




2013 Annual Report

# Center of Excellence

## in Livestock Diseases and Human Health

THE UNIVERSITY of TENNESSEE

INSTITUTE of AGRICULTURE

COLLEGE of VETERINARY MEDICINE

# Our Mission

- 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
- Develop new strategies for the diagnosis, treatment, and prevention of disease

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

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# Message from the Dean

We are pleased to present the 2013 annual report for the Center of Excellence in Livestock Diseases and Human Health. This marks the 30th year the center has been able to make an investment in both (1) new investigators who show professional promise and (2) established investigators for the conception of novel and innovative lines of research.

When the College of Veterinary Medicine proposed the center to Tennessee's state government in 1984, administrators looked to focus on the college's strengths in human health research with comparative models and farm animal health research. For 30 years, we have been able to maintain these strengths, and center faculty continue to strive for answers to difficult yet important research questions related to the center's focus areas.

Within this report, you will see highlights of such faculty research projects funded by the center in fiscal year 2013. During 2013, 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. The opening of our new Large Animal Hospitals will further facilitate such research.

Benchmark data are also included for fiscal years 2009–2013. Research funding steadied, and the return on investment, as the ratio of research expenditures to the state appropriation for the center, was 4.1:1.

Center faculty continue to garner national and international recognition for their research and scholarship. During calendar year 2012, center faculty published 51 peer-reviewed articles and gave 45 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


THE UNIVERSITY of TENNESSEE
INSTITUTE OF AGRICULTURE


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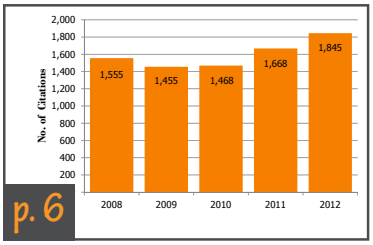

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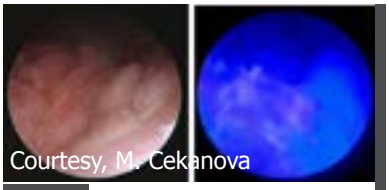

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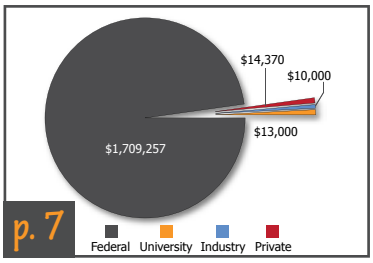

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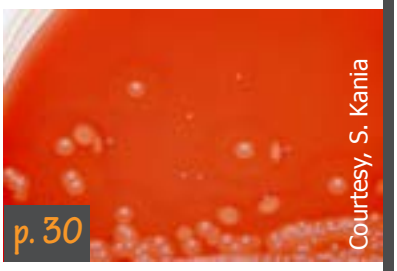

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**Editing**
Misty R. Bailey

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Dr. Michael McEntee

**Special Thanks**
Lisa Cashion
Emily Dyke
Becky Greene
Kim Rutherford
Kathy Yates

# Comparative Summary of Accomplishments

| Benchmark | 2013<br>12 faculty | 2012<br>12 faculty |
|---|---|---|
| **Publications** | n (mean)* | n (mean)† |
| Peer-reviewed articles | 51 (4.25) | 39 (3.25) |
| Books or book chapters | 0 (0) | 2 (0.17) |
| Abstracts or posters | 41 (3.42) | 63 (5.25) |
| **Presentations** | | |
| International | 30 (2.5) | 9 (0.75) |
| National | 10 (0.83) | 40 (3.33) |
| State or local | 5 (0.42) | 14 (1.17) |
| **Research monies** | | |
| External funding | $1,746,627<br>($145,552) | $2,466,712<br>($205,559) |
| Research expenditures | $2,057,499<br>($171,458) | $2,332,888<br>($194,407) |
| Return on investment | 4.1:1 | 4.7:1 |

*Publications and presentations based on 2012 calendar year; research monies based on 2013 fiscal year.
†Publications and presentations based on 2011 calendar year; research monies based on 2012 fiscal year.


L–R: Drs. Hwa-Chain Robert Wang, Amy LeBlanc, Xuemin Xu, and Seung Joon Baek

# 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. 26–37).

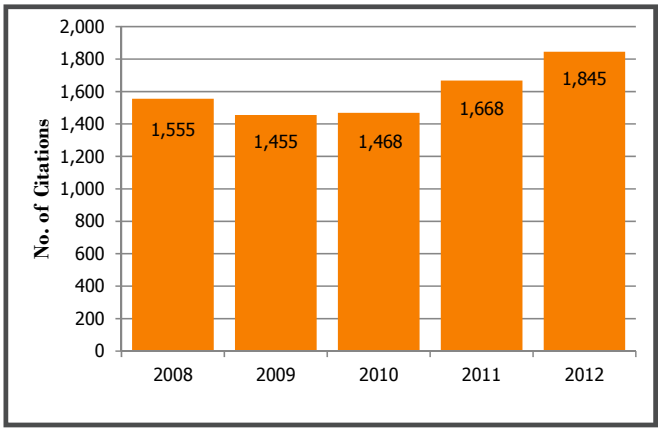



**Fig. 1.** Number of times 2013 center faculty publications were cited by others from calendar years 2008 to 2012 (excludes self-citations).

During the 2012 calendar year, the 12 center faculty each averaged 4 peer-reviewed publications (51 total) and 3 presentations at prestigious national and international meetings (40 total). Figure 1 shows the number of times 2013 center faculty publications have been cited by others over the last six calendar years. These numbers tell us that scientists worldwide have evaluated center faculty work positively and used it to stimulate, validate, and/or support their own work in simimilar fields. Therefore, citations are indicators of the quality of faculty work.

Particularly noteworthy articles in 2012 were by Drs. David Brian, Barry Rouse, Hildegard Schuller, and Hwa-Chain Robert Wang. Drs. Brian and Rouse published articles in the *Journal of Virology*. Dr. Rouse's work was also published in the *Journal of Immunology*. Both Drs. Schuller and Wang had articles published in *Carcinogenesis*. All these journals have an impact factor above 5.0. The impact factor is frequently used as a measure of a journal's importance in its field. The higher the number, the more times articles published in the journal have been cited in a particular year. See Publications and Presentations (pp. 40–48 ) for more details.

**External Funding:**
$1,746,627

**New Grants:**
$786,471

The return on the state's investment in the center was 4.1:1, calculated as ratio of expenditures from extramural funding to center appropriation. This calculation means that for every $1 of center funds spent, center faculty returned over $4 in extramural funding. Extramural funding totaled

$1,746,627 this year, while expenditures for the year were $2,057,499.
Figure 2 shows the percentage breakdown of external funding by source. The funding includes a new, multi-year award for Dr. Barry Rouse totaling $2,464,341 over the course of the project, and new, one-year awards for Drs. Maria Cekanova, Shigetoshi Eda, Stephen Kania, and Amy LeBlanc, totaling $304,071. See "Research Funded Externally" and "Research Expenditures" on p. 12 for the fiscal year 2013 data summary.

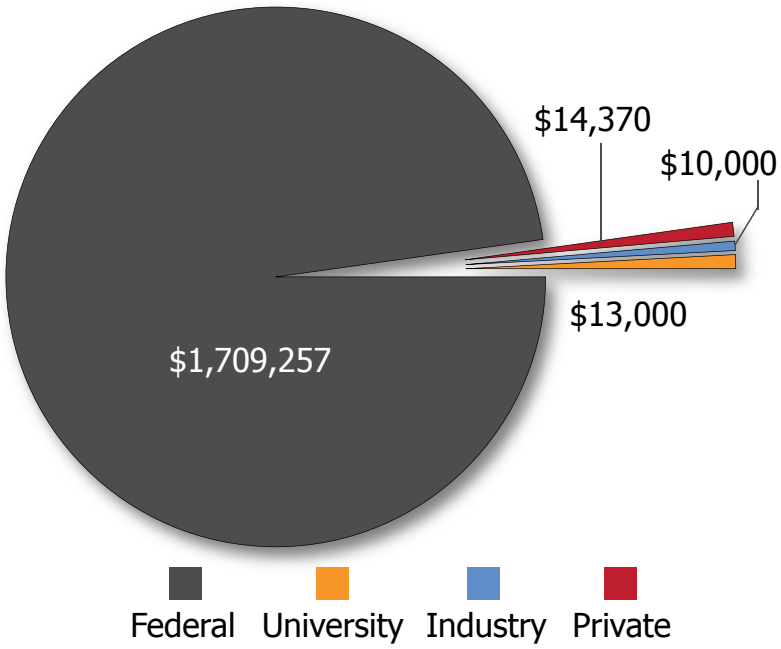



**Fig. 2.** FY 13 external funding by source.
Total = $1,746,627.

# Introduction

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

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

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

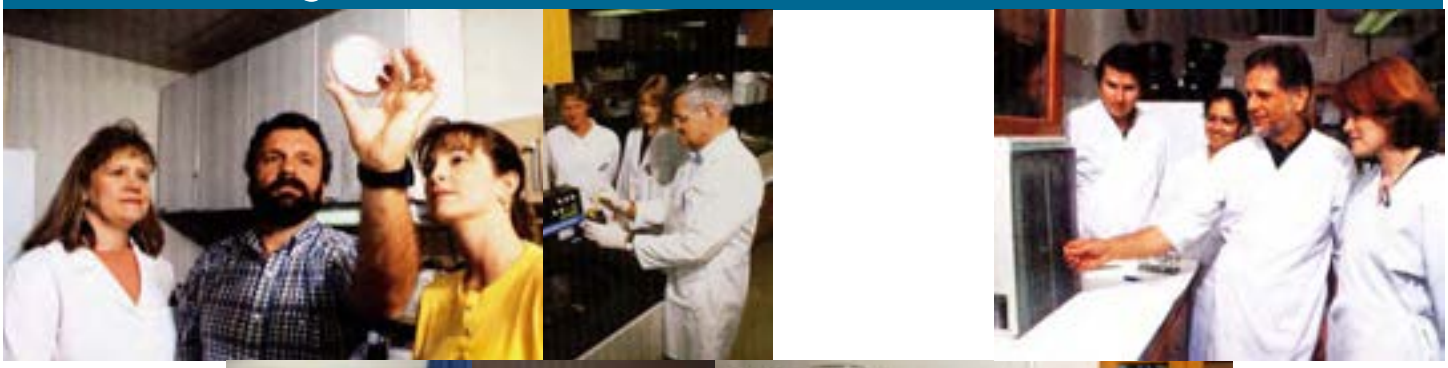
These two areas are highly interrelated, and the center plays a critical and unique role in developing these focused areas of strength in both the University of Tennessee College of Veterinary Medicine (UTCVM) and the Institute of Agriculture. These areas also encompass the "One Health" concept, wherein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

## Personnel

Dr. Michael McEntee has served as director of the center since October 1, 2012, having served as interim director since February 2011. Dr. Stephen Kania chaired the Research Advisory Committee responsible for selecting 2013 funded proposals. Ms. Misty Bailey produces the annual report, and Ms. Kim Rutherford oversees submissions of faculty proposals for funds.

