

*Center of Excellence*  
in Livestock Diseases  
and Human Health

Annual Report

2012



THE UNIVERSITY of TENNESSEE 

INSTITUTE of AGRICULTURE  
COLLEGE of VETERINARY MEDICINE

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# Welcoming Remarks

We are pleased to present the 2012 annual report for the Center of Excellence in Livestock Diseases and Human Health. Along with benchmark data for fiscal years 2008–2012, this report includes highlights of faculty research projects funded by the center in fiscal year 2012.

The center continues to adapt to the changing extramural funding environment. Nationally, there continues to be increasing competition for federal research funds, and levels of federal awards have dramatically decreased. This has affected all investigators across the spectrum of academic institutions, including those engaged in biomedical and farm animal-based research here at the University of Tennessee. In response to this trend, the center has concentrated on maintaining competitiveness of active research programs, fostering new avenues of investigation, and promoting the initial efforts of new College of Veterinary Medicine (UTCVM) faculty recruits. In addition, the center is investing in initiatives that promote translational research, the coordinated movement of bench-level research to the clinic, and stimulation of professional students in developing an investigative, research-oriented mindset. Thus, the areas of active research in the UTCVM that are impacted by the center have increased.

During 2012, the center supported the efforts of 12 faculty. These faculty have made significant advancements in cancer biology, molecular pathophysiology, host defense, and disease transmission. Center faculty also made significant advancements in the prevention and treatment of infectious and non-infectious livestock diseases that affect agricultural productivity. Research funding steadied, and the return on investment, as the ratio of research expenditures to the state appropriation for the center, was 4.7:1.

Center faculty continue to garner national and international recognition for their research and scholarship. During calendar year 2011, center faculty published 39 peer-reviewed articles and gave 63 presentations at regional, national, and international meetings.

Despite increased fiscal challenges faced by our center faculty, we are extremely proud of their efforts and continued success; we hope you enjoy this summary presentation of center activities and accomplishments.



Dr. Jim Thompson, Dean



# Center of Excellence in Livestock Diseases and Human Health

2012 Annual Report

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2012 Annual Report

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# Comparative Summary of Accomplishments

Benchmark	2012 12 faculty	2011 15 faculty
<b>Publications</b>	n (mean)*	n (mean)†
Peer-reviewed articles	39 (3.25)	59 (4.92)
Books or book chapters	2 (0.17)	3 (0.20)
Abstracts or posters	63 (5.25)	69 (4.6)
<b>Presentations</b>		
International	9 (0.75)	23 (1.53)
National	40 (3.33)	22 (1.83)
State or local	14 (1.17)	9 (0.60)
<b>Research monies</b>		
External funding	\$2,466,712 (\$205,559)	\$5,401,346 (\$360,089)
Research expenditures	\$2,332,888 (\$194,407)	\$3,916,121 (\$261,074)
Return on investment	4.7:1	7:1

\*Publications and presentations based on 2011 calendar year; research monies based on 2012 fiscal year. †Publications and presentations based on 2010 calendar year; research monies based on 2011 fiscal year.

*The key to success isn't kicking down the door; it's building your own.*  
-Brian Celio



# Comparative & Experimental Medicine *and* Public Health Research Symposium

The Center of Excellence was a major sponsor of the Comparative & Experimental Medicine and Public Health Research Symposium, which brought together researchers from 22 different departments for a 2-day-long event that included special seminars on communicable diseases of public health interest in Africa, potential dietary treatments for cancer, the growing academic emphasis on interdisciplinary research and education, and open-mindedness and skepticism about causes and alleviators of the obesity epidemic.

Featured was Dr. Sten Vermund of the Vanderbilt Institute for Global Health at Vanderbilt University. Also featured were Dr. Jay Whelan of the UT Department of Nutrition and Dr. Lee Riedinger of the UT Center for Interdisciplinary Research and Graduate Education. Dr. David Allison, director of the Office of Energetic & Nutrition Obesity Research Center at the University of Alabama at Birmingham, presented a plenary address. The symposium culminated with an awards banquet and guest speaker Dr. Gary McCracken, known for his research on white-nose syndrome in bats.

Fifty researchers from the Institute of Agriculture presented talks at the symposium, including heavy participation by members of the Biomedical & Diagnostic Sciences and Animal Science departments. These 50 representatives were among 76 new scientists to present, and at the end of the 2 days, the institute was able to boast five winners of travel awards. The center sponsored two of the 2011 award winners to present at two national scientific meetings during fiscal year 2012.

The symposium was designed to allow sharing of research results, promote collaboration, and provide new investigators meeting-format experience via 10-minute presentations, with 5 minutes for questions from the audience. It remains an entirely unique, cross-campus, cross-disciplinary venue for presenting new research data on the Knoxville campuses of the university.

**<http://www.vet.utk.edu/research/symposium/>**



# Introduction

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The center was created in 1984 to promote interdisciplinary activities designed to improve the quality of human life through better animal health; expand livestock disease research capabilities in the College of Veterinary Medicine (UTCVM) and the Institute of Agriculture; identify and characterize animal diseases that are similar to human diseases; and develop new strategies for the diagnosis, treatment, and prevention of disease.

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

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

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

These two areas are highly interrelated, and the center plays a critical role in developing these focused areas of strength in both the UTCVM and the Institute of Agriculture. These areas also encompass the “One Health” concept, wherein the inter-related disciplines of animal, human, and environmental health are combined for the betterment of all three.

## **Personnel**

Dr. Michael McEntee serves as director of the center as of October 1, 2012, having served as interim director since February 2011. Ms. Misty Bailey produces the annual report, and Ms. Kim Rutherford oversees submissions of faculty proposals for funds.

# Collaborations



Photo by Thararat Nuaisanit  
Baek and two former students in Bangkok, Thailand.

**D**r. Seung Joon Baek epitomizes the word “collaborator.” His professional and personal devotion to finding ways to **prevent and treat cancer** without harsh side-effects has made his expertise and connections sought after by researchers both within the university and around the world.

He maintains a close working relationship with his postdoctoral mentor at the National Institute of Environmental Health Sciences, where Dr. Baek discovered a novel gene (NAG-1) induced by non-steroidal anti-inflammatory drugs and some natural food compounds. While still working to characterize the

functions of this gene, he has clearly linked it to anti-cancer, anti-inflammatory, and anti-obesity effects.

Dr. Baek has actively expanded his sphere of influence here at UT since joining our faculty in 2003. He has collaborated with individuals and groups from at least eleven different departments and units across the Knoxville campuses, ranging from the Department of Nutrition to UT’s Center for Environmental Biotechnology. Dr. Baek is also involved with the *UT Obesity Research Center* (ORC), which is dedicated to developing interdisciplinary approaches for the prevention and treatment of obesity in order to decrease obesity-related complications like cancer. Within the ORC, Dr. Baek’s focus is on **chemoprevention of obesity-related cancer** via dietary compounds, non-steroidal anti-inflammatory drugs, and molecules that bind to PPAR gamma, which regulates fatty acid storage and glucose metabolism. He joins other faculty involved in cellular and molecular mechanisms of obesity, as well as those studying genetics and genomics, clinical interventions, and population research.

Through the *UT College of Engineering*, Dr. Baek became involved in using atmospheric **non-thermal plasma** to decrease colorectal cancer cell migration and invasion, as well as halt the growth of the cells. This work with Dr. Seyeoul Kwon and Dr. Philip D. Rack in the Department of Materials Science and Engineering led to further collaborations with colleagues at the *Ajou University School of Medicine* (South Korea) and *PSM America, Inc.*, a company that develops and sells plasma systems and materials. Dr. Baek also collaborated with Dr. K. Kihm (Department of Mechanical, Aerospace & Biomedical Engineering) in taking real-time images by differential interference contrast microscopy and interference

## Program Report

reflection contrast microscopy, as well as measuring dynamic bioelectrical impedance for cancer cells.

Because Dr. Baek is also heavily involved in teaching and training graduate students, visiting scholars, and postdoctoral fellows, several of his current collaborations are the result of relationships built and sustained with former students. For example, every year, Dr. Baek hosts graduate students who are funded by the Royal Golden Jubilee PhD program in Thailand. These rotations in his laboratory have helped produce research results about the molecular efficacy of various dietary compounds, including ***Coscinium fenestratum***, ***Abutilon indicum***, and ***Morinda citrifolia***. These are Thai plants traditionally used as phytomedicines to treat several disorders, including diabetes mellitus and cancer. With another Thai scholar, Dr. Baek studied the antitumorigenic activity of fruit from the **noni tree** as it relates to colorectal cancer. His body of work and reputation in graduate student training has also led to requests for his participation on graduate committees from institutions such as the University of Toronto (Canada), Hong Kong Baptist University (Hong Kong), Northwest A&F University (China), and Mahidol University (Thailand).

Dr. Baek's most current collaboration comes with an invitation from the newly-founded ***Thailand Center of Excellence for Drug Discovery and Development*** in Bangkok, Thailand. This center seeks to bring together the best and most influential scholars in a combined effort to create new, natural drugs to treat disease. Dr. Baek recently spent 4 weeks in Thailand presenting seminars and training sessions at institutions around the country, as well as brainstorming with center members in Bangkok.



Noni fruit

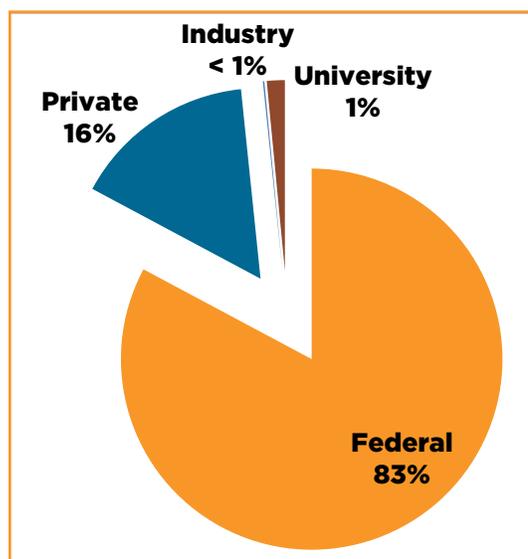
At the core, members of Dr. Baek's laboratory have been involved in discovering how a number of compounds act to treat or prevent different types of cancer at the molecular level. These include tolfenamic acid (an aspirin-like compound), resveratrol (an antioxidant found in grapes), capsaicin (a component of red chili peppers), EGCG (a component of green tea), DIM (present in cruciferous vegetables like cabbage), and gingerol (the active constituent of ginger), among others.

# Accomplishments

Despite the persisting, sluggish funding environment, center faculty continue to make excellent progress in ongoing projects, gaining national and international recognition for their expertise and accomplishments. Details of current faculty research are provided in the Faculty Reports section (pp. 28–39). Center faculty have successfully adapted to the increased competition for federal funds and are also aggressively seeking more awards from foundations and other private and industry sources. Figure 1 shows the percentage breakdown of external funding by source.

**External Funding:**  
\$2,466,712

**New Grants:**  
\$77,286



**Fig. 1.** FY 12 external funding by source. Total = \$2,466,712.

During this reporting year, the 12 center faculty each averaged three peer-reviewed publications (39 total) and four presentations at prestigious national and international meetings (49 total). Particularly noteworthy are articles by Drs. David Brian, Barry Rouse, and Hwa-Chain Robert Wang. Dr. Rouse published articles in both the *Journal of Virology* and the *Journal of Immunology*. These two journals are the most cited of any other in their respective fields. Dr. Brian’s work was published in the *Journal of Virology*, as well. Dr. Wang’s knowledge of bladder cancer was the catalyst for his expert review in *Nature Reviews Urology*. The *Nature* group of publications is one of the most well respected in all fields of science. See Publications and Presentations (pp. 40–48 ) for more details.

The return on the state’s investment in the center was 4.7:1, calculated as ratio of expenditures from extramural funding to center appropriation. Extramural funding totaled \$2,466,712 this year, while expenditures for the year were \$2,332,888. The funding includes new, multi-year awards for Drs. Seung Joon Baek, Maria Cekanova, and Stephen Kania totaling \$155,938 over the course of the projects and new, one-year awards for Drs. Madhu Dhar, Baek, and Cekanova totaling \$46,234. See “Research Funded Externally” and “Research Expenditures” on p. 12 for the fiscal year 2012 data summary.

## Success Story



**D**r. Barry Rouse has always had an inner drive to learn. This is probably one reason he has been continuously funded by the National Institutes of Health since 1978 for his research on immunity mechanisms in herpesvirus infection. Having been raised on a farm in England, Dr. Rouse considers himself lucky to have had the motivation and self-discipline necessary to map his own educational and professional opportunities.

After graduating in the top of his veterinary class and practicing veterinary medicine for only a few months, Dr. Rouse became an intern at a veterinary hospital. There, he published his first two research papers and realized he preferred the laboratory over the clinic. It was then that his training was initiated to eventually become an independent investigator.

Dr. Rouse trained as a postdoctoral fellow in the Division of Immunogenetics at the Walter and Eliza Hall Institute of Medical Research in Melbourne, Australia, which was known as one of the best immunology institutes in the world at the time. There, he published nine papers in just 2 years. Now, he has over 400 publications to his credit.

