

Welcoming Remarks



We are pleased to present the 2009 annual report for the Center of Excellence in Livestock Diseases and Human Health. Along with benchmark data for fiscal years 2005-2009, this report includes highlights of faculty research projects funded by the center in fiscal year 2009.

The center is adapting to the changing extramural funding environment. With the precipitous increase in competition for decreasing federal research funds, the center has concentrated on maintaining competitiveness of active research programs, providing bridging funds to keep important research programs viable, and promoting the start-up of new College of Veterinary Medicine (UTCVM) investigators. In addition, the center is investing in initiatives that promote translational research, the coordinated movement of bench-level research to the clinic. Thus, even though the number of center faculty has decreased, the areas of active research in the UTCVM impacted by the center have increased.

During 2009, the center supported the efforts of 15 faculty members. These faculty have made significant advancements in cancer biology, molecular pathophysiology, host defense, and disease transmission. Center faculty also made significant advancements in the prevention and treatment of infectious and non-infectious livestock diseases that affect agricultural productivity. Research funding remained stable even with fewer center faculty. In addition, the return on investment, as the ratio of research expenditures to the state appropriation for the center, was a slightly improved 5.8:1. Key performance indicators predict a very strong upsurge in extramural funding for fiscal year 2010.

Center faculty continue to garner national and international recognition for their research and scholarship. During calendar year 2009, center faculty published 59 peer-reviewed articles and gave 26 invited presentations at regional, national, and international meetings.

We are proud of the progress made by center faculty, and we hope you enjoy this summary presentation of center activities and accomplishments.

Jim Thompson, Dean

Robert N. Moore, Director

Misty R. Bailey, Editor



L-R: Moore, Thompson, Bailey

Center of Excellence in Livestock Diseases and Human Health 2009 ANNUAL REPORT

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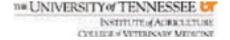
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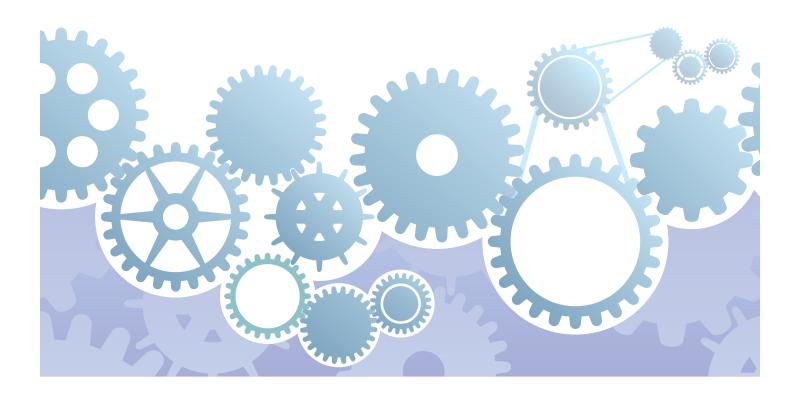
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Comparative Summary of Accomplishments

BENCHMARK	2009 (15 faculty in center)	2008 (20 faculty in center)				
Publications*						
Peer-reviewed articles	59	60				
Books or book chapters	8	16				
Abstracts or posters	26	53				
Presentations						
International	9	7				
National	15	24				
State or local	2	13				
Research monies [†]	Research monies [†]					
External funding	\$3,030,150	\$2,900,319				
Research expenditures	\$3,167,426	\$3,118,056				
Return on investment	5.8:1	5.5:1				

^{*} Based on calendar year through publication date of this report.



[†] Based on fiscal year.

Dissemination of Research

The UTCVM distributes two publications to the public—the magazine Veterinary Vision and the newsletter Volunteer Vet—and one in-house newsletter, Discovery. In addition, Center of Excellence faculty share their research with a worldwide audience through scientific conferences. The map showcases where their research has been presented in 2009.



The quarterly, in-house The quarterly newsletter Volunteer and is distributed to donors and employees.



The annual magazine

Veterinary Vision newsletter Discovery keeps UTCVM Vet features research carries features researchers informed activities and results concerning ongoing about each other's research activities work and researchand the results of related policies and concluded research resources. www.vet. studies. It is written utk.edu/research/ for a general newsletters/ audience.

