FACULTY RESEARCH SUMMARIES

Dr. Elizabeth Collar

ASSISTANT PROFESSOR
UTCVM LARGE ANIMAL CLINICAL SCIENCES

About Dr. Collar

PhD
Oregon State University

DVM
University of Minnesota

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

Collaborators:
Drs. David Harper and Pierre-Yves Mulon

Peer-Reviewed Publications:
2 in 2021

Presentations:
4 in 2021

COE SEED FUND RESEARCH:
Creation of a subchondral bone disease ovine model utilizing impact loading: A preliminary study

Dr. Collar's research looks at subchondral bone (bone underlying the cartilage surface within a joint) disease (bone resorption and microdamage). Subchondral bone disease is a significant problem in humans, horses, and other species. No "gold standard" animal model for subchondral bone disease exists. The development of an impact model (weight dropped onto joint surface) to create physiologically representative focal subchondral bone disease will allow for scientific advancement in the study of this important disease. This study provides a valuable and useful translational animal model. Additionally, this research will provide valuable data to aid in external grant funding acquisition for studies required to establish a reliable animal model.

Dr. Madhu Dhar

RESEARCH ASSOCIATE PROFESSOR
UTCVM LARGE ANIMAL CLINICAL SCIENCES

About Dr. Dhar

PhD
University of Pune, india

MS
University of Pune, India

Supported by:
Department of Defense, National Institutes of Health, National Institute of Arthritis and Musculo-skeletal and Skin Diseases, and the Center of Excellence in Livestock DIseases and Human Health

Collaborators:
Drs. David Harper and David Keffer

Peer-Reviewed Publications:
4 in 2021

Abstracts and Proceedings:
5 in 2021

Presentations:
2 in 2021

COE SEED FUND RESEARCH:
Establishing a versatile, cosistent, and efficacious platform tissue

Dr. Dhar's research focuses on tissue engineering research. Despite significant progress in basic and clinical tissue engineering research over the past two decades, an optimal, efficacious, and versatile therapy is lacking. This is primarily due to the multiple sources of cells and a variety of biomaterials that are available. Therefore, the regenerative response is variable. This project uses the engineering philosophy or "design, build, and test" based on a logistical approach of material science and engineering. Throughout this study, carbon nanocomposites with varied topographical properties have been engineered, and molecular dynamic simulations have been used to provide mechanistic insight relating cell adhesion to variation in the nanoscale architecture of cell binding sites. The in vitro response of rat fat-derived adult mesenchymal stem cells in presence of carbon-based nanocomposites has been confirmed. The osteogenic platform was used to generate the proof-of-concept data with a long-term goal of developing a versatile ECM-based therapeutic approach that will yield consistent and reproducible response of cells and biomaterials in a way that it can be adapted to any cell and tissue type.

Dr. Richard Gerhold

ASSOCIATE PROFESSOR
UTCVM BIOMEDICAL AND DIAGNOSTIC SCIENCES

COE SEED FUND RESEARCH:
Investigation of the pathogenesis, tropism, and epidemiology of the zoonotic pathogen, *Toxoplasma gondii*, in Mallard ducks (*Anas platyrhynchos*)

Dr. Gerhold's research focuses on obtaining a better understanding of T. gondii impacts on waterfowl and transmission potential associated with consumption of hunter-harvested waterfowl. Waterfowl are an important game species with approximately 1,000,000 hunters harvesting and consuming wild waterfowl annually in the United States. Dr. Gerhold's research team has revealed surprisingly high seroprevalence rates (25.8-73%, n = 785) of *Toxoplasma gondii* in various waterfowl species across multiple states in the US. These findings represent a previously unknown zoonotic potential via consumption of undercooked waterfowl. Furthermore, waterfowl and humans often share water sources (e.g. water reservoirs), which suggests that waterfowl may be a sentinel for T. gondii oocyst contaminated water potentially leading to human infections. Given this significant zoonotic threat, there is a dire need to understand the transmission, tissue tropism, clinical signs, and lesions associated with T. gondii infections in waterfowl. This project focuses on elucidating the tropism, clinical signs, lesions, T. gondii antibody titer duration in Mallard ducks (*Anas platyrhynchos*), which are commonly harvested by hunters. Investigation methods will include experimental infection of T. gondii, serial titer serology, observation of clinical signs, gross and histopathological necropsy findings, and quantitative PCR of select organs.

About Dr. Gerhold

PhD
University of Georgia

DVM
Purdue University

MS
The University of Georgia

Supported by:
BioMed Diagnostics, Tennessee Wildlife Resources Agency, The One Health Initiative, Purina, and Land of Lakes

Collaborators:
Drs. Michelle Dennis, Chunlei Su, and Nicole Szafranski

Peer-Reviewed Publications:
8 in 2021

Presentations:
15 in 2021

Honors in 2021:
Boehringer Ingelheim Faculty Research Mentoring Award

Dr. Stephen Kania

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

About Dr. Kania

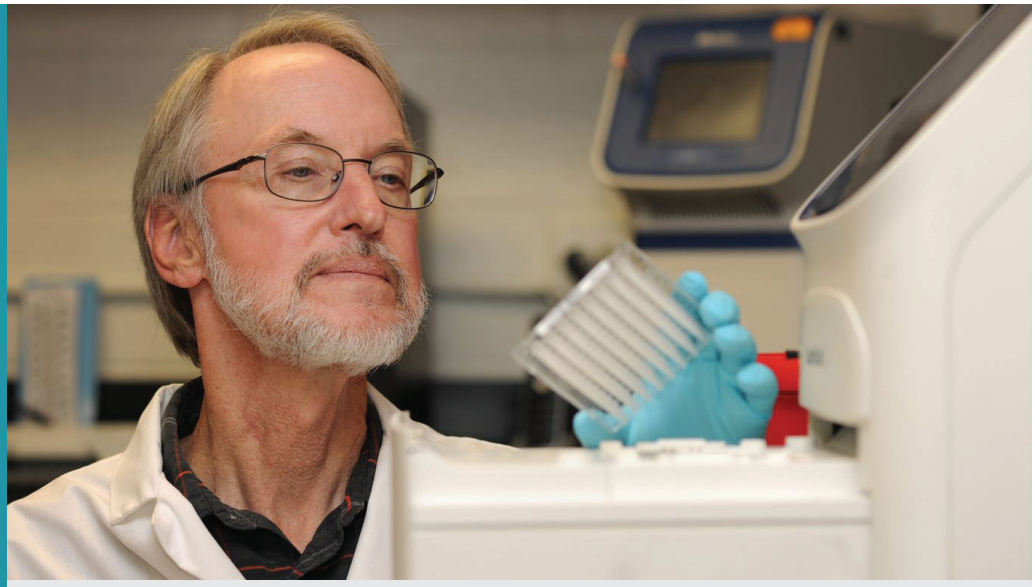
MS
Washington State University

PhD
University of Florida

Supported by:
Department of Defense, GeneOne Life Sciences, American Kennel Club Canine Health Foundation, Boehringer Ingelheim, & the Center of Excellence in Livestock Diseases and Human Health

Collaborators:
Drs. Mohamed Abouelkhair and Sreekumari Rajeev

Peer-Reviewed Publications:
2 in 2020



COE SEED FUND RESEARCH:
Novel antibiotics from extremophile bacteria

Dr. Kania's research involves using samples collected from environments within Yellowstone National Park at high temperatures and a variety of pH levels to potentially identify novel antimicrobial agents. Antibiotic resistance has become a major concern in in human and veterinary medicine with a steady increase in resistance to multiple classes of antibiotics. It has been shown that extreme conditions favor diverse and unique bacterial strains that compete for limited resources and produce an array of antimicrobials. Dr. Kania and his team believe that bacteria obtained from extremely physiologically challenging environments will produce novel antimicrobials effective against infectious organisms, and these may include thermostable and pH stable antibiotics.

Dr. Sreekumari Rajeev

PROFESSOR
UTCVM BIOMEDICAL AND DIAGNOSTIC SCIENCES

COE SEED FUND RESEARCH:
Leptospira and host specific gene expression patterns: A study using in vitro bovine whole blood culture stimulation system and whole transcriptome analysis

Dr. Rajeev's research focuses on further understanding *Leptospira*. Reports of fatal cases of leptospirosis are increasing in incidence in animals and humans. Zoonotic transmission is of concern due to the close contact between humans, animals, and contaminated environment. *Leptospira* enters the body through the skin and mucous membranes and colonizes organs. This results in life-threatening clinical disease or reservoir status. In animals, after *Leptospira* breaches the physical barriers of the host, it encounters the robust innate wing of the immune system that leads to concerted interaction of humoral and cellular components to eliminate or maintain the pathogen. This relationship is complex and involves the interaction of multiple cell types, molecules, and specific or nonspecific antibodies and depends on various bacterial and host-specific factors. In this study, Dr. Rajeev is using a novel approach, combining an in vitro whole blood culture stimulation system and robust next-generation RNA sequencing to study the *Leptospira* and bovine-specific gene expression patterns to facilitate the deconvolution of this complex interaction. Her long-term goal is to clarify how the host immune system eliminates or allows this extracellular pathogen to persist without causing clinical symptoms in some animals while inducing life-threatening illness in others. She also hopes to unravel the evolutionary mechanisms of *Leptospira* host adaptation and use this knowledge to develop prevention and intervention strategies to mitigate the impacts of this zoonotic infection.