When Dr. Rouse joined the UT faculty in 1977, there were fewer than 10 viral immunologists in the world, and he was the first one to work with the herpes simplex virus type 1 (HSV-1) model. In 1994, the University of Tennessee bestowed upon him the honor of the distinguished professor title. This title is reserved for professors who have displayed an exceptional record of teaching, research and/or creativity, and service. Dr. Rouse especially deserves such an honor since he has had up to five R01 grants (the largest available) from the National Institutes of Health *simultaneously* over the last 25 years. Such a feat is unheard of in the research realm.

Additionally, Dr. Rouse has become a popular choice for keynote invitations, and he travels extensively throughout the United States and Europe to present his work.

Dr. Rouse's students identify him as "not only tough with us; he is tough with everybody!" However, he stresses to his students the importance of skepticism and trains them to be highly inquisitive (like him) and to defend their ideas and data.



# Funding & Expenditures

## Research Funded\* Externally FY 2012

Investigator	Federal	Industry	Foundation/ Private	University	Totals
Baek, Seung Joon		\$3,000		\$27,460	\$30,460
Brian, David	\$348,671				\$348,671
Cekanova, Maria			\$100,918	\$10,000	\$110,918
Dhar, Madhu			\$58,300		\$58,300
Kania, Stephen			\$65,716		\$65,716
Miller, Debra			\$25,308		\$25,308
Rouse, Barry	\$691,948				\$691,948
Schuller, Hildegard	\$545,276				\$545,276
Xu, Xuemin	\$456,782		\$133,333		\$590,115
<b>Totals</b>	<b>\$2,042,677</b>	<b>\$3,000</b>	<b>\$383,925</b>	<b>\$37,460</b>	<b>\$2,466,712</b>

\*Represents FY 2012 receipts for active grants

## Research Expenditures FY 2012

Investigator	Federal	Industry	Foundation/ Private	University	Totals
Baek, Seung Joon	\$79,793	\$1,615		\$966	\$82,374
Brian, David	\$317,110				\$317,110
Cekanova, Maria			\$105,417	\$9,907	\$115,324
Dhar, Madhu			\$24,609		\$24,609
Kania, Stephen			\$35,310		\$35,310
Miller, Debra	\$6,080				\$6,080
Rouse, Barry	\$699,756				\$699,756
Schuller, Hildegard	\$597,522				\$597,522
Wang, Hwa-Chain Robert	\$68,674				\$68,674
Xu, Xuemin	\$314,785		\$71,344		\$386,129
<b>Totals</b>	<b>\$2,083,720</b>	<b>\$1,615</b>	<b>\$236,680</b>	<b>\$10,873</b>	<b>\$2,332,888</b>

# Allocation of Funding

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

Center faculty consist of senior members who have research interests in line with center objectives and a strong history of securing external funding using center funds. Junior members are those who have received seed money or bridge funding or are new faculty who have received start-up funds. Junior members are expected to secure external funding within 2 years; members who fail to secure such funding will be placed on probation for 1 year. If, at the end of the probationary period, external funding has not been secured, the member will no longer be eligible for center funds.

## Research Advisory Committee's Three Main Criteria for Funding

- ☞ Scientific merit
- ☞ Potential to lead to external funding
- ☞ Relevance to the center's objectives

## *Junior COE Faculty*



Dr. Jill  
Narak



Dr. Brian  
Whitlock



Dr. Sophy  
Jesty



Dr. Erica  
Fields



Dr. Karen  
McCormick



Dr. Valeria  
Tanco



Dr. Christine  
Cain



Dr. Nathan  
Lee



Dr. M. Reza  
Seddighi



Dr. Tomás  
Martín-Jiménez

**Start-up funds** – The center provided \$113,750 in start-up funds for ten junior faculty members to secure additional external funding in 2012.

Faculty Member	Use of Funds	\$ Amount
<b>Biomedical &amp; Diagnostic Sciences</b>		
Tomás Martín-Jiménez, pharmacology	Investigating potential pharmaceutical synergy between two different antibacterial drugs in lowering the minimum inhibitory concentrations (MIC) for each, and thereby improving clinical efficacy.	30,000
<b>Large Animal Clinical Sciences</b>		
Karen McCormick, equine health	Purchased a new computer in preparation for a Potomac horse fever project.	5,000
M. Reza Seddighi, anesthesiology	Equipping the laboratory and developing research projects on the anesthetic effects of a common injectable analgesic drug (fentanyl) in interaction with nitrous oxide (an anesthetic gas). Exploring a better way of providing analgesia for animals undergoing painful conditions to improve their quality of life.	10,000
Brian Whitlock, food animal medicine	Studying brain regulation of two reproductive hormones (kisspeptin and gonadotropin-inhibiting hormone) to enhance fertility in cattle. This information will be critical in helping identify the best timeframes to use (and not use) these hormones to promote reproductive efficiency.	25,000
<b>Small Animal Clinical Sciences</b>		
Christine Cain, dermatology	Investigating the humoral immune response to <i>Staphylococcus pseudintermedius</i> in healthy dogs and dogs with skin infections prior to and following treatment. Little is known about the host immune response and what influence this response may have on treatment outcome.	10,000
Erica Fields, radiation oncology	Investigating the frequency with which cystocentesis causes urinary bladder hematomas in dogs. Occasional masses are seen on ultrasound examination that “disappear” during recheck.	1,250
Sophy Jesty, cardiology	Embarking on the effect of conditioning on right ventricular structure and electrical function and the effect of high-dose atenolol on the severity of pulmonic stenosis in dogs.	5,000
Nathan Lee, radiation oncology	Purchased a MapCheck quality assurance hardware and software that will allow intensity-modulated radiation therapy (IMRT) on patients. We are only the 5th veterinary facility in the country with the ability to do this type of treatment, and Dr. Lee is in talks to do some comparative studies with the UT Medical Center, as well.	5,000
Jill Narak, neurology	Began looking at brilliant blue G as an adjunct to surgery for intervertebral disk disease in dogs.	5,000
Valeria Tanco, theriogenology	In vitro studies on adult stem cells in mammary gland adipose tissue, how the cells are affected by environmental carcinogens, and how the affected cells contribute to breast cancer.	17,500

## Program Report

**Infrastructure and supplies** – The center promotes the research infrastructure of both the UTCVM and the Institute of Agriculture through the purchase and maintenance of essential research equipment. The Research Advisory Committee reviews requests based on three criteria: justification of need, current availability of equipment, and number of investigators who may benefit. In support of the UTCVM's research enterprise in 2012, the center funded service contracts for

equipment purchased previously with center funds. Service and calibration for a centrifuge, a cell sorter, two lasers associated with the cell sorter, and two research microscopes totaled \$26,346. All pieces of equipment are available for use by UTCVM and center faculty members and are located centrally in the core Tumor Biology Laboratory. The equipment is vital in research processes like isolating specific cells of interest via fluorescent chemical compounds. A back-up, external hard drive (\$129) purchased for the same laboratory ensures added security to avoid loss of important research data generated by the above-mentioned machines.

**\$30,094 helped fund equipment, service contracts, and supplies**



Nancy Neilsen (above) and Mohammed Al-Wadei at the 2012 Comparative & Experimental Medicine and Public Health Research Symposium.

In addition, the center sponsors equipment service performed by the Biology Service Facility at the university. Repairs for a tabletop centrifuge and other pieces of essential equipment totaled \$1,775.

Supplies purchased with center funds for the Tumor Biology Laboratory include liquid nitrogen and associated tank rental (\$106), items for cell culture and flow cytometry (\$461), and various other supplies (\$1,277).

**Training** – To keep faculty, staff, and students abreast of new research and techniques and to increase our competitiveness in obtaining extramural funding, the center sponsors training and continuing education opportunities.



Ms. Nancy Neilsen was sponsored for \$626 to attend training in Billerica, MA, to learn to use a new piece of equipment in the Tumor Biology Laboratory. Through an intra- and intercampus effort, the UTCVM obtained funds to install an Aria III cell sorter in this laboratory, replacing the failed, out-of-date sorter that had helped support research across the Knoxville campuses of the university. This new piece of equipment will continue to represent an integral source of data for center research faculty, in particular Dr. Barry Rouse, as well as other investigators across

## Program Report

the university and including faculty at East Tennessee State University. It is the only research-quality sorter currently available to faculty in this region of east Tennessee. Ms. Neilsen manages the laboratory.

Mohammed Al-Wadei, PhD student in the college's doctoral program, traveled (\$700) to Chicago, IL, for the American Association for Cancer Research Annual Meeting (March 31–April 4, 2012), where he presented a poster entitled “Pancreatic normal duct epithelial and cancer cells express an autocrine catecholamine loop that is activated by the  $\alpha 3$ , 5 and 7-nicotinic acetylcholine receptor.” Al-Wadei was a recipient of a first-place *travel award* at the Comparative & Experimental Medicine and Public Health Research Symposium for his presentation about the effects of nicotine and ethanol on pancreatic cancer. His mentor is center member Dr. Hildegard Schuller.

Dr. Christopher Stephens, who also earned a travel award (\$1,000) at the 2011 symposium, attended the Advances in Tissue Engineering Short Course at Rice University in Houston, TX. This symposium was composed of lectures by subject experts in the areas of tissue scaffolds, stem cells, gene delivery, bioreactors, and tissue-specific engineering. Dr. Stephens is a research assistant professor in the Graduate School of Medicine and collaborates with center faculty member Dr. Madhu Dhar.

# Dissemination of Research

Faculty are encouraged to share their research via *speaking engagements* for professional groups, community groups, and civic groups. A complete list of faculty publications and presentations for the 2011 calendar year can be found in the Publications and Presentations section (pp. 40-48).

In addition, 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.

Within the last year, UTCVM has also launched a *Facebook* page and a new VolVet Connect *alumni e-newsletter*. As of September 2012, the Facebook page had 2,204 “likes” from individuals from 20 different countries, and over 20,000 unique users saw content related to the UTCVM page in July 2012 alone. Misty Bailey, the editor of this report, and Sandra Harbison, the media relations coordinator for UTCVM, administer the page and post clinical and research information for users. The alumni e-newsletter is compiled and distributed by Megan McMurray Dugan, assistant director of development & alumni relations. VolVet Connect contains items of note aimed at DVM alumni, including UTCVM news, and continuing education and networking opportunities.



# Dissemination of Research



*Center of Excellence* faculty share their research with a worldwide audience through scientific conferences. The map showcases where their research was presented in 2011.

# Dissemination of Research



The quarterly, in-house newsletter **Discovery** keeps UTCVM researchers informed about each other's work and research-related policies and resources. The quarterly newsletter **Volunteer Vet** features research activities and results and is distributed to donors and employees. The annual magazine **Veterinary Vision** carries features concerning ongoing research activities and the results of concluded research studies. It is written for a general audience.

The three UTCVM news publications described above are also available on the UTCVM Web site (<http://www.vet.utk.edu/publications/index.php>), which provides an overview of the types of research conducted by UTCVM and center faculty.

# Center of Excellence Summer Student Research Program

In an effort to foster interest in careers in biomedical research and enhance appreciation for scientific investigation, inquiry, and the acquisition of new knowledge, the center helped provide opportunities for veterinary students to do research at the UTCVM.

Students participated in laboratory and field research and attended weekly professional development seminars, during which guest speakers addressed topics such as career opportunities in research, compliance issues in laboratory animal care, science writing, and the grant proposal process. They also participated in the Comparative & Experimental Medicine and Public Health Research Symposium. Near the end of the 10-week program, the students presented their research findings to their colleagues and to UTCVM faculty.

\$10,000 from Merial helped fund the Summer Student Program

Dr. Stephen Kania, a center faculty member, coordinated the program along with Dr. Linda Frank; they received a \$10,000 grant from Merial to help support the program. Two student salaries were funded, as well as travel funds for one student

to present her work as a poster at the Merial-NIH Symposium in Colorado. The UTCVM sponsored the other Merial-funded student's presentation at the same conference. To maximize student participation, the program is open to both center and non-center faculty. During fiscal year 2012, two COE senior faculty members and one junior member participated in the program. The center will continue to encourage participation of its faculty.

The students involved in the summer research program and a brief description of their activities follow:

**Caroline Brown**, 2nd year. *Faculty Mentor:* Dr. Richard Gerhold.

Grapevine, TX. BS in biology with a minor in chemistry from the University of North Texas, Denton, TX. *Summer Project:* Determine host preference of the *Ixodes scapularis* tick, between the white-footed mouse and the broad-headed skink. *I. scapularis* affects the life-cycle and transmission of *Borrelia burgdorferi*, the bacteria that causes **Lyme disease**. Preliminary data show that *I. scapularis* prefer to feed on skinks over mice. *Career Interests:* Exotic or wildlife medicine, parasitology.

**Jill Wilson Bull**, 2nd year. *Faculty Mentor:* Dr. Richard Gerhold.

Franklin, TN. BS in wildlife and fisheries sciences from the University of Tennessee, Knoxville. *Summer Project:* National Science Foundation-funded study on the disease ecology of **Lyme borreliosis** in the Southeast, including the agent, *Borrelia burgdorferi*, the vector, the black-legged tick, and potential hosts. Investigated the role that skinks play in Lyme borreliosis epidemiology by examining the prevalence of *B. burgdorferi* in wild-caught skinks. Investigated co-feeding as a means of transmission in skinks. *Career Interests:* Public health, infectious disease ecology, mixed animal practice, academia, research.