L–R: McEntee, Kania, Bailey, Rutherford

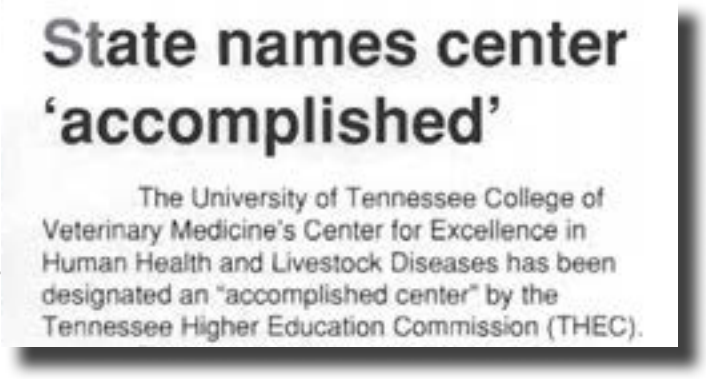
# Our Story: 1984-2013



File Photos

The Center of Excellence for the Study of Livestock Diseases and Human Health, as it was originally called, began operations at the start of the new fiscal year in July 1984 with a $250,000 grant from the Tennessee Better Schools Program. At the time, it was one of 14 centers established by the Tennessee Higher Education Commission (THEC) and was one of three centers targeted by THEC to have the greatest potential to bring national recognition to Tennessee.

By 1989, THEC had designated the center as "accomplished"; this designation, then earned by only four centers in the university, meant the center had met or exceeded all projected objectives and had achieved the recognition THEC predicted.



**State names center 'accomplished'**

The University of Tennessee College of Veterinary Medicine's Center for Excellence in Human Health and Livestock Diseases has been designated an "accomplished center" by the Tennessee Higher Education Commission (THEC).

This year marks the 30th anniversary for the center, and to commemorate, we asked some of our most frequently center-funded faculty to recall their most proud research accomplishments.

# Mastitis in Dairy Cows

**Dr. Stephen Oliver** (seen on p. 9, top left):

"Center support resulted in the generation of the necessary preliminary data that allowed us to be competitive at the national level. Our research on identification and characterization of *Streptococcus uberis* virulence factors resulted in the discovery of a molecule that we refer to as *Streptococcus uberis* Adhesion Molecule or SUAM. SUAM is a novel bacterial protein involved in the pathogenesis of *Strep. uberis* mastitis. SUAM has several potential applications, including use as an antigen/vaccine for the prevention of *Strep. uberis* mastitis in dairy cows, and use as a therapeutic in the treatment of cows with mastitis.

This discovery resulted in the submission of U.S. Non-Provisional Patent and PCT International Patent applications. SUAM now has patent protection in the United States, several countries in the European Union, Canada, Mexico, New Zealand, Australia, and Brazil. From 2004 to 2011, we received over $1 million from USDA for research on SUAM projects. We are in deliberations with a commercial partner to continue to develop SUAM technology. The center has been very meaningful to me as a research scientist and has helped move the science forward more expeditiously."

# Setting Interpretive Standards for Methicillin-Resistance

**Drs. David Bemis** (R) **& Stephen Kania** (L):

"Center-sponsored work led to a change in the way the Clinical Laboratory Standards Institute (CLSI) interprets methicillin resistance in *Staphylococcus pseudintermedius* isolated from dogs. The CLSI is an internationally-recognized organization that sets standards and publishes guidelines for all aspects of diagnostic laboratory operations. As a result of our center work, the CLSI document outlining susceptibility testing guidelines was altered to enable detection of a considerable number of strains that had previously tested negative due to the original interpretive criteria being based on *S. aureus*."

# Discovering Ways to Better Treat Coronaviruses in Animals

**Dr. David Brian** (seen on p. 9, top right):

"My work on coronaviruses began when I arrived at the UTCVM in 1976, a time when coronaviruses were known as serious pathogens in domestic animals but minor pathogens in humans

(common cold, mostly); little was known about how coronaviruses replicate inside cells. Our goal was to identify targets for new therapeutic agents. We tackled coronavirus replication by studying the pig and cow coronaviruses that belong to separate coronavirus subgroups. Our major contribution came in 1989: the discovery that coronavirus messenger RNAs, unlike those in other known viruses, behave (in part) as mini replicons and undergo rapid amplification. Rapid amplification aids survival of this virus with the largest known RNA genome. This discovery was first presented at an International Coronavirus Conference in Cambridge, England, and was later published in the *Proceedings of the National Academies of Science U S A* (Coronavirus subgenomic minus-strand RNAs and the potential for mRNA replicons. 1989;86:5626–30). The finding changed the working model for how virologists think coronaviruses replicate and identified new potential target sites for blocking virus replication. Today, we know that there are several serious veterinary and human coronavirus pathogens. These include the recently-discovered SARS and MERS coronaviruses, which are zoonotic and harbored in bat reservoirs. Our lab remains focused on identifying potential targets for therapeutic agents against coronaviruses."

# Bovine Viral Diarrhea

### Dr. Leon Potgieter

Dr. Potgieter was frequently funded by the center immediately after its inception in 1984. From 1995 to 2001, he was appointed as the assistant director of the center. When asked about the role the center played in his research, he talked about how "BVD had a primary role in enhancing the severity of other respiratory infections in cattle. The Center of Excellence helped with equipment and supplemental funding to continue our research program for the development of a 'safe' vaccine for the disease. Some of our COE funding went toward purchasing the first PCR [polymerase chain reaction] machine in a UT campus laboratory. I went to the Keystone Symposia in Colorado to learn PCR technique and then to a conference in North Carolina to learn DNA sequencing. Now, PCR is a necessity in every lab."

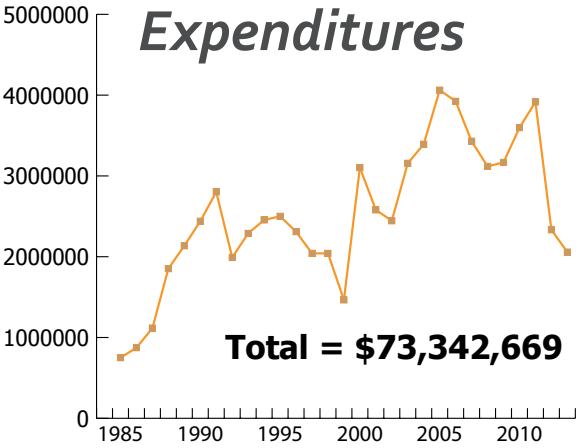



Fig. 3. Expenditures from extramural funding since the inception of the center.

*COE Faculty Have Published:*
**2,443 peer-reviewed articles**
**303 books or book chapters**

*Presented:*
**3,339 talks or posters**

# Funding & Expenditures

## Research Funded* Externally FY 2013

| Investigator | Federal | Industry | Foundation/ Private | University | Totals |
|---|---|---|---|---|---|
| Cekanova, Maria | $200,000 | | | $13,000 | $213,000 |
| Cui, Mei-Zhen | $347,480 | | | | $347,480 |
| Eda, Shigetoshi | | | $3,700 | | $3,700 |
| Kania, Stephen | | $10,000 | $10,670 | | $20,670 |
| LeBlanc, Amy | $79,701 | | | | $79,701 |
| Rouse, Barry | $801,683 | | | | $801,683 |
| Schuller, Hildegard | $280,393 | | | | $280,393 |
| **Totals** | **$1,709,257** | **$10,000** | **$14,370** | **$13,000** | **$1,746,627** |

*Represents FY 2013 receipts for active grants

## Research Expenditures FY 2013

| Investigator | Federal | Industry | Foundation/ Private | University | Totals |
|---|---|---|---|---|---|
| Baek, Seung Joon | | | | *$34,442 | $34,442 |
| Brian, David | $277,902 | | | | $277,902 |
| Cekanova, Maria | $3,420 | | $16,133 | $7,258 | $26,811 |
| Cui, Mei-Zhen | $286,898 | | | | |
| Eda, Shigetoshi | | | $1,128 | | $1,128 |
| Kania, Stephen | | $10,000 | $24,912 | | $34,912 |
| LeBlanc, Amy | $78,657 | | | | $78,657 |
| Rouse, Barry | $687,985 | | | | $687,985 |
| Schuller, Hildegard | $469,570 | | | | $469,570 |
| Xu, Xuemin | $114,982 | | $44,210 | | $159,192 |
| **Totals** | **$1,919,414** | **$10,000** | **$86,385** | **$41,700** | **$2,057,499** |

*Federal flow-through (National Institutes of Health)

# 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.

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

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

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.

## Bridge funds

The center provided $92,235 in bridge funding to support Dr. Madhu Dhar and Dr. Cristina Lanzas while they pursue additional sources of external funding.

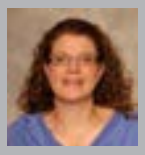
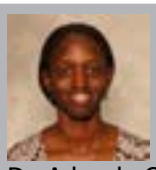
In fiscal year 2013, Dr. Dhar was funded by Morris Animal Foundation and the Physician's Medical Education and Research Foundation. She had five publications published in peer-reviewed journals, including three articles in the *FASEB Journal*, which has an impact factor of 5.704. Her research focuses on harvesting and using adult equine stem cells in horse rehabilitation and healing.

Dr. Lanzas' research interests include developing and applying mathematical and epidemiological approaches to study the dynamics and control of infectious diseases caused by zoonotic and gastrointestinal pathogens in human and animal populations. She published in *PLoS One* in calendar year 2012. *PLoS One* is one of the oldest and most well-respected open-access journals. Open-access journals provide free content to all readers rather than charging subscription fees.

The center provided $138,333 in start-up funds for 13 junior faculty members to secure additional external funding in 2013.

## Start-up Funds

| Faculty Member | Area of Research | $ Amount |
|---|---|---|
| **Biomedical & Diagnostic Sciences** | | |
|  Dr. Richard Gerhold | Wildlife parasitology, including *Trichomonas gallinae* in birds | 25,000 |
| **Large Animal Clinical Sciences** | | |
|  Dr. Marc Caldwell | Production animal medicine, infectious diseases of livestock | 8,333 |
|  Dr. Karen McCormick | Large animal clinical medicine, including testing blood coagulation variation in horses | 5,000 |
|  Dr. M. Reza Seddighi | Pharmacokinetics/dynamics of anesthetic drugs with emphasis on the potency of inhalational anesthetics | 10,000 |
|  Dr. Brian Whitlock | Large animal field service medicine and food animal theriogenology (reproduction medicine) | 25,000 |
| | | |
|  Dr. Katie Tolbert | Feline gastrointestinal disease as a translational model for human disease | 15,000 |

| Faculty Member | Area of Research | $ Amount |
|---|---|---|
| **Small Animal Clinical Sciences** | | |
|  Dr. Erica Fields | Radiation oncology, including optimizing contrast-enhanced, multidetector abdominal CT in sedated canine patients | 1,250 |
|  Dr. Sara Frazier | Oncology, including effects of pioglitazone, rosiglitazone, carboplatin, mitoxantrone, and doxorubicin to treat canine cancers | 24,500 |
|  Dr. Sophy Jesty | Cardiology, including heart disease in dogs, cats, and horses and specifically arrythmias in the exercising animal | 5,000 |
|  Dr. Nathan Lee | Palliative care for cancer patients; developing new radiation therapy protocols for small animal patients with various tumor types | 5,000 |
|  Dr. Elizabeth May | Bacterial skin and ear infections, staphylococcal bacteria and mechanisms of resistance, hair coat disorders in Schipperkes | 5,000 |
|  Dr. Adesola Odunayo | Emergency and critical care | 5,000 |
|  Dr. Valeria Tanco | Large and small animal theriogenology | 2,500 |

# Infrastructure and supplies

The center promotes the research infrastructure of both the UTCVM and the Institute of Agriculture through the purchase and maintenance of essential research equipment. The Research Advisory Committee reviews requests based on three criteria: justification of need, current availability of equipment, and number of investigators who may benefit. In support of the UTCVM's research enterprise in 2013, the center funded tests and certifications for two fume hoods in research laboratories in the college ($200). Such tests ensure that faculty and staff who use these hoods are safe from harmful fumes and other potentially dangerous airborne substances; they also protect research cells by preventing their contamination. A total of $1,103.16 was paid for carbon dioxide gas to be used in incubators in the Tumor Biology Laboratory, as well as for liquid nitrogen to maintain frozen cells. Faculty members Dr. Madhu Dhar, Dr. Maria Cekanova, and Dr. Casey LeBlanc benefit from this laboratory equipment.

***$2,903 helped fund equipment, service contracts, and supplies***

Various supplies for the Tumor Biology Laboratory totaled $1,600; however, cell sorter services provided by laboratory manager Nancy Neilsen for numerous faculty throughout the college and university earned the center $2,025 in income to more than offset the cost of supplies.

# 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.

Dr. Stephen Kania received center funds to travel with two students in the Summer Student Research Program to present their work at the 2012 Merial-NIH Veterinary Scholars Program Symposium in Ft. Collins, CO, at Colorado State University. By attending this meeting, Dr. Kania was able to make an essential contact with a National Institutes of Health director for sponsored training programs, and as a direct result, drafted two applications to support pre- and post-doctoral students. If one of these is awarded, the entire research enterprise at the UTCVM will be enriched.

In further support of the Summer Student Research Program, the center provided meals ($137.93) during the student/faculty matching session, as well as during one of the students' professional development sessions.

Ms. Rachel Dutkosky, one of the students in the 2012 Summer Student Research Program, received travel funds ($688) to present a poster at the American College of Veterinary Pathology Conference in December 2012. The poster was a result of her work with Dr. Marcy Souza and Dr. Kim Newkirk: evaluating the effectiveness of a subcutaneous implant to treat white nose syndrome in captive bats.

Likewise, Mr. Christopher Lee Emery, also a 2012 summer student, presented his work at the Association of Avian Veterinarians annual conference, which took place in August 2012 in Louisville, KY. Emery won the Student Manuscript Competition, which funded his conference registration. The center provided other travel-associated costs ($664.10). Emery's work was on the pharmacokinetics of nebulized terbinafine in Hispaniolan Amazon parrots.

Center faculty member Dr. Maria Cekanova met with Dr. Lawrence Marnett's cancer research group at Vanderbilt University to discuss current progress and future studies for clinical development of fluorocoxib use in humans and domestic animals. The meeting included Dr. Christopher Contag from Stanford University's School of Medicine and Dr. William C. Kruka, executive vice president for corporate development and imaging business head unit at Perkin Elmer. Dr. Cekanova received center travel support ($600) to give a presentation about her progress using fluorocoxib A in dogs and cats with cancers. *Cekanova is shown at right with Dr. Joseph Bartges using the technique on a client-owned cat. >>>*

Dr. Cekanova was also partially funded by the center to present a poster at the Veterinary Cancer Society's annual conference in Las Vegas, NV.

The center also provided $1,503 for a tuition waiver for one student in the Comparative and Experimental Medicine graduate program for 3 hours of coursework in summer 2013.

# Comparative & Experimental Medicine and Public Health Research Symposium

The center was a major sponsor of the Comparative & Experimental Medicine and Public Health Research Symposium, which brought together researchers from 17 different departments for a 2-day-long event that included special seminars on diagnosis of and outbreak investigations into fungal infections, translational disease intervention strategies, and one health.

Featured was Dr. Ralph Tripp (above, center) of the Department of Infectious Diseases at the University of Georgia College of Veterinary Medicine. Also featured were Dr. Marion Kainer of the Tennessee Department of Health and Dr. David Bemis, professor at the UTCVM and center co-investigator. Ms. Channa Palmer, lead university recruiter for the Oak Ridge National Laboratory, gave an overview of postdoctoral opportunities available at ORNL. The symposium culminated with an awards banquet and guest speaker Dr. Marcy Souza, known for her research on infectious and zoonotic diseases of exotic pets and wildlife.

Fifty-five researchers from the Institute of Agriculture presented talks, including heavy participation by members of the Biomedical and Diagnostic Sciences and Small Animal Clinical Sciences departments. They were among 76 new scientists to present, and at the end of the 2 days, the institute was able to boast seven winners of travel awards.

The center sponsored five of the 2012 award winners to present at four national scientific meetings during fiscal year 2013. Dr. Ricardo Videla presented at the American Association of Immunologists meeting in Honolulu, HI. Dr. Tinting Xu traveled to San Antonio, TX, to present at the 52nd Annual Meeting of the Society of Toxicology. Dr. Maria Cekanova went to Las Vegas, NV, to present a poster and oral presentation to the Veterinary Cancer Society, and Dr. Eman Anis presented at the Conference of Research Workers in Animal Disease in Chicago.

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/**

# 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 2012 calendar year can be found in the Publications and Presentations section (pp. 38–49).

Through scientific conferences, Center of Excellence faculty share their research with a worldwide audience. The map above showcases where their research was presented in 2012.

# Dissemination of Research

In addition to faculty speaking engagements, the UTCVM issues press releases to state, regional, and national media, resulting in numerous television and print features, many of which relate directly to research conducted through the center.

The UTCVM has a recurring spot on local NBC affiliate **WBIR, Channel 10**'s "Live at Five at Four" news show. Within the last 2 years, UTCVM has also launched a **Facebook** page and a new **VolVet Connect** alumni e-newsletter. At the end of July 2013, the Facebook page had 3,122 "likes" from individuals from seven different countries. Page administrators post clinical and research information for users. VolVet Connect contains items of note aimed at DVM alumni, including UTCVM research news, and continuing education and networking opportunities. UTCVM is also on **Twitter** (1,362 followers), has a **YouTube** channel with 65 subscribers and 3,062 views since its inception in 2012, and a **Pinterest** presence with 68 followers.

Our researchers are also occasionally featured in **Tennessee Alumnus** and **Tennessee Land, Life & Science**, tri-annual and bi-annual magazines produced by the University of Tennessee and the UT Institute of Agriculture, respectively. The center itself was featured in the spring 2012 issue of Tennessee Land, Life & Science (see Fig. 4).

The 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.

For Better Livestock & Human Health

The Center of Excellence in Livestock Diseases and Human Health. Sounds like a misnomer, doesn't it? It isn't. In the past five years, the center, which is administered through the UT College of Veterinary Medicine, has funded research on everything from mastitis (a complex disease of cows and other ruminants) to malignant catarrhal fever (a costly and mysterious infectious disease of certain livestock) to human heart disease to multiple drug resistance of Staphylococcus strains in both humans and animals.

The center's goals are to:

- Improve the quality of human life through better animal health.
- Identify and characterize animal diseases that are similar to human diseases.
- Develop new strategies to diagnose, treat and prevent disease.

Center faculty began to achieve these goals in 1984, when the state of Tennessee created several centers of excellence for public higher education to provide service to Tennesseans through results of critical research. Through this competitive process, this center was born.

Researchers receiving grants from the center use the funds in one of two ways: as seed money to establish preliminary results and become more competitive for larger grants, and as bridge funding to keep their laboratories competitive during times between grants. Partly as a result of that support, over the past five years center faculty members have been awarded more than $19.5 million in grant funding. That's a 7:1 return on the state's investment.

A recent success story was Distinguished Professor Hildegard Schuller, who used her bridge funding in 2009 to secure more than $2 million for multiyear research on the effects of GABA (an inhibitor in the central nervous system) on lung and pancreatic cancers. This included a highly competitive National Institutes of Health "Challenge Grant," for which only 4 percent of applications were funded. Her accomplishments made her the perfect candidate for the esteemed UT Chancellor's Award in Research and Creative Achievement, which she won in 2010.

More recently, the center-funded Regenerative Medicine Alliance of Tennessee has had measurable results in its adult stem cell activities. The group has successfully isolated adult stem cells from horses and used these cells to treat bone and tendon damage, as well as laminitis. In dogs, the stem cells have been used to treat knee injuries. These results may be transferrable to treatment of people with the same type of therapy.

Dr. Michael McEntee, center director, sums it up best: "The center creates an environment that encourages new, risk-worthy research. Funds offered through the center provide investigators the ability to develop new ideas that might otherwise lie dormant."
–*Misty Bailey*

*Above: A close-up of MRSA, a contagious staph bacteria that can infect skin and also invade other parts of the body. Left: Dr. Seung Joon Baek investigates colorectal cancer prevention and intervention using natural remedies.*

Greg Hasbrouck

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Fig. 4. The center was featured in the spring 2012 issue of Tennessee Land, Life & Science, a bi-annual magazine produced by the UT Institute of Agriculture.

# Summer Student Research Program

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

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*

The center funded 19 student salaries. A grant from Morris Animal Foundation funded one student. 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. From Merial, four additional student salaries were funded in summer 2013; these students also received travel funds from Merial to present their work as posters at the 2013 Merial-NIH Veterinary Scholars Program Symposium in East Lansing, MI, at Michigan State University. Three center-sponsored students attended the symposium, as well (see below). From 2008–2012, 30 peer-reviewed publications were produced as a result of past summer students' work.

To maximize student participation, the program is open to both center and non-center faculty. During fiscal year 2013, five junior members participated in the program. The center will continue to encourage participation of its faculty.

L-R: Jose Grenet, Marissa Torre, Jessica Chin, Patrick Reilly, Kimberly Pompo, Brooke Giff, and Erin Felty at the 2013 Merial-NIH Veterinary Scholars Program Symposium. Photo: Courtesy, S. Kania

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

**Victoria J. Balvin**, 2nd year. **Faculty Mentor:** Dr. Brian Whitlock.
Bethesda, OH. BS in pre-veterinary studies and animal science from the University of Findlay, Findlay, OH. **Summer Project:** Studied the effects of betahydroxy-buterate on luteinizing hormone in wethers. **Career Interests:** Food animal and equine medicine, field service.

**Jessica Chin**, 2nd year. **Faculty Mentor:** Dr. Angela Witzel.
Brooklyn, NY. BS in biology from Trinity College, Hartford, CT. **Summer Project:** Retrospective study of dual absorptiometry x-ray (DEXA) scan data, which differentiates between bone mineral content, fat body mass, and lean body mass. Goal was to determine what portion of excess body weight in overweight and obese dogs and cats can be attributed to fat body mass versus lean body mass. Data will be useful in calculating energy needs and drug dosages for overweight pets because fat body mass does not metabolize drugs. **Career Interests:** Small animal or exotic medicine.

**Emily Credit**, 3rd year. **Faculty Mentor:** Dr. Julie Albright.
Pittsford, NY. BA in organismal biology from Keuka College, Keuka Park, NY. **Summer Project:** Compiled data on how puppies develop and their use of different toys in play behavior. **Career Interests:** Small animal medicine.

**Mary Dell Deweese**, 3rd year. **Faculty Mentor:** Dr. Karen Tobias.
Germantown, TN. Studied animal science at the University of Tennessee, Knoxville, TN. **Summer Project:** Predicting tracheal diameter using radiographs. Success would enable surgeons to obtain an ideal stent size pre-operatively, increasing survival time of dogs undergoing surgery to treat tracheal collapse. **Career Interests:** Surgery.

**Carrie Dobey**, 2nd year. **Faculty Mentor:** Dr. Richard Gerhold.
Lawrenceville, GA. MS in wildlife biology from the University of Tennessee, Knoxville, TN; BS in biology from North Georgia College, Dahlonega, GA. **Summer Project:** Helped validate a recently-developed PCR test to detect *Parelaphostrongylus tenuis* (brain worm) in domestic and wild hooved animals. Evaluated which lesions can be used to detect *P. tenuis* DNA when the worm itself is not present. **Career Interests:** Pathology and small animal surgery.

**Blake Everett**, 2nd year. **Faculty Mentors:** Dr. Agricola Odoi and Dr. David Bemis.
Lewisburg, TN. BS in animal science from Middle Tennessee State University, Murfreesboro, TN. **Summer Project:** Compared three antibiotic-impregnated disks both singly and in combination to detect methicillin resistance in *Staphylococcus pseudintermedius* in dogs. **Career Interests:** Mixed-animal practice and surgery.

**Sloane Everett**, 2nd year. **Faculty Mentor:** Dr. Rebecca Wilkes.
Collierville, TN. BS in biological sciences from the University of Missouri, Columbia, Missouri. **Summer Project:** Used PCR to analyze genomic differences between *Tritrichimonas foetus* in cats vs. the same species in cattle. Evaluated the genetic differences between three strains of *Trichimonas gallinae* from band-tailed pigeons. **Career Interests:** Laboratory animal medicine, pathology, research.


Courtesy, S. Kania
Victoria Balvin

**Erin Felty**, 2nd year. **Faculty Mentors:** Dr. Angela Witzel and Dr. Nancy Howell.
Collierville, TN. BS in biology from the University of Tennessee at Chattanooga, Chattanooga, TN. **Summer Project:** Evaluated the quality of

veterinary nutrition programs at other veterinary colleges by surveying recent graduates' perceived level of adequacy in nutrition knowledge, and gathered information about nutrition curriculum and requirements at U.S. veterinary schools. **Career Interests:** Feline medicine, small animal internal medicine, nutrition, and pathology.

**Jose Grenet**, 2nd year. **Faculty Mentor:** Dr. Edward Ramsay.
Memphis, TN. BA in neuroscience and Latin American studies from Vanderbilt University, Nashville, TN. **Summer Project:** Studied epidemiological risk factors associated with red panda neonatal mortality to provide recommendations for captive red panda husbandry in order to improve neonatal survival. **Career Interests:** Conservation medicine, international medicine, zoo and wildlife medicine.

**Brooke Griff**, 2nd year. **Faculty Mentor:** Dr. Debra Lee Miller.
Virginia Beach, VA. BS in zoology, North Carolina State University, Raleigh, NC. **Summer Project:** Evaluated the gray whale epidermis microscopically and measured mercury, selenium, and stable isotope levels to determine the effect of their different levels on the epidermis. **Career Interests:** Zoological and wildlife medicine.

**Benton Harvey**, 3rd year. **Faculty Mentor:** Dr. Brian Whitlock.
Nashville, TN. BS in neuroscience, College of William & Mary, Williamsburg, VA. **Summer Project:** Collected over 800 blood samples from beef cattle in each Southeastern state to complete a survey of anaplasmosis and to complete a write-up of data from PCR and cELISA tests. **Career Interests:** Veterinary mission work in Central or South America.

**Lauren Henderson**, 2nd year. **Faculty Mentor:** Dr. Richard Gerhold.
Hendersonville, TN. BS in animal science from the University of Tennessee, Knoxville. **Summer Project:** Collected samples and extracted DNA to analyze heart tissue samples of raccoons, opposums, and feral hogs in southern Appalachia for *Toxoplasma gondii* and *Trypanosoma cruzi*. **Career Interests:** Wildlife rehabilitation and conservation medicine, public health, international medicine, zoonotic disease research.

**Nicole Laia**, 3rd year. **Faculty Mentor:** Dr. Jacqueline Whittemore.
Morgan Hill, CA. BS in biochemistry from California Polytechnic State University, San Luis Obispo, CA. **Summer Project:** Determining if administration of a probiotic helps prevent antibiotic-associated diarrhea in cats being given oral clindamycin. **Career Interests:** Small animal practice.

**Jacob Malugin**, 2nd year. **Faculty Mentor:** Dr. Valeria Tanco.
Culleoka, TN. BS in veterinary science from the University of Tennessee at Martin, Martin TN. **Summer Project:** Evaluated the effects of gonadotropin-inhibitory hormone on luteinizing hormone surge and ovulation in dairy heifers. **Career Interests:** Mixed-animal practice (50/50 small and large animals), reproduction, and surgery.


Brooke Griff
Courtesy, S. Kania

**Kelly Miller**, 2nd year. **Faculty Mentor:** Dr. David Bemis.
Kingsport, TN. BS in animal science from the University of Tennessee, Knoxville. **Summer Project:** Studied antimicrobial effects of Yerba mate tea extracts on methicillin-resistant staphylococci obtained from samples submitted to the UTCVM. Concentrations of tea extract as low as 20 mg/mL successfully killed all strains of bacteria tested. **Career Interests:** Dermatology, radiology, feline internal medicine, community practice.

**Kristen Niemann**, 2nd year. **Faculty Mentor:** Dr. Rebecca Wilkes.
Youngsville, NY. BA in biology from Elmira College, Elmira, NY. **Summer**

**Project:** Evaluated several different efficient delivery methods for the treatment of feline herpes using RNA interference. **Career Interests:** Small animal medicine and research.

**Kimberly Pompo**, 2nd year. **Faculty Mentor:** Dr. Rebecca Trout-Fryxell.
Syracuse, NY. BS in biology with medical concentration from Le Moyne College, Syracuse, NY. **Summer Project:** Collected ticks from UT Research and Education Centers across the state to determine the distribution of *Anaplasma marginale* within ticks. Bovine anaplasmosis has emerged in East Tennessee. It is an often fatal disease of humans and ruminants (including cattle). **Career Interests:** Mixed-animal practice, zoo or wildlife medicine.

**Brianna Potter**, 3rd year. **Faculty Mentor:** Dr. Sophy Jesty.
Ramona, CA. BS in general biology from the University of California, San Diego, La Jolla, CA. **Summer Project:** Hypothesized that long-term, intense exercise can cause arrhythmias in the heart. Rarely, ventricular arrhythmias can cause sudden cardiac death in high-level athletes. Performed heart pacing protocols by exercising dogs on a treadmill. **Career Interests:** Cardiology specialization.

**Patrick Reilly**, 2nd year. **Faculty Mentor:** Dr. Debra Lee Miller.
Collierville, TN. BAS in biology from the University of Memphis, Memphis, TN. **Summer Project:** Tested for differences in two ranavirus isolates among four host wood frog populations, as well as tested whether individual tadpoles infected with ranavirus can act as a superspreader. **Career Interests:** Wildlife research.

**Mike Robbins**, 3rd year. **Faculty Mentor:** Dr. Martha Cline.
Medina, OH. BS in pre-veterinary medicine from the University of Findlay, Findlay, OH. **Summer Project:** Analyzed how different water bowls affect drinking habits in cats and if the bowl type makes a difference in urine concentration and the likelihood of certain stone formation. **Career Interests:** Small animal nutrition, academic medicine.

**Shannon Shuttle**, 2nd year. **Faculty Mentor:** Dr. Madhu Dhar.
New Ipswich, NH. BS in biology from the University of Southern Main, Portland/Gorham, ME; studies in biology at Elmira College, Elmira, NY. **Summer Project:** Analyzed data from skin biopsy samples for a wound healing study in horses. Assisted with adult stem cell injections and biopsy sampling. **Career Interests:** Mixed-animal practice, incorporating research.

**Alicia Thomas**, 3rd year. **Faculty Mentor:** Dr. Olya Smrkovski.
Midlothian, VA. BS in biochemistry from Virginia Tech University, Blacksburg, VA. **Summer Project:** Retrospective study on canine hemangiosarcoma. Collected specific information from patient medical records. Wrote and submitted an abstract for the Veterinary Oncology Conference. **Career Interests:** Small animal private practice, oncology or surgery residency.

**Marissa Torre**, 2nd year. **Faculty Mentor:** Dr. Stephen Kania and Dr. Linda Frank.
Inwood, NY. BS in biology from Binghamton University in Binghamton, NY. **Summer Project:** Studied the diagnostic efficacy of real-time PCR on dermatophytosis. Extracted DNA from feline samples and tested them via real-time PCR and then compared the results to the gold standard, which is fungal culture, for each of the samples. **Career Interests:** Private practice, small animal medicine internship.

Courtesy, S. Kania

# Five-Year Benchmark Data

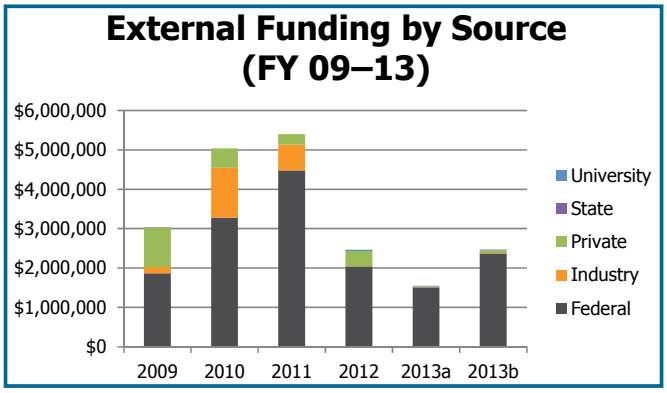



Fig. 5. External research funding by fiscal year. Column 2013b shows FY 13 funding from investigators supported by the center from FY 10–13.

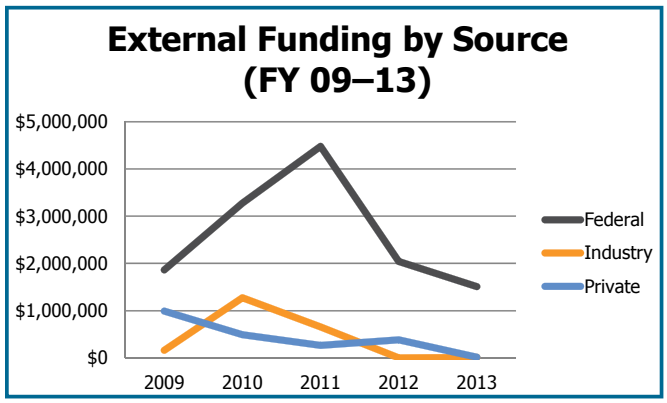



Fig. 6. External research funding from the three major sources of fiscal year receipts.

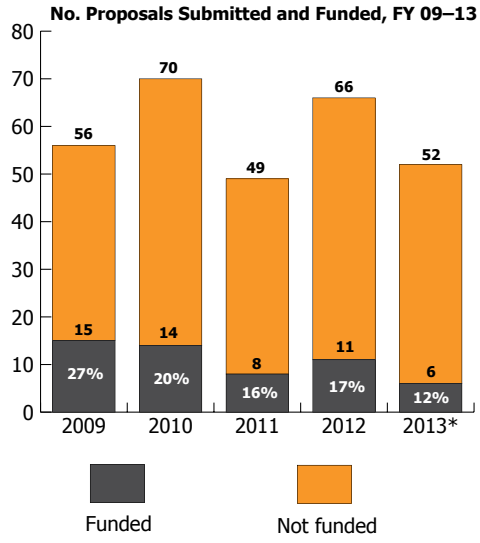



Fig. 7. Number of proposals submitted by center faculty and success rate for fiscal years 2009 to 2013. *Eight proposals are still awaiting decision by the funding agency.

Productivity among center faculty has been stable during the last 5-year period. From 2009-2013, center faculty published 255 articles in peer-reviewed journals and gave 207 presentations at national and international meetings.

Total research funding was down from $2.5 million in 2012 to $1.75 million in 2013 (Fig. 5); this downturn is a direct result of decreased federal support for our nation's research efforts and increasing competition for these diminishing funds. Figure 6 shows federal funding from 2009 to 2013.

It is also important to note that center support may not garner extramural funding in the same year, potentially requiring years for the necessary preliminary studies to mature, and requiring additional time for the application cycle. For instance, when considering external research funding for 2013 obtained by investigators supported by the center during the previous 3 years, and not just 2013 (Fig. 5), it is apparent that such funding for these most recently supported faculty was considerably higher.

Over the past 5 years, center faculty have submitted 293 extramural grant proposals. Of those, 54 have been funded, and eight await decisions by the funding agencies. The 5-year funding rate for center faculty-submitted proposals is 18% (Fig. 7). This success rate is in line with

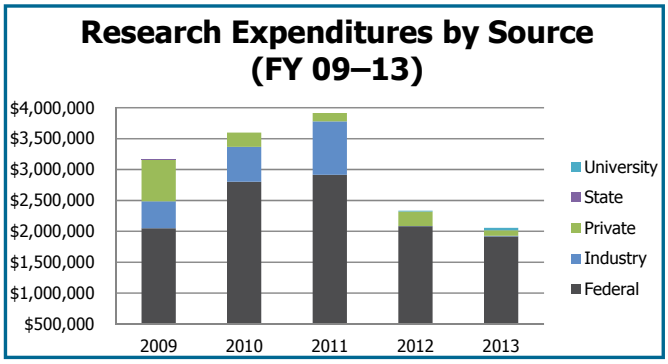


Fig. 8. Research expenditures by fiscal year.

the overall National Institutes of Health success rate for the same time period (17.6%).

Expenditures per faculty member were $171,458 in FY 2013. Over the past 5 years, the mean expenditure amount per faculty member has been $215,948. The 5-year average return on the state's investment in the center is 5.5:1, the ratio of research expenditures to the state's appropriation. For comparison, benchmark data from 2009-2013 are summarized in Figs. 5–8.

## Benchmark Summary (2009-2013)

Average refereed articles per faculty member: 4

Federal funding total: $11,769,436

Average return on investment: 5.54:1

# FUTURE Plans

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 (FY14) the center will expend approximately $204,088 to fund 11 projects. In addition, the center will continue to support core facilities and contribute to the purchase of essential research software and equipment. Already, 2014 center faculty have secured approximately $375,000 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. With the opening of both a new Equine Hospital and a new Farm Animal Hospital, the College of Veterinary Medicine is poised to be an academic and professional leader in the study of livestock infectious disease, tissue repair, and reproductive health. In addition, the research emphasis of the newly-hired department head in the UTCVM Large Animal Clinical Sciences Department, Dr. David Anderson, will ensure our faculty actively seek opportunities to positively influence livestock research.

The Equine Hospital, half of UTCVM's new Large Animal Hospital, opened in spring 2013. The Farm Animal Hospital opened in fall 2013.

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 nearly 80 presentations at the 2013 symposium with participants representing 17 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

6 refereed publications in 2012

327 article citations in 2012

In addition to center funds, Dr. Baek's research is supported by the University of Maryland (National Institutes of Health flow-through).

Co-investigator: Dr. Robert Donnell

# Ways to Prevent and Treat Colorectal Cancer

Colorectal cancer is the third-most common cancer in the United States, and it is the third deadliest, with more than 140,000 new cases each year. Obesity and chronic inflammation may increase the risk of colon cancer.

Nonsteroidal anti-inflammatory drug activated gene-1 (NAG-1) is a gene that exhibits anti-inflammatory, anti-obesity, and anti-tumorigenic activities. How this gene accomplishes these activities is poorly understood and is the subject of Dr. Baek's research.

Dr. Baek's preliminary data suggest that NAG-1 is somehow linked to a signaling pathway that has already been determined to play an important role in obesity/inflammation-related colorectal cancer. By changing the way the body expresses NAG-1, this pathway–termed TGF-beta signaling–may also be altered. By manipulating these potentially connected processes, we can become one step closer to finding a way to prevent or treat colorectal cancer.

# Early Bladder Cancer Detection

Dr. Maria Cekanova

Research Assistant Professor, Small Animal Clinical Sciences

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

1 refereed publication in 2012

66 article citations in 2012

In addition to center funds, Dr. Cekanova's research is supported by the Winn Feline Foundation, The Physician's Medical Education and Research Foundation, UT-Battelle–Oak Ridge National Laboratory, and Vanderbilt University Medical Center.

Co-investigators: Drs. Lawrence Marnett & Jashim Uddin, Vanderbilt University; Drs. Joseph Bartges & Alfred Legendre

Like people, as dogs age, their risk for developing cancer increases. The early detection of cancer is imperative for diagnosis and treatment of human and canine patients to increase survival and quality of life. In her study, Dr. Cekanova is evaluating a new optical imaging agent, fluorocoxib A, for use in detecting cyclooxygenase-2 (COX-2)-expressing, naturally-occurring urinary bladder tumors in dogs as a model for human cancers.

Fluorocoxib A accumulates in tumors and generates fluorescence, which can then be used to detect the tumors during endo/cystoscopy, a minimally-invasive procedure that allows clinicians to examine the bladder, urethra, colon, small intestine, esophagus, mouth, and nose.

Results from this pre-clinical study will improve the identification of COX-2-expressing tumors in dogs and have an immediate veterinary application; the results can then be translated for use in humans, who will develop over a million new cases of cancer in 2013 in the United States alone.

The dual images in the Table of Contents show fluorocoxib A uptake in tissues during a cystoscopy procedure in a dog.

# Using Foam Cells to Fight Atherosclerosis

**Dr. Mei-Zhen Cui**

Professor, Biomedical and Diagnostic Sciences

PhD, Tokyo Institute of Technology, Japan

4 refereed publications in 2012

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

Co-investigator: Dr. Stephen Kania

Atherosclerosis, a chronic inflammatory disease, results in part from the accumulation of modified lipoproteins in the arterial wall and formation of lipid-laden "foam cells." These foam cells surround fatty deposits (usually cholesterol) on blood vessel walls and help form plaques (build-ups).

Lysophosphatidic acid (LPA) is abundant in atherosclerotic plaques, and Dr. Cui's research group recently discovered that LPA helps induce foam cell formation. Understanding how LPA mediates foam cell formation is the focus of her current investigation.

Because LPA regulates a range of physiologic and pathologic processes, it is emerging as a target for a new class of therapeutics for cardiovascular disease. Dr. Cui's research is the first step in developing new ways to treat atherosclerotic lesions and thus prevent unnecessary deaths from heart attacks.

# Host Immunity to *Staphylococcus pseudintermedius*

Dr. Stephen Kania

Professor, Biomedical and Diagnostic Sciences

PhD, University of Florida

4 refereed publications in 2012

178 article citations in 2012

In addition to center funds, Dr. Kania's research is supported by the American Kennel Club Canine Health Foundation, Winn Feline Foundation, and Merial Limited.

Co-investigator: Dr. David Bemis

*Staphylococcus pseudintermedius* is the primary cause of pyogenic skin infections in dogs and is responsible for numerous other canine infectious diseases. The resistance to multiple classes of antibiotics that has developed throughout our geographic region (estimated at 30% by Dr. Kania's group) has left few therapeutic choices.

Recognizing that conventional antibiotic therapy will no longer be an option, control strategies are shifting to new approaches, like Dr. Kania's project to determine how dogs' immune systems fight *S. pseudintermedius* and reveal *S. pseudintermedius* vulnerabilities toward the long-term goal of developing new, effective treatments.

These results will translate to human medicine since the problems encountered in dogs with *S. pseudintermedius* are analogous to those seen with *S. aureus* in humans.

The red petri dish image in the Table of Contents shows *Staphylococcus pseudintermedius* growth.

# Stress and Pancreatic Cancer

**Dr. Hildegard Schuller**

Distinguished Professor, Biomedical and Diagnostic Sciences

PhD, College of Veterinary Medicine, Hannover, Germany; DVM, Justus Liebig University, Giessen, Germany

10 refereed publications in 2012

323 article citations in 2012

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

Smoking, psychological stress, and alcohol consumption are all known risk factors for pancreatic ductal adenocarcinoma (PDAC). These risk factors simultaneously *sensitize* the nicotinic acetylcholine receptors (nAChRs) that *stimulate* PDAC and *desensitize* the nAChRs that *inhibit* PDAC.

Dr. Schuller's goal is to determine the ways in which this pathologic process works. Her data emphasize the role of two types of molecules on a cell's surface that receive chemical signals from outside the cell. These receptors appear to contribute to PDAC via the activation of multiple signaling pathways by stress neurotransmitters.

Dr. Schuller's results could lead to clinical trials and eventually to improving survival rates of PDAC patients and preventing the development of PDAC in individuals at risk.

# Intervening in Obesity-associated Breast Cancer


Dr. Hwa-Chain Robert Wang

Professor, Biomedical and Diagnostic Sciences

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

3 refereed publications in 2012

17 article citations in 2012

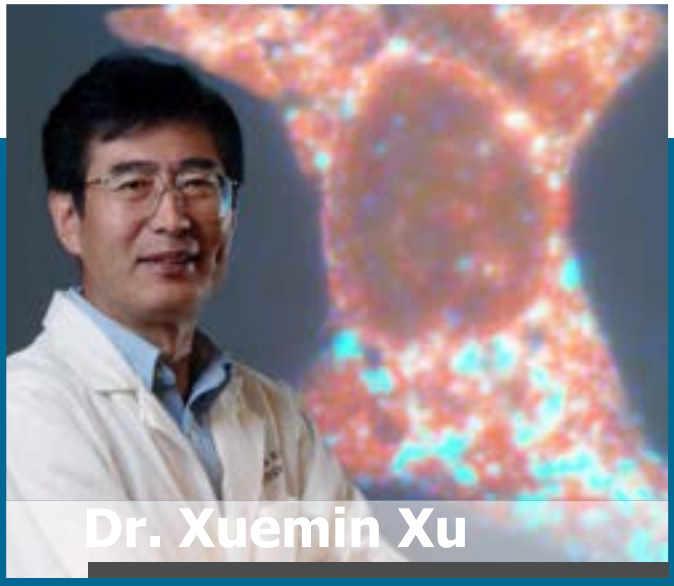
Co-investigators: Drs. Robert Donnell, Agricola Odoi, and Ling Zhao

During summer 2013, the American Medical Association officially declared obesity a disease. Over 35% of women in the United States are considered obese. Growing evidence indicates a link between obesity and increased risk for developing breast cancer. Sorting through the details of this link and developing methods for intervention are the foci of Dr. Wang's research.

Using an in vitro cell model created in his laboratory, Dr. Wang studies the effects of cumulative exposures of carcinogens B[a]P and PhIP on normal and pre-cancerous breast cells. Exposure to these carcinogens comes from various places, including from smoke (burning wood and cigarettes) and red meat cooked at high temperatures (like grilled meats).

Studies suggest that carcinogens like B[a]P and PhIP may also induce carcinogenesis of obesity-involved cells. Dr. Wang is assessing the ability of certain types of carcinogen-exposed cells to increase the likelihood of breast cells becoming cancerous, as well as agents (like green tea catechins) capable of blocking such cancer progression.

# Dissecting the Intracacies of Alzheimer's Disease



**Dr. Xuemin Xu**

Professor, Biomedical and Diagnostic Sciences

PhD, Tokyo Institute of Technology, Japan

5 refereed publications in 2012

46 article citations in 2012

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

Co-investigator: Dr. Shelley Newman

Apoptosis, a type of cell death regulated by the body, is believed to be a springboard for the neuronal degeneration that leads to Alzheimer's disease. Determining the way this process happens is the focus of Dr. Xu's research.

Dysfunction in mitochondria, the powerhouse of the cell, can lead to apoptosis, and Dr. Xu wants to know how that connection may lead to Alzheimer's disease. In his laboratory, they are studying PSAP, a cellular protein expressed in the mitochondria in neurons in the brain. Dr. Xu has found that when PSAP is overexpressed, cells undergo apoptosis associated with mitochondrial dysfunction.

Therefore, his goal is to determine the pathological role of PSAP in order to lead to new therapeutic targets for treatment and prevention of Alzheimer's disease.

# Role of *Streptococcus uberis* in Dairy Cattle Mastitis

**Dr. Raul Almeida**

Research Associate Professor, Animal Science

PhD, MSc, Iowa State University; DVM, Universidad del Litoral, Veterinary Medicine, Argentina

3 refereed publications in 2012

99 article citations in 2012

Co-investigators: Drs. Loren Hauser, ORNL; Arnold Saxton and Oudessa Kerro Dego; Mr. Douglas Luther

Mastitis occurs worldwide and is characterized by inflammation of mammary tissue, which severely affects milk production and quality. In the dairy industry, mastitis is the most costly disease of dairy cattle, costing U.S. dairy producers over $2 billion annually. Mastitis is caused by bacterial pathogens, and among them Streptococcus uberis is showing an alarming increasing prevalence.

In spite of this, how S. uberis affects mammary tissue to cause mastitis is still not understood and is the focus of Dr. Almeida's research. Thus far, he has identified a list of genes associated with early bacterial infection events, and his immediate goal is to describe the roles of three of these genes in relation to S. uberis.

The long-term goal of this research is to develop vaccines to prevent or control S. uberis mastitis to not only minimize the negative financial impact but also to improve the health and comfort of dairy cattle.

**Dr. David Brian**

Professor, Biomedical and Diagnostic Sciences

PhD, DVM, Michigan State University

1 refereed publication in 2012

30 article citations in 2012

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

Co-investigator: Dr. Yu-Pin Su

# Halting Bovine Coronavirus Replication

Coronaviruses cause common upper respiratory and gastrointestinal infections in mammals and birds, including humans and livestock. One type of coronavirus causes severe acute respiratory syndrome (SARS) (discovered in 2002) and another is the more recently-found (in 2012) Middle Eastern respiratory syndrome (MERS), which is seen in bats in the wild.

Both the SARS and MERS coronaviruses are zoonotic, and in humans, infections cause high death rates (approaching 10% and 50%, respectively). Coronaviruses may also be a cause of multiple sclerosis in humans.

Coronaviruses harbor the largest, single-stranded RNA virus genome known. Dr. Brian's group studies how the coronavirus genome replicates with the goal of characterizing the inter-molecular steps required for reproduction. These steps involve RNA-RNA interactions, protein-RNA interactions and protein-protein interactions. Once characterized, these interactive sites may be useful targets for anti-coronaviral drug design.

# On-site Diagnosis of Johne's Disease in Dairy Cattle

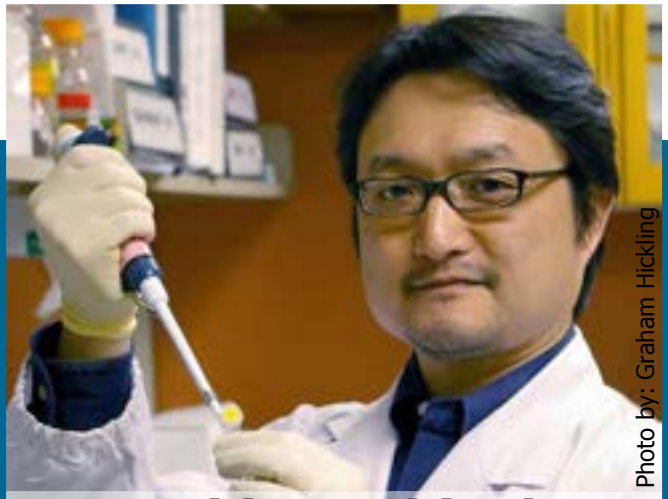


Photo by: Graham Hickling

## Dr. Shigetoshi Eda

Associate Professor, Forestry, Wildlife and Fisheries

PhD, MS, Tokyo University of Pharmacy and Life Science, Japan

3 refereed publications in 2012

60 article citations in 2012

In addition to center funds, Dr. Eda's research is supported by the Physician's Medical Education and Research Foundation.

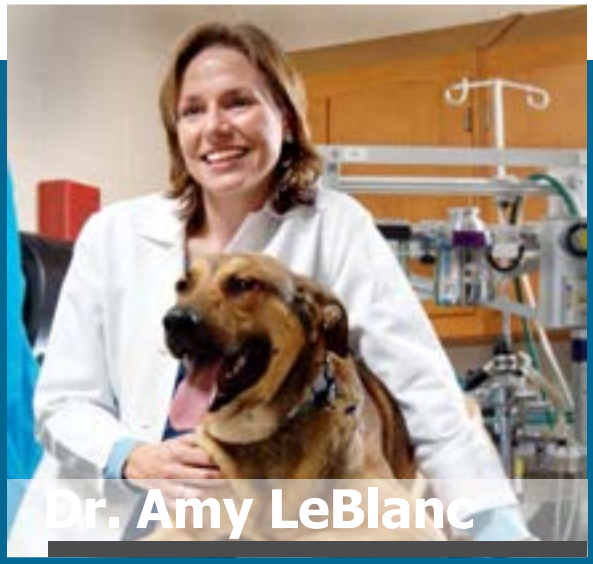
Co-investigators: Drs. Jayne Wu, Maria Prado, and Brian Whitlock

The U.S. Department of Agriculture describes Johne's disease (JD) as "a contagious, chronic and usually fatal infection that affects the small intestine of ruminants." It is caused by a hardy bacteria related to the agents of leprosy and tuberculosis. The disease is causing significant economic loss to the global dairy industry.

Dr. Eda's research group seeks to develop an on-site (cow-side) device for diagnosis of JD on dairy farms. The current method suffers from low sensitivity to detect the infection, high cost, and delayed diagnosis. These drawbacks discourage farmers from testing their herds.

Dr. Eda is using nano-scale science in a diagnostic device about the size of a smart phone. The protocol is now being optimized and validated to maximize the test's sensitivity and specificity. So far, a provisional patent application has been submitted for the device.

# Using Viruses to Kill Tumor Cells




Associate Professor, Small Animal Clinical Sciences

DVM, Michigan State University

5 refereed publications in 2012

55 article citations in 2012

In addition to center funds, Dr. LeBlanc's research is supported by UT-Battelle–Oak Ridge National Laboratory.

Co-investigator: Dr. Shruthi Naik

Dr. LeBlanc's research group is using a technique known as oncolytic virotherapy as a new form of cancer treatment. This promising experimental approach to cancer treatment uses viruses that target specific cancer cells.

This strategy has demonstrated success in preclinical studies, and work is underway to determine which cancers seem most likely to respond to these viruses. The results produced in dogs will be translatable to humans.

In collaboration with researchers at Mayo Clinic, who develop, manufacture, and study recombinant vesicular stomatitis virus and other oncolytic viruses, Dr. LeBlanc's team has determined a well-tolerated dose of a novel oncolytic virus in dogs in preparation for clinical trials in pet dogs with cancer.

Dr. LeBlanc will also characterize viral shedding and assess the dog's ability to neutralize the virus through a natural immune response.

If successful, application of this strategy will help eliminate the requirement for long-term, potentially toxic and expensive chemotherapy.

Dr. Barry Rouse

Distinguished Professor, Biomedical and Diagnostic Sciences

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

6 refereed publications in 2012

533 article citations in 2012

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

# Bringing Clarity to Immunopathogenesis of Corneal Disease

For optimal vision, the cornea must be transparent so light goes to the retina without interruption. To maintain transparency, the cornea normally suppresses all tissue-damaging inflammatory and immune reactions.

However, this control system breaks down in response to some events, such as herpes simplex virus-1 (HSV-1) infection of the cornea. This infection can result in stromal keratitis (SK), which is the most common infectious cause of blindness in developed countries.

A key feature of SK is the establishment of new blood vessels in the cornea (angiogenesis), but how virus infection results in angiogenesis is poorly understood and is the focus of Dr. Rouse's research.

# Publications & Presentations

## Raul Almeida (p. 34)

Oliver SP, Headrick SI, Lewis MJ, Gillespie GE, Johnson DL, **Almeida RA**. Experimental intramammary infection with a strain of *Escherichia coli* isolated from a cow with persistent *E. coli* mastitis. *Open Journal of Veterinary Medicine* 2012;2:186–190.

Gillespie BE, Lewis MJ, Boonyayatra S, Maxwell ML, Saxton A, Oliver SP, **Almeida RA**. Short communication: Evaluation of bulk tank milk microbiological quality of nine dairy farms in Tennessee. *Journal of Dairy Science* 2012;95:4275–9.

Kerro Dego O, Oliver SP, **Almeida RA**. Host–pathogen gene expression profiles during infection of primary bovine mammary epithelial cells with *Escherichia coli* strains associated with acute or persistent bovine mastitis. *Veterinary Microbiology* 2012;155:291–7.

**Almeida RA**, Kerro-Dego O, Headrick SI, Lewis MJ, Young C, Gillespie BE, Siebert LS, Luther DA, Pighetti GM, Oliver SP. Defining the role of SUAM in the pathogenesis of *Streptococcus uberis* mastitis using a SUAM-negative gene deletion mutant [abstract]. Proceedings of the 2012 Annual Meeting of Mastitis Research Workers. Chicago, IL. 2012.

**Almeida RA**, Kerro-Dego O, Headrick SI, Lewis MJ, Young C, Gillespie Be, Siebert LS, Luther DA, Pighetti GM, Oliver SP. Use of anti-SUAM antibodies in a passive protection model to prevent *Streptococcus uberis* mastitis [abstract]. Proceedings of the 2012 Annual Meeting of Mastitis Research Workers. Chicago, IL. 2012.

Kerro Dego O, Luther DA, Oliver SP, Saxton AM, Hauser LJ, **Almeida RA**. Transcriptome expression profiles of *Streptococcus uberis* during bovine mastitis [abstract]. Proceedings of the 2012 Annual Meeting of Mastitis Research Workers. Chicago, IL. 2012.

Luther DA, Kerro Dego O, Kania SA, Hauser L, Saxton AM, Oliver SP, **Almeida RA**. Next-generation sequencing of *Streptococcus uberis* UT888 genome facilitates quest for virulence /pathogenic associated gene features [abstract]. Proceedings of the 2012 Annual Meeting of Mastitis Research Workers. Chicago, IL. 2012.

## Seung Joon Baek (p. 27)

Whitlock NC, **Baek SJ**. The anticancer effects of resveratrol: Modulation of transcription factors [invited review]. *Nutrition and Cancer* 2012;64:493–502.

Kang SU, Shin YS, Hwang HS, **Baek SJ**, Lee SH, Kim CH. Tolfenamic acid induces apoptosis and growth inhibition in head and neck cancer: Involvement of NAG-1 expression. *PLoS ONE* 2012;7:e34988.

Lee SH, Richardson RL, Dashwood RH, **Baek SJ**. Capsaicin represses transcriptional activity of β-catenin in human colorectal cancer cells. *Journal of Nutritional Biochemistry* 2012;23:646–55.

Nualsanit T, Rojanapanthu P, Gritsanapan W, Lee SH, Lawson DB, **Baek SJ**. Damnacanthal, a Noni compo-

nent, exhibits anti-tumorigenic activity in human colorectal cancer cells. *Journal of Nutritional Biochemistry* 2012;23:915–23.

Min KW, Zhang X, Imchen T, **Baek SJ**. MCC-555 Enhances anti-tumorigenic activity in pancreatic cancer cells via multiple targets. *Toxicology and Applied Pharmacology* 2012;263:225–32.

Zhang X, Min KW, Wimalasena J, **Baek SJ**. Cyclin D1 degradation and p21 induction contribute to growth inhibition of colorectal cancer cells induced by epigallocatechin-3-gallate. *Journal of Cancer Research and Clinical Oncology* 2012;138:2051–60.

**Baek SJ**. Molecular targets of NSAIDs in anti-tumorigenesis [invited presentation]. BK21 Pharmacology Conference. Kwangju, Korea. 2012.

**Baek SJ**. Alternative splicing of Kruppel-like factor 4 plays a role in colorectal tumorigenesis [invited presentation]. The Korea Society for Microbiology and Biotechnology 2012 Symposium. Kyungju, Korea. 2012.

**Baek SJ**. Animal models in cancer research [invited presentation]. Center of Excellence in Drug Discovery and Development. Khonkaen, Thailand. 2012.

**Baek SJ**. Inflammation and cancer [invited presentation]. Center of Excellence in Drug Discovery and Development. Khonkaen, Thailand. 2012.

**Baek SJ**. Phytochemicals in cancer prevention [invited presentation]. Center of Excellence in Drug Discovery and Development. Khonkaen, Thailand. 2012.

**Baek SJ**. Animal models in cancer research [invited presentation]. Center of Excellence in Drug Discovery and Development. Chiangmai, Thailand. 2012.

**Baek SJ**. Inflammation and cancer [invited presentation]. Center of Excellence in Drug Discovery and Development. Chiangmai, Thailand. 2012.

**Baek SJ**. Phytochemicals in cancer prevention [invited presentation]. Center of Excellence in Drug Discovery and Development. Chiangmai, Thailand. 2012.

**Baek SJ**. Animal models in cancer research [invited presentation]. Center of Excellence in Drug Discovery and Development. Bangkok, Thailand. 2012.

**Baek SJ**. Inflammation and cancer [invited presentation]. Center of Excellence in Drug Discovery and Development. Bangkok, Thailand. 2012.

**Baek SJ**. Phytochemicals in cancer prevention [invited presentation]. Center of Excellence in Drug Discovery and Development. Bangkok, Thailand. 2012.

**Baek SJ**, Bahn JH, Lee SH, Yoon JH. Alternative splicing of Kruppel-like factor 4 plays a role in colorectal tumorigenesis [abstract]. 24th EORTC-NCI-AACR Symposium on Molecular Targets and Cancer Therapeutics. Dublin, Ireland. November 2012.

Pandith H, Thongpraditchote S, Wongkrajang Y, Zhang X, Gritsanapan W, **Baek SJ**. Effect of Siam weed extracts on anti-inflammatory and antioxidant activities [abstract]. 2012 International Congress on Natural Products Research. New York. July 2012.

Imchen T, Min KY, **Baek SJ**. Characterization of PPARγ ligand MCC-555 in AOM-induced colorectal tumorigenesis [abstract]. Experimental Biology 2012. San Diego, CA. April 2012. *Selected for poster competition at ASPET.

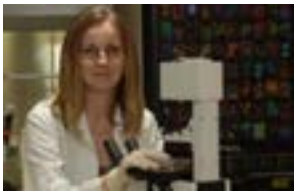
Zhang X, **Baek SJ**. Effect of (-)-epigallocatechin gallate on cyclin D1 down-regulation at the post-translational level [abstract]. Experimental Biology 2012. San Diego, CA. April 2012. *Selected for travel award from ASN.

Min KY, **Baek SJ**. MCC-555 induces apoptosis through the combination of PPARγ-dependent and PPARγ-independent pathways in pancreatic cancer cells [abstract]. Experimental Biology 2012, San Diego CA. April 2012.

Nualsanit T, Rojanapanthu P, Gritsanapan W, **Baek SJ**. Characterization of Noni component damnacanthal in anti-tumorigenic activity [abstract]. Experimental Biology 2012. San Diego, CA. April 2012.

## David Brian (p. 35)

Guan B-J, Su Y-P, Wu H-Y, **Brian DA**. Genetic evidence of a long-range RNA-RNA interaction between the genomic 5′-untranslated region and nonstructural protein 1 coding region in murine and bovine coronaviruses. *Journal of Virology* 2012;86:4631-43.



## Maria Cekanova (p. 28)

**Cekanova M**, Uddin JM, Legendre A, Galyon G, Bartges J, Callens AJ, Marnett L. Preclinical single-dose safety and pharmacokinetic evaluation of fluorocoxib A, a novel COX-2-targeted optical imaging agent. *Journal of Biomedical Optics* 2012;17:116002.

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**Cekanova M**. Evaluation of fluorocoxib A, a novel COX-2-targeted optical imaging agent [presentation]. Comparative & Experimental Medicine and Public Health Research Symposium. Knoxville, TN. May 2012. *1st place in research assistant professor category.

Rathore K, **Cekanova M**. Cyclooxygenase-2 induction by Masitinib (AB1010) in head and neck squamous cell carcinomas through activation of MAPK signaling pathway [abstract]. Comparative & Experimental Medicine and Public Health Research Symposium. Knoxville, TN. May 2012.

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enchymal stem cells (MSC) isolated from adipose tissue [abstract]. Comparative & Experimental Medicine and Public Health Research Symposium, Knoxville, TN. May 2012.

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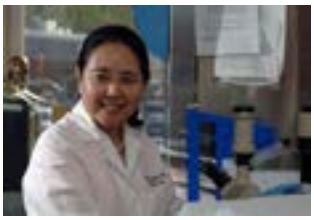

## **Mei-Zhen Cui** (p. 29)

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Hao F, Wu D, Xu X, **Cui M-Z**. Histamine induces activation of protein kinase D that mediates tissue factor expression and activity in human aortic smooth muscle cells. *American Journal of Physiology–Heart and Circulatory Physiology* 2012;303:H1344–52.

**Cui M-Z**. Heart disease treatment with angioplasty and stents–New ideas of biocompatible stent materials [keynote talk]. The 2nd Nanostructures and Functional Materials Forum. Jilin University Zhuhai Branch. Zhuhai, China. January 2012.

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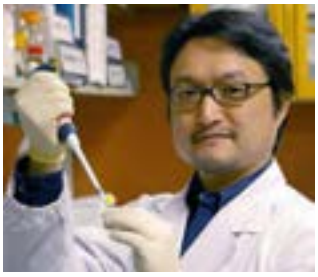
Takuya I, Sun L, Zhang F, Schmitz-Peiffer C, Xu X, **Cui M-Z**. Lysophosphatidic acid induces early growth response protein 1 expression via the protein kinase Cdelta-regulated ERK and JNK activation in vascular smooth muscle cells [abstract]. Arteriosclerosis, Thrombosis and Vascular Biology Annual Conference. Chicago, IL. April 2012.



## Shigetoshi Eda (p. 36)

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Wadhwa A, Bannantine JP, Byrem T, Speer CA, **Eda S**. Optimization of serum EVELISA for milk testing of Johne's disease. *Foodborne Pathogens and Disease* 2012;9:749–54.

Momotani E, Ozaki H, Hori M, Kuribayashi S, Yamamoto S, **Eda S**, Ikegami M. *Mycobacterium avium* subsp. paratuberculosis lipophilic antigen causes Crohn's disease-type necrotizing colitis in mice. *SpringerPlus* 2012;1:47.

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Massaro T, Lenhart S, **Eda S**. Mathematical modeling for cost analysis of EVELISA-based Johne's disease control [presentation]. Society for Mathematical Biology Annual Meeting. Knoxville, TN. July 2012.

## Stephen Kania (p. 30)

Beall MJ, Alleman AR, Breitschwerdt ED, Cohn LA, Guillermo Couto C, Dryden MW, Guptill L, Hoffmann WE, Iazbik C, **Kania SA**, et al. *Ehrlichia canis, Ehrlichia chaffeensis* and *Ehrlichia ewingii* seroprevalence in dogs in North America – a multi-institutional study. *Parasites and Vectors* 2012;5:29.

Miller S, Roth-Johnson L, **Kania S**, Bemis D. Isolation and sequence-based identification of *Oxyporus corticola* from a dog with generalized lymphadenopathy. *Journal of Veterinary Diagnostic Investigation* 2012;24:178–81.

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Development of immunologic assays to measure response in horses vaccinated with xenogeneic plasmid DNA encoding human tyrosinase. *Journal of Equine Veterinary Science* 2012;32:607–15.

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Rowe J, LeBlanc C, **Kania S**, Newman S, Akula M, Galyon G, Long M, Kennel S, Kabalka G, LeBlanc A. 18FLT-PET/CT for non-invasive functional imaging of canine bone marrow [abstract]. Comparative & Experimental Medicine and Public Health Research Symposium. Knoxville, TN. May 2012.

Anis E, Wilkes RP, **Kania S**, Legendre AM, Kennedy M. Effectiveness of small interfering RNA (siRNA) to inhibit feline coronavirus replication [abstract]. Comparative & Experimental Medicine and Public Health Research Symposium. Knoxville, TN. May 2012.

Videla R, Lanzas C, Solyman SM, Morron AM, Bemis DA, **Kania SA**. Antimicrobial susceptibility and genetic characterization of *Staphylococcus pseudintermedius* isolates from 206 dogs [abstract]. 2012 ASM KY-TN Branch Meeting. Maryville, TN. October 2012.

## **Amy LeBlanc** (p. 37)

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Bastin BD, Martin EG, Wall JS, Morandi F, **LeBlanc AK**, Kojima CJ. Effects of supplementation with n-3 fatty acids on subcutaneous, visceral and pericardial adiposity in minipigs fed a high-fat diet [abstract]. The Obesity Society 30th Annual Scientific Meeting. San Antonio, TX. September 2012.

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Wall J, **LeBlanc A**, Richey T, Stuckey A, Martin E, Macy S, Kennel S. Specific binding of heparin-reactive peptides with melanoma in vitro and in vivo [abstract]. Society of Nuclear Medicine 2012 Annual Meeting. Miami Beach, FL. June 2012.

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Quinn MP, **LeBlanc AK**, Lewis SA, Debastani R, Lewis LA, Nichols TL, Kabalka GW. Synthesis of novel near-infrared (NIR) cyanine dyes [abstract]. ACS National Meeting. Philadelphia, PA. August 2012.

**LeBlanc AK**. Realizing the clinical potential of VSV as a vaccine platform and anticancer drug – Initial experience with VSV-hIFNb-NIS in dogs [invited talk]. International VSV Workshop. Big Sky, MT. September 2012.

**LeBlanc AK**. Development and implementation of off-site PET imaging programs [invited lecture]. Forum Focus, 2012 ACVR Scientific Conference. Las Vegas, NV. October 2012.

**LeBlanc AK**. Positron emission tomography: Oncology and beyond [invited lecture]. Pre-Forum Symposium, Thirtieth Annual Forum of the American College of Veterinary Internal Medicine. New Orleans, LA. 2012.

**LeBlanc AK**. Initial experience with VSV-hIFNβ-NIS in dogs: a novel oncolytic virus [invited lecture]. University of Tennessee Graduate School of Medicine Seminar Series. Knoxville, TN. November 2012.

**LeBlanc AK**. Companion animals in imaging research IEEE-EMBS [invited lecture]. UT Graduate School of Medicine Fall Seminar. Knoxville, TN. October 2012.

**LeBlanc AK**. Kinetic assessment of myocardial 14(R,S) –[18F]fluoro-6-thia-heptadecanoic acid and 18F-fluorodeoxyglucose uptake with PET/CT in domestic cats [invited lecture]. University of Tennessee Graduate School of Medicine Seminar Series. January 2012.

# **Barry Rouse** (p. 38)

Kao C-L, Chan T-C, Tsai C-H, Chu K-Y, Chuang S-F, Lee C-C, Li Z-RT, Wu K-W, Chang L-Y, Shen Y-H, Huang L-M, Lee P-I, Yang CL, Compans R, **Rouse BT**, King C-C. Emerged HA and NA mutants of the pandemic influenza H1N1 viruses with increasing epidemiological significance in Taipei and Kaoshiung, Taiwan, 2009–10. *PLoS One* 2012;7:e31162.

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**Rouse BT**. Galectins influence whether immunity or tissue damage results from viral infections–Therapeutic implications [invited lecture]. Molecular Basis of Disease Program Distinguished Lecture Series. Georgia State University. 2012.

**Rouse BT**. Host factors that influence whether immunity or tissue damage results from viral infections–Therapeutic implications [invited seminar]. Bristol Immunology Group, University of Bristol. Bristol, UK. September 2012.

**Rouse BT**. On the good and bad side of host galectins in viral infections [invited seminar]. Harvard Medical School. March 2012.

**Rouse BT**. Critical events in the pathogenesis of herpetic stromal keratitis [invited seminar]. University of Illinois College of Medicine at Chicago. Chicago, IL. October 2012.

**Rouse BT**. Invited seminar. Immunology Seminar Series, Cleveland Clinic Lerner Research Institute. Cleveland, OH. October 2012.

**Rouse BT**. On the good and bad side of host galectins in viral infections [invited seminar]. IMP Seminar. Valdosta State University. Valdosta, GA. January 2012.

# Hildegard Schuller (p. 31)

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**Wang H-CR**. Intervention of cellular carcinogenesis [invited talk]. North West Agricultural and Forestry University, College of Animal Science and Veterinary Medicine. Yangling City, Shaanxi Province, China. October 2012.

**Wang H-CR**. Teaching molecular & cell biology and biochemistry in cancer research [invited talk]. North West Agricultural and Forestry University, College of Innovation Experiment. Yangling City, Shaanxi Province, China. October 2012.

**Wang H-CR**. American veterinary education [invited talk]. Hanzhong City Centre for Animal Disease Control. Hanzhong City, Shaanxi Province, China. October 2012.

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*Publications and presentations listed are for the 2012 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 | 2013 Receipts | 2013 Expenditures |
|---|---|---|---|---|---|
| **Baek, Seung Joon** | Prevention of colorectal cancer by tolfenamic acid | University of Maryland (National Institutes of Health flow-through) | 7/01/11–6/30/15 | $0* | $34,442 |
| **Brian, David** | Coronavirus RNA replication | National Institutes of Health | 6/01/08–5/31/13 | $0† | $277,902 |
| **Cekanova, Maria** | New staging techniques & evaluation of therapies for oral squamous cell carcinomas | Winn Feline Foundation | 2/18/10–7/30/12 | $0* | $7,964 |
| | Role of estrogen receptor beta in breast cancer | The Physician's Medical Education and Research Foundation | 9/01/11–3/21/13 | $0† | $8,169 |
| | Potential use of neutron imaging for biomedical and biological application | UT-Battelle, LLC–Oak Ridge National Laboratory | 8/03/11–8/02/12 | $0* | $0 |
| | Detection of COX-2 expressing canine tumors by new optical imaging tracer | Vanderbilt University Medical Center | 11/01/11–6/30/13 | $13,000 | $7,258 |
| | Investigation of a novel approach to forensic analysis using neutron imaging techniques | UT-Battelle, LLC–Oak Ridge National Laboratory | 1/28/11–9/30/13 | $0* | $3,420 |
| | Evaluation of neutron radiography and computed tomography for detection of cancer using COX-2-targeted boronated contrast agents | Oak Ridge National Laboratory/ Spallation Neutron Source/U.S. Department of Energy | 6/01/13–10/30/13 | $200,000 | Beam time only; no monetary expenditures |
| **Cui, Mei-Zhen** | Novel mechanism mediating LPA-induced smooth muscle cell and fascular responses | National Institutes of Health | 06/15/11–05/31/13 | $347,480 | $286,898 |

| Investigator | Project Title | Funding Agency | Project Period | 2013 Receipts | 2013 Expenditures |
|---|---|---|---|---|---|
| **Eda, Shigetoshi** | A portable and rapid assay system to detect levels of circulating D-dimer protein | The Physician's Medical Education and Research Foundation | 11/21/12–11/30/13 | $3,700 | $1,128 |
| **Kania, Stephen** | Genomic resources for the control of canine pyoderma | AKC Canine Health Foundation | 1/01/11–12/31/12 | $0† | $16,723 |
| | Effectiveness of small interfering RNA (siRNA) to inhibit feline coronavirus replication | Winn Feline Foundation | 1/01/12–12/31/14 | $0* | $8,189 |
| | Detection of dermatophytosis in cats by PCR | Winn Feline Foundation | 5/01/13–4/30/14 | $10,670 | $0 |
| | Veterinary student research program | Merial Limited LLC | 5/01/13–9/01/13 | $10,000 | $10,000 |
| **LeBlanc, Amy** | Imaging properties and toxicity of selected near-IR dyes in dogs | UT-Battelle, LLC–Oak Ridge National Laboratory | 9/26/12–4/10/13 | $79,701 | $78,657 |
| **Rouse, Barry** | Mechanisms in herpetic keratitis | National Institutes of Health | 1/1/13–12/31/16 | $482,400 | $380,175 |
| | T-Regulatory cells in HSV immunity and immunopathology | National Institutes of Health | 2/02/11–1/31/16 | $319,283 | $307,810 |
| **Schuller, Hildegard** | The GABA-B receptor is a novel drug target for pancreatic cancer | National Institutes of Health | 5/01/09–4/30/13 | $0* | $252,042 |
| | Modulation of cancer prevention by social stress | National Institutes of Health | 9/30/09–8/31/12 | $0† | $0 |
| | GABA-BR-mediated prevention of pancreatic cancer | National Institutes of Health | 9/01/09–8/31/14 | $280,393 | $217,528 |
| **Xu, Xuemin** | The role of the new zeta cleavage in Abeta formation | National Institutes of Health | 4/01/07–3/31/14 | $0† | $70,913 |
| | Vascular risk factors in Alzheimer's disease | American Health Assistance Foundation | 4/1/09–3/31/14 | $0† | $44,210 |
| | Role of presenilin-associated protein (PSAP) in apoptosis and Abeta formation | National Institutes of Health | 4/15/11–3/31/13 | $0† | $44,069 |
| **Totals** | | | | **$1,746,627** | **$2,057,499** |

*All funds were awarded in year 1.
†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.

Schedule 7

Center of Excellence in Livestock Diseases and Human Health

ACTUAL, PROPOSED, AND REQUESTED BUDGET

| | FY 2012-13 Actual | | | FY 2013-14 Proposed | | | FY 2014-15 Requested | | |
|---|---|---|---|---|---|---|---|---|---|
| | Matching | Appropr. | **Total** | Matching | Appropr. | **Total** | Matching | Appropr. | **Total** |
| **Expenditures** | 187,289 | 374,577 | **561,866** | 261,661 | 523,321 | 784,982 | 274,744 | 549,487 | 824,231 |
| **Salaries** | | | | | | | | | |
| Faculty | 6,264.46 | 12,529 | **18,793** | | | 0 | 0 | 0 | 0 |
| Other Professional | 47,832 | 95,665 | **143,497** | 54,823 | 109,662 | 164,484 | 57,564 | 115,145 | 172,708 |
| Clerical/ Supporting | 34,282 | 68,565 | **102,847** | 37,514 | 75,028 | 112,543 | 39,386 | 78,784 | 118,170 |
| Assistantships | 8,084 | 16,169 | **24,253** | 6,111 | 12,222 | 18,333 | 6,416 | 12,834 | 19,250 |
| **Total Salaries** | 96,464 | 192,927 | **289,391** | 98,448 | 196,912 | 295,360 | 103,366 | 206,763 | 310,128 |
| Longevity | 1,085 | 2,170.28 | **3,255** | 891 | 1,782 | 2,672 | 935 | 1,871 | 2,806 |
| Fringe Benefits | 23,195 | 46,389 | **69,584** | 18,040 | 36,080 | 54,120 | 18,940 | 37,886 | 56,826 |
| **Total Personnel** | 120,743 | 241,487 | **362,230** | 117,379 | 234,774 | 352,153 | 123,241 | 246,519 | 369,760 |
| **Non-Personnel** | | | | | | | | | |
| Travel | 3,887 | 7,773.28 | **11,656** | 8,330 | 16,661 | 24,991 | 8,746 | 17,495 | 26,241 |
| Software | 1,013.33 | 2,027 | **3,040** | | | 0 | 0 | 0 | 0 |
| Books & Journals | | | | 533 | 1,066 | 1,599 | 559 | 1,119 | 1,678 |
| Other Supplies | 43,312 | 86,623 | **129,935** | 110,132 | 220,265 | 330,397 | 115,628 | 231,290 | 346,917 |
| Equipment | 2,162 | 4,323 | **6,485** | | | 0 | | | 0 |
| Maintenance | 941.12 | 1,882 | **2,823** | 762 | 1,523 | 2,285 | 800 | 1,600 | 2,399 |
| Scholarships | 2,309 | 4,618 | **6,927** | 2,329 | 4,657 | 6,986 | 2,445 | 4,890 | 7,335 |
| Consultants | | | **0** | | | 0 | | | 0 |
| Services | 8,544 | 17,088 | **25,632** | 19,775 | 39,550 | 59,325 | 20,762 | 41,530 | 62,291 |
| **Total Non-Personnel** | 62,167 | 124,334 | **186,502** | 141,861 | 283,722 | 425,583 | 148,939 | 297,923 | 446,862 |
| **GRAND TOTAL** | 182,911 | 365,821 | **548,732** | 259,240 | 518,496 | 777,736 | 272,180 | 544,442 | 816,623 |
| **Revenue** | | | | | | | | | |
| New State Appropriation | | 505,110 | **505,110** | | 523,321 | 523,321 | 0 | 549,487 | 549,487 |
| Carryover State Appropriation | | 231,207 | **231,207** | | 371,802 | 371,802 | | | 0 |
| New Matching Funds | 252,555 | | **252,555** | 261,661 | | 261,661 | 274,744 | | 274,744 |
| Carryover, Prev. Matching Funds | 115,604 | | **115,604** | 185,901 | | 185,901 | | | 0 |
| **Total Revenue** | 368,159 | 736,317 | **1,104,476** | 447,562 | 895,123 | 1,342,685 | 274,744 | 549,487 | 824,231 |