About Dr. Rajeev

PhD
University of Tennessee

DVM
Kerala Agricultural University, Kerala, India

Supported by:
Morris Animal Foundation, American Kennel Club Canine Health Foundation, and the Center of Excellence in Livestock Diseases and Human Health

Collaborators:
Drs. Andrea Lear and Liliana Salvador

Peer-Reviewed Publications:
1 in 2021

Presentations:
7 in 2021

Dr. Augustin Rius

PROFESSOR
HERBERT COLLEGE DEPARTMENT OF ANIMAL SCIENCE

About Dr. Rius

PhD
Virginia Tech

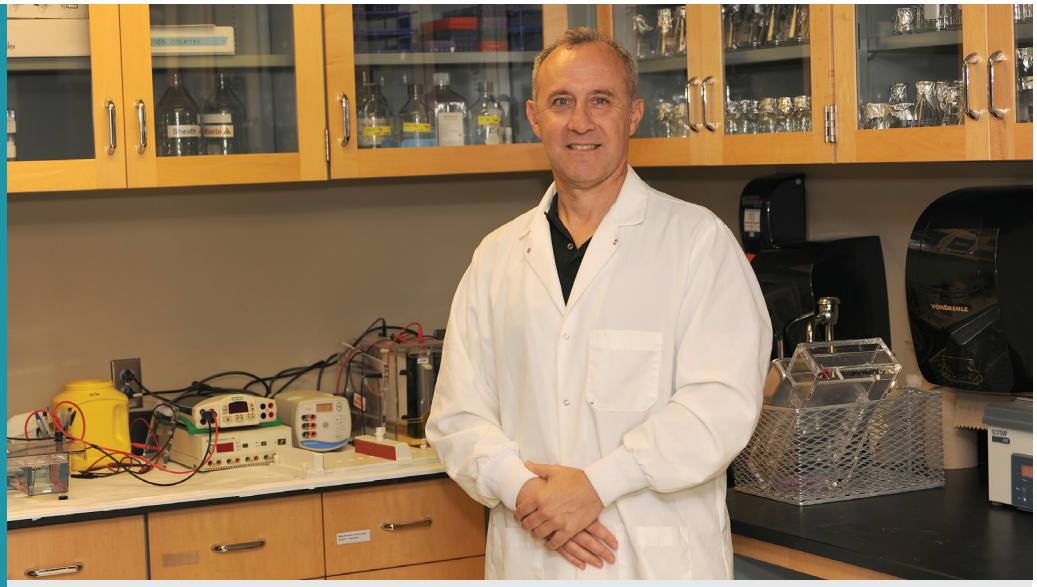
DVM
National University of La Plata, Buenos Aires, Argentina

MS
University of Illinois

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

Collaborators:
Drs. Stephen Kania and Vermont Dia

Peer-Reviewed Publications:
2 in 2021



COE SEED FUND RESEARCH:
Heat stress-mediated systemic inflammation in dairy calves

Dr. Rius's research focuses on the impacts of heat stress on dairy calves. Environmental heat stress reduces dramatically the welfare of animals and costs the U.S. animal agriculture industries approximately $2.5 billion each year. Summer ambient temperature and humidity conditions are difficult and expensive to control on farm. With the increased pressure to reduce the environmental footprint of dairy and beef operations, there is an urgent need to develop affordable and practical strategies to reduce losses to heat stress. Therefore, U.S. livestock producers would most benefit from pharmaceutical interventions that allow them to minimize the impact of heat stress on their animals. Dr. Rius's team and others have reported systemic inflammation in heat-stressed cattle, and their central hypothesis is that reducing systemic inflammation will improve health and productivity of these animals. By exposing dairy calves to heat stress for five days, Dr. Rius's first objective is to determine how heat stress activates immunity by measuring immune-mediated pro- and anti-inflammatory molecules regulated by nuclear factor kappa-light-chain-enhancer of activated B-cells (NF-KB) pathway. His second objective is to demonstrate how glucocorticoid, an approved and widely-used anti-inflammatory steroid hormone, can alleviate heat stress-induced inflammation by inhibiting the NF-KB. The results of the experiment will broaden the current understanding of heat stress physiology, specifically as it pertains to growth and development of calves and their immune competency.

Dr. Barry Rouse

DISTINGUISHED PROFESSOR
UTCVM BIOMEDICAL AND DIAGNOSTIC SCIENCES

COE SEED FUND RESEARCH:
Investigation of the role of metabolic manipulation on blood-brain barrier

Dr. Rouse's research focuses on using an in vitro model of the blood-brain barrier (BBB) to discover the influence of different metabolic pathways on the BBB's function. Herpes simplex virus (HSV) is an occasional cause of encephalitis in adult humans, and without rapid antiviral therapy, this disease has significant consequences. Dr. Rouse speculates that some change in metabolism could explain why the virus eludes immune control and can invade the brain. The brain is normally well protected from infection, and few agents have the capacity to gain entrance. Access to the brain can occur in different ways, but the most common entry route is likely by crossing the blood-brain barrier. The BBB is a multicellular organization composed of tightly connected vascular endothelial cells supported by astrocyte cells on the central nervous side. The normally functioning BBB allows the exchanges of nutrients and metabolites between the blood circulation and the brain but limits the passage of many soluble compounds as well as most pathogens. However, when the BBB is damaged physically or physiologically, the permeability is impaired and the brain becomes more accessible to infection. It is still not clear if changes in host metabolism could impact on the BBB integrity. Thus, it is possible that some changes in host metabolism could influence the function of the BBB and then permit some viruses to cross and cause damage to CNS tissues.

About Dr. Rouse

PhD
University of Guelph, Canada

DVM
University of Bristol, England

MSc
University of Guelph, Canada

Supported by:
National Institutes of Health and the Center of Excellence in Livestock Diseases and Human Health

Collaborator:
Dr. Engin Berber

Peer-Reviewed Publications:
8 in 2021

Dr. Rebecca Trout Fryxell

ASSOCIATE PROFESSOR
HERBERT COLLEGE DEPARTMENT OF ENTOMOLOGY AND PLANT PATHOLOGY

About Dr. Trout Fryxell

PhD
University of Arkansas

MS
University of Kentucky

Supported by:
National Institute of Food and Agriculture, United States Forest Service, Agriculture and Food Research Initiative Education and Workforce Development

Collaborator:
Dr. Rebecca Butler

Peer-Reviewed Publications:
12 in 2021

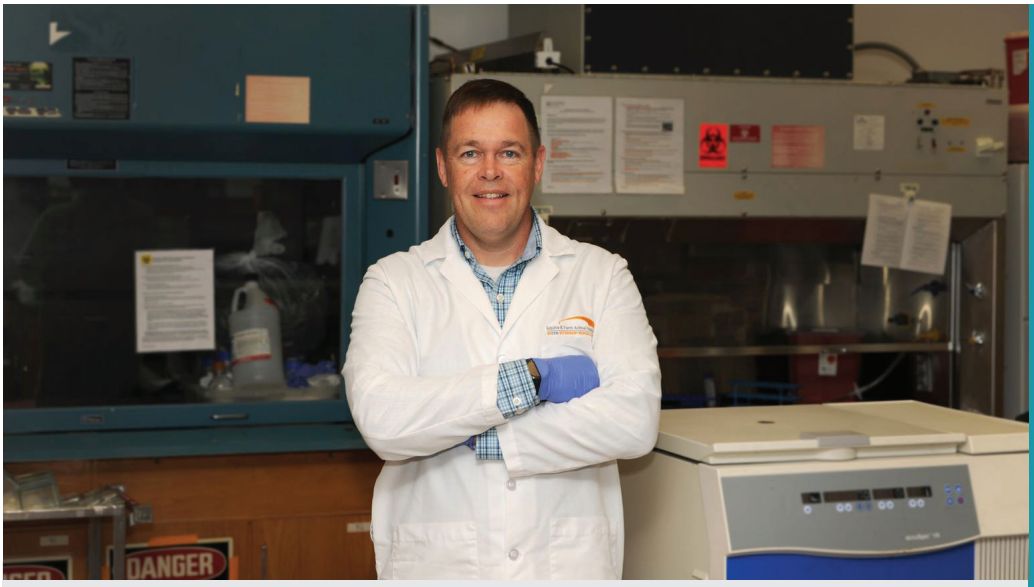
Presentations:
7 in 2021

COE SEED FUND RESEARCH:
Confirming *Anaplasma marginale*, *Ehrlichia ewingii*, and *Theileria orientalis* Ikeda in Tennessee-collected ticks

Dr. Trout Fryxell's research focuses on identifying *Anaplasma marginale*, *Ehrlichia ewingii*, and *Theileria orientalis* Ikeda pathogens within Asian longhorned ticks, American dog ticks, and lone star ticks. She is also working to identify the prevalence of these three pathogens along with host-associated predictors for the occurrence of ticks and their pathogens. Tick-borne diseases affect 80% of the world's cattle population, and outdated global cost estimates are between $13.9 and $18.7 billion US dollars. Animal diseases associated with ticks and their pathogens cause extensive economic loss to livestock and companion animals. In the United States, this problem is exacerbated by the establishment of an exotic and invasive tick species (Asian longhorned tick) infected with a deadly protozoan (*Theileria orientalis* Ikeda genotype), representing a new and emerging vector and disease threat to the beef and dairy cattle industries. Currently in Tennessee, the Asian longhorned tick is found feeding with lone star ticks and American dog ticks, vectors of *Ehrlichia ewingii* causing canine ehrlichiosis, and Anaplasma marginale causing bovine anaplasmosis, respectively. Yet, we do not know infection status of any of these ticks with any of those pathogens. Project findings will be used as baseline data for upcoming proposals aimed at identifying strategies to prevent tick bites and tick-borne disease and these results will be used to develop infographics for our stakeholders and referred publications for our scientific communities.

Dr. Brian Whitlock

PROFESSOR
UTCVM LARGE ANIMAL CLINICAL SCIENCES



COE SEED FUND RESEARCH:
Evaluation of a general cyclo-oxygenase inhibitor for protection of KNDy neurons from acute endotoxin-induced inflammation.

Dr. Whitlock's research focuses on determining wether or not flunixin will be protective of the inflammation-induced suppression in KNDy neurons and LH. Inflammation caused by lipopolysaccharide (LPS) impairs reproduction through the suppression of gonadotropin releasing hormone (GnRH) and luteinizing hormone (LH) (Daniel et al 2003). Kisspeptin (KP)-neurokinin B (NKB)-dynorphin (DYN) neurons (KNDy) in the arcuate nucleus (ARC) of the hypothalamus are essential for pulsatile release of GnRH/LH which is required for normal reproduction. Kisspeptin and NKB are stimulatory and DYN is inhibitory of GnRH/LH secretion (Nestor et al 2018). Sixteen wethers were divided into four groups - control (CON; n=4; treated with saline and saline); control with flunixin [CONF; n=4; treated with saline and flunixin (a general cyclo-oxygenase inhibitor)]; LPS (LPS; n=4; treated with LPS and saline); and LPS with flunixin (LPSF; n =4; treated with LPS and flunixin). The animals in the LPS and LPSF groups were treated with 400 ng of LPS/kg of body weight intravenously (IV) while CON and CONF will be treated with saline IV. Thirty minutes before their respective LPS and saline treatments, LPSF and CONF received 2.2 mg/kg flunixin IV. The animals underwent a serial blood collection (every 12 minutes for 6 hours) prior to euthanasia and tissue collection. Plasma from blood samples were assayed for LH, cortisol, and cytokines. Hypothalamic brain tissue was collected and evaluated for KP, NKB, DYN, and allograft inflammatory factor-1 (AIF-1; and indicator of microglia activity).

About Dr. Whitlock

PhD
Auburn University

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Supported by:
Wellcome Leap Foundatioon, University of Tennessee One Health Initative, and the Center of Excellence in Livestock Diseases and Human Health

Collaborator:
Allison Renwick

Peer-Reviewed Publications:
4 in 2021

Abstracts and Proceedings:
5 in 2021

RESEARCH ENGAGEMENT CITATIONS

Dr. Jonathan Abbott

PEER-REVIEWED PUBLICATIONS

Franchini A, Abbott JA, Lahmers S, Eriksson A. Clinical characteristics of cats referred for evaluation of subclinical cardiac murmurs. J Feline Med Surg. 2021;23(8):708–14.

Franchini A, Borgarelli M, Abbott JA, Menciotti G, Crosara S, Häggström J, et al. The Longitudinal Outcome Of Canine (K9) myxomatous mitral valve disease (LOOK-Mitral registry): Baseline characteristics. J Vet Cardiol. 2021;36:32–47.

Menciotti G, Abbott JA, Aherne M, Lahmers SM, Borgarelli M. Accuracy of echocardiographically estimated pulmonary artery pressure in dogs with myxomatous mitral valve disease. J Vet Cardiol [Internet]. 2021;35:90– 100.

Franchini A, Abbott JA, Tyrrell W, Rosenthal S, Lahmers S, Menciotti G, et al. Predictors of reoccurrence of congestive signs within 180 days after successful treatment of the first episode of congestive heart failure in dogs with myxomatous mitral valve disease. J Vet Cardiol. 2021 Apr;34:112–9.

Lawson PB, Abbott JA. Idioventricular tachycardia and unstable ventricular escape rhythm in a canine patient with third-degree atrioventricular block. J Vet Cardiol [Internet]. 2021;36:186–90.

Keebaugh AE, DeMonaco SM, Panciera DL, Abbott JA, Boes KM, Menciotti G. Evaluation of hemostasis in hyperthyroid cats. J Vet Intern Med. 2021;(March):1–10.

Boissady E, De La Comble A, Zhu X, Abbott J, Adrien-Maxence H. Comparison of a Deep Learning Algorithm vs. Humans for Vertebral Heart Scale Measurements in Cats and Dogs Shows a High Degree of Agreement Among Readers. Front Vet Sci. 2021;8(December):1–6.

BOOK CHAPTERS, ABSTRACTS, AND PROCEEDINGS

Abbott JA. Ventricular Septal Defect In: Tilley, Larry P, Smith FWK (ed). The 5 Minute Veterinary Consult 7th Edition. Wiley-Blackwell Publishing, New Jersey, 2021:1411-1413. Abbott JA. Tetralogy of Fallot In: Tilley, Larry P, Smith FWK (ed). The 5 Minute Veterinary Consult 7th Edition. Wiley-Blackwell Publishing, New Jersey, 2021:1322.

Franchini A, Borgarelli M, Abbott JA, Menciotti G, Crosara S, Haggstrom J, Lahmers S , Rosenthal S, Tyrrell W. The longitudinal outcome of canine myxomatous mitral valve disease (LOOK-Mitral) study - Baseline treatment characteristics. (Abstract) 31st ECVIM-CA Online. Sept 2021.

PRESENTATIONS

Abbott J. Arrhythmogenic ("Boxer Dog") Cardiomyopathy Feline Cardiomyopathy: An Update Pulmonary Hypertension Canine Congenital Cardiac Disease: A mini-Review Eastern Tennessee Veterinary Medical Association - Annual Conference Gatlinburg, TN Sept 26, 2021 15

Dr. Elizabeth Collar

PEER-REVIEWED PUBLICATIONS

Collar EM, Duesterdieck-Zellmer KF, Huber MJ, Semevolos SA, Parker J, and Husby KA. (2021) Outcome of bilateral equid laparoscopic ovariectomies. Vet. Surg. 50, 975-983.

Collar EM, Watson LJ, Whitmer C, and Hansen S. (2021), Successful closed reduction and conservative management with traumatic elbow luxation and medial collateral ligament rupture in an equid. Equine Veterinary Education, 33: e25-e29. https://doi.org/10.1111/eve.13171

PRESENTATIONS

Collar EM. Sarcoids, Squamous Cell Carcinoma, and Melanomas: Treating Cutaneous Massess in Equids." Henton Veterinary Conference. December 2021.

Collar EM. Musculoskeletal Injuries in Racehorses. UTCVM Comparative and Experimental Medicine Seminar. October 2021.

Collar EM. Subchondral Bone Disease and Osteoarthritis. UTCVM Faculty Research Showcase. October 2021.

Collar EM. Equine Cutaneous Masses. Knoxville Veterinary Medical Association. September 2021.

Dr. Michelle Dennis

PEER-REVIEWED PUBLICATIONS

Atherley N, Dennis MM, Behringer DC, Freeman MA. Size at sexual maturity and seasonal reproductive activity of the Caribbean spiny lobster Panulirus argus. Marine Ecology Progress Series. 2021, 671, 129-145.

Rich L, Arnot C, Dennis MM. Pathology of growth anomalies in massive Caribbean corals of the family Faviidae. Veterinary Pathology. 2021, 58:6, 1119-1130. DOI: 10.1177/03009858211020675
Meuten D, Moore F, Donovan T, Bertram C, Klopfleisch R, Foster R, Smedley R, Dark M, Milovancev M, Stromberg P, Williams B, Aubreville M, Avallone G, Bolfa P, Cullen J, Dennis M, Goldschmidt M, Luong R, Miller A, Miller M, Munday J, Roccabianca P, Salas E, Schulman F, Laufer-Amorim R, Asakwa M, Craig L, Dervisis N, Esplin D, Hauck M, Kagawa Y, Kiupel M, Linder K, Meichner C, Marconato L, Oblak M, Santos R, Simpson M, Whitley D, Tvedten H. International Guidelines for Veterinary Tumor Pathology: A Call to Action. Veterinary Pathology. 2021, 58:5, 766-794.
Virwani, S. Rajeev, G. Carmichael-Branford, M.A. Freeman, M.M. Dennis. Gross and microscopic pathology of West Indian sea eggs (Tripneustes vetnricosus). Journal of Invertebrate Pathology. 2021, 107526
B.K. Diggles, L. Barnes, M. Landos, M.M. Dennis, J.P.J. O'Carroll. Sea lice Lepeophtheirus spinifer, Tuxophorus sp. and Caligus sp. (Copepoda: Caligidae) infections on wild-caught queenfish Scomberoides commersonnianus (Pisces: Carangidae) from northern Australia. Diseases of Aquatic Organisms. 2021. 143: 37-50.
P. Bolfa, M. Cercone, M.M. Dennis, A. Conan, B. Grevemeyer, N.G. Ducharme. Clinical and Pathological Features in Horses with Advanced Arytenoid Chondritis. Veterinary Pathology. 2021, 1:91-102.

PRESENTATIONS

G. Aeby, S. Montano, M.M. Dennis (instructors). Coral Health and Disease Assessment Workshop. Marine Research and High Education Center (MaRHE), Bicocca University, Magoodhoo Island, Maldives, Nov 30-Dec 7, 2021. Oral presentations and field training; Invited instructor.
M.M. Dennis. Microspcopic anatomy of octocorals. Cellular responses to injury in corals. Review and assessments. CL Davis-Tompson Foundation Day Seminars: Coral Diseases (Virtual) Februar 23, 2021. Oral presentations. Invited speaker.

Dr. Madhu Dhar

PEER-REVIEWED PUBLICATIONS

Austin J. Bow, Thomas J. Masi and Madhu S. Dhar. Etched 3D-Printed Polycaprolactone Constructs Functionalized with Reduced Graphene Oxide for Enhanced Attachment of Dental Pulp-Derived Stem Cells. Pharmaceutics 2021, 13, 2146. https://doi.org/10.3390/pharmaceutics13122146.
MacDonald A, Gross A, Jones B, Dhar M. Muscle Regeneration of the Tongue: A review of current clinical and regenerative research strategies. Tissue Eng Part B Rev. 2021 Oct 23; doi: 10.1089-/ten.TEB.2021.0133. [Epub ahead of print] PubMed PMID: 34693743.
MacDonald AF, Trotter RD, Griffin CD, Bow AJ, Newby SD, King WJ, Amelse LL, Masi TJ, Bourdo SE, Dhar MS. Genetic profiling of human bone marrow and adipose tissue-derived mesenchymal stem cells reveals differences in osteogenic signaling mediated by graphene. J Nanobiotechnology. 2021 Sep 22;19 (1):285. doi: 10.1186/s12951-021-01024-x.
Zayed M, Adair S, Dhar M. Effects of Normal Synovial Fluid and Interferon Gamma on Chondrogenic Capability and Immunomodulatory Potential Respectively on Equine Mesenchymal Stem Cells. Int J Mol Sci. 2021 Jun 15;22(12). doi: 10.3390/ijms22126391.

BOOK CHAPTERS, ABSTRACTS, AND PROCEEDINGS

S Newby, A Bow, S Bourdo, A Gross, VJ Cheever, R Moffat, F Licari, Man Hung, Madhu Dhar. Biocompatibility and Osseointegration of a Novel 3D Printed Poly (lactic-co-glycolic acid) Graphene-based Nanoscaffold in a Rat Femoral Critical Sized Segmental Defect. FASEB J 35: S1 (2021).
Caroline Billings, Kassandra Downing, Austin Bow, Steven Newby, Robert Donnell, Sree Rajeev, Madhu Dhar, David Anderson. Characterization of Gentamicin Impregnated Collagen Scaffolds: In Vitro Elution, Cytocompatibility, and In Vivo Tissue Interface. FASEB J 35: S1 (2021).
A Bow, T Masi, M Dhar. Extraction and Characterization of Dental Pulp Stem Cells from Rat Mandibles to Develop a Multi-potential Cell Bank for Tissue Graft Technologies. FASEB J 35: S1 (2021).
Amber MacDonald, Ruby Trotter, Austin Bow, Amanda Murphy, Lisa Amelse, Thomas Masi, Shawn Bourdo, Madhu Dhar. Osteogenic Regulation by Graphene Nanoparticles in Human Mesenchymal Stem Cells. FASEB J 35: S1 (2021).
Thomas Masi, Ruby Trotter, Steven Newby, Austin Bow, Nicholas Millis, Shawn Bourdo, Madhu Dhar, Stacy Stephenson. Lentiviral Transduced Fluorescent Adipose Derived Stem Cells (ADSCs) Undergo Spontaneous Osteogensis on Low-Oxygen Content Graphene (LOG) Surfaces. FASEB J 35: S1 (2021).

PRESENTATIONS

Madhu Dhar. "Regenerative Medicine: Successful Translation of Basic Science Research from the Bench to the Clinic 3rd International Conference on PharmScience Research and Development. San Francisco Feb 22-24, 2021 (Virtual).
Amber MacDonald, Lisa Amelse, Austin Bow, Steven Newby, Thomas Masi, Madhu Dhar. "Stem Cell Activity During Osteoporosis". Comparative & Experimental Medicine and Public Health Research Symposium 2021 (Virtual). Knoxville TN, Sep 20.

Dr. Cassio Ferrigno

PEER-REVIEWED PUBLICATIONS

Peterson LC, Kim SE, Lewis DD, Johnson MD, Ferrigno CRA. Calcium sulfate antibiotic-impregnated bead implantation for deep surgical site infection associated with orthopedic surgery in small animals. Vet Surg. 2021;(December 2020):1–10.

PRESENTATIONS

Ferrigno CRA. Four presentations delivered for the 2021 AO Master Suite Course. The Meniscus, TPLO Planning, TPLO vs TPLO, CBLO Basic Theory and Planning.
Ferrigno CRA. Correction of bone deformities of the radius and ulna. AOVET World Education Webinar. 2021.

Dr. Richard Gerhold

PEER-REVIEWED PUBLICATIONS

Kurth, K., T. Jiang, L. Muller, C. Su and R. Gerhold. 2021. Toxoplasma gondii contamination at an animal agriculture facility: Environmental, agricultural animal, and wildlife contamination indicator evaluation. International Journal for Parasitology: Parasites and Wildlife 16: 191-198.
Ginsberg, H., J. Hickling, R. Burke, N. Ogden, L. Beati, R. LeBrun, I. Arsnoe, R. Gerhold. 2021. Why Lyme disease is common in the northern U.S., but rare in the south: the roles of host choice, host-seeking behavior, and tick density. PLoS Biology 19(1): e3001066.
Dell, B., C. Masembe, R. Gerhold, A. Wilcox, C. Okafor, and M. Souza. 2021. Species misidentification in local markets: Discrepancies between reporting and molecular identification of bushmeat species in northern Uganda. One Health 13, https://doi.org/10.1016/j.onehlt.2021.100251.
Ammar, S. L. Wood, C. Su, M. Spriggs, J. Brown, K. Van Why, R. Gerhold. 2021. Toxoplasma gondii prevalence in carnivorous wild birds in the eastern United States. International Journal for Parasitology: Parasites and Wildlife 15: 153-157.
R. Trout Fryxell, D. Vann, R. Butler, D. Paulsen, J. Chandler, M. Willis, H. Wyrosdick, J. Schaefer, R. Gerhold, et al., 2021. Rapid discovery and detection of Haemaphysalis longicornis through the use of passive surveillance and collaboration: Building a state tick-surveillance network. Int. J. Environ. Res. Public Health 18(15): 7980 https://doi.org/10.3390/ijerph18157980
Ammar, S., N. Hoggard, L. Wood., C. Su., and R. W. Gerhold. 2021. Toxoplasma gondii strain and dose effects on feed conversion rate, body weight, serum antibodies response and systemic distribution in intraperitoneally infected domestic turkey poults. Avian Diseases 65 (1): 138-148. https://doi.org/10.1637/aviandiseases-D-20-00104
Locklear, T., R. Videla, R. Breuer, P. Mulon, M. Passmore, J. Mochel, R. Gerhold, J. Schaefer, and J. Smith. 2021. Presentation, clinical pathology abnormalities, and identification of gastrointestinal parasites in camels (Camelus bactrianus and Camelus dromedaries) presenting to two North American veterinary teaching hospitals. A retrospective study: 1980-2020. Front. Vet. Sci. 8:651672. https://dx.doi.org/10.3389%2Ffvets.2021.651672
Von Stade, D., B. McHale, R. Gerhold, L. Williamson, E. Howerth. 2021. Pathology in practice:chronicParelaphostrongylus tenuisin a llama. JAVMA. 258: 1083-1085. https://doi.org/10.2460/javma.258.10.1083

PRESENTATIONS

Gerhold, R.W. 2021. Epidemiology of filarial and Metastrongylid nematodes in wild cervids from North America. Hamilton College, Clinton, New York. September 2021.
Gerhold, R.W. 2021. Ecology of wildlife diseases in southeastern US. Cornell University Student Chapter, Wildlife Disease Association. Ithaca, NY. September 2021.
Kurth, K., E. Watson, D. Metts, B. Miller, R. Gerhold, D. Morin, S. Yang, L. Muller. (2021, November). Population abundance and survival rate estimates of elk in East Tennessee [Oral presentation]. The Wildlife Society 28th Annual Conference, Virtual (National). Bethesda, MD (Headquarters)
Szafranski, N., A. Reeves, C. Hilton, M. Tewes, J. Kern, T. Campbell, D. Miller and R. Gerhold. 2021. Vector-borne and blood-borne parasitic disease prevalence survey in wild Texas ocelots (Leopardus pardalis) and bobcats (Lynx rufus). American Association of Veterinary Parasitologists (AAVP) Annual Conference. Virtual, Oral presentation. Lexington, KY
Cross, C. and R. Gerhold. Assessing the healthcare burden of zoonotic diseases: An Analysis of hospital discharge records for characterizing patient and analyzing trends in Toxoplasma gondii cases in Nevada from 2013-2019. American Association of Veterinary Parasitology, Lexington, KY. July 2021.
Szafranski, N., K. Van Why, and R. Gerhold. 2021. Investigation of thePrevalenceofToxoplasma gondiiin Pennsylvania Waterfowl. Northeast Fish and Wildlife Conference, April2021, Virtual oral presentation. Long Branch, NJ
Watson, E., K. Kurth, D. Metts, S. Moorey, B. Miller, R. Gerhold, L. Muller. November 2021. Determining the Efficacy of Non-Invasive Techniques for Pregnancy Assessment of a Reintroduced Elk Population. The Wildlife Society Annual Conference, Virtual. Poster Presentation. Baltimore, MD
Watson, E., K. Kurth, D. Metts, S. Moorey, B. Miller, R. Gerhold, L. Muller. August 2021. The efficacy of non-invasive sampling

techniques for pregnancy determination of elk in East Tennessee, USA. The International Society of Wildlife Endocrinologists Virtual Event. Poster Presentation. Yulee, FL (Headquarters)

Kurth, K., B. LaMendola, and R. Gerhold. (2021, July). A retrospective study of elk (Cervus canadensis) morbidity and mortality in Tennessee and Great Smoky Mountain National Park [Oral presentation]. World Association for the Advancement of Veterinary Parasitology, Virtual (International). Dublin, Ireland

Szafranski, N., K. Van Why, J. Kelly, C. Bahnson, J. Veon, A. Blake-Bradshaw, B. Cohen, and R. Gerhold. 2021. Investigation of the Prevalence of Toxoplasma gondii in North American Waterfowl. Conference name: World Association for the Advancement of Veterinary Parasitology (WAAVP) Annual Conference. Virtual, oral presentation. Dublin, Ireland.

Kurth, K., E. Watson, D. Metts, B. Miller, R. Gerhold, D. Morin, S. Yang, and L. Muller. (2021, March). Population abundance and survival rate estimates of elk in East Tennessee [Oral presentation]. The Tennessee Chapter of The Wildlife Society 53rd Annual Meeting, Virtual (State).

Szafranski, N. and R. Gerhold. 2021. Ecology of Toxoplasma gondii in wild waterfowl. Comparative and Experimental Medicine Symposium. Knoxville, TN. Virtual. First place award for graduate student competition.

Baker E and Gerhold R. 2021. Health survey of coyotes from South Carolina and Tennessee. Comparative and Experimental Medicine Symposium. Knoxville, TN. Virtual. Second place award for graduate student competition

Dawant, T., C. Su, and R. Gerhold. 2021. To Isolate Toxoplasma gondii in cell culture: an alternative to conventional bioassay. Comparative and Experimental Medicine Symposium. Knoxville, TN. In person.

Szafranski, N. and R.W. Gerhold. 2021. Ecology of Toxoplasma gondii in wild waterfowl. The Wildlife Symposium One Health Symposium. October 2021 (virtual). Nashville, TN.

HONORS

Boehringer Ingelheim Faculty Research Mentoring Award. 2021.

Dr. Chiara Hampton

PEER-REVIEWED PUBLICATIONS

Reabel, S.N., Queiroz-Williams, P., Cremer, J., Hampton, C.E., Liu, C.C., da Cunha, A. and Nevarez, J.G., 2021. Assessment of intramuscular administration of three doses of alfaxalone combined with hydromorphone and dexmedetomidine for endoscopic-guided orotracheal intubationin domestic rabbits (Oryctolagus cuniculus).Journal of the American Veterinary Medical Association,259(10), pp.1148-1153.

PRESENTATIONS

Hampton, C.E. Anesthesia and Electrolytes: The Who, When, and How. The Henton Veterinary Conference, Knoxville, TN. December 2021.

Hampton, C.E., Dehghanpir,S., Armstrong,C., Scully,C., Baker,R.E., Mitchell,M. Measuring the level of agreement between EldonCard™, Standard Saline Agglutination, and PCR for blood typing, and prevalence of A0 blood group phenotypes in pet pigs from Louisiana. Poster presentation at the International Veterinary Emergency and Critical Care Symposium. September 2021. Nashville, TN.

Hampton C.E., Da Cunha, A., Queiroz, P., Desselle A., Hofmeister, E. H. Aging does not affect the induction dose of propofol in dogs. Annual ACVAA Abstract presentation. Nashville, TN, September 2021.

Elizabeth Benton-Levith, Chiara E Hampton, Colin Mitchell, Xiaocun Sun, Anderson daCunha, Patricia Queiroz-Williams, Mark Mitchell. Correlation between sepsis scores and arterial blood pressures and their variability in anesthetized foals. Poster presentation at the 2021 National Veterinary Scholars Symposium, Online Event. August 2021. Duluth, GA.

Dr. Ashley Hartley

BOOK CHAPTERS, ABSTRACTS, AND PROCEEDINGS

Komutrattananon R, Hartley AN, Pegram C, Church D, Bordbelt D, O'Neill DG. "What makes dogs tick? Risk factors and clinical management of tick infestations in UK dogs" BSAVA Congress, Clinical Abstracts, 25 May 2021.

Wilkinson K, Szafranski N., Gerhold R, Hartley AN. "Detection of select vector borne agents of ticks collected from East Tennessee." UTCVM Research Day, 20 September 2021.

Dr. Stephen Kania

PEER-REVIEWED PUBLICATIONS

Sewid AH, Kania SA. Evidence of host adaptation of coagulase positive Staphylococcus schleiferi from human and canine origin.

Microbiology Spectrum (in revision).
Balachandran, M. J. Baudry, Stephen A. Kania. Use of a molecular homology model to identify inhibitors of Staphylococcus pseudintermedius sortase A. Results in Chemistry. January 2021, Vol 3, 100185

Dr. Stephanie Kleine

PEER-REVIEWED PUBLICATIONS

Trenholme HN, Barletta M, Quandt JE, Reed RA, Kleine SA, Hofmeister EH. Arterial oxygenation in anesthetized horses placed in a 5-degree reverse Trendelenburg position. Res Vet Sci; 6 pages.

Dr. Denae LoBato

PEER-REVIEWED PUBLICATIONS

Roopa Biswas, Shannon Eaker, Dharmendra Kumar Soni, Swagata Kar, Denae LoBato, Cymbeline Culiat. Neural Epidermal Growth Factor-Like 1 Protein Variant Increases Survival and Modulates the Inflammatory and Immune Responses in Human ACE-2 Transgenic Mice Infected with SARS-CoV-2. bioRxiv 2021.02.08.430254; doi: https://doi.org/10.1101/2021.02.08.430254

BOOKS AND BOOK CHAPTERS

LeZachary Ready, Denae LoBato, Elise LaDouceur, Andrew Cushing*. Melanocytic Neoplasia In Panthera Species: Clinical Presentations, Pathologic Findings And Responses To Treatment.

PRESENTATIONS

Liu, M, R Gerhold, N Stahlman, and DN LoBato. Prevalence And Microscopic Findings Of Parelaphostrongylus Tenuis In Free-Ranging Cervids In North Dakota And Tennessee. Poster presentation and selected for an oral presentation at the 2021 annual meeting of the American College of Veterinary Pathologists. Virtual. November 2021. (Seattle, WA)
Cordero, CA and DN LoBato. Respiratory Cryptococcosis in an Umbrella Cockatoo (Cacatua alba). Selected as a featured poster presentation at the 2021 annual meeting of the American College of Veterinary Pathologists. Virtual. November 2021. Seattle, WA
Cremerius, H+ and DN LoBato. Thymoma-Associated Exfoliative Dermatitis in a Goat. Oral presentation at the Midwest Association of Veterinary Pathologists conference. Virtual. August 2021. Powell, OH
Cordero, CA and DN LoBato. Disseminated Cytauxzoonosis with Spinal Cord Hemorrhage in a Cat. Oral presentation at the Midwest Association of Veterinary Pathologists conference. Virtual. August 2021. Powell, OH
Liu, M and DN LoBato. Vitamin D–dependent rickets Type 1a in a Guinea Pig. Oral presentation at the Midwest Association of Veterinary Pathologists conference. Virtual. August 2021. Powell, OH

Dr. Girish Neelakanta

PEER-REVIEWED PUBLICATIONS

Taank, V., Lattanzio, F.A., Sultana, H., and Neelakanta, G.*Double anus in an Ixodes scapularisnymph, a medically important tick vector. Parasit Vectors14,251.
Ahmed, W., Neelakanta, G.,and Sultana, H. Tetraspanins as Potential Therapeutic Candidates for Targeting Flaviviruses. Front Immunol12,630571.
Rajendran, K.V., Neelakanta, G., and Sultana, H. Sphingomyelinases in a journey to combat arthropod-borne pathogen transmission. FEBS Lett595,1622-1638.

PRESENTATIONS

Neelakanta G. Emerging role for tick exosomalHSP70 at vector-host interface. Extracellular Vesicles and Infectious Disease Meeting. Virtual meeting. Invited oral presentation. Royal, NJ.
Neelakanta G. March to the beat of a different drummer! Rickettsial pathogen modulates signaling in ticks for its survival. College of Veterinary Medicine, Kansas State University, KS, USA. Invited oral presentation.
Neelakanta G. Targeting Tick-borne Diseases from Bench to Bedside. Henton Veterinary conference. University of Tennessee,

Knoxville, Virtual meeting. Invited oral presentation.

Namjoshi G, Dahmani, M, Sultana H and Neelakanta G. Rickettsial pathogen uses tryptophan metabolite xanthurenic acid to facilitate tick cell survival. University of Tennessee, Knoxville, Research Day.

Ahmed W,Zhou W, Neelakanta G, and Sultana H. Role of tick exosomes in acquisition or transmission of tick-borne pathogens. University of Tennessee, Knoxville, Research Day. Postdoc oral presentation.

Neelakanta G. Rickettsial pathogen orchestrate tick signaling for its survival and to infect the mammalian host. Department of Microbiology, University of Tennessee, Knoxville, TN, USA. Invited oral presentation.

Dr. Augustin Rius

PEER-REVIEWED PUBLICATIONS

Cantet, J.M., Z. Yu, and A.G. Ríus. 2021. Heat stress-mediated activation of immune–inflammatory pathways. Antibiotics, 10(11), 1285.3.J.D.

Kaufman, Y. Seidler, H.R. Bailey, L. Whitacre, F. Bargo, K. Lüersen, G. Rimbach, G.M. Pighetti, I.R. Ipharraguerre, and A.G. Ríus. 2021. A postbiotic from Aspergillus oryzae attenuates the impact of heat stress in ectothermic and endothermic organisms. Scientific Reports 11(1):6407. https://doi.org/10.1038/s41598-021-85707-3

Dr. Sreekumari Rajeev

PEER-REVIEWED PUBLICATIONS

Prakoso D, Zhu X, Rajeev S. Galleria mellonella infection model to evaluate pathogenic and nonpathogenic Leptospira strains. Vet Microbiol. 2021 Nov 24;264:109295. doi: 10.1016/j.vetmic.2021.109295. Epub ahead of print. PMID: 34875420.

PRESENTATIONS

S. Rajeev, R. Xu, D. Prakoso, L. Salvador. Detection of polyadenylated mRNA in Leptospira transcriptome using Nanopore based RNA sequencing CRWAD 2021 -Oral presentation. Chicago, IL

R. Xu , S. Rajeev, L. Salvador. Leptospira pangenome analysis reveals recombination events in the core and accessory genes CRWAD 2021 -Oral presentation. Chicago, IL

D. Prakoso, S. Rajeev. Feasibility of Galleria mellonella invertebrate model to study Leptospira. CRWAD 2021-Poster presentation. Chicago, IL

Kimberly Lehman, Christine Quance, Tyler Thacker, Angela Pelzel-McCluskey, Linden Craig, Rebekah Jones, Brian Johnson, Sreekumari Rajeev. Case report of Brucella suis biovar isolated from aborted materials in a mare. AAVLD 2021. Aurora, CO

Myranda Gorman, Dhani Prakoso, Julie Bedwani, Michelle Dennis, Richard Gerhold, Sreekumari Rajeev. A pilot study to assess the prevalence of Leptospira infection in wild animals in Tennessee. AAVLD 2021. Aurora, CO

Ruijie Xu, Liliana Salvador, Sreekumari Rajeev. Comparison of taxonomical profiling programs for the analysis of metagenomic data from biological specimens AAVLD2021. Aurora, CO

Porsha Reed, Dhani Prakoso, Linden Craig, Andrew Cushing, Rebekah Jones, Brian Johnson, Stephen Kania, Sreekumari Rajeev. Isolation of Blastomyces gilchristii from a tiger lung. AAVLD 2021. Aurora, CO

Dr. Barry Rouse

PEER-REVIEWED PUBLICATIONS

Sumbria, D., Berber, E and Rouse, B.T. Supplementing the Diet with Sodium Propionate Suppresses the Severity of Viral Immuno-inflammatory Lesions. J Virol 2021. 95: e02056-02020. doi: 10.1128/jvi.02056-20. PMID: 33208449.

Sehrawat, S., and Rouse, B.T. COVID-19: disease, or no disease? - that is the question. It's the dose stupid! Microbes Infect. 2021. 23: 104779. doi: 10.1016/j.micinf.2021.104779. PMID: 33450356.

Dash, S. P., Dipankar, P, Burange, P.S., Rouse, B.T. and Sarangi P.P. Climate change: how it impacts the emergence, transmission, resistance and consequences of viral infections in animals and plants. Crit Rev Microbiol 2021. 47: 307-322. doi: 10.1080/1040841x.2021.1879006. PMID: 33570448.

Berber, E., Sumbria, D. and Rouse, B.T. Could targeting immunometabolism be a way to control the burden of COVID-19 infection? Microbes Infect 2021. 23: 104780. doi: 10.1016/j.micinf.2021.104780. PMID: 33482357.

Sumbria, D., Berber, E., Miller L, Rouse B.T. Modulating glutamine metabolism to control viral immuno-inflammatory lesions. Cell Immunol 2021. 370: 104450. doi: doi: 10.1016/j.cellimm.2021.104450. PMID: 34678554.

Berber, E., Sumbria, D., Newkirk, K. M. and Rouse, B.T. Inhibiting glucose metabolism results in herpes simplex encephalitis. J. Immunol. 2021. 207 (7): 1824-35. doi: 10.4049/jimmunol.2100453. PMID: 34470854.

Gupta S, Rouse B.T. and P., Sarangi. Did climate change influence the emergence, transmission, and expression of the COVID-19 Pandemic.2021 Frontiers in Medicine2021. 8: 769208. doi: 10.3389/fmed.2021.769208. PMID: 34957147.
Miller L, Berber E, Sumbria, D and Rouse B.T. Controlling the burden of Covid-19 infection by manipulating host metabolism. Viral Immunology 2021.35: 24-32. doi: 10.1089/vim.2021.0150. PMID: 34905407.

Dr. Joseph Smith

PEER-REVIEWED PUBLICATIONS

Breuer, Ryan; Riedesel, Elizabeth; Fowler, Jennifer; Yaeger, Michael; Smith, Joe; Kreuder, Amanda. Use of ultrasonography and digital radiography to aid in the diagnosis of clinical disease associated with ovine progressive pneumonia in sheep. Accepted by the Canadian Veterinary Journal, 10/18/21.58.
Videla R, Sommardahl C, Smith J, Schaefer DMW and Cox S (2021) Pharmacokinetics of Orally Administered Prednisolone in Alpacas. Frontiers in Veterinary Science8:745890. doi: 10.3389/fvets.2021.745890.57.
Joe S. Smith, Jonathan P. Mochel, Windy M. Soto-Gonzalez, Olivia G. Escher, Rebecca R. Rahn,Bryanna N. Fayne, Anastasia M. Geletka, Lainey E. Harvil, Joan B. Bergman and Sherry Cox. Pharmacokinetics of Pantoprazole and Pantoprazole Sulfone in Goats after Intravenous Administration. Accepted 8/26/2021 by Frontiers in Veterinary Science.
Michael Yaeger, Jonathan P. Mochel, Zuowei Wu, Paul Plummer, Orhan Sahin, Joseph Smith, Melda Ocal, Ashenafi Beyi, Changyun Xu, Qijing Zhang, Ronald W Griffith. Pharmacokinetics of Tulathromycin in pregnant ewes (Ovis aries) challenged with Campylobacter jejuni. PLoS ONE16(8): e0256862. https://doi.org/10.1371/journal.pone.0256862
Liz Marchant, Dane M. Tatarniuk, Joe Smith, Amanda Kreuder, Paul Merkatoris, Elizabeth A. Riedesel. What Is Your Diagnosis: "Subchondral bone cyst of the calcaneous communicating with the proximal intertarsal joint in a calf". Journal of the American Veterinary Medical Association. August 15, 2021, Vol. 259, No. 4, Pages 357-359. https://doi.org/10.2460/javma.259.4.35754.
Chapuis RJJ, Smith JS, French HM, Toka FN, Peterson EW, Little EL. Nonlinear Mixed-Effect Pharmacokinetic Modeling and Distribution of Doxycycline in Healthy Female Donkeys after Multiple Intragastric Dosing–Preliminary Investigation. Animals. 2021; 11(7):2047. https://doi.org/10.3390/ani11072047.53.
Chapuis, R. J. J., Smith, J. S., Uehlinger, F. D., Meachem, M., Johnson, R., & Dowling, P. M. Pharmacokinetics and pharmacodynamics of doxycycline in a Streptococcusequi subsp. zooepidemicus infection model in horses. Journal of Veterinary Pharmacology and Therapeutics, (2021); 00, 1–10. https://doi.org/10.1111/jvp.12982.52.
Mosichuk AP, Smith JS, Tatarniuk DM, Troy JR and Kreuder AJ (2021) Meropenem Administered via Intravenous Regional Limb Perfusion for Orthopedic Sepsis in Horses: A Clinical Retrospective Study. Front. Vet. Sci.8:629627. doi: 10.3389/fvets.2021.629627Published 3/27/2021 51.
Locklear TR, Videla R, Breuer RM, Mulon P-Y, Passmore M, Mochel JP, Gerhold R, Schaefer JJ and Smith JS (2021). Presentation, Clinical Pathology Abnormalities, and Identification of Gastrointestinal Parasites in Camels (Camelus bactrianus and Camelus dromedarius) Presenting to Two North American Veterinary Teaching Hospitals. A Retrospective Study: 1980–2020. Front. Vet. Sci.8:651672. doi: 10.3389/fvets.2021.651672

PRESENTATIONS

AC Bowden, RA Allbaugh, JP Mochel, J Smith, L Sebbag. PHARMACOKINETICS OF EXTENDED-RELEASE PARENTERAL CEFTIOFUR (EXCEDE®) IN THE CANINE TEAR FILM. 2021 American College of Veterinary Ophthalmology Annual Conference, 9/30/2021.53. Indianapolis, IN .
J. Smith, L. Ebner, H. Cremerius, C. Cantrell, J. Olivarez, D. Tatarniuk, A.J. Kreuder, P. Mulon. Implementation of surgical abomasal cannulation for smartphone measurement of abomasalpH in beef calves. 2021 Conference of Research Workers of Animal Disease. 12/2/2021.52. Chicago, IL.
Sydney K Richardson, Patrick J. Gorden, Kelsey Meyer, Rebecca L. Parsons, Joe S. Smith, Bonnie Kraus, Suzanne T. Millman. Efficacy of a liposomal bupivacaine suspension (Nocita®) for disbudding in dairy calves. 2021 National Veterinary Scholars Symposium, August, 2021. Ames, IA.
Taylor R. Locklear, Ryan M. Breuer, Ricardo Videla, Pierre-Yves Mulon, Mary Passmore, Jonathan P. Mochel, Richard W. Gerhold, John J. Schaefer, Joe. S Smith. Clinical Findings of Gastrointestinal Parasitismin Camels Presenting to a Veterinary Teaching Hospital. Accepted 3/19/21 for 2021 ACVIM Forum. Greenwood Village, CO.
Joe Smith, Amanda Kreuder, Bente Flatland. Comparison of a point-of-care hematocrit assay and an automated microcentrifuge for cattle and sheep. Accepted 3/19/21 for 2021 ACVIM Forum. Greenwood Village, CO.
Smith J. Antimicrobial Selection for Small Ruminants", TVMA. 12/3/202118. "What's New in Ruminant Pharmacology: An Update."2021 ACVIM Forum.17. "Responsible Antimicrobial Use in Small Ruminants: Navigating Drug Selection", AASRP Continuing Education Seminary Series. 5/12/2021. Ahsland, OH.
Smith J. Antimicrobial Selection in Small Ruminants", Henton Veterinary Conference, Knoxville, TN. 12/3/21"Responsible Antimicrobial Use in Small Ruminants: Navigating Drug Selection", AASRP Continuing Education Seminary Series. 5/12/21"Small Ruminant Euthanasia", Co-presented with Dr. Ryan Breuer. AASRP Euthanasia Wetlab, Iowa State University. Zoom. 3/27/21.
Haley Cremerius, PY Mulon, Jeff Olivarez, Channing Cantrell, Rebecca Rahn, Windy Soto-Gonzalez, Lainey Harvill, Joan Bergman, Lisa Ebner, Sherry Cox, and Joe Smith. Pharmacokinetics and Pharmacodynamics of pantoprazole in neonatal calves.

UTCVM Research Day 2021, 9/20/2021*Ms. Cremerius received 2ndplace in the Veterinary Student category for this work. Knoxville, TN.

Channing Cantrell, Joe Smith, Sreemari Rajeev, Haley Cremerius, and Pierre-Yves Mulon. Efficacy of a Hypochlorous acid solution on bacterial re-colonization of surgical sites. UTK CVM COE Research Day 2021, 9/20/202150. Knoxville, TN.

C Burlison, S Cox, G Galyon, J Smith, J Stokes, J Whittemore, B DeBolt. PHARMACOKINETICS OF ORALLY ADMINISTERED SINGLE-DOSE PONAZURIL IN CATS. Accepted by the 2021 ABVP Conference, Cancelled due to hurricane Conditions. Presented at UTK CVM COE Research Day 2021, 9/20/202149 Knoxville, TN.

Joe Smith, Lisa Ebner, Haley Cremerius, Channing Cantrell,Windy Soto-Gonzalez, Rebecca Rahn, Jeff Olivarez, Jonathan Mochel, Amanda Kreuder. A FIELD COMPARISON OF 2 POINT OF CARE GLUCOMETERS IN HEALTHY CALVES. 2021 International Veterinary Emergency and Critical Care Symposium. September 11-15, Nashville, TN.48. Ronan J.

J. Chapuis, Joe S. Smith, Hilari M. French, Felix N. Toka, Erik W. Peterson, Erika L. Little. Pharmacokinetic Modelling and Distribution of Doxycycline in Healthy Female Donkeys After Multiple Intragastric Administration. 2021 AAEP Convention, December 7th, 2021, Nashville, TN.

Lisa Ebner, Odette O, Bradley Simon, Joe Smith, Ignacio LizarragaSherry Cox. Intravenous and Intramuscular Butorphanol Pharmacokinetics in Donkeys. 2021 AAEP Convention, December 7th, 2021, Nashville, TN.

Bryanna Fayne, Windy Soto, Rebecca Rahn, Anastasia Geletka, Olivia Escher, Joe Smith. A Retrospective Investigation of the Clinical Safety of Ponazuril in Hospitalized Sheep, Goats, and other Small Ruminant Species (#322). Presented April 19-23, 2021. Exhibition of Undergraduate Research and Creative. Knoxville, TN.

Smith J. Local News One Shot Briefs. "Carfentanyl and Fentanyl Use in Veterinary Medicine"WVLT 8, Knoxville, TN, 12/3/2021.2. "Large Animal Ivermectin and COVID-19"1. "Bovine Hoof Trimming."

Dr. Hameeda Sultana

PEER-REVIEWED PUBLICATIONS

Sphingomyelinases in a journey to combat arthropod-borne pathogen transmission. Rajendran, KR., Neelakanta, G., Sultana, H#. FEBS Letters.2021 (REVIEW),Jun;595(12):1622-1638. doi: 10.1002/1873-3468.14103.#.

Tetraspanins as Potential Therapeutic Candidates for Targeting Flaviviruses. Ahmed, A., Neelakanta, G., Sultana, H#.Frontier in Immunology. 2021 (REVIEW), Apr 21;12:630571. doi: 10.3389/fimmu.2021.630571. eCollection 2021.#.

Double anuses tick: A case report from a medically important vector Ixodes scapularis. Taank, V., Lattanzio, F.A., Sultana, H., Neelakanta, G #. Parasit vectors.2021 May 11;14(1):251. doi: 10.1186/s13071-021-04757-8.

PRESENTATIONS

Sultana, H., Arthropod Exosomes, pathogen transmission and vector-borne Diseases, Targets for Therapeutics. 2021 Henton Veterinary Conference, Hilton Knoxville Airport, Knoxville, TN, USA. December 2021.

Sultana, H., Arthropod EVs, flaviviruses and the cargo; all at the vertebrate skin interface. 1stAnnualmeeting of the American Society for Intercellular Communication (ASIC), Bolger Center, Potomac, MD, USA. October 2021.

Sultana, H. Arthropod EVs and their molecular determinants at the crossroads of virus-vector host interactions.4th Annual Meeting of Extracellular vesicles and Infection (EV & I), (May) (Invited Talk; VIRTUAL). Royal, NJ. October 2021.

Dr. Rebecca Trout Fryxell

PEER-REVIEWED PUBLICATIONS

Smith, K. V. b, K. L. DeLong, A. P. Griffith, C. N. Boyer, C. C. Martinez, S. M. Schexnayder, and R. T. Trout Fryxell c. 2021. Cost of horn fly (Diptera: Muscidae) control for cow-calf producers in Tennessee and Texas. Journal of Economic Entomology,115(1): 371-380. https://doi.org/10.1093/jee/toab239.

Trout Fryxell, R. T.c, M. Camponovo, B. Smith, K. Butefish, J. M. Rosenberg, J. L. Andsager, C. A. Dayg, and M. Willis. Development of a community-d riven mosquito surveillance program for vectors of La Crosse virus to educate, inform, and empower a community. Insects. 13(2): 164.https://doi.org/10.3390/insects130201647.

Butler, R. A.ac, J. G. Chandler, K. M. Vail, C. J. Holderman, and R. T. Trout Fryxell. 2021. Spray and pour-on acarcides killed Tennessee (United States) field-collected Haemaphysalis longicornis nymphs (Acari: Ixodidae) in laboratory bioassays. Journal of Medical Entomology. 58(6): 2514-2518. https://doi.org/10.1093/jme/tjab115a.

Hamilton, A. M., D. J. Paulsen, R. T. Trout Fryxell, V. E. Orta, S. J. Gorma, D. M. Smith, J. R. Buchanan, A. L. Wszelaki, and F. J. Critzer c. 2021. Prevalence of Salmonella enterica in flies on a diversified cattle and fresh produce farm across two growing seasons. Journal of Food Protection. 84(6): 1009-1015. https://doi.org/10.4315/JFP-20-3399.

Butler, R. A.ac, R. T. Trout Fryxell, M. L. Kennedy, A. E. Houston, E. K. Bowers, L. B. Coons, and D. Paulsen. 2021. No evidence of competition between the blacklegged tick (Ixodes scapularis Say) and American dog tick (Dermacentor variabilis Say) on the rodent host white-footed deermouse (Peromyscus leucopus Rafinesque) in southwestern Tennessee. Journal of

Medical Entomology. 58(3): 1470-1475. https://doi.org/10.1093/jme/tjab01210.
Black, M. u, J. G. Chandler, R. T. Trout Fryxell, and K. M. Vailc. 2021. The common bed bug, Cimex lectularius (Hemiptera: Cimicidae), does not commonly use canines and felines as a host in low-income, high-rise apartments. Journal of Medical Entomology. 58(6): 2040-2046.https://doi.org/10.1093/jme/tjab070.
Cook, C. ac, A. Blesiu, S. Brozaku, S. Lenhart, H. Reedu, C. Urquharta, A. Moncayo, R. Trout Fryxell. 2021. La Crosse virus spread within the mosquito population in Knox county, TN. PLoS ONE. 16(4): e0249811. https://doi.org/10.1371/journal.pone.024981112.
Trout Fryxell, R. T. c, R. Moon, D. Boxler, and D. W. Watson. 2021. Face fly (Diptera: Muscidae) – Biology, pest status, current management prospects, and research needs. Journal of Integrated Pest Management. 12(1): 5. Invited paper in "Filth flies affecting animal agriculture series" https://doi.org/10.1093/jipm/pmaa02013.
Brewer, G. c, D. Boxler, L. Domingues, C. Holderman, K. Loftin, E. Machtinger, B. Smythe, J. Talley, R. Trout Fryxell, W. Watson. Horn Fly, (Diptera: Muscidae) - Biology, Management, and Future Research Directions. Journal of Integrated Pest Management. 12(1): 42., Invited paper in "Filth flies affecting animal agriculture series" https://doi.org/10.1093/jipm/pmab01914.
Trout Fryxell, R. T.c, D. N. Vann, R. A. Butler, D. J. Paulsen, J. G. Chandler, M. P. Willis, H. M. Wyrosdick, J. J. Schaefer, R. W. Gerhold, D. M. Grove, J. Z. Ivey, K. W. Thompson, R. D. Applegate, J. Sweaney, S. Daniels, S. Beaty, D. Balthaser, J. D. Freye, J. W. Mertins, D. L. Bonilla, and K. Lahmers. 2021. Rapid discovery and detection of Haemaphysalis longicornis through the use of passive surveillance and collaboration: building a state tick-surveillance network. International Journal of Environmental Research and Public Health. 18(15): 7980-7993. https://www.mdpi.com/1660-4601/18/15/7980/htm.
Vogt, J. T. c, B. D. Allen, D. Paulsen, R. T. Trout Fryxell. 2021. A unique academic-government collaboration yields first report of detailed habitat description for Haemaphysalis longicornis (Ixodida: Ixodidae) in Madison county, KY. Journal of Medical Entomology. 67: 1310-1313. https://doi.org/10.1093/jme/tjab061.
Psota, E. c, E. Lucb, G. Pighetti, L. Schneider, R. T. Trout Fryxell, J. Keele, and L. Kuehn. 2021. Development and validation of a neural network for the automated detection of horn flies on cattle. Computers and Electronics in Agriculture. 180: 105927. https://doi.org/10.1016/j.compag.2020.105927.

PRESENTATIONS

Trout Fryxell, RT. The neglected story of La Crosse virus in Appalachia and how community-driven surveillance is enhancing its awareness to find solutions. Invited Presentation by the American Committee of Medical Entomology (ACME) Symposium II: Fresh Voices in Neglected Vector-Borne Diseases. American Society of Tropical Medicine and Hygiene. Virtual.
Butler, R. A., Trout Fryxell RT, et al. 2021. An ecological assessment of tick encounters in the southeastern United States. Invited Presentation to the Acarological Society of America, Denver, CO. Outstanding student presentation competition (2nd place).
Butler, R. A. a and R. T. Trout Fryxell. 2021. Developing a tick surveillance program for the state of Tennessee: responding to Haemaphysalis longicornis. Invited Webinar, by Public Tick Integrated Pest Management Working Group
Trout Fryxell RT. December 2021. Asian longhorned tick and Theileria: updates on these exotic and invasive pests. University of Tennessee Beef and Forage Council, Knoxville, TN.
Camponovo, M. and R. T. Trout Fryxell. 2021. Medical Entomology & Geospatial AnalysesBringing Innovation To Teacher Education & Surveillance Studies (MEGA:BITESS); ESRI Teachers Teaching Teachers GIS (T3G), Virtual
Trout Fryxell, R. T., M. Camponovo, K. Butefish, B. Smith, J. Andsager, and J. Rosenberg.2021. Medical Entomology & Geospatial Analyses:Bringing Innovation To Teacher Education & Surveillance Studies (MEGA:BITESS); TN Geographic Information Council (TNGIC) Spring Conference, Virtual
Trout Fryxell, R. T., M. Camponovo, K. Butefish, B. Smith, J. Andsager, and J. Rosenberg. 2021. Medical Entomology & Geospatial Analyses:Bringing Innovation To Teacher Education & Surveillance Studies (MEGA:BITESS); TN 4-H Eastern Region Planning Meeting, Virtual

Dr. Brian Whitlock

PEER-REVIEWED PUBLICATIONS

Barber AM, Helms A, Thompson R, Whitlock BK, Steffen DJ, Petersen JL. Whole-genome sequencing to investigate a possible genetic basis of perosomus elumbis in a calf resulting from a consanguineous mating. Translational Animal Science. 2021 Dec;5(Supplement_S1):S1-5.
Curtis AK, Whitlock BK, Daniel JA, Okafor CC, Kleinhenz MD, Coetzee JF. Assessment of statewide and within-herd seroprevalence of Anaplasma marginale antibodies in 12 Bos taurus–Bos indicus cow herds and the association with sporadic outbreaks of bovine anaplasmosis in Florida. Applied Animal Science. 2021 Dec 1;37(6):689-96.
Kent E, Okafor CC, Caldwell JM, Walker T, Whitlock BK, Lear A. Control of Salmonella Dublin in a bovine dairy herd. Journal of Veterinary Internal Medicine. 2021 Jun 1. https://doi.org/10.1111/jvim.16191. Co-author, study design, writing and editing
Brown WE, Garcia M, Mamedova LK, Whitlock BK, Daniel JA, Bradford BJ. Acute-phase protein -1-acid glycoprotein is negatively associated with feed intake in postpartum dairy cows. Journal of Dairy Science. 2021 January; 104(1): 806-817.

BOOK CHAPTERS, ABSTRACTS, AND PROCEEDINGS

Bickmeier N, Flowers M, Anantatat T, Okafor CC, Whitlock BK, Strickland LG, Rhinehart J, Carter C, Reif K. Genetic Diversity of Anaplasma Marginale in Tennessee Beef Cattle Herds. Conference of Research Workers in Animal Disease. December 2021.

Curtis A, Whitlock BK, Daniel JA, Okafor CC, Kleinhenz M, Coetzee JF. Comparison of Statewide and Herd Level Seroprevalence of Anaplasma Marginale Antibodies in Florida Cattle. Conference of Research Workers in Animal Disease. December 2021.

Okafor CC, Reif K, Rhinehart J, Strickland LG, Beever J, Whitlock BK. Within Herd Seroprevalence of Bovine Anaplasmosis in Tennessee, 2020-2021. Conference of Research Workers in Animal Disease. December 2021.

Whitlock BK, Renwick A, Pi A, Daniel JA. PSX-A-2 Late-Breaking: Acute Endotoxinemia May Increase Intercostal Temporary Mechanical Nociception in Wethers. Journal of Animal Science. 2021. Nov;99(Supplement_3):370-371.

Renwick A, Daniel JA, Whitlock BK. PSX-A-25 Late-Breaking: The Effects of Chronic Endotoxinemia on Rectal and Subcutaneous Temperature in Wethers. Journal of Animal Science. 2021 Nov;99(Supplement_3):370-371.

Research Funded Externally

Lead Investigator	Proposal Title	Sponsor	Amount Awarded
Dr. Madhu Dhar	Optimization and validation of ex vivo models of equine laminitis	Byrock Technologies	$24,656
	Cellulose–based scaffolds for tissue engineering	USDA NIFA Sun Grant Program - Southeastern Region	$342,340
Dr. Trout Fryxell	Arthropod study at Arnold Air Force Base	United States Air Force	$220,000
Dr. Richard Gerhold	Investigating the efficacy of an all-natural product on the egg viability of the cecal nematode, Heterakis gallinarum	Akrion Life Sciences, LLC	$11,027
	Funding agreement - Dr. Nicole Szafranski	Oklahoma State University Foundation	$55,000
	Black Bear population health monitoring in the Great Smoky Mountains National Park	Great Smoky Mountains Conservation Association	$7,500
Dr. Stephen Kania	2022 Boehringer Ingelheim Veterinary Scholars Program	Boehringer Ingelheim Animal Health	$5,000
Dr. Sreekumari Rajeev	Genome-wide identification and characterization of peptide epitopes from *Ehrlichia canis* and *Anaplasma platys*, with potential preventive, diagnostic, and therapeutic value in dogs	AKC Canine Health Foundation	$100,244
	Leptospira and host specific gene expression patterns: A study using in vitro bovine whole blood culture stimulation system and whole transcriptome analysis	USDA/NIFA	$15,000
Dr. Brian Whitlock	Non-invasive spectroscopic quantification of depression biomarkers	Wellcome Leap Foundation	$660,460
		TOTAL	$1,442,277

Research Funded Internally

Lead Investigator	Proposal Title	Amount Awarded
Dr. Elizabeth Collar	Creation of a subchondral bone disease ovine model utilizing impact loading: A preliminary study	$15,000
	Feasibility and safety of intra-articular ultrafication probes to collect synovial fluid in horses	$4,998
	Pharmacokinetic and pharmacodynamic comparison of epidural and intramuscular triamcinolone in horses	$5,000
Dr. Michelle Dennis	Transdisciplinary diagnostic investigation of freshwater mussel mortality in the Clinch River	$75,000
Dr. Madhu Dhar	To establish a versatile, consistent, and efficacious platofrm for tissue engineering	$14,194
	Investigation into viability of synovial mesenchymal stem cells after repeated intra-articular allogenic stem cell injection in MHC-micmatched horses	$5,000
	Multiscale, poly-topographic platforms for complex, multifunctional tissue regeneration using precision engineering: A prelude to organogenesis	$40,000
	Neural tissue engineering: Preliminary advances towards transforming nerve repair in human and veterinary medicine	$5,000
Dr. Richard Gerhold	Investigation of the pathogensis, tropism, and epidemilogy of the zoonotic pathogen, *Toxoplasma gondii*, in mallard ducks (*Anas platyrhynchos*)	$15,000
	Develop a system for molecular detection and identification of zoonotic pathogens of most concern in the United States of America	$24,500
	Investigation of parvovirus in wild carnivores	$5,000
	Quantification of Toxoplasma gondii tachyzoites in blood clots as an early diagnostic tool and the relationship between number of tachyzoites in peripheral blood antibody titer	$5,000
Dr. Stephen Kania	Novel antibiotics from extremophile bacteria	$7,375
	Pilot studies on use of immunoglobin therapy for treatment of disease states	$7,000
	Effect of co-incubation with mediations or crystalloid solutions on canine packed red blood cells	$6,000
	Effect of co-incubation with medications or crystalloid solutions on canine packed red blood cells	$5,000
	Heat stress-mediated systemic inflammation in dairy calves	$13,760
Dr. Stephanie Kleine	Effect of co-incubation with medications or crystalloid solutions on canine packed red blood cells	$6,000
Dr. Sreekumari Rajeev	Novel antiobiotics from extremophile bacteria	$7,375
	Develop a system for molecular detection and identification of zoonotic pathogens of most concern in the United States of America	$24,500
	Novel antiobiotics from extremophile bacteria	$7,375
Dr. Augustin Rius	Heat stress-mediated systemic inflammation in dairy calves	$13,760
Dr. Barry Rouse	Investigating the role of metabolic manipulation on the bloob brain barrier	$14,787
Dr. Trout Fryxell	Confirming *Anaplasma marginale*, *Ehrlichia ewingii*, and *Therileria orientalis* Ikeda in Tennessee-collected ticks	$15,000
Dr. Brian Whitlock	Evaluation of a general cyclo-oxygenase inhibitor for protection of KNDy neurons from acute endotoxin-induced inflammation	$15,000
	TOTAL	**$356,624**

Actual and Proposed Budget

	FY22 Actual			FY23 Proposed		
	Matching	Appropr.	Total	Matching	Appropr.	Total
Expenditures	**$**	**$**	**$**	**$**	**$**	**$**
Salaries						
Faculty	-	-	-	-	-	-
Other Professional	$18,375	$36,749	$55,124	$32,581	$65,161	$97,742
Clerical/ Supporting	$24,334	$48,668	$73,002	$50,177	$100,355	$150.532
Assistantships	$39,204	$78,408	$117,612	$52,303	$104,606	$156,909
Total Salaries	**$81,913**	**$163,825**	$245,738	**$135,061**	**$270,122**	$405,183
Longevity (Excluded from Salaries)	-	-	-	-	-	-
Fringe Benefits	$13,924	$27,848	$41,772	$18,274	$36,549	$54,823
Total Personnel	**$95,837**	**$191,673**	$287,510	**$153,335**	**$306,671**	$460,006
Non-Personnel						
Travel	$886	$1,772	$2,658	$1,567	$3,133	$4,700
Software	$3,297	$6,595	$9,892	$4,959	$9,918	$14,877
Books & Journals	-	-	-	-	-	-
Other Supplies	$102,206	$204.412	$306,618	$149,639	$299,277	$448,916
Equipment	$111,065	$222,129	$333,194	$342,584	$685,168	$1.027,752
Maintenance	$6,617	$13,233	$19,850	$10,000	$20,000	$30,000
Scholarships	$24,457	$48,913	$73,370	$62,520	$125,040	$187,560
Consultants	-	-	-	-	-	-
Renovation	$92,415	$184,831	$277,246	$102,509	$205,019	$307,528
Other (Specify):						
Livestock	$1,067	$2,133	$3,200	-	-	-
Utilities/Fuel/Rentals/Insurance	$201	$401	$602	$211	$421	$632
Printing/Publications/Postage	$1,603	$3,206	$4,809	$178	$356	$534
Contracted Special Services	$15,546	$31,092	$46,638	$10,710	$21,420	$32,130
Total Non-Personnel	**$359,359**	**$718,718**	$1,078,077	**$684,876**	**$1,369,753**	$2,045,629
GRAND TOTAL	**$455,196**	**$910,391**	1,365,587	**$838,212**	**$1,676,423**	$2,514,635
Revenue						
New State Appropriation	-	$542,778	$542,778	-	$561,013	$561,013
Carryover State Appropriation	-	$1,483,024	$1,483,024	-	$1,115,410	$1,115,410
New Matching Funds	$271,389	-	$271,389	$280,507	-	$280,507
Carryover from Previous Year Matching Funds	$741,512	-	$741,512	$557,705	-	$557,705
TOTAL REVENUE	**$1,012,901**	**$2,025,802**	$3,038,703	**$838,212**	**$1,676,423**	$2,514,635

Requested Budget

	FY24 Requested		
	Matching	Appropr.	Total
Expenditures			
Salaries			
Faculty	-	-	-
Other Professional	$16,667	$33,333	$50,000
Clerical/ Supporting	$23,333	$46,667	$70,000
Assistantships	$33,333	$66,667	$100,000
Total Salaries	**$73,333**	**$146,667**	$220,000
Longevity (Excluded from Salaries)	-	-	-
Fringe Benefits	$13,333	$26,667	$40,000
Total Personnel	**$86,667**	**$173,333**	$260,000
Non-Personnel			
Travel	$667	$1,333	$2,000
Software	$3,333	$6,667	$10,000
Books & Journals	-	-	-
Other Supplies	$85,865	$171,731	$257,596
Equipment	$87,333	$174,667	$262,000
Maintenance	$3,667	$7,333	$11,000
Scholarships	$10,667	$21,333	$32,000
Consultants	-	-	-
Renovation	-	-	-
Other (Specify)			
Livestock	-	-	-
Utilities/Fuel/Rentals/Insurance	$333	$667	$1,000
Printing/Publications/Postage	$1,000	$2,000	$3,000
Contracted Special Services	$15,000	$30,000	$45,000
Total Non-Personnel	**$207,865**	**$415,731**	$623,596
GRAND TOTAL	**$294,532**	**$589,064**	$883,596
Revenue			
New State Appropriation	-	$589,064	$589,064
Carryover State Appropriation	-	-	-
New Matching Funds	$294,532	-	$294,532
Carryover from Previous Year Matching Funds	-	-	-
TOTAL REVENUE	**$294,532**	**$589,064**	$883,596

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