**Kelly Chameroy**, 2nd year. *Faculty Mentor:* Dr. Brian Whitlock.

Manchester, CT. MS in animal science with a minor in nutrition from the University of Connecticut, Storrs, CT; PhD in comparative and experimental medicine from the University of Tennessee, Knoxville. *Summer Project:*

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Assessed serum concentrations of *luteinizing hormone* (a sex hormone) in response to administration of Kisspeptin-10 or a Kisspeptin-10 receptor agonist (TOM 80) in female sheep. Sought to evaluate what concentration of TOM 80 was capable of eliciting a greater response in LH secretion. *Career Interests*: Clinical research, endocrinology, food animal production.

**Karianne Chung**, 2nd year. *Faculty Mentor*: Dr. Linda Frank.

Chattanooga, TN. BA in American studies from Emory University, Atlanta, GA; MS in animal science from the University of Tennessee, Knoxville. *Summer Project*: Collected skin and hair samples from privately-owned cats and those from rescues and shelters and tested to see if they had *dermatophyte/ringworm* or *mites*. *Career Interests*: Laboratory animal or small animal medicine.

**Andrea Cote**, 2nd year. *Faculty Mentor*: Dr. Brian Whitlock.

Clarksville, TN. BSAg in animal science from the University of Tennessee at Martin. *Summer Project*: Determine if kisspeptin or gonadotropin-inhibiting hormone is present in *bovine* hypothalamus tissue at certain times of estrous. Application of the results may allow for manipulation of the *hormones* for better *pregnancy rates* in artificial insemination. *Career Interests*: Large animal medicine, public health.

**“I grew to appreciate the immunological aspect of research, and I had fun doing it. At this point, I don’t know what I want to do with my DVM once I graduate, but I would love to go into academia to teach bacteriology or something similar.”** – Hannah Evans

**Katie DiTulio**, 2nd year. *Faculty Mentor*: Dr. Brian Whitlock.

Cordova, TN. BS in animal science with a minor in chemistry from Berry College, Rome, GA. *Summer Project*: Placement of ventricular cannulas in *sheep and cattle* for collection of cerebrospinal fluid. *Career Interests*: Mixed practice, surgery.

**Rachel Dutkosky**, 3rd year. *Faculty Mentor*: Dr. Marcy Souza.

Memphis, TN. BS in wildlife and fisheries science from the University of Tennessee, Knoxville. *Summer Project*: Evaluate a terbinafine-loaded subcutaneous implant for the treatment of *bats* infected with *Geomyces destructans* (*white-nose syndrome*). Analyzed the extent of wing and muzzle damage in UV photos and histology slides. *Career Interests*: Pathology, wildlife medicine, public health.

**Brittany Enders**, 3rd year. *Faculty Mentor*: Dr. Linda Frank.

Eden, NC. BS in biology from the University of North Carolina, Chapel Hill, NC. *Summer Project*: Recruited normal dogs and dogs with *Cushing’s disease* and drew blood samples to measure cortisol levels to help form a better understanding of the disease and develop better diagnostic tests. *Career Interests*: Internal medicine, small animal emergency and critical care.

**Hannah Evans**, 2nd year. *Faculty Mentor*: Dr. Stephen Kania.

Annapolis, MD. BS in biology with a minor in creative writing from the University of Maryland, Baltimore



Ms. Rachel Dutkosky

## Program Report

County. *Summer Project*: Determine some of the protein makeup of the surface of *Staphylococcus pseudintermedius*. Cultured and incubated various strains of the bacterium and learned to use a micropipetter and the workings of a flow cytometer. Used flow cytometry to measure fluorescence levels of antibodies attached to surface proteins on *S. pseudintermedius*. *Career Interests*: Bacteriology and virology.

**Auldon Francis**, 2nd year. *Faculty Mentor*: Dr. Shigetoshi Eda.

Speedwell, TN. Studied chemistry at East Tennessee State University, Johnson City, TN. *Summer Project*: Improve detection for *Johne's Disease*, a contagious, chronic, and sometimes fatal infection that affects the small intestine of ruminants. *Career Interests*: Food animal medicine.

**Michelle Gates**, 3rd year. *Faculty Mentors*: Dr. Debra Miller and Dr. Richard Gerhold.

Rockaway, NJ. BS in animal and veterinary science at Clemson University, Clemson, SC. *Summer Project*: Studied the *health* of a population of *coyotes* from Georgia. *Career Interests*: Exotic animal or wildlife medicine.

**Kienan Gold**, 2nd year. *Faculty Mentors*: Dr. Matt Gray, Dr. Marcy Souza, Dr. David Bemis, and Dr. Debra Miller.

Dallas, PA. BS in zoology at the North Carolina State University, Raleigh, NC. *Summer Project*: Effectiveness of disinfectants on *Batrachochytrium dendrobatidis*, a potentially *deadly fungus* that infects *amphibians*. *Career Interests*: Zoo medicine or small animal medicine.

**Mary Hall**, 2nd year. *Faculty Mentor*: Dr. Becky Wilkes.

Knoxville, TN. BS in animal science with a minor in biology at the University of Tennessee, Knoxville. *Summer Project*: Treating *feline herpes virus* in vitro using RNA interference, a process within living cells that moderates the activity of genes. *Career Interests*: Companion animal, shelter medicine, and research.

**Benton Harvey**, 2nd year. *Faculty Mentor*: Dr. Brian Whitlock.

Nashville, TN. BS in neuroscience at the College of William & Mary, Williamsburg, VA. *Summer Project*: Contacted two veterinary association memberships concerning the prevalence and economic impact of *anaplasmosis*, including analyzing data for samples submitted for anaplasmosis testing from diagnostic labs. *Career Interests*: Large animal or mixed animal medicine in Central or South America, coinciding with mission or humanitarian work.

**Rebecca Huether**, 3rd year. *Faculty Mentor*: Dr. Matt Gray. Nashville, TN. BS in wildlife biology at the University of Minnesota, Minneapolis, MN. *Summer Project*: Transmission of three *ranavirus* isolates to species of *baitfish*. *Career Interests*: Surgery.

**Ji-In (Jean) Lee**, 2nd year. *Faculty Mentor*: Dr. Olya Smrkovski.

Murfreesboro, TN. BS in biology with a minor in chemistry from Middle Tennessee State University, Murfreesboro; BA in history from Columbia University, New York, NY. *Summer Project*: Retrospective study on the efficacy and toxicity of a specific *chemotherapy* protocol for treatment of relapsed



Mr. Daniel McCarthy

## Program Report

**Lymphoma** in dogs. Collaborated with Auburn University to compile a large number of cases. An abstract of the study will be presented at the 2012 Veterinary Cancer Society Conference. *Career Interests:* Small animal medicine, focusing on integrative medicine, oncology, and/or shelter medicine.

**Taylor Lewis**, 2nd year. *Faculty Mentor:* Dr. Rebecca Trout-Fryxell. Indianapolis, IN. BS in animal sciences with a minor in Spanish from Purdue University, West Lafayette, IN. *Summer Project:* Identified canine **heartworm** vectors in Tennessee by collecting **mosquitoes** to identify to species level and

then running PCR to screen for the pathogens. *Career Interests:* Exotic/zoo animal medicine, academic, research.

**Felicia Magnaterra**, 2nd year. *Faculty Mentors:* Dr. Jacqueline Whittemore and Dr. Dianne Mawby. Nashville, TN. Studied chemistry at Tennessee State University, Nashville, TN. *Summer Project:* Comparison of operator judgment and impedance measurement for **hip joint needle placement**. *Career Interests:* Small animal or feline medicine.

**Daniel McCarthy**, 2nd year. *Faculty Mentor:* Dr. David Bemis. Lebanon, TN. BS in biology with a minor in chemistry from Middle Tennessee State University, Murfreesboro, TN. *Summer Project:* Examined the causative agent of “pink eye,” *Moraxella bovis* to observe if it formed a bacterial biofilm. The main goal for the future is to ultimately develop a new vaccine for **pink eye in cows** by identifying an antigenic target from the biofilm. *Career Interests:* Orthopedic surgery, ophthalmology, large and small animal medicine.

**Anna McRee**, 3rd year. *Faculty Mentor:* Dr. Melissa Kennedy. Knoxville, TN. BS in biology from Maryville College, Maryville, TN. *Summer Project:* Collaborated with the Wild Horizons Wildlife Trust (WHWT) to establish a **diagnostic facility** near the **Victoria Falls** National Park and Victoria Falls township in Zambia. Assisted Trust managers with setting up various diagnostic capabilities on samples from companion animals, livestock, and wildlife to test for canine distemper, canine parvovirus, feline herpesvirus, ehrlichial species, and equine herpesvirus, to name a few. *Career Interests:* Zoo and wildlife medicine.

**Ellen Messenger**, 3rd year. *Faculty Mentor:* Dr. Stephen Kania. Franklin, TN. BE in biomedical engineering from Vanderbilt University, Nashville, TN. *Summer Project:* Sequencing the genome of methicillin-resistant **Staphylococcus pseudintermedius** in order to identify resistance genes. *Career Interests:* Comparative medical research, clinical practice, oncology, cardiology, or anesthesia.

**Hannah Peace**, 2nd year. *Faculty Mentor:* Dr. Rebecca Trout-Fryxell. Florence, SC. BA in psychology with a minor in biology from the University of South Carolina, Columbia, SC. *Summer Project:* Collected and identified **avian malaria vectors** (mosquitoes) to species level and tested via PCR to determine pathogen presence. *Career Interests:* Neurology, small animal medicine.

**Addie Roberts**, 2nd year. *Faculty Mentors:* Dr. Stephen Kania and Dr. Robert Donnell. Crossville, TN. BS in biology with a minor in psychology from East Tennessee State University, Johnson City, TN.



Ms. Jill Wilson Bull

## Program Report

*Summer Project:* DNA extraction, real-time PCR, and ELISA laboratory techniques. Trimming and embedding tissue and cutting slides. Drew blood from sheep. Presented research poster at **Merial Symposium** in Loveland, CO. *Career Interests:* Small animal medicine, exotics, academia, research.

**Ashley Schenk**, 2nd year. *Faculty Mentor:* Dr. Marcy Souza.

Chattanooga, TN. BS in marine science and biology with minors in chemistry and visual arts from the University of Miami, Coral Gables, FL. *Summer Project:*

Investigated the reasons **wildlife species** present to the UTCVM avian and exotics clinic. Looked at almost 15,000 records from the past 10 years; many cases were human-related. Attacks from domestic pets and hit-by-car cases accounted for many of the animals, but habitat fragmentation and pollution accounted for others. A manuscript has been written and will be submitted for publication to discuss these findings. *Career Interests:* Public health, zoonotic disease transfer, environmental conservation, academia, epidemiological research, wildlife rescue and rehabilitation.

**Dottie Williams**, 2nd year. *Faculty Mentor:* Dr. Erica Fields.

Nashville, TN. BA in writing, literature, and publishing with a minor in women's and gender studies from Emerson College, Boston, MA. *Summer Project:* Retrospective study to establish **radiographic** and **ultrasonographic** parameters for normal **renal** size in lions, tigers, and servals. *Career Interests:* Radiology.

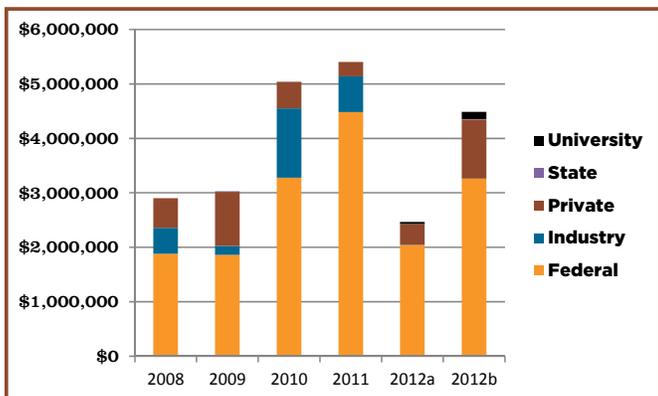
**Clint Young**, 3rd year. *Faculty Mentor:* Dr. Melissa Hines.

Mud Creek, TN. BS in animal science from the University of Tennessee at Martin, Martin, TN. *Summer Project:* **Equine wound management** to refamiliarize himself with the finer points of equine medicine and to improve his handling and lab skills. *Career Interests:* Mixed animal practice with a focus on wound management.

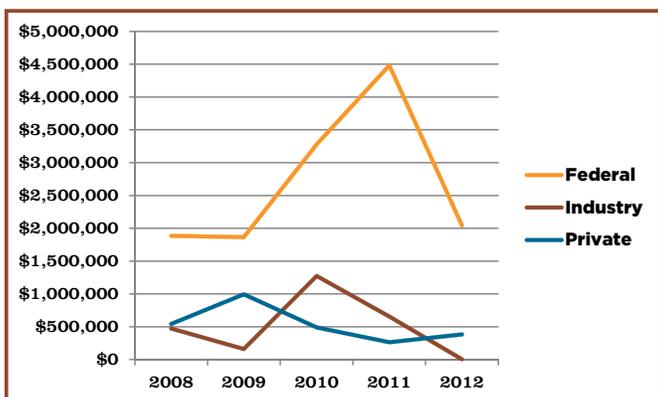


Ms. Andrea Cote

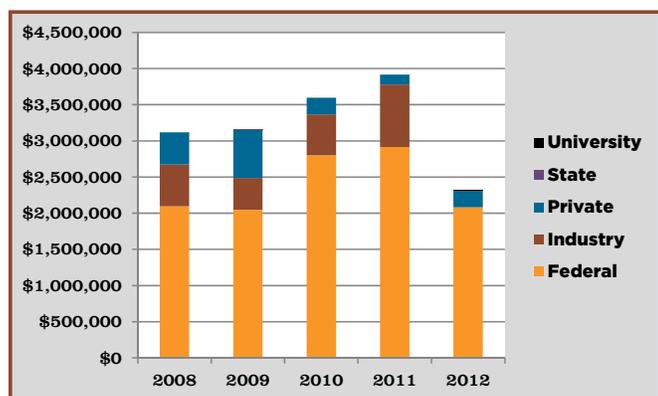
# Five-Year Benchmark Data



**Fig. 2.** External research funding by fiscal year. Column 2012b shows funding from investigators supported by the center for the past 3 years.



**Fig. 3.** External research funding from the three major sources of fiscal year receipts.



**Fig. 4.** Research expenditures by fiscal year.

Productivity among center faculty has been stable during the last 5-year period. From 2008-2012, center faculty published 264 articles in peer-reviewed journals and gave 198 presentations at national and international meetings.

Total research funding was down from \$5.40 million in 2011 to \$2.5 million in 2012 (Fig. 2); this downturn is due, in large part, to the **end of the two-year federal Recovery Act initiative. The national recession has also affected industry**, making collaborations with companies less common than they were even a year ago. **However, as shown in Fig. 3, federal funding actually increased from \$1,883,119 in 2008 to \$2,042,677 in 2012 (Fig. 3).**

It is also important to note that center support may not garner extramural funding in the same year, potentially requiring months to a year for the necessary preliminary studies to mature, and requiring additional time for the application cycle. For instance, when considering external research funding for 2012 obtained by investigators supported by the center for the past 3 years, and not just 2012 (Fig. 2, column 2012a), it is apparent that such funding for these most recently supported faculty was considerably higher (Fig. 2, column 2012b).

Grant and contract expenditures per center faculty member had steadily decreased to a nadir of \$155,000 in FY 2008 (Table 1). However, **expenditures per faculty**

**member were increased to \$194,407 in FY 2012, an amount that surpassed the 2008 total by over \$38,000.** These indicators promote confident projections that the center is recovering and remains strong.

The 5-year average return on the state’s investment in the center is 4.7:1, the ratio of research expenditures to the state’s appropriation. For comparison, benchmark data from 2008-2012 are summarized in Figs. 2 - 4.

**Table 1.** *Average expenditures per faculty member by fiscal year.*

<b>Fiscal Year</b>	<b>\$ Expenditures</b>
2008	155,000
2009	213,000
2010	239,800
2011	261,075
2012	193,433

**Benchmark Summary** (2008-2012)

Average refereed articles per faculty member: 3.43  
 Federal funding increased: \$159,558  
 Average return on investment: 4.7:1

The center successfully endured several years of sluggish federal funding and is poised to advance with an even greater commitment to livestock and human health. This year (FY13) the center will expend approximately \$208,750 to fund 10 projects. In addition, the center will continue to support core facilities and contribute to the purchase of essential research software and equipment. Already, 2013 center faculty have secured approximately \$309,000 in external funding.

In recent years, the center has emphasized comparative medicine and human health and has contributed significantly to innovation and scientific literature in these areas. In fact, center faculty are responsible for a large proportion of federal biomedical research funds granted across all Knoxville campuses of the University of Tennessee, in particular those funds from the National Institutes of Health. While these programs are anticipated to continue and grow with center support, we are also looking forward to a larger emphasis on livestock health research to bring our agricultural mission into greater focus. The center has committed funds toward this end

in collaboration with the College of Veterinary Medicine as new faculty members with expertise in livestock infectious disease, tissue repair, and reproductive health are recruited to the University of Tennessee, providing seed money for their work and supporting professional (DVM) students interested in obtaining experience in these areas of medical research. Our center will actively seek opportunities to positively influence livestock research as additional faculty members are recruited in the coming months and years.



**The expansion of the UTCVM's Large Animal Hospital, slated to open in 2013, will place our facilities at a level equal to our expertise.**

The center will again be a major contributor to the Comparative & Experimental Medicine and Public Health (CEMPH) Research Symposium. The CEMPH Symposium provides a venue for new investigators (graduate students, postdocs, and research assistant professors) to gain experience presenting their research as oral presentations in scientific meeting format. The symposium grew from 15 student presentations at the inaugural 2007 event to over 70 presentations at the 2012 symposium with participants representing 22 UT departments and programs. More than 300 people attended the 2-day event. An additional goal of the symposium is to promote and facilitate the development of research collaborations among biomedical scientists from the different campuses of the university, a goal that closely parallels important objectives of the center.

Additionally, we will continue to participate conceptually and materially in strategic planning to develop areas of investigative strength in the UTCVM and the Institute of Agriculture, as well as across the University of Tennessee campuses and with other regional universities.

# Dr. Seung Joon Baek

Associate Professor

Biomedical and  
Diagnostic Sciences

PhD, University of  
Maryland

8 refereed  
publications in 2011

In addition to center  
funds, Dr. Baek's  
research is supported  
by the National  
Institutes of Health,  
the University of  
Maryland, and Mirus  
Bio.



## Dietary Remedies for Cancer

The American Cancer Society estimates that colorectal cancer is the third-deadliest cancer in both men and women. Over 1 million Americans are assumed to be living with this cancer.

Colorectal tumors typically begin as noncancerous polyps. Dr. Baek's research team wants to find ways to prevent the polyps from turning cancerous.

Several projects in Dr. Baek's laboratory address colorectal cancer prevention and intervention via natural remedies. For example, one project focuses on noni fruit (*Morinda citrifolia* L.). Noni is a tropical plant found in Southeast Asia, and Dr. Baek has found that one of its compounds, Damnacanthal, inhibits cancer cell growth.

In another project, he is looking at how resveratrol stalls the progression of colorectal cancer. Resveratrol is a component of the skin of red grapes and other fruits and is currently available as a nutritional supplement. Dr. Baek has discovered that resveratrol works by modulating specific genes in cancer cells, thereby causing cell death.

Dr. Baek's work builds a basic foundation for future clinical trials using these natural compounds to prevent and slow colorectal and potentially other types of cancer.

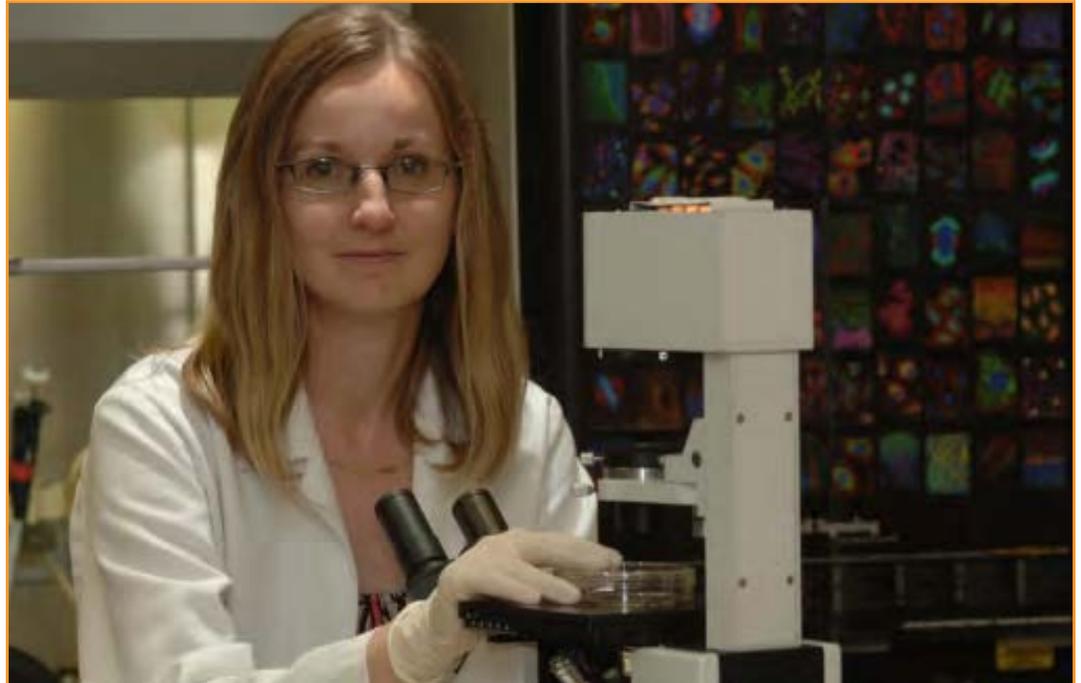
# Dr. Maria Cekanova

Research Assistant  
Professor

Small Animal Clinical  
Sciences

MS, RNDr, PhD,  
University of Pavol  
Jozef Safarik, Slovakia

In addition to center  
funds, Dr. Cekanova's  
research is supported  
by Winn Feline  
Foundation, The  
Physician's Medical  
Education and  
Research Foundation,  
UT-Battelle/ORNL,  
and Vanderbilt  
University Medical  
Center.



## Improving Tumor Imaging

When diagnosing and treating a tumor, getting a clear, precise look at it is important. Better imaging leads to earlier and more reliable diagnoses, as well as more exact management and treatment by enabling careful monitoring and directed radiation therapy. That's why physicians and veterinarians sometimes use tracers to reveal the exact locations of cancer cells.

Dr. Cekanova is collaborating with scientists from Vanderbilt University to develop a new, tumor-specific tracer to improve the imaging of tumors that overexpress the enzyme COX-2. Fluorocoxib binds to COX-2, so using fluorocoxib to help identify COX-2-expressing urinary bladder cancer cells is a natural step toward better imaging. Such cancers that overexpress COX-2 are aggressive and associated with high mortality rates in humans. The naturally-occurring bladder tumors in dogs behave similarly to those in humans, so Dr. Cekanova is using dogs during routine testing to determine how well the cancer cells' absorb the Fluorocoxib. She has already determined Fluorocoxib as safe to use in dogs and cats.

Not only will these results be useful in the future in human patients, but they have immediate application in the Veterinary Medical Center's Small Animal Hospital.

# Dr. Madhu Dhar

Research Associate  
Professor

Large Animal  
Clinical Sciences

PhD, University of  
Poona, India

2 refereed  
publications in 2011

In addition to  
center funds, Dr.  
Dhar's research is  
supported by the  
American Diabetes  
Association and  
Morris Animal  
Foundation.



## Corneal Healing in Horses via Stem Cells

At the UTCVM, over 90% of horses being seen for eye problems suffer from corneal ulcers. These ulcers on the transparent, front part of the eye often become infected if they do not heal promptly. Therefore, rapid treatment that promotes healing is necessary to prevent prolonged pain, thousands of dollars in recovery costs, and perhaps permanent visual impairment.

Dr. Dhar's research group hypothesizes that applying equine adult stem cells to the cornea will increase the rate of healing and decrease scarring, leading to a better visual outcome and saving owners money and time. This technique has already been reported as beneficial in humans, mice, and rabbits via in vitro studies (i.e., "test tube" studies). Dr. Dhar seeks to establish her own equine in vitro model.

Once the efficacy of adult stem cell treatment is determined using an in vitro model, clinical studies can commence, and eventually, this novel treatment can be used right here at the Veterinary Medical Center's Equine Hospital.

*Dhar (center) is pictured with technician Sarah Elliott (L) and PhD student Sarah Hurst (R).*

# Dr. Stephen Kania

Professor  
Biomedical and  
Diagnostic Sciences

PhD, University of  
Florida

3 refereed  
publications in 2011

In addition to  
center funds, Dr.  
Kania's research is  
supported by the  
AKC Canine Health  
Foundation.



## Treating Methicillin-Resistant Skin Infections

*Staphylococcus pseudintermedius* is the primary cause of pyoderma (a skin infection) in dogs and is responsible for numerous other canine infectious diseases, including infections of the urinary tract, wounds, surgical sites, and the ear. The *S. intermedius* affecting dogs is analogous to *S. aureus* in humans, and many times, both bacteria become resistant to methicillin antibiotics.

Dr. Kania has shown that about 30% of isolates tested in his laboratory are resistant to methicillin and related drugs, making them difficult to treat effectively. He, as well as others, have recognized that conventional antibiotic therapy may soon no longer be an option, and they are shifting to new approaches. The focus of Dr. Kania's project is the BlaR1 protein and its role in antibiotic resistance. The BlaR1 protein is present on virtually all penicillin- and methicillin-resistant *S. pseudintermedius*. This protein appears to play a key role in the expression of *mecA*, a gene that encodes methicillin resistance.

Dr. Kania's strategy is to target BlaR1 with an antibody that can not only help destroy the *S. pseudintermedius* pathogen but also serve as an adjunct to antibiotic therapy by increasing the pathogen's susceptibility to certain drugs.

# Dr. Hildegard Schuller

Distinguished  
Professor

Biomedical and  
Diagnostic Sciences

PhD, University  
of Veterinary  
Medicine, Hanover;  
DVM, Justus Leibig  
University, Germany

In addition to  
center funds, Dr.  
Schuller's research  
is supported by the  
National Institutes  
of Health.



## Effect of Nicotine & Stress on Cancer

Stress motivates some of us to get things done, but increases in stress hormones enhance our vulnerability to numerous diseases. In particular, stress may be a potent driving force in cancer development and progression. The American Cancer Society states that low socioeconomic status, which often creates chronic stress, is associated with higher incidence and mortality of all cancers.

With her unique project, Dr. Hildegard Schuller is examining how chronic stress and chronic nicotine exposure work together to hinder cancer prevention measures. Nicotine alone and stress hormones alone activate a signaling messenger, cAMP, that is important in many regulatory biological processes but also perhaps in the growth of some cancers. An inhibitor in the central nervous system known as gamma-aminobutyric acid (GABA) normally counterbalances the activity of this pathway. However, the combination of the effects of smoking and stress virtually shuts down GABA production.

# Dr. Hwa-Chain Robert Wang

Professor  
Biomedical and  
Diagnostic Sciences

PhD, University  
of Virginia; DVM,  
National Chung-  
Hsing University,  
Taiwan

3 refereed  
publications in 2011

In addition to  
center funds, Dr.  
Wang's research is  
supported by the  
National Institutes  
of Health.



## Using Green Tea to Prevent Breast Cancer

We have long known that eating meat may increase colon cancer risk, but what about breast cancer risk? That is exactly what Dr. Wang seeks to determine. Specifically, he believes that meats cooked at high temperatures, such as occurs with grilling or broiling, release certain types of cancer-causing substances.

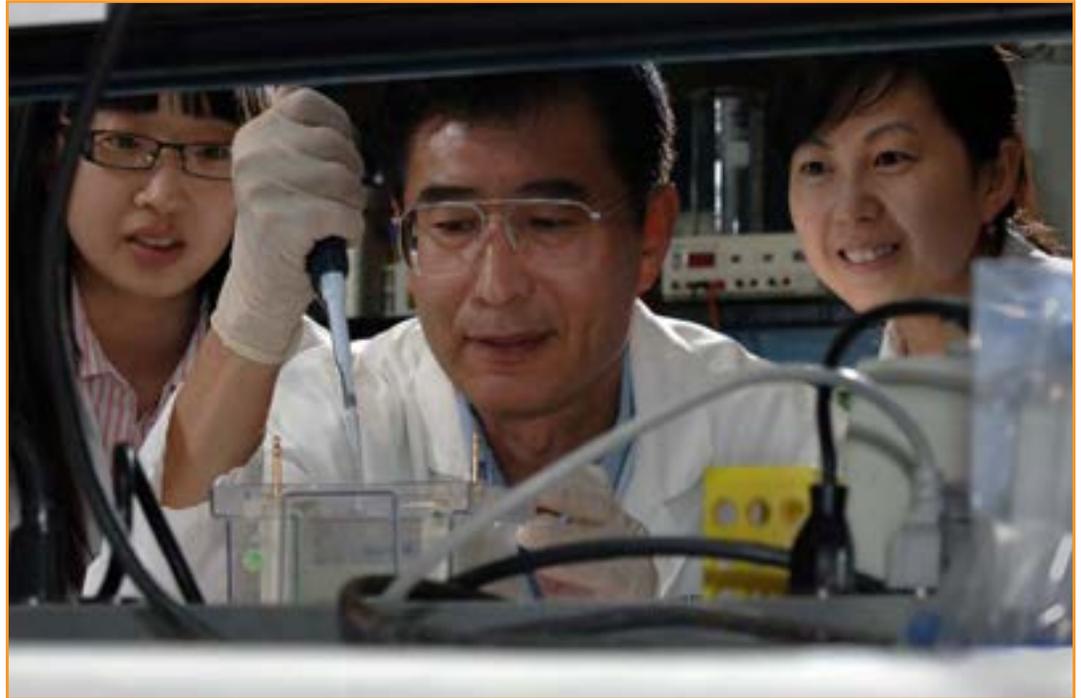
When we consume meats cooked in these ways, we ingest micrograms of the chemical compound PhIP. Although these micrograms metabolize to pico and nano levels (substantially less than micrograms) in our bodies, Dr. Wang has found that these low levels of PhIP are able to induce breast cells to acquire certain cancer-associated properties. These properties are recognizable biological and cellular changes that may be used as targets to investigate dietary agents that may be able to prevent them. In particular, the catechins found in green tea seem to be promising for use as preventive agents.

Cancerous changes, and the dietary agents that prevent them, follow and affect specific biological pathways. Dr. Wang's studies focus on identifying the role of the ERK pathway in PhIP-induced breast cell carcinogenesis and in catechin suppression of this carcinogenesis.

# Dr. Xuemin Xu

Professor  
Biomedical and  
Diagnostic Sciences  
PhD, Tokyo Institute  
of Technology,  
Japan

In addition to  
center funds, Dr.  
Xu's research is  
supported by the  
National Institutes  
of Health and  
the American  
Health Assistance  
Foundation.



## Identifying Therapeutic Targets for Alzheimer's Disease

Although Alzheimer's disease is the sixth-leading cause of death in the United States, it is the only cause of death in the top ten that cannot yet be prevented, cured, or even slowed. The Alzheimer's Association estimates that 5.4 million Americans are living with the disease.

Dr. Xu seeks to determine the pathogenesis of an underlying mechanism of neuronal degeneration observed in the Alzheimer's brain: apoptosis. Apoptosis is a genetically-determined, natural process of cell self-destruction; normally, it eliminates damaged or unwanted cells from the body, such as when developing frogs lose their tadpole tails. However, in Alzheimer's disease, apoptosis signals are sent where they are not needed or wanted. Dr. Xu believes that a protein called PSAP may function as a mediator molecule to transfer apoptotic signals and promote the dysfunction of mitochondria, the power houses of cells where most cellular energy is produced. His preliminary studies have shown that PSAP interacts with DR6, a death receptor on the cell surface that transmits apoptotic signals. Specifically, Dr. Xu aims to determine the role of PSAP in DR6-mediated apoptosis.

His research may lead to the identification of new therapeutic targets for treatment and prevention of Alzheimer's disease.

*Dr. Xu (center) is pictured with PhD student Ting Li (L) and postdoctoral associate Jing Shi (R).*

# Dr. Raul Almeida

Research Assistant  
Professor  
Animal Science  
DVM, Universidad  
del Litoral,  
Veterinary  
Medicine,  
Argentina; MSc,  
PhD, Iowa State  
University  
5 refereed  
publications in 2011



## Lowering the Potential for *S. uberis* to Cause Bovine Mastitis

Mastitis is a contagious disease that can become a major problem even in well-managed dairy farms. It can cause dairy farmers to lose about 11% of their total milk production each year due to lower nutritional value and quality of the milk and decreased production; these costs may eventually be passed on to the consumer at the grocery store dairy aisle.

The environmental pathogen *Streptococcus uberis*, one of the causative agents of mastitis, is not well controlled by current prevention methods. Dr. Almeida is seeking a way to change the ease by which *S. uberis* adheres to and gains entry into bovine mammary epithelial cells. His research group discovered an adhesion molecule that helps *S. uberis* attach and internalize itself. More recently, he has created a mutant of this same adhesion molecule that reduces the drive of the pathogen to invade its potential mammary cell host.

Dr. Almeida's next step is to discover exactly what leads to this reduced adherence and internalization by exploring which genes are expressed by the mutant when it is co-cultured with host cells. In doing so, he hopes to identify genes associated with early infection phases to eventually allow for the design of effective tools to control mastitis.

# Dr. David Brian

Professor  
Biomedical and  
Diagnostic Sciences  
DVM, PhD, Michigan  
State University

1 refereed  
publication in 2011

In addition to  
center funds, Dr.  
Brian's research is  
supported by the  
National Institutes  
of Health.



## Curing Cattle Coronavirus

Coronaviruses cause infections of the upper respiratory and gastrointestinal tracts of many different species of animals, including humans. The virus is responsible for winter dysentery in cattle and feline infectious peritonitis in cats, and appears to lead to multiple sclerosis in humans.

When cultured cells are infected with a coronavirus, the virus hijacks the cells' ability to build their own protein in favor of virus proteins. For years, scientists assumed that this hijacking process for the coronavirus involved a "cap" site. This cap is a special tag at the end of a messenger RNA molecule where the virus enters. However, Dr. Brian's group determined that the coronavirus also seems to have a cap-independent mechanism, otherwise known as an internal ribosomal entry site (IRES). He has been working to characterize this entry site and determine if the virus "switches" between cap-dependent and cap-independent entry.

The coronavirus IRES does not appear to be like any other IRES that has been described. Therefore, Dr. Brian believes the coronavirus IRES has unique features with exploitable potential for treating diseases caused by the virus. More knowledge of this "riboswitch" may also allow scientists to manipulate the riboswitch in coronavirus-infected cells.

*Dr. Brian (center) is pictured with post-doctoral associates Yu-Pin Su (L) and Yi-Hsin Fan (R).*

# Dr. Debra Miller

Professor  
Forestry, Wildlife, &  
Fisheries Science

DVM, PhD,  
Mississippi State  
University

6 refereed  
publications in 2011

In addition to  
center funds, Dr.  
Miller's research is  
supported by the  
U.S. Geological  
Survey Eastern  
Region, Nashville  
Zoo, and Coastal  
Plains Institute and  
Land Conservancy.



## Assessing Fish Susceptibility to Ranavirus

Economic loss for fisheries and aquaculture in the United States can exceed \$50 billion annually, with disease being a major contributing factor. Ranaviruses are known to infect fish, reptiles, and amphibians, and recent die-offs of endangered pallid sturgeon fingerlings in a Missouri hatchery by frog virus 3 (a type of ranavirus) suggest that cross-class transmission is possible.

Historically, it was believed that ranaviruses that infected fish did not infect amphibians or reptiles or vice versa. Dr. Miller seeks to determine the susceptibility of two fish species (tilapia and channel catfish) to two amphibian ranaviruses. Both species of fish are commonly raised commercially in aquaculture ponds through the southeastern United States, and the two together represent the largest aquaculture industry in the country. Therefore, there is an urgent need to assess the susceptibility of various fish species to ranaviruses isolated from amphibians.

*Miller (center) is pictured with PhD student Roberto Brenes (L) and faculty member Dr. Matthew Gray (R).*

# Dr. Maria Prado

Research Assistant  
Professor

Animal Science

DVM, University of  
Zulia, Venezuela;  
PhD, Oklahoma  
State University

3 refereed  
publications in 2011



## Mastitis Control & Intervention

The dairy industry loses approximately \$2 billion each year due to mastitis, an inflammatory disease of the udder that is both painful and affects milk production and quality. One of the causative agents of mastitis, *Streptococcus uberis*, is the focus of Dr. Prado's research.

Her research group hypothesizes that *S. uberis* colonizes epithelial cells in the bovine mammary gland, forming a biofilm that serves as a protective shield against the cow's immune system and increases resistance to antibiotics, thus leading to increased survival of *S. uberis* and resulting in chronic infections. The next step in this research is investigating how this biofilm forms. To that end, Dr. Prado is creating an *S. uberis* bioreporter, a cell that will be engineered to produce a measurable, fluorescent signal in response to biofilm formation.

Results from this study will allow her to identify candidate molecular targets for developing the next generation of mastitis control and intervention strategies.

# Dr. Barry Rouse

Distinguished  
Professor

Biomedical and  
Diagnostic Sciences

BVS, University of  
Bristol, UK; MSc,  
PhD, University of  
Guelph, Canada

8 refereed  
publications in 2011

In addition to  
center funds, Dr.  
Rouse's research is  
supported by the  
National Institutes  
of Health.



## Controlling Severity of Stromal Keratitis

Infection of the eye with herpes simplex virus-1 (HSV-1) results in a chronic, inflammatory reaction known as stromal keratitis, which can lead to blindness. Controlling inflammatory diseases, such as HSV-1 keratitis, is challenging, particularly if treatment begins late after initial infection.

Recent studies suggest that certain regulatory T cells (Tregs) can diminish the severity of keratitis lesions. However, these cells are unstable, meaning they can change and instead increase the severity of the disease. Dr. Barry Rouse's research aims at stabilizing these Tregs using epigenetics. Epigenetics is the study of heritable changes in genes that occur without changing the DNA sequence.

Epigenetic modifier drugs like trichostatin and azacytidine have been shown to increase the stability of Foxp3 Tregs; therefore, Dr. Rouse plans to determine the effect of these two drugs on maintaining this Treg stability in hopes that the drugs will eventually help control the severity and duration of lesions in patients with stromal keratitis.

# Publications & Presentations



## Raul Almeida (p. 35)

Oliver SP, Pighetti GM, **Almeida RA**. Mastitis pathogens, Environmental pathogens. In: Roginski H, Fuquay JW, Fox PF, eds. *Encyclopedia of Dairy Sciences*, 2nd Ed. Oxford: Elsevier Limited;2011:415–421.

Prado ME, **Almeida RA**, Ozen C, Luther DA, Lewis MJ, Headrick SJ, Oliver SP. Vaccination of dairy cows with recombinant *Streptococcus uberis* adhesion molecule induces antibodies that reduce adherence to and internalization of *S. uberis* into bovine mammary epithelial cells. *Veterinary Immunology and Immunopathology* 2011;141:201–208.

**Almeida RA**, Dogan B, Klaessing S, Schukken YH, Oliver SP. Intracellular fate of strains of *Escherichia coli* isolated from dairy cows with acute or chronic mastitis. *Veterinary Research Communications* 2011;35:89–101.

Kerro Dego O, **Almeida RA**, Oliver SP. Presence of ISS1-like insertion sequence in wild type *Streptococcus uberis* strains isolated from cases of bovine mastitis. *Veterinary Microbiology* 2011;151:315–320.

Kerro-Dego O, Prado ME, Chen X, Luther DA, **Almeida RA**, Oliver SP. pGh9:ISS1 transpositional mutations in *Streptococcus uberis* UT888 causes reduced bacterial adherence to and internalization into bovine mammary epithelial cells. *Veterinary Microbiology* 2011;151:379–85.

**Almeida RA**, Luther DA, Patel D, Oliver SP. Predicted antigenic regions of *Streptococcus uberis* adhesion molecule (SUAM) are involved in adherence to and internalization into mammary epithelial cells. *Veterinary Microbiology* 2011;148:323–28.

**Almeida RA**. Design and evaluation of vaccines to control *Streptococcus uberis* intramammary infections. Invited seminar at: College of Biochemistry and Biological Sciences of the Universidad Nacional del Litoral (UNL); September 2011; Santa Fe, Argentina.

**Almeida RA**. Vaccines for bovine mastitis control. Invited seminar at: College of Veterinary Science, UNL, Esperanza; September 2011; Santa Fe, Argentina.

Prado ME, Moore G, Kerro-Dego O, **Almeida R**, Oliver S. *Streptococcus uberis* mastitis isolates vary in their ability to form biofilms. Presented at: 44th Annual Conference of the American Association of Bovine Practitioners (AABP) and 3rd International Symposium on Mastitis and Milk Quality; September 22–24, 2011; St. Louis, MO.

Kerro Dego O, **Almeida RA**, Oliver SP. Gene expression of bovine mammary epithelial cells infected with *Escherichia coli* associated with acute or persistent bovine mastitis. Presented at: 44th Annual Conference AABP and 3rd International Symposium on Mastitis and Milk Quality; September 22–24, 2011; St. Louis, MO.

Kerro Dego O, **Almeida RA**, Oliver SP. Identification of virulence-associated genes and their expression patterns in strains of *Escherichia coli* associated with bovine mastitis. Presented at: 44th Annual Conference AABP and 3rd International Symposium on Mastitis and Milk Quality; September 22–24, 2011; St. Louis, MO.

**Almeida RA**, Chen X, Prado ME, Oliver SP. Role of *Streptococcus uberis* adhesion molecule in adherence to and internalization of *Streptococcus uberis* into bovine mammary epithelial cells. Presented at: 44th Annual Conference AABP and 3rd International Symposium on Mastitis and Milk Quality; September 22–24, 2011; St. Louis, MO.

**Almeida RA**. Design and evaluation of vaccines to control *Streptococcus uberis* intramammary infections. Presented at: College of Biochemistry and Biological Sciences, UNL; September 2011; Santa Fe, Argentina.

**Almeida RA**. Vaccines for bovine mastitis control. Presented at: College of Veterinary Science, UNL, Esperanza; September 2011; Santa Fe, Argentina.



## Seung Joon Baek (p. 28)

**Baek SJ**, Whitlock NC. Molecular targets of resveratrol in carcinogenesis. In: Cho WCS, ed. *Evidence-Based Anticancer Materia Medica*. Dordrecht, Netherlands: Springer Science;2011:319–347.

Wang X, **Baek SJ**, Eling TE. COX inhibitors directly alter gene expression: Role in cancer prevention? *Cancer Metastasis Reviews* 2011;30:641–657.

Whitlock N, Bahn JH, Lee SH, Eling TE, **Baek SJ**. Resveratrol-induced apoptosis is mediated by early growth response-1, Krüppel-like factor 4, and activating transcription factor 3. *Cancer Prevention Research* 2011;4:116–127.

Krisanapun C, Lee SH, Peungvicha P, Temsiririrkkul R, **Baek SJ**. Antidiabetic properties involved in insulin sensitivity of *Abutilon indicum* Sweet are mediated by enhancement of adipocyte differentiation and activation of GLUT1 promoter. *Evidence-Based Complementary and Alternative Medicine*. 2011:167684.

Close D, Hahn RE, Patterson S, **Baek SJ**, Ripp SA, Saylor G. Comparison of human optimized bacterial luciferase, firefly luciferase, and green fluorescent protein for continuous imaging of cell cultures and mouse models. *Journal of Biomedical Optics* 2011;16:047003.

Flatland B, Fry MM, **Baek SJ**, et al. May-Hegglin anomaly in a dog. *Veterinary Clinical Pathology*. 2011;40:207–214.

Margraves CH, Kihm KD, Yoon SY, Choi CK, Lee SH, Liggett JL, **Baek SJ**. Simultaneous measurements of cytoplasmic viscosity and intracellular vesicle sizes for live human brain cancer cells. *Biotechnology and Bioengineering*. 2011;108:2504–2508.

Huang EC, Chen G, **Baek SJ**, McEntee MF, et al. Zylamend reduces the expression of androgen receptor in a model of castrate-resistant prostate cancer. *Nutrition and Cancer*. 2011;63:1287–1296.

Nualsanit T, Rojanapanthu P, Gritsanapan, W, Kwankitpraniti T, Min KW, **Baek SJ**. Damnacanthol-induced anti-inflammation is associated with inhibition of NF- $\kappa$ B activity. *Inflammation & Allergy: Drug Targets*. 2011;10:455–463.

**Baek SJ**. Molecular targets of NSAIDs in colorectal tumorigenesis. Invited presentation for: The Royal Golden Jubilee PhD Program, Mahidol University; March 22, 2011; Bangkok, Thailand.

**Baek SJ**. Alternative splicing of Kruppel-like factor 4 plays a role in colorectal tumorigenesis. Invited presentation at: International Conference & Exhibition on Cancer Science & Therapy; August 15–17, 2011; Las Vegas, NV.

Shen RF, Wu W, Hsiao CT, Patel S, Martin B, **Baek SJ**. Combined technical platforms facilitate the identification and quantification of biomarkers responding to an anti-diabetic compound. Presentation at: 59th American Society for Mass Spectrometry Conference on Mass Spectrometry and Allied Topics; June 2011; Denver, CO.

Lee SH, Richardson RL, **Baek SJ**. Capsaicin represses transcriptional activity of  $\beta$ -catenin in human colorectal cancer cells. Presentation at: American Association for Cancer Research Annual Meeting; April 2011; Orlando, FL.

Lee SH, Bahn JH, Whitlock N, Baek SJ. Activating transcription factor 2 (ATF2) controls tolfenamic acid-induced ATF3 expression via MAP kinase pathways. Presentation at: American Association for Cancer Research Annual Meeting; April 2011; Orlando FL.



## David Brian (p. 36)

Guan B-J, Wu H-Y, **Brian DA**. An optimal cis-replication stem-loop IV in the 5' untranslated region of the mouse coronavirus genome extends 16 nucleotides into open reading frame 1. *Journal of Virology* 2011;85:5593-5605.



## Maria Cekanova (p. 29)

**Cekanova M**, Lucy K, Geiser D, Millis D, Legendre A, Whitlock D. Hyperbaric oxygen treatment affects canine mesenchymal stem cells in vivo. Poster presented at: 2nd North American Veterinary Regenerative Medicine Conference; June 2-4, 2011; Lexington, KY.

**Cekanova M**, Uddin JM, Bartges J, Callens A, Legendre A, Marnett L. Detection of COX-2 expressing canine bladder cancers using novel optical tracer, Fluorocoxib. Poster presented at: Frontiers of Biomedical Imaging Science III, Vanderbilt University, Institute of Imaging Science; June 13-16, 2011; Nashville, TN.

Bilheux H, Nichols T, Vass A, Walker L, Voisin S, Bilheux J, **Cekanova M**, Legendre A, Donnell R, LeBlanc A. Investigation of a novel approach to forensic analysis using neutron imaging techniques: Preliminary measurements. Oral presentation at: National Institute of Justice Conference; June 20, 2011; Washington, DC.

**Cekanova M**, Fernando R, Wimalasena J. The BCL2 antagonist of death, BAD is down-regulated in breast cancer and inhibits cancer cell invasion. Poster presented at: The 34th Annual San Antonio Breast Cancer Symposium; December 6-10, 2011; San Antonio, TX.

**Cekanova M**, Uddin JM, Bartges J, Callens A, Legendre A, Marnett L. COX-2 expressing canine transitional cell carcinoma by novel optical tracer, Fluorocoxib A. Oral presentation at: Comparative & Experimental Medicine and Public Health Research Symposium; June 20-21, 2011; Knoxville, TN.

Harris BJ, **Cekanova M**, Dalhaimer P. Quantifying interactions between drug delivery vehicles and target cells using an affinity- and size-tunable model system. Presented at: American Institute of Chemical Engineers Annual Meeting; October 16-21, 2011; Minneapolis, MN.

## Madhu Dhar (p. 30)



Hurst SE, Minkin S, Biggerstaff J, **Dhar M**. Characterization of ATP10C and multiple signaling pathway proteins in C2C12 cells using immunoblot assays and immunofluorescence microscopy. *FASEB Journal* 2011;25:530.7.

**Dhar MS**, Neilsen N, Beatty K, Adair H, Geiser D. Equine peripheral blood-derived mesenchymal stem cells: Isolation, identification, adipocyte differentiation and effect of hyperbaric oxygen treatment. *FASEB Journal* 2011;25:679.4.

**Dhar M**. Stem cells, cloning and regenerative medicine. Invited presentation at: Preprofessional Science Forum, South College; December 6, 2011; Knoxville, TN.

**Dhar M**, Neilsen N, Beatty K, Adair HS, Geiser D. Equine peripheral blood-derived mesenchymal stem cells: Isolation, identification, adipocyte differentiation and effect of hyperbaric oxygen treatment. Presented at: Experimental Biology 2011; April 9-13, 2011; Washington, DC.

Carter-Arnold JL, **Dhar MS**, Neilsen N, Schumacher J. Treatment of a horse for superficial digital flexor tendonitis with equine bone marrow-derived allogenic mesenchymal stem cells. Presented at: 2nd Annual North American Veterinary Regenerative Medicine Conference; June 2-4, 2011; Kentucky.

**Dhar M**, Neilsen N, Eaker S, Adair HS, Geiser D. Effect of hyperbaric oxygen treatment on equine adult mesenchymal stem cells. Presented at: 2nd Annual North American Veterinary Regenerative Medicine Conference; June 2-4, 2011; Kentucky.

**Dhar M**, Neilsen N, Beatty K, Eaker S, Adair HS, Geiser D. Equine peripheral blood-derived mesenchymal stem cells. Presented at: 9th Annual Meeting of The International Society for Stem Cell Research; June 15-18, 2011; Toronto, Canada.

## Stephen Kania (p. 31)



Bemis DA, Greenacre CB, Bryant MJ, Jones RD, **Kania SA**. Isolation of a variant *Porphyromonas* sp. from polymicrobial infections in central bearded dragons (*Pogona vitticeps*). *Journal of Veterinary Diagnostic Investigation* 2011;23:99-104.

Black CC, Eberlein LC, Solyman SM, Wilkes RP, Hartmann FA, Rohrbach BW, Bemis DA, **Kania SA**. The role of *mecA* and *blaZ* regulatory elements in *mecA* expression by regional clones of methicillin-resistant *Staphylococcus pseudintermedius*. *Veterinary Microbiology* 2011;151:345-353.

Adams HR, van Vuuren M, Bosman AM, **Kania S**, Kennedy MA. Detection and genetic analysis of feline immunodeficiency virus (FIVple) in southern African lions (*Panthera leo*). *South African Journal of Wildlife Research* 2011;41:173-180.

Solyman SM, Black CC, Fitzgerald JR, Duim B, van Duijkeren E, Wagenaar JA, Eberlein LA, Bemis DA, **Kania SA**. Multilocus sequence typing (MLST) for characterization of methicillin-resistant and methicillin-susceptible clones of *Staphylococcus pseudintermedius*. Presented at: Comparative & Experimental Medicine and Public Health Research Symposium; June 20-21, 2011; Knoxville, TN.

Wells J, Bartges J, **Kania SA**, Bemis D. Association between presence of urovirulence factors and antimicrobial resistance patterns in 221 uropathogenic *Escherichia coli* samples isolated from dogs. Presented at: Comparative & Experimental Medicine and Public Health Research Symposium; June 20-21, 2011; Knoxville, TN.

Lembcke LM, **Kania SA**, Blackford JR, Trent DJ, Odoi A, Phillips JC. Measurement of immunologic responses in horses and dogs vaccinated with xenogenic plasmid DNA encoding human tyrosinase. Presented at: Comparative & Experimental Medicine and Public Health Research Symposium; June 20-21, 2011; Knoxville, TN.

Alexeff I, **Kania SA**, Kania RJ, Bemis DA. Methicillin-resistant *Staphylococcus pseudintermedius* do not develop resistance to atmospheric pressure cold plasma discharges. Presented at: 38th International Conference on Plasma Science and 24th Symposium on Fusion Engineering; June 29, 2011; Chicago, IL.

Solyman SM, Black CC, Duim B, van Duijkeren E, Wagenaar JA, Eberlein LA, Bemis DA, **Kania S**. Multilocus sequence typing (MLST) for characterization of methicillin-resistant and methicillin-susceptible clones of *Staphylococcus pseudintermedius*. Presented at: 2nd ASM-ESCMID Methicillin-resistant Staphylococci in Animals: Veterinary and Public Health Implications; September 8, 2011; Washington, DC.



## Debra Miller (p. 37)

**Miller DL**, Gray MJ, Storfer A. Ecopathology of ranaviruses infecting amphibians [invited review article]. *Viruses* 2011;3:2351-2373.

Ingram DR, **Miller DL**, Ingram TR, Tannehill JE. Intersex condition of shoal bass (*Micropterus catenaractae*) in the Flint River, Georgia. *Journal of Aquatic Animal Health* 2011;23:189-194.

**Miller DL**, Woshner VM, Styer EL, Ferguson S, Knott KK, Gray MJ, Wells RS, O'Hara TM. Histological findings in free-ranging Sarasota Bay bottlenose dolphin (*Tursiops truncatus*) skin: Mercury, selenium and seasonal factors. *Journal of Wildlife Diseases* 2011;47:1012-1018.

Haislip NA, Gray MJ, Hoverman JT, **Miller DL**. Development and disease: How susceptibility to an emerging pathogen changes through anuran development. *Public Library of Science ONE* 2011;6(7): e22307.

Perrault J, Wyneken J, Thompson LJ, Johnson C, **Miller DL**. Why are hatching and emergence success low? Mercury and selenium concentrations in nesting leatherback sea turtles (*Dermochelys coriacea*) and their young in Florida. *Marine Pollution Bulletin* 2011;62:1671-1682.

Hueffer K, Lieske C, McGilvary LM, Hare R, **Miller DL**, O'Hara TM. *Streptococcus phocae* isolated from a spotted seal (*Phoca largha*) with pyometra in Alaska. *Journal of Zoo and Wildlife Medicine* 2011;42:108-112.

**Miller DL**, Wyneken J, Mader DR. Sea turtle hatchling deaths associated with elevated beach temperatures. Poster presented at: 18th Annual Conference of The Wildlife Society; November 5-10, 2011; Waikoloa, HI.

Goodman RM, Ararso YT, **Miller DL**. Presence of ranavirus and the fungus *Batrachochytrium dendrobatidis* in reptiles and amphibians sharing three water bodies in Virginia. Poster presented at: 96th Ecological Society of America Annual Meeting; August 7-12, 2011; Austin, TX.

Rothermel BB, Travis ER, Hill RL, **Miller DL**. Stream salamander occupancy and pathogen prevalence in a protected watershed in the Southern Blue Ridge Mountains, USA. Poster presented at: Joint Meeting of Ichthyologists and Herpetologists; July 6-12, 2011; Minneapolis, MN.

**Miller DL**. Comparative pathology of ranaviral disease among amphibians, reptiles and fish. Invited presentation at: First International Symposium on Ranaviruses. Joint Meeting of Ichthyologists and Herpetologists; July 6-12, 2011; Minneapolis, MN.

**Miller DL**, Gray MJ. Pathological changes associated with ranaviral disease. Invited presentation at: 36th Annual Eastern Fish Health Workshop; March 28-April 1, 2011; Mt. Pleasant, SC.

Perrault J, Wyneken J, **Miller DL**. Selenium saves the day: First explanation for decreased hatch and emergence success in leatherback sea turtles (*Dermochelys coriacea*). Lessons learned from two populations. Presented at: 31st Sea Turtle Symposium, International Sea Turtle Society; April 12-15, 2011; San Diego, CA.

Perrault J, **Miller DL**, Wyneken J. Salps to sea turtles: Hg and Se in leatherback sea turtles (*Dermochelys coriacea*). Lessons learned from two populations. Poster presented at: Integrative and Comparative Biology. Society for Integrative and Comparative Biology; January 2011; Salt Lake City, UT.

**Miller DL**. Review of *Biology and Management of White-tailed Deer*. Hewitt DB, ed. Boca Raton, FL: CRC Press; 2011.

**Miller DL**, Gerhold R. Wildlife necropsy laboratory. Workshop presented for: University of Tennessee Pathology Club and student chapter of Wildlife Disease Association; November 2011; Knoxville, TN.

Lankton J, **Miller DL**. Case #10: Ranavirus pathology in a wood frog. Presented at: American Association of Veterinary Laboratory Diagnosticians Meeting, Diagnostic Pathology Slide Session; October 2011; Buffalo, NY.

Lankton J, **Miller DL**. Hot nests and sea turtles. Presented at: Southeastern Veterinary Pathology Conference; May 2011; Tifton, GA.

**Miller DL**, Gray MJ. Ranavirus infection in aquatic turtles [lay article]. *Year of the Turtle News: A Publication of Partners in Amphibian and Reptile Conservation*. 2011;11:1,5,6.

**Miller DL**, Perrault J, Wyneken J. Does mercury or maternal health impact leatherback sea turtle nest success? [lay article]. *Year of the Turtle News: A Publication of Partners in Amphibian and Reptile Conservation*. 2011;11:7.



### **Maria Prado (p. 38)**

**Prado ME**, Ryman JT, Boileau MJ, Martin-Jimenez T, Meibohm B. Oral ponazuril pharmacokinetics in healthy llamas (*Lama glama*). *American Journal of Veterinary Research* 2011;72:1386-1389.

Kerro-Dego O, **Prado ME**, Chen X, Luther DA, Almeida RA, Oliver SP. pGh9:ISS1 transpositional mutations in *Streptococcus uberis* UT888 causes reduced bacterial adherence to and internalization into bovine mammary epithelial cells. *Veterinary Microbiology* 2011;151:379-385.

**Prado ME**, Almeida R, Ozen C, Luther DA, Lewis MJ, Headrick SI, Oliver SP. Recombinant *Streptococcus uberis* adhesion molecule (rSUAM) induces antibodies that block adherence to and internalization of *S. uberis* into bovine mammary epithelial cells. *Veterinary Immunology and Immunopathology* 2011;141:201-208.

**Prado ME**, Moore GE, Kerro-Dego O, Almeida RA, Oliver SP. *Streptococcus uberis* mastitis isolates vary in their ability to form biofilms. Presented at: 3rd International Symposium on Mastitis and Milk Quality and 44th Annual Conference of the American Association of Bovine Practitioners; September 2011; St. Louis, MO.



### **Barry Rouse (p. 39)**

Sehrawat S, **Rouse BT**. Tregs and infections: On the potential value of modifying their function. *Journal of Leukocyte Biology* 2011;90:1079-87.

Veiga-Parga T, Suryawanshi A, **Rouse BT**. Controlling immunoinflammatory viral lesions by modulating aryl hydrocarbon receptor signaling. *PLoS Pathogens*. 2011:e1002427.

Rajasagi NK, Reddy PB, Suryawanshi A, Mulik S, Gjorstrup P, **Rouse BT**. Controlling herpes simplex virus induced ocular inflammatory lesions with the lipid derived mediator Resolvin E1. *Journal of Immunology* 2011;186:1735-1746.

Suryawanshi A, Mulik S, Sharma S, Reddy PB, Sehrawat S, **Rouse BT**. Ocular neovascularization caused by herpes simplex virus type 1 infection results from breakdown of binding between vascular endothelial growth factor A and its soluble receptor. *Journal of Immunology* 2011;186:3653-3665.

Mott KR, Gate D, Zandian M, Allen SJ, Rajasagi NK, van Rooijen N, Chen S, Arditi M, **Rouse BT**, et al. Macrophage IL-12p70 signaling prevents HSV-1-induced CNS autoimmunity triggered by autoaggressive CD4+ Tregs. *Investigative Ophthalmology & Visual Science* 2011;52:2321-2133.

Sharma S, Mulik S, Kumar N, Suryawanshi A, **Rouse BT**. An anti-inflammatory role of VEGFR2/Src kinase inhibitor in HSV-1-induced immunopathology. *Journal of Virology* 2011;85:5995-6007.

Mulik S, Sharma S, Suryawanshi A, Veiga Parga T, Babu P, **Rouse BT**. Activation of endothelial roundabout receptor 4 (Robo 4) reduces the severity of virus-induced keratitis. *Journal of Immunology* 2011;186:7195-7204.

Suryawanshi A, Veiga-Parga T, Rajasagi N, Reddy PBP, Sehrawat S, Sharma S, **Rouse BT**. Role of IL-17 and Th17 cells in HSV-induced corneal immunopathology. *Journal of Immunology* 2011;187:1919-1930.

**Rouse BT**. Invited discussant at: Alcon Meeting; March 4-5, 2011; Ft. Worth, TX.

**Rouse BT**. Invited seminar at: Cedars-Sinai Medical Center; February 2011; Los Angeles, CA.

**Rouse BT**. Invited participant at: Kansas State University Center of Excellence for Emerging and Zoonotic Animal Diseases Advisory Meeting; February 2011; Jackson, FL.

**Rouse BT**. Immunity & immunopathology to infection: Some factors that influence the outcome. Invited seminar at: Department of Ophthalmology & Visual Sciences, Case Western Reserve University; March 15, 2011; Cleveland, OH.

**Rouse BT**. Role of IL-17 in the pathogenesis of herpetic stromal keratitis. Invited presentation at: 5th International Conference on Autoimmunity; September 23-28, 2011; Crete, Greece.

**Rouse BT**. Invited presentation at: Harnessing Immunity to Prevent and Treat Disease, Cold Spring Harbor Winter Biotechnology Conference; November 16-19, 2011; Cold Spring Harbor, NY.

**Rouse BT**. Invited participant: Kansas State University Center of Excellence for Emerging and Zoonotic Animal Diseases and Center of Biomedical Research Excellence Advisory Meeting; January 25, 2011; Baton Rouge, LA.



### Hildegard Schuller (p. 32)

Ullah MF, Al-Wadei HA, Brody JR, **Schuller HM**. Social stress stimulates and GABA inhibits the progression of pancreatic cancer xenografts in nude mice. Presented at: Comparative & Experimental Medicine and Public Health Research Symposium; June 2011; Knoxville, TN.

Al-Wadei MH, Al-Wadei HA, **Schuller HM**. Proliferation of cell lines from pancreatic ductal adenocarcinomas and their normal ductal epithelia are stimulated by acute and chronic exposure to nicotine and ethanol via modulation in neurotransmitter production. Presented at: Comparative & Experimental Medicine and Public Health Research Symposium; June 2011; Knoxville, TN.



### Hwa-Chain Robert Wang (p. 33)

Choudhary S, Rathore K, **Wang H-CR**. Differential induction of reactive oxygen species through Erk1/2 and Nox-1 by FK228 for selective apoptosis of oncogenic H-Ras-expressing human urinary bladder cancer J82 cells. *Journal of Cancer Research and Clinical Oncology* 2011;137:471-480.

Choudhary S, Wang KKA, **Wang H-CR**. Oncogenic H-Ras, FK228, and exogenous H<sub>2</sub>O<sub>2</sub> cooperatively activated the ERK pathway in selective induction of human urinary bladder cancer J82 cell death. *Molecular Carcinogenesis* 2011;50:215-219.



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**Wang H-CR**, Choudhary S. Reactive oxygen species-mediated therapeutic control of bladder cancer. *Nature Reviews Urology* 2011;8:608–616.

Pluchino L, **Wang H-CR**. The role of HSD11B2 in the regulation of cellular properties. Poster presented at: The University of Tennessee/Oak Ridge National Laboratory Graduate School of Genome Science & Technology Annual Retreat; March 4, 2011; Knoxville, TN.

Rathore K, **Wang H-CR**. Green tea catechins at non-cytotoxic levels suppress cellular carcinogenesis induced by environmental carcinogens. Poster presented at: The University of Tennessee/Oak Ridge National Laboratory Graduate School of Genome Science & Technology Annual Retreat; March 4, 2011; Knoxville, TN.

Choudhary S, Rathore K, Sood S, **Wang H-CR**. Synergistic induction of Mek1/2 and Nox-1 by histone deacetylase inhibitors leads to differential induction of reactive oxygen species for mediating selective apoptosis of oncogenic H-Ras-expressing cells. Poster presented at: American Association for Cancer Research Annual Meeting; April 4, 2011; Washington, DC.

Rathore K, **Wang H-CR**. Green tea catechin suppression of carcinogenesis and cell proliferation induced by environmental carcinogens 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone and benzo[a]pyrene. Presented at: American Association for Cancer Research Annual Meeting; April 4, 2011; Washington, DC.

Sood S, Choudhary S, **Wang H-CR**. Precancerous carcinogenesis of human breast epithelial cells by chronic exposure to 3, 4, 4'-trichlorocarbanilide. Presented at: Comparative & Experimental Medicine and Public Health Research Symposium; June 20, 2011; Knoxville, TN.

Rathore K, **Wang H-CR**. Green tea catechins at non-cytotoxic levels suppress cellular carcinogenesis induced by environmental carcinogens. Presented at: Comparative & Experimental Medicine and Public Health Research Symposium; June 20, 2011; Knoxville, TN.

Choudhary S, Rathore K, Sood S, **Wang H-CR**. Synergistic induction of Mek1/2 and Nox-1 by histone deacetylase inhibitors leads to differential induction of reactive oxygen species for mediating selective apoptosis of oncogenic H-Ras-expressing cells. *Experimental and Molecular Therapeutics*. Poster presented at: American Association for Cancer Research Annual Meeting; April 4, 2011; Washington, DC.

**Wang H-CR**. In vitro progressive cellular carcinogenesis model. Invited speaker at: NIMBioS Investigative Workshop–Solid Tumor Modeling; January 2011; Knoxville, TN.

**Wang H-CR**. Globalization of veterinary education and veterinary medicine. Invited seminar: China Animal Disease Control Center, Ministry of Agriculture; August 2, 2011; Beijing, China.

**Wang H-CR**. Chronic cell carcinogenesis model. Invited specialist speaker at: Xinjiang Academy of Animal Science, Institute of Veterinary Medicine; August 2011; Urumqi, Xinjiang Province, China.

**Wang H-CR**. Intervention of chronic cell carcinogenesis. Invited keynote speaker at: The 17th Annual Conference of Chinese Veterinary Pathology, Pathology Association of Chinese Animal Science and Veterinary Medicine, Northwest Agricultural and Forestry University, College of Animal Science and Veterinary Medicine; August 2011; Yanglin City, China.

**Wang H-CR**. Inducing ROS-mediated selective apoptosis of oncogenic Ras-expressing cancer cells. Invited speaker at: Middle Tennessee State University; March 21, 2011; Murfreesboro, TN.

# Publications & Presentations



## Xuemin Xu (p. 34)

Zeng LL, Li TT, Mao GZ, Cui M-Z, **Xu X**. Molecular mechanism of death receptor-6 (DR-6)-induced apoptosis. Presented at: Society for Neuroscience 41st Annual Meeting; November 2011; Washington, DC.

Li TT, Zeng LL, Mao GZ, Cui M-Z, **Xu X**. Molecular mechanism of PSAP-induced apoptosis. Presented at: Society for Neuroscience 41st Annual Meeting; November 2011; Washington, DC.

Shi J, Mao GZ, Cui M-Z, **Xu X**. Vascular factor LPA may contribute to Alzheimer's disease. Presented at: Society for Neuroscience 41st Annual Meeting; November 2011; Washington, DC.

**Xu X**, Mao G, Cui M-Z. Determine the molecular mechanism of the assembly and activation of gamma-secretase complex. Presented at: International Conference on Alzheimer's Disease; June 16-21, 2011; Paris, France.

\*Publications and presentations listed are for the 2011 calendar year. The reporting method for this report was changed in 2009 to more accurately reflect the total number of publications and presentations by including all items from the previous calendar year. Past reports included only items from the current calendar year through the publication date of the report. Some items may be duplicated between individual investigators.

## Research Funded Externally - Detail

Investigator	Project Title	Funding Agency	Project Period	2012 Receipts	2012 Expenditures
<b>Baek, Seung Joon</b>	PPAR-gamma ligands in colorectal cancer	National Institutes of Health	06/01/06-05/31/12	*\$0	\$79,793
	Prevention of colorectal cancer by tolfenamic acid	University of Maryland	07/01/11-06/30/15	\$27,460	\$966
	Transfection of normal colon epithelial cells	Mirus Bio LLC	05/07/12-05/31/13	\$3,000	\$1,615
<b>Brian, David</b>	Coronavirus RNA replication	National Institutes of Health	06/01/08-05/31/13	\$348,671	\$317,110
<b>Cekanova, Maria</b>	New staging techniques & evaluation of therapies for oral squamous cell carcinomas	Winn Feline Foundation	02/18/11-07/30/12	*\$0	\$0
	Role of estrogen receptor beta in breast cancer	The Physician's Medical Education and Research Foundation	09/01/11-08/31/12	\$906	\$952
	Potential use of neutron imaging for biomedical and biological application	UT-Battelle, LLC-Oak Ridge National Laboratory	08/03/11-08/02/12	\$1,870	\$4,072
	Detection of COX-2-expressing canine tumors by new optical imaging tracer, Fluor	Vanderbilt University Medical Center	11/01/11-06/30/13	\$10,000	\$9,907
	Investigation of a novel approach to forensic analysis using neutron imaging techniques	UT-Battelle, LLC-Oak Ridge National Laboratory	01/28/11-09/30/12	\$98,142	\$100,393
<b>Dhar, Madhu</b>	P-type ATPases, insulin signaling, protein trafficking	American Diabetes Association	01/01/	\$47,500	\$23,839
	In vitro model of equine corneal damage to test the efficacy of mesenchymal stem cells in repair	Morris Animal Foundation	03/01/12-03/31/13	\$10,800	\$770
<b>Kania, Stephen</b>	Genomic resources for the control of canine pyoderma	AKC Canine Health Foundation	01/01/11-12/31/12	\$42,466	\$23,617
	Effectiveness of small interfering RNA (siRNA) to inhibit feline coronavirus replication	Winn Feline Foundation	01/01/12-12/31/14	\$23,250	\$11,693

Investigator	Project Title	Funding Agency	Project Period	2012 Receipts	2012 Expenditures
<b>Miller, Debra</b>	Designing an amphibian disease monitoring program at Northeastern National Wildlife Refuges	U.S. Geological Survey Eastern Region Acquisition	10/18/11-12/31/11	*\$0	\$6,080
	Surveys, disease testing, and gene banking of hellbenders across Tennessee	Nashville Zoo	06/01/00-01/01/13	\$19,975	\$0
	Threat of ranaviral disease to the imperiled striped newt in the Apalachicola National Forest	Coastal Plains Institute and Land Conservancy	03/23/11-02/28/14	\$5,333	\$0
<b>Rouse, Barry</b>	Mechanisms in herpetic keratitis	National Institutes of Health	01/01/08-12/31/12	\$335,412	\$295,822
	T-Regulatory cells in HSV immunity and immunopathology	National Institutes of Health	02/01/11-01/31/16	\$356,536	\$403,934
<b>Schuller, Hildegard</b>	The GABA-B receptor is a novel drug target for pancreatic cancer	National Institutes of Health	05/01/09-04/30/13	\$264,476	\$281,012
	Modulation of cancer prevention by social stress	National Institutes of Health	09/30/09-08/31/12	*\$0	\$67,637
	GABA-BR-mediated prevention of pancreatic cancer	National Institutes of Health	09/28/09-08/31/14	\$280,800	\$248,874
<b>Wang, Hwa-Chain Robert</b>	Green tea catechins in precancer prevention	National Institutes of Health	09/01/08-03/31/12	*\$0	\$68,674
<b>Xu, Xuemin</b>	The role of the new zeta cleavage in Abeta formation	National Institutes of Health	04/01/07-03/31/12	\$277,202	\$184,806
	Vascular risk factors in Alzheimer's disease	American Health Assistance Foundation	04/01/09-03/31/12	\$133,333	\$71,344
	Role of presenilin-associated protein (PSAP) in apoptosis and Abeta formation	National Institutes of Health	04/15/11-03/31/13	\$179,580	\$129,978

\*No-cost extension granted, resulting in no new funds in the current year. Expenditure amounts, if any, are from carry-over from the previous year.

**\$2,466,712      \$2,332,888**

**CENTER OF EXCELLENCE in Livestock Diseases and Human Health  
ACTUAL, PROPOSED, AND REQUESTED BUDGET**

	FY 2011-12 Actual			FY 2012-13 Proposed			FY 2013-14 Requested		
	Matching	Appropriations	Total	Matching	Appropriations	Total	Matching	Appropriations	Total
Expenditures	188,484	376,972	<b>565,456</b>	252,555	505,110	<b>757,665</b>	265,183	530,365	<b>795,548</b>
<b>Salaries</b>									
Faculty	17,927	35,855	<b>53,782</b>	12,860	25,720	<b>38,580</b>	13,503	27,006	<b>40,509</b>
Other Professional	32,135	64,271	<b>96,406</b>	38,779	77,558	<b>116,337</b>	40,718	81,436	<b>122,154</b>
Clerical/Supporting	28,999	57,998	<b>86,997</b>	35,809	71,618	<b>107,427</b>	37,599	75,199	<b>112,798</b>
Assistantships	16,529	33,058	<b>49,587</b>	3,502	7,004	<b>10,506</b>	3,677	7,354	<b>11,031</b>
<b>Total Salaries</b>	<b>95,590</b>	<b>191,182</b>	<b>286,772</b>	<b>90,950</b>	<b>181,900</b>	<b>272,850</b>	<b>95,497</b>	<b>190,995</b>	<b>286,492</b>
<b>Longevity</b>	1,262	2,525	<b>3,787</b>	1,202	2,404	<b>3,606</b>	1,262	2,524	<b>3,786</b>
Fringe Benefits	22,108	44,217	<b>66,325</b>	16,540	33,080	<b>49,620</b>	17,367	34,734	<b>52,101</b>
<b>Total Personnel</b>	<b>118,960</b>	<b>237,924</b>	<b>356,884</b>	<b>108,692</b>	<b>217,384</b>	<b>326,076</b>	<b>114,126</b>	<b>228,253</b>	<b>338,593</b>
<b>Non-Personnel</b>									
Travel	3,781	7,561	<b>11,342</b>	3,583	7,167	<b>10,750</b>	3,763	7,525	<b>11,288</b>
Software	223	446	<b>669</b>			<b>0</b>			<b>0</b>
Books & Journals	(35)	(69)	<b>(104)</b>			<b>0</b>			<b>0</b>
Other Supplies	29,896	59,793	<b>89,689</b>	125,321	250,642	<b>375,963</b>	131,587	263,174	<b>394,761</b>
Equipment	1,759	3,517	<b>5,276</b>	1,167	2,333	<b>3,500</b>	1,225	2,450	<b>3,675</b>
Maintenance	9,430	18,861	<b>28,291</b>	4,920	9,840	<b>14,760</b>	5,166	10,332	<b>15,498</b>
Scholarships	6,424	12,848	<b>19,272</b>	4,205	8,411	<b>12,616</b>	4,416	8,831	<b>13,247</b>
Consultants			<b>0</b>			<b>0</b>			<b>0</b>
Renovation			<b>0</b>			<b>0</b>			<b>0</b>
<b>Other (Specify)</b>									
Insurance	996	1,992	<b>2,988</b>			<b>0</b>			<b>0</b>
Media/Communication	240	481	<b>721</b>	667	1,333	<b>2,000</b>	700	1,400	<b>2,100</b>
Legal, Prof.Fees/Food & Lodging/Commercial Svc/Seminar Conf. Reg.	8,239	16,477	<b>24,716</b>	4,000	8,000	<b>12,000</b>	4,200	8,400	<b>12,600</b>
Other services/expenditures	37	73	<b>110</b>			<b>0</b>			<b>0</b>
Services	8,534	17,068	<b>25,602</b>			<b>0</b>			<b>0</b>
<b>Total Non-Personnel</b>	<b>69,524</b>	<b>139,048</b>	<b>208,572</b>	<b>143,863</b>	<b>287,726</b>	<b>431,589</b>	<b>151,057</b>	<b>302,112</b>	<b>453,169</b>
<b>GRAND TOTAL</b>	<b>188,484</b>	<b>376,972</b>	<b>565,456</b>	<b>252,555</b>	<b>505,110</b>	<b>757,665</b>	<b>265,183</b>	<b>530,365</b>	<b>791,762</b>
<b>Revenue</b>									
New State Appropriations		499,482	<b>499,482</b>		505,110	<b>505,110</b>		530,366	<b>530,366</b>
Carryover Appropriations		108,696	<b>108,696</b>		231,207	<b>231,207</b>		231,207	<b>231,207</b>
New Matching Funds	249,741		<b>249,741</b>	252,555		<b>252,555</b>	265,182		<b>265,182</b>
Carryover from Prev. Matching Funds	54,348		<b>54,348</b>	115,604		<b>115,604</b>	115,604		<b>115,604</b>
<b>Total Revenue</b>	<b>304,089</b>	<b>608,178</b>	<b>912,267</b>	<b>368,159</b>	<b>736,317</b>	<b>1,104,476</b>	<b>380,786</b>	<b>761,573</b>	<b>1,142,359</b>