Comparative & Experimental Medicine and Public Health Research Symposium

The Center of Excellence was a major sponsor of the Comparative & Experimental Medicine and Public Health Research Symposium, which brought together researchers from 20 different departments across three UT-Knoxville campuses for a 2-day-long event that included special seminars on omega-3 fatty acids, polyamines, energy homeostasis, and public health. Featured was the center's own Dr. Hildegard Schuller, who presented her research on nicotine addiction and cancer. The symposium culminated with an awards banquet and guest speaker Bill Landry, known locally for narrating the lives of East Tennesseeans through "The Heartland Series" television feature.

Fifty researchers from the Institute of Agriculture presented talks at the symposium, including heavy participation by members of the Department of Animal Science. These 50 representatives were among 85 new scientists to present, and at the end of the day, the institute was able to boast 12 winners of travel awards. The center sponsored ten of the 2008 award winners to present at scientific meetings during FY 2009, including four international and seven national conferences.

The symposium was designed to allow sharing of research results, promote collaboration, and provide new investigators meeting-format experience via 10-minute presentations.

http://www.vet.utk.edu/research/symposium/



Introduction

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

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

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

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

These areas are each highly interrelated, and the center plays a critical role in developing these focused areas of strength in both the UTCVM and the Institute of Agriculture.

Personnel

Dr. Robert N. Moore, Professor and Associate Dean for Research and Graduate Studies, continues as director of the center. In October 2008, Dr. Jim Thompson began as dean following Dr. Leon Potgieter as interim dean after Dr. Michael Blackwell retired.

Collaborations

Center faculty pursuing collaborative research between laboratories include Dr. Mei-Zhen Cui and Dr. Xuemin Xu, who are doing their part in the worldwide animal research effort known as "Replace, Reduce, Refine" by sharing specific strains of laboratory mice.

Accomplishments

Despite the persisting, dismal 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. 12–26) and are excellent in terms of benchmarks for 2009. Center faculty have successfully adapted to the increased competition for federal and corporate funds. To

External Funding: \$3,030,150 New Grants: \$415,381

balance the loss of federal funds, center faculty aggressively and successfully sought more awards from foundations and other private sources. Figure 1 shows the percentage breakdown of external funding by source.

The 15 center faculty also averaged 4 peer-reviewed publications (67 total) and 2 invited presentations (26 total) at prestigious national and international meetings. See Publications and Presentations (pp. 27–35) for details.

The return on the state's investment in the center was 5.8:1, calculated as ratio of expenditures from extramural funding to center appropriation. Extramural funding totaled \$3,030,150 this year, while expenditures for the year were \$3,167,426. The total funding includes new, multi-year awards for Drs. Wang and Xu, totaling \$293,421; and new, one-year awards for Drs. Frank, Kania, and Oliver, totaling \$121,960. Research expenditures continued to stabilize at \$3,167,426. See "Research Funded Externally" and "Research Expenditures" on p. 3 for the fiscal year 2009 data summary.

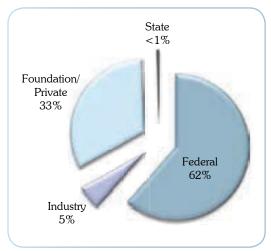


Fig. 1. FY 09 external funding by type. Total = \$3,030,150

Research Funded* Externally FY 2009

INVESTIGATOR	FEDERAL	Industry	FOUNDATION/ PRIVATE	STATE	TOTALS
Baek, Seung Joon	\$199,929		\$180,000		\$379,929
Brian, David	\$355,750				\$355,750
Cui, Mei-Zhen	†				†
Dhar, Madhu			\$12,960		\$12,960
Frank, Nicholas		\$25,982	\$12,440		\$38,422
Kania, Stephen		\$20,000	\$4,000		\$24,000
Oliver, Stephen	\$121,425	\$115,520		\$13,000	\$249,945
Rouse, Barry	\$661,756				\$661,756
Sangster, Mark			\$75,492		\$75,492
Schuller, Hildegard			\$50,000		\$50,000
Schrick, F. Neal			\$524,670		\$524,670
Wang, Hwa-Chain Robert	\$232,588				\$232,588
Xu, Xuemin	\$291,305		\$133,333		\$424,638
Totals	\$1,862,753	\$161,502	\$992,895	\$13,000	\$3,030,150

^{*}Represents FY 2009 receipts for active grants

Research Expenditures FY 2009

			FOUNDATION/		
Investigator	FEDERAL	INDUSTRY	PRIVATE	STATE	TOTALS
Baek, Seung Joon	\$307,078		\$172,031		\$479,109
Brian, David	\$395,471				\$395,471
Cui, Mei-Zhen	\$12,716				\$12,716
Dhar, Madhu			\$11,234		\$11,234
Frank, Nicholas		\$47,038	\$66,367		\$113,405
Kania, Stephen	\$14,169	\$38,601	\$23,991		\$76,761
Oliver, Stephen	\$138,805	\$323,907	\$15,000	\$12,018	\$489,730
Rouse, Barry	\$755,756				\$755,756
Sangster, Mark		\$28,828	\$73,024		\$101,852
Schuller, Hildegard			\$22,665		\$22,665
Schrick, F. Neal			\$225,432		\$225,432
Wang, Hwa-Chain Robert	\$159,840				\$159,840
Xu, Xuemin	\$265,048		\$58,408		\$323,456
Totals	\$2,048,883	\$438,374	\$668,151	\$12,018	\$3,167,426

[†]Award was granted a no-cost extension

Allocation of Funding

The Center of Excellence in Livestock Diseases and I 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 and promotes new Research and Graduate Programs **Advisory Committee's Three Main Criteria for Funding**

Scientific merit

Potential to lead to external funding Œ

Relevance to the center's objectives

investigators' potential to develop competitive research programs.

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 be dismissed from the center.

Start-Up Funds

The center provided start-up funds for one faculty member to secure additional external funding. Dr. Brian Whitlock was awarded \$25,000 to jump-start his research, which involves studying concentrations of kisspeptin, a hormone that is released from placenta during pregnancy in sheep, cattle, horses, and dogs. In humans, kisspeptin stimulates puberty in males and seems to induce ovulation in females. Dr. Whitlock used some of his start-up funds to purchase an ultrasound machine for use in future ovulation experiments. In the long-run, his studies could affect farm animal production.

Graduate Student Support

The center supported four stipends for Comparative and Experimental Medicine graduate students of center faculty. These stipends allow the students to work half-time in faculty laboratories to perform research for their theses or dissertations.

Infrastructure

\$39,807 helped fund service contracts and equipment

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 and Graduate Programs Advisory Committee reviews equipment requests based on three criteria: justification of need, current availability of equipment, and

number of investigators who may benefit. During fiscal year 2009, the committee authorized \$1,608 toward the purchase of one piece of equipment; this H_oO water purification system and its accompanying reservoir benefited the center's animal science faculty.

In support of the UTCVM's research enterprise, the center funded service contracts for several pieces of equipment purchased previously with COE funds. Service for an ultracentrifuge, two cell sorters, and miscellaneous laboratory instruments totaled \$38,199. The ultracentrifuge, laboratory instruments, and one cell sorter are college-wide resources and benefit nearly every investigator in the college, including clinicians. The second cell sorter is shared by center faculty members Dr. Barry Rouse and Dr. Mark Sangster and is used almost daily.

Seminars and Sponsored Lectures

COMPARATIVE AND EXPERIMENTAL MEDICINE SEMINAR COURSE-Fall 2008 & Spring 2009

The COE provided sponsorship for this course, which focuses on topics relevant to comparative and experimental medicine and emphasis areas of the COE. The following guest lectures were incorporated into the course:

Mark Smith, "*The Two-Hit Hypothesis of Alzheimer's Disease*" Professor, Department of Pathology, Case Western Reserve University

Kumar Sambamurti, "Common Mechanisms of Neurodegeneration in the Eye and the Brain Places APP in the Middle"

Associate Professor, The Neuroscience Institute, Medical University of South Carolina

Steven C. Zicker, "Cognitive Aging in Dogs and Nutritional Intervention"
Principle Scientist and Veterinary Clinical Nutritionist, Hill's Science and Technology Center

Melissa A. de la Garza, "**Non-human Primate Biosafety and Biosecurity in Biomedical Research**" Assistant Veterinarian & ABSL3 Laboratory Scientific Manager, Southwest National Primate Research Center

Yasmine Belkaid, "Role of T Regulatory Cells During Pathogenesis of Infectious Disease" Mucosal Immunology Unit, National Institute of Allergy and Infectious Diseases, NIH

Tony Kong, "Genomics and Cancer Chemoprevention by Dietary Food Factors"
Professor & Director, Graduate Program in Pharmaceutical Sciences, Ernest Mario School of Pharmacy,
Rutgers University

James C. Fleet, "Vitamin D and Calcium Metabolism: A Critical Role for Intestinal Calcium Absorption"

Professor, Department of Foods and Nutrition, Purdue University

Kirstin Barnhart, "A Novel Therapeutic for Metastatic Prostate Cancer: From Bench to Investigational New Drug"

Assistant Professor, Department of Veterinary Sciences, University of Texas M.D. Anderson Cancer Center

Yeonhwa Park, "Application of Conjugated Fatty Acids for Prevention of Obesity and Osteoporosis"

Assistant Professor, Department of Food Science, University of Massachusetts

Nigel Mackman, "Atherosclerosis and Thrombosis"

Distinguished Professor & Co-Director, Thrombosis and Hemostasis Program, University of North Carolina

David W. Horohov, "Age and Immunity to Influenza in Horses"

Chair & Professor, Department of Veterinary Science, Maxwell H. Gluck Equine Research Center, University of Kentucky

Dissemination of Research

Faculty are encouraged to share their research by speaking to professional groups, community groups, and civic groups. The center partially supported travel expenses for two faculty and one graduate student to be able to attend national scientific meetings (total \$2,332) in Charlotte, NC, and Chicago, IL, also paying the printing charge for a scientific poster for one of these meetings (\$168). A complete list of faculty publications and presentations for the 2009 calendar year can be found in the Publications and Presentations section (pp. 27-35).

Travel awards totaling \$5,487 for 10 new investigators involved in the 2008 Comparative and Experimental Medicine Research Symposium allowed them to disseminate their research at 12 different local, national, and international meetings.

In addition, the UTCVM issues press releases to state, regional, and national media, resulting in numerous television and print features, many of which relate directly to research conducted through the center. The three UTCVM news publications described on p. ii are available on the UTCVM Web site (http://www.vet.utk.edu/), which also provides an overview of the types of research conducted by UTCVM and COE faculty.



COE Summer students accompany zoo medicine specialist, Dr. Ed Ramsay, to the Knoxville Zoo.

Back row L-R: Blake Marcum, Leslie Sadeghi, Kate Carpenter, Kate Purple, Dr. Ed Ramsay; *Middle row*: Mary Hes, Cristina Noltenius, Joci Forkner, Tamara Chamberlin, Erica Pounds, Rebekah Mullins; *Front row*: Katherine Barber, Amy Schuver, Caroline Horner, Amanda Lutzy, Baye Williamson, Katherine Hamon, Ashley Miller, Laura Eberlein

Center of Excellence Summer Student Research Program

In an effort to foster interest in careers in biomedical research, the center helped provide opportunities for 23 veterinary students to perform research within the UTCVM during the summer.

In addition to laboratory and field research, students attended weekly professional development seminars, during which guest speakers addressed topics such as career opportunities in research, compliance issues in lab

animal care, scientific 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.

To maximize student participation, the program is open to both center and non-center faculty. During fiscal year 2009, four COE faculty participated in the program. The center will continue to encourage participation of its faculty.

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

Katherine Barber, a 2nd-year student who majored in biology at Middle Tennessee State University, assisted Dr. Kim Newkirk and Dr. Robert Donnell in examining the prevalence and role of mast cells in cutaneous hemangiosarcomas and hemangiomas. Barber is from Nashville and is interested in an academic career in anatomic pathology.

Spencer, TN, native *Kate Carpenter*'s interest in large animal medicine led her to seek the mentorship of Dr. Robert Donnell, who oversaw her project in locating caprine herpesvirus 2 (a viral agent of Malignant Catarrhal Fever) in goats, cattle, camelids, cervids, and sheep. Carpenter holds animal science and wildlife and fisheries bachelor's degrees from the University of Tennessee.

Third-year student *Cristina Catasus* is from Gainesville, FL, but earned a bachelor of science degree in biology from Jacksonville University. She worked with Dr. James Schumacher analyzing the effect of

hyperbaric oxygen therapy on joint inflammation in horses.

Lissette Cepero assisted Dr. Al Legendre with data collection for an oncology clinical trial. Her goal for the summer was to become more familiar with the process of scientific writing, and thus she helped compose the results of the study. Cepero holds a bachelor of science degree in biology from the University of Miami, in her hometown.

Third-year student *Tamara Chamberlin* learned molecular and genetic techniques from Dr. Jeff Phillips to measure the immune response in horses and dogs that received a specific melanoma vaccine. Chamberlain calls Kingsport, TN, her hometown and earned a degree in biochemistry and cellular and molecular biology from the University of Tennessee.

Laura Eberlein worked in Dr. Stephen Kania's laboratory sequencing the staphylococcus genome. This 3rd-year student from Columbia, TN, is interested in a career in research and/or animal behavior. She studied biology and ecology at the University of Tennessee.

Because of her interest in veterinary ophthalmology, *Joci Forkner* chose to work with Dr. Dan Ward determining the mechanism of action of a topical drug used to reduced intraocular pressure in dogs with glaucoma. Forkner is a native of Blacksburg, VA, and earned her biochemistry degree from Virginia Tech.

Hailing from Conway, MA, is **Sarah Gorman**, who worked under the supervision of Dr. Madhu Dhar looking for the expression of the ATP10C gene in lean versus obese dogs. Obese dogs had a higher rate of expression, a finding that may help in understanding diabetes mellitus. Gorman attended Skidmore College in Saratoga Springs, NY, where she studied neuroscience and chemistry. She is interested in a career in equine surgery.

Katherine Hamon earned her bachelor of science degree from North Carolina State University but also studied abroad at Australia's University of the Sunshine Coast in Queensland. Her faculty mentors were Dr. Kim Newkirk and Dr. Andrea Matthews, and her project looked at variation of feline kidney sizes in an attempt to determine whether abnormal size correlated to a higher incidence of renal disease.

Second-year student *Mary Hes* worked with Dr. Brian Whitlock to induce a surge in the levels of two specific hormones in sheep. Hes holds bachelor of science degrees in cellular and molecular biology and in French from the University of North Carolina at Asheville. She calls Hillsborough, NC, home.

Dr. Claudia Kirk and Dr. Joseph Bartges served as mentors for **Caroline Horner** to study the influence of saline treatment on urinary supersaturation of calcium-containing substances in cats. Horner is from Brentwood, TN, and has a bachelor of science degree in biology from the University of Tennessee.

Amanda Lutzy is a 2nd-year student from Knoxville, TN, who earned a biology bachelor of science degree from Rhodes College in Memphis. During her work with Dr. Barton Rohrbach and Dr. Sharon Patton this summer, she helped develop and process a follow-up survey to dog owners across the country regarding their current heart worm prevention practices in order to better understand the public's general knowledge of heart worm prevention and determine areas in which there may be room for further education.

Dr. Jacqui Whittemore oversaw the work of **Blake Marcum**, a 3rd-year student from Centralia, IL. Marcum, who majored in biological science at the University of Illinois-Edwardsville, assisted Whittemore in measuring survival time associated with microalbuminuria in critically ill dogs.

University of Tennessee at Chattanooga graduate **Ashley Miller** worked with Dr. Amy LeBlanc collecting specimens for a canine cancer biospecimen repository. Miller is a 3rd-year student from Chattanooga, TN, and is interested in small animal internal medicine, oncology, and clinical pathology.

Working with Dr. Linda Frank was **Rebekah Mullins**, a 3rd-year student from Kingsport, TN. Mullins holds a bachelor of science degree in biology from East Tennessee State University and spent the summer studying the fluctuation of estradiol levels in normal dogs. Her career interests lie in veterinary dermatology.

Second-year student *Cristina Noltenius* worked with Dr. Jeff Phillips to evaluate the expression of tyrosinase from canine and equine melanomas. Noltenius has a bachelor of science degree in biological sciences from the University of Tennessee. Although she is still uncertain about her career, she sees herself heading toward large animal medicine in the future.

Brentwood, TN, native **Eve O'Neil** earned biology and German bachelors degrees from Boston College. Dr. Linden Craig mentored O'Neil in an investigation of the incidence of malignant mammary masses in cats. She is interested in anatomic pathology or large animal medicine as a career.

Erica Pounds spent her summer working with Dr. Margo Holland transforming bovine mammary stem cells via chemicals, irradiation, and xenotransplantation. Originally from Clarksville, TN, Pounds attended Mississippi State University, earning a bachelor of science in biochemistry and molecular biology. She is a 3rd-year student.

Hailing from Germantown, TN, is *Kate Purple*. This 3rd-year student holds a bachelor of science degree in natural resources and environmental studies from the University of Illinois, Champaign. Dr. Linden Craig was Purple's mentor and directed her in studying the pathology of megaesophagus in llamas. They plan to submit a paper on their findings. Purple's ultimate plans are to enter rural, mixed-animal practice, but she is also interested in pathology and research.

A native of Knoxville, TN, *Lisa Reynolds* earned her bachelor of science degree in agriculture from Austin Peay State University. Her faculty mentor was Dr. Linda Frank, with whom she performed a hypothyroid study. Reynolds is a 3rd-year student and is interested in a career in veterinary internal medicine.

Leslie Sadeghi spent the summer in Dr. Stephen Kania's and Dr. David Bemis's laboratory, where she learned to genetically identify bacterial isolates in order to determine regional similarities and differences between *Staphylococcus pseudintermedius* isolates. Sadeghi is from Nashville, TN, and majored in animal science at the University of Tennessee. Her career interests lie in veterinary public health.

Originally from Charlotte, NC, *Amy Schuver* earned a bachelor of science degree in biology from North Carolina State University. Because of her interest in equine medicine, she chose to work with Dr. Nicholas Frank in performing glucose tolerance tests on horses to determine the validity of an oral versus intravenous test.

Second-year student *Baye Williamson* worked with Dr. Karen Tobias studying storage and processing conditions of canine protein C. She is from Kingsport, TN, and holds a bachelor of science degree in biology from Converse College in South Carolina.

Five-Year Benchmark Data

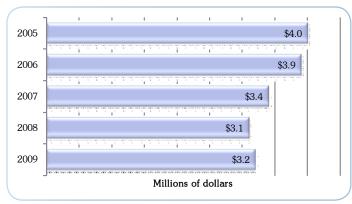


Fig. 2. Research expenditures by fiscal year.

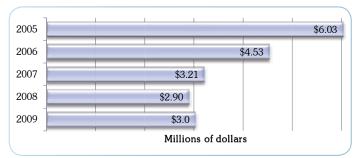


Fig. 3. External research funding by fiscal year receipts.

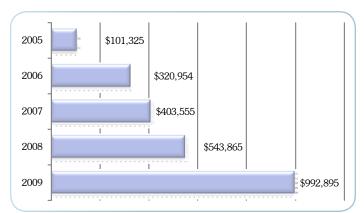


Fig. 4. Private and foundation research funding by fiscal year receipts.

Benchmark Summary (2005-2009)

Average refereed articles per faculty member: 4

Private and foundation funding increased: \$891,570

Average return on investment: 6.6:1

Productivity among center faculty has been outstanding during the last 5-year period. From 2005-2009, center faculty published 352 articles in peer-reviewed journals and gave 176 invited presentations at national and international meetings.

Total research funding was up from \$2.9 million in 2008 to \$3.03 million in 2009, with funding from foundations and other private sources increasing dramatically from \$101,325 in 2005 to \$992,895 in 2009. This shift in funding dynamics reflects the faculty's aggressive and successful search for support in response to the increased competition for diminished federal funds beginning in 2006.

It is important to note that research awards are reported differently in this Annual Report than in previous reports for the center. Previous years' reports gave award amounts based on total years' funding for active grants and contracts. Beginning with this report, awards data are being presented as yearly receipts, allowing for more meaningful comparisons with expenditures data and projections for future spending.

Over the past 5 years, grant and contract expenditures per center faculty member have reflected the economic downturn with a steady decrease that fell to a nadir of \$155,000 for FY2008 (Table 1). Expenditures per faculty member, however, increased to \$213,000 in FY2009, approaching the FY2005 pre-downturn level of \$222,000. Coupled with at least three new NIH R01 grants coming online in 2010, these indicators promote confident projections that the center is recovering vigorously.

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

Fiscal Year	\$ Exp/Center Faculty Member
2005	222,000
2006	195,000
2007	189,000
2008	155,000
2009	213,000

The 5-year average return on the state's investment in the center is 6.6:1, the ratio of research expenditures to the state's appropriation. For comparison, benchmark data from 2005-2009 are summarized in Figs. 2-4.



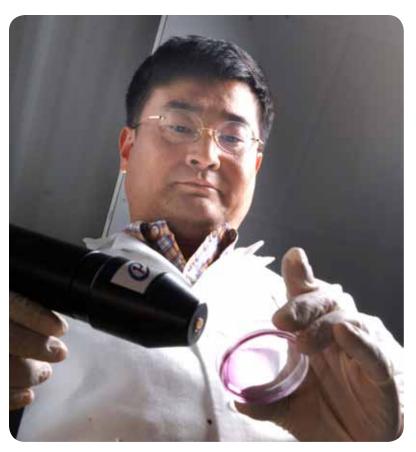
The center has successfully endured 3 years of diminished federal and corporate funding and is poised to advance with an even greater commitment to livestock and human health. This year (FY10) the center will expend approximately \$418,000 to fund 16 projects. In addition, the center will continue to support core facilities for flow cytometry/cell sorting and tissue culture and has committed \$40,000 for purchasing essential research software and research equipment, including real-time PCR instrumentation.

The center will again be a major contributor to the Comparative and Experimental Medicine (CEM) Research Symposium. The CEM 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 initial 2007 event to 85 presentations at the 2009 symposium with participants representing 20 UT departments and programs. More than 300 people attended the 2-day event that also included a small number of poster presentations. An additional goal of the symposium is to promote and facilitate the development of research collaborations among biomedical scientists from the different Knoxville campuses of the university, a goal that closely parallels important objectives of the center.

The center will continue to increase its involvement in research training of veterinary students and graduate students by providing increased opportunities for summer internships, matching travel grants, and stipend upgrades to help recruit and retain superior graduate students. The center will continue to offer "invited speaker" courses to increase national and international exposure of the center's faculty, students, and programs and at the same time enhance the potential for developing external collaborations for our faculty and postdoctoral opportunities for our students. During FY10, the center will again cosponsor, along with the UTCVM, the CEM Seminar Course, supporting the visits of up to 10 noted speakers.

The UTCVM is aggressively pursuing initiatives in several different areas of research pertinent to the center. A primary goal of these initiatives is rapid movement of bench-level science to the clinic or farm, i.e., translational research. Established initiatives include investigations of equine and canine stem cells and regulatory and stimulatory interactions involving gamma aminobutyric acid (GABA) and norepinephrine receptors in lung and pancreatic cancers. Developing interactions include early stage interactions with biomedical investigators at Vanderbilt University in the general areas of pathology and laboratory animal medicine, oncology, and obesity and diabetes. The center is funding the stem cell and GABA initiatives and is providing early funding for developing interactions with Vanderbilt investigators. The oncology initiative is enhanced by earlier center investment in a developing collaboration between UTCVM oncologists and the pre-clinical imaging group at the Knoxville branch of the UT Health Sciences Center. That earlier initiative has resulted in the UTCVM participating in the National Cancer Institute Comparative Oncology Trial Consortium as well as having developed a mature collaboration involving PET/CT scanning of client-owned animals, one of the few such interactions in the country.

The center will continue to participate conceptually and materially in strategic planning to develop areas of investigative strength in the UTCVM and the Institute of Agriculture.



SEUNG JOON BAEK

Associate Professor Pathobiology Department

PhD, University of Maryland

9 refereed publications in 2009

In addition to center funds, Dr. Baek's research is supported by the American Cancer Society and the National Institutes of Health.

Taking Aim at Cancer Cells

The American Cancer Society estimates that over 10 million people in the United States are living with cancer. The traditional theory of cancer prevention and therapy is to reduce the occurrence of it by slowing, blocking, or reversing cancer development via drugs or herbs.

Dr. Baek hopes to expand that theory to include the small amounts of energy present in plasma. Scientists have found that the same substance used in televisions and fluorescent light bulbs (cold plasma) have promising biomedical application. Dr. Baek seeks to determine whether plasma exposure affects the growth of specific types of colorectal, breast, prostate, lung, and bone cancer cells. He is shown at left aiming a plasma gun at a cell-filled petri dish.

Plasma technology is an exciting new field of treatment that has already proven to be useful in promoting wound healing. Its ability to attack cancer cells while leaving minimal damage to healthy cells is part of its allure.

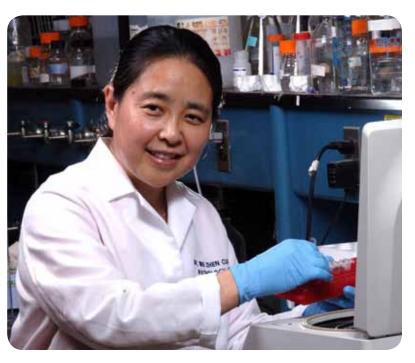
The results of Dr. Baek's research will help clinical scientists direct and narrow their studies of plasma therapy to specific cancer types.

The Secret Life of Cholesterol

When low-density lipoproteins (LDL, also known as "bad" cholesterol) enter the bloodstream, they can adhere to the walls of the arteries that lead to the heart and brain. Thus, LDL contributes to the formation of plaques that can build up to form a blockage, causing a stroke or heart attack.

When LDL is combined with oxygen in the blood, one of its byproducts is lysophosphatidic acid (LPA), which has been found to accumulate in arterial plaques and to induce proliferation and migration of vascular smooth muscle cells. The movement of smooth muscle cells from one part of the cell wall to another, in addition to their proliferation, contributes to narrowing the passage for blood flow.

In Dr. Cui's laboratory, researchers have discovered that a specific sequence of cellular events, known as the MAPK pathway, is responsible for LPA-induced migration of smooth muscle cells, and they have been able to reproduce this phenomenon in a mouse model they created. In the future, clinical investigators will be able to use these discoveries in the development of strategies to prevent the formation of arterial plaques.



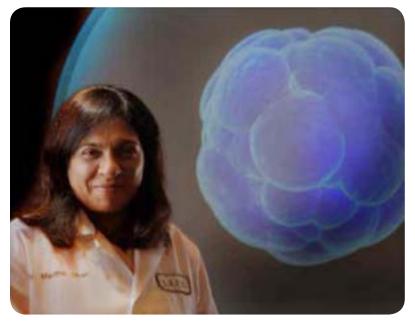
MEI-ZHEN CUI

Associate Professor Pathobiology Department

PhD, Tokyo Institute of Technology, Japan

2 refereed publications in 2009

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



MADHU DHAR

Research Associate Professor Large Animal Clinical Sciences Department

PhD, University of Poona, India

2 refereed publications in 2009

In addition to center funds, Dr. Dhar's research is supported by the American Kennel Club's Canine Health Foundation.

Dissecting the Nature vs Nurture Effect in Diabetes and Obesity

Both our genetics and our lifestyles contribute to whether we may develop certain diseases, including type II diabetes and obesity. Furthermore, this complex combination of factors makes it difficult to study ways to prevent and treat such diseases. Dr. Dhar's research group is developing a cellular model that accurately reflects that human complexity.

Dr. Dhar hypothesizes that a protein known as ATP10C influences the flow of molecules in and out of the cell. Hence, certain alterations in this protein could lead to serious change in cell function, including glucose uptake and fat deposition, which could ultimately lead to diabetes and/or obesity.

This research indicates that the ATP10C gene is a strong candidate to target for obesity-related diabetes prevention and treatment, and Dr. Dhar's research can be used for future in vivo studies of ATP10C gene expression.

Combatting Multi-drug-Resistant MRSP

When most people hear "MRSA" (methicillinresistant *Staphylococcus aureus*), they may also imagine the familiar, dreadful music from the movie *JAWS*. However, MRSP (methicillinresistant *Staphylococcus pseudintermedius*) does not evoke quite the same fear, and for good reason: until recently, methicillin resistance in *S. pseudintermedius*, the most common canine bacterial skin pathogen, was extremely rare.

Methicillin resistance includes resistance to all members of a specific class of antibiotics, including cephalosporin and a type of amoxicillin, and MRSP in dogs is a potential source for the transfer of resistance to humans. The transfer of the methicillin resistance gene mecA via the SCCmec chromosome cassette is the focus of Dr. Kania's research. His investigative group has found a specific type of S. pseudintermedius, agrD III, in East Tennessee that was not thought to exist in the United States. This specific type has been associated with multidrug resistance. Now, Dr. Kania's focus is applying genetic fingerprinting to determine the relationships between the MRSP isolates found in East Tennessee and to detect whether a pattern of disease emergence exists.

Epidemiological studies such as this one will allow public health officials to focus on potentially at-risk areas and help them determine the steps to take to intervene, if necessary.



STEPHEN KANIA

Associate Professor Comparative Medicine Department

PhD, University of Florida

8 refereed publications in 2009

In addition to center funds, Dr. Kania's research is supported by Morris Animal Foundation, Sci-Tec, East Tennessee Clinical Research Foundation, Winn Feline Foundation, and other private industry.



HILDEGARD SCHULLER

Distinguished Professor Pathobiology Department

PhD, Justus Liebig University, Germany

7 refereed publications in 2009

In addition to center funds, Dr. Schuller's research is supported by the National Lung Cancer Partnership.

Regulatory Mechanisms in Lung Cancer

East Tennessee has one of the highest lung cancer death rates in the country. In an attempt to help combat that problem, Dr. Schuller is focusing on the effects of nitrosamines on the lungs.

Nitrosamines are cancer-causing substances found in nicotine, food, beverages, cosmetics, and drugs. The tobacco-specific nitrosamine NNK reacts with nicotinic acetylcholine receptors (nAChRs) on cells, resulting in hyperstimulation of these receptors, a reaction that causes toxic effects. In her laboratory, Dr. Schuller has determined that many of nicotine's biological effects may be caused by the interaction of nitrosamines (like NNK) with nAChRs. Likewise, other factors in the human environment, such as diet and use of certain cosmetics and medicines, may also heighten the sensitivity of nAChRs, thