This page left intentionally blank.
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
This report is produced by the University of Tennessee, College of Veterinary Medicine, Office of the Associate Dean for Research.

**Associate Dean for Research**  
Dr. Michael McEntee

**Dean, College of Veterinary Medicine**  
Dr. Jim Thompson

**Chancellor, Institute of Agriculture**  
Dr. Larry Arrington

For more information  
Ph: 865-974-0227  
Fax: 865-974-4773

University of Tennessee  
College of Veterinary Medicine  
Office of the Associate Dean for Research  
2407 River Dr, Rm A102  
Knoxville, TN 37996-4550
Center of Excellence in Livestock Diseases and Human Health

Comparative Summary of Accomplishments 5
CEMPH Research Symposium 6

Program Report
Introduction 7
Collaborations 8
Accomplishments 10
Success Story 11
Funding & Expenditures 12
Allocation of Funding 13
Dissemination of Research 17
Summer Student Research Program 20
Five-year Benchmark Data 25
Future Plans 27

Faculty Reports
Seung Joon Baek 28
Maria Cekanova 29
Madhu Dhar 30
Stephen Kania 31
Hildegard Schuller 32
Hwa-Chain Robert Wang 33
Xuemin Xu 34
Raul Almeida 35
David Brian 36
Debra Miller 37
Maria Prado 38
Barry Rouse 39

Publications and Presentations 40
Research Funded Externally – Detail 49
Center Budget 51
### Comparative Summary of Accomplishments

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

*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
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

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 interrelated 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.
Dr. 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
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.

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.
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.

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.
Dr. 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.
### Research Funded* Externally FY 2012

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

*Represents FY 2012 receipts for active grants

### Research Expenditures FY 2012

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

<table>
<thead>
<tr>
<th>Faculty Member</th>
<th>Use of Funds</th>
<th>$ Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biomedical &amp; Diagnostic Sciences</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tomás Martín-Jiménez, pharmacology</td>
<td>Investigating potential pharmaceutical synergy between two different antibacterial drugs in lowering the minimum inhibitory concentrations (MIC) for each, and thereby improving clinical efficacy.</td>
<td>30,000</td>
</tr>
<tr>
<td><strong>Large Animal Clinical Sciences</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Karen McCormick, equine health</td>
<td>Purchased a new computer in preparation for a Potomac horse fever project.</td>
<td>5,000</td>
</tr>
<tr>
<td>M. Reza Seddighi, anesthesiology</td>
<td>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.</td>
<td>10,000</td>
</tr>
<tr>
<td>Brian Whitlock, food animal medicine</td>
<td>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.</td>
<td>25,000</td>
</tr>
<tr>
<td><strong>Small Animal Clinical Sciences</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Christine Cain, dermatology</td>
<td>Investigating the humoral immune response to <em>Staphylococcus pseudintermedius</em> 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.</td>
<td>10,000</td>
</tr>
<tr>
<td>Erica Fields, radiation oncology</td>
<td>Investigating the frequency with which cystocentesis causes urinary bladder hematomas in dogs. Occasional masses are seen on ultrasound examination that “disappear” during recheck.</td>
<td>1,250</td>
</tr>
<tr>
<td>Sophy Jesty, cardiology</td>
<td>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.</td>
<td>5,000</td>
</tr>
<tr>
<td>Nathan Lee, radiation oncology</td>
<td>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.</td>
<td>5,000</td>
</tr>
<tr>
<td>Jill Narak, neurology</td>
<td>Began looking at brilliant blue G as an adjunct to surgery for invertebral disk disease in dogs.</td>
<td>5,000</td>
</tr>
<tr>
<td>Valeria Tanco, theriogenology</td>
<td>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.</td>
<td>17,500</td>
</tr>
</tbody>
</table>
**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.

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 the institute.
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 α3, 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.
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.
Center of Excellence faculty share their research with a worldwide audience through scientific conferences. The map showcases where their research was presented in 2011.
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.
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.

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**: 
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.

**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 terbinaine-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. **Career Interests:** Pathology, wildlife 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

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 micropipette 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...
**Program Report**

**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.
Program Report

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.
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.

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>$ Expenditures</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>155,000</td>
</tr>
<tr>
<td>2009</td>
<td>213,000</td>
</tr>
<tr>
<td>2010</td>
<td>239,800</td>
</tr>
<tr>
<td>2011</td>
<td>261,075</td>
</tr>
<tr>
<td>2012</td>
<td>193,433</td>
</tr>
</tbody>
</table>

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 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

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 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.

Animal Models & Comparative Medicine
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.

Identifying Therapeutic Targets for Alzheimer’s Disease

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.

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.

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.

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.
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.
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 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).
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).
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.
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)


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.


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.


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.


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. 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 β-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)


Maria Cekanova (p. 29)


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)


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


Stephen Kania (p. 31)


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.

Publications and Presentations 43
Debra Miller (p. 37)


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, 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, 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.


Maria Prado (p. 38)


Prado ME, Almeida R, Ozen C, Luther DA, Lewis MJ, Headrick SL, 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)


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)


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)


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.


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.
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.


*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.
<table>
<thead>
<tr>
<th>Investigator</th>
<th>Project Title</th>
<th>Funding Agency</th>
<th>Project Period</th>
<th>2012 Receipts</th>
<th>2012 Expenditures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baek, Seung Joon</td>
<td>PPAR-gamma ligands in colorectal cancer</td>
<td>National Institutes of Health</td>
<td>06/01/06–05/31/12</td>
<td>*$0</td>
<td>$79,793</td>
</tr>
<tr>
<td></td>
<td>Prevention of colorectal cancer by tolfenamic acid</td>
<td>University of Maryland</td>
<td>07/01/11–06/30/15</td>
<td>$27,460</td>
<td>$966</td>
</tr>
<tr>
<td></td>
<td>Transfection of normal colon epithelial cells</td>
<td>Mirus Bio LLC</td>
<td>05/07/12–05/31/13</td>
<td>$3,000</td>
<td>$1,615</td>
</tr>
<tr>
<td>Brian, David</td>
<td>Coronavirus RNA replication</td>
<td>National Institutes of Health</td>
<td>06/01/08–05/31/13</td>
<td>$348,671</td>
<td>$317,110</td>
</tr>
<tr>
<td>Cekanova, Maria</td>
<td>New staging techniques &amp; evaluation of therapies for oral squamous cell carcinomas</td>
<td>Winn Feline Foundation</td>
<td>02/18/11–07/30/12</td>
<td>*$0</td>
<td>$0</td>
</tr>
<tr>
<td></td>
<td>Role of estrogen receptor beta in breast cancer</td>
<td>The Physician’s Medical Education and Research Foundation</td>
<td>09/01/11–08/31/12</td>
<td>$906</td>
<td>$952</td>
</tr>
<tr>
<td></td>
<td>Potential use of neutron imaging for biomedical and biological application</td>
<td>UT-Battelle, LLC–Oak Ridge National Laboratory</td>
<td>08/03/11–08/02/12</td>
<td>$1,870</td>
<td>$4,072</td>
</tr>
<tr>
<td></td>
<td>Detection of COX-2-expressing canine tumors by new optical imaging tracer, Fluor</td>
<td>Vanderbilt University Medical Center</td>
<td>11/01/11–06/30/13</td>
<td>$10,000</td>
<td>$9,907</td>
</tr>
<tr>
<td></td>
<td>Investigation of a novel approach to forensic analysis using neutron imaging techniques</td>
<td>UT-Battelle, LLC–Oak Ridge National Laboratory</td>
<td>01/28/11–09/30/12</td>
<td>$98,142</td>
<td>$100,393</td>
</tr>
<tr>
<td>Dhar, Madhu</td>
<td>P-type ATPases, insulin signaling, protein trafficking</td>
<td>American Diabetes Association</td>
<td>01/01/</td>
<td>$47,500</td>
<td>$23,839</td>
</tr>
<tr>
<td></td>
<td>In vitro model of equine corneal damage to test the efficacy of mesenchymal stem cells in repair</td>
<td>Morris Animal Foundation</td>
<td>03/01/12–03/31/13</td>
<td>$10,800</td>
<td>$770</td>
</tr>
<tr>
<td>Kania, Stephen</td>
<td>Genomic resources for the control of canine pyoderma</td>
<td>AKC Canine Health Foundation</td>
<td>01/01/11–12/31/12</td>
<td>$42,466</td>
<td>$23,617</td>
</tr>
<tr>
<td></td>
<td>Effectiveness of small interfering RNA (siRNA) to inhibit feline coronavirus replication</td>
<td>Winn Feline Foundation</td>
<td>01/01/12–12/31/14</td>
<td>$23,250</td>
<td>$11,693</td>
</tr>
<tr>
<td>Investigator</td>
<td>Project Title</td>
<td>Funding Agency</td>
<td>Project Period</td>
<td>2012 Receipts</td>
<td>2012 Expenditures</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>-----------------------------------------</td>
<td>-----------------------</td>
<td>---------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Miller, Debra</td>
<td>Designing an amphibian disease monitoring program at Northeastern National Wildlife Refuges</td>
<td>U.S. Geological Survey Eastern Region Acquisition</td>
<td>10/18/11–12/31/11</td>
<td>*$0</td>
<td>$6,080</td>
</tr>
<tr>
<td></td>
<td>Surveys, disease testing, and gene banking of hellbenders across Tennessee</td>
<td>Nashville Zoo</td>
<td>06/01/00–01/01/13</td>
<td>$19,975</td>
<td>$0</td>
</tr>
<tr>
<td></td>
<td>Threat of ranaviral disease to the imperiled striped newt in the Apalachicola National Forest</td>
<td>Coastal Plains Institute and Land Conservancy</td>
<td>03/23/11–02/28/14</td>
<td>$5,333</td>
<td>$0</td>
</tr>
<tr>
<td>Rouse, Barry</td>
<td>Mechanisms in herpetic keratitis</td>
<td>National Institutes of Health</td>
<td>01/01/08–12/31/12</td>
<td>$335,412</td>
<td>$295,822</td>
</tr>
<tr>
<td></td>
<td>T-Regulatory cells in HSV immunity and immunopathology</td>
<td>National Institutes of Health</td>
<td>02/01/11–01/31/16</td>
<td>$356,536</td>
<td>$403,934</td>
</tr>
<tr>
<td>Schuller, Hilde-gard</td>
<td>The GABA-B receptor is a novel drug target for pancreatic cancer</td>
<td>National Institutes of Health</td>
<td>05/01/09–04/30/13</td>
<td>$264,476</td>
<td>$281,012</td>
</tr>
<tr>
<td></td>
<td>Modulation of cancer prevention by social stress</td>
<td>National Institutes of Health</td>
<td>09/30/09–08/31/12</td>
<td>*$0</td>
<td>$67,637</td>
</tr>
<tr>
<td></td>
<td>GABA-BR-mediated prevention of pancreatic cancer</td>
<td>National Institutes of Health</td>
<td>09/28/09–08/31/14</td>
<td>$280,800</td>
<td>$248,874</td>
</tr>
<tr>
<td>Wang, Hwa-Chain Robert</td>
<td>Green tea catechins in precancer prevention</td>
<td>National Institutes of Health</td>
<td>09/01/08–03/31/12</td>
<td>*$0</td>
<td>$68,674</td>
</tr>
<tr>
<td>Xu, Xuemin</td>
<td>The role of the new zeta cleavage in Abeta formation</td>
<td>National Institutes of Health</td>
<td>04/01/07–03/31/12</td>
<td>$277,202</td>
<td>$184,806</td>
</tr>
<tr>
<td></td>
<td>Vascular risk factors in Alzheimer’s disease</td>
<td>American Health Assistance Foundation</td>
<td>04/01/09–03/31/12</td>
<td>$133,333</td>
<td>$71,344</td>
</tr>
<tr>
<td></td>
<td>Role of presenilin-associated protein (PSAP) in apoptosis and Abeta formation</td>
<td>National Institutes of Health</td>
<td>04/15/11–03/31/13</td>
<td>$179,580</td>
<td>$129,978</td>
</tr>
</tbody>
</table>

*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
<table>
<thead>
<tr>
<th></th>
<th>FY 2011-12 Actual</th>
<th>FY 2012-13 Proposed</th>
<th>FY 2013-14 Requested</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Matching</td>
<td>Approp.</td>
<td>Total</td>
</tr>
<tr>
<td>Expenditures</td>
<td>188,484</td>
<td>376,972</td>
<td>565,456</td>
</tr>
<tr>
<td>Salaries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faculty</td>
<td>17,927</td>
<td>35,855</td>
<td>53,782</td>
</tr>
<tr>
<td>Other Professional</td>
<td>32,135</td>
<td>64,271</td>
<td>96,406</td>
</tr>
<tr>
<td>Clerical/Supporting</td>
<td>28,999</td>
<td>57,998</td>
<td>86,997</td>
</tr>
<tr>
<td>Assistantships</td>
<td>16,529</td>
<td>33,058</td>
<td>49,587</td>
</tr>
<tr>
<td>Total Salaries</td>
<td>95,590</td>
<td>191,182</td>
<td>286,772</td>
</tr>
<tr>
<td>Longevity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fringe Benefits</td>
<td>22,108</td>
<td>44,217</td>
<td>66,325</td>
</tr>
<tr>
<td>Total Personnel</td>
<td>118,960</td>
<td>237,924</td>
<td>356,884</td>
</tr>
<tr>
<td>Non-Personnel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Travel</td>
<td>3,781</td>
<td>7,561</td>
<td>11,342</td>
</tr>
<tr>
<td>Software</td>
<td>223</td>
<td>446</td>
<td>669</td>
</tr>
<tr>
<td>Books &amp; Journals</td>
<td>(35)</td>
<td>(69)</td>
<td>(104)</td>
</tr>
<tr>
<td>Other Supplies</td>
<td>29,896</td>
<td>59,793</td>
<td>89,689</td>
</tr>
<tr>
<td>Equipment</td>
<td>1,759</td>
<td>3,517</td>
<td>5,276</td>
</tr>
<tr>
<td>Maintenance</td>
<td>9,430</td>
<td>18,861</td>
<td>28,291</td>
</tr>
<tr>
<td>Scholarships</td>
<td>6,424</td>
<td>12,848</td>
<td>19,272</td>
</tr>
<tr>
<td>Consultants</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Renovation</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other (Specify)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insurance</td>
<td>996</td>
<td>1,992</td>
<td>2,988</td>
</tr>
<tr>
<td>Media/Communication</td>
<td>240</td>
<td>481</td>
<td>721</td>
</tr>
<tr>
<td>Legal, Prof.Fees/Food</td>
<td>8,239</td>
<td>16,477</td>
<td>24,716</td>
</tr>
<tr>
<td>Other services/</td>
<td>37</td>
<td>73</td>
<td>110</td>
</tr>
<tr>
<td>expenditures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Services</td>
<td>8,534</td>
<td>17,068</td>
<td>25,602</td>
</tr>
<tr>
<td>Total Non-Personnel</td>
<td>69,524</td>
<td>139,048</td>
<td>208,572</td>
</tr>
<tr>
<td>GRAND TOTAL</td>
<td>188,484</td>
<td>376,972</td>
<td>565,456</td>
</tr>
<tr>
<td>Revenue</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New State Appropr.</td>
<td>499,482</td>
<td></td>
<td>499,482</td>
</tr>
<tr>
<td>New Matching Funds</td>
<td>249,741</td>
<td></td>
<td>249,741</td>
</tr>
<tr>
<td>Carryover from Prev. Matching Funds</td>
<td>54,348</td>
<td></td>
<td>54,348</td>
</tr>
<tr>
<td>Total Revenue</td>
<td>304,089</td>
<td>608,178</td>
<td>912,267</td>
</tr>
</tbody>
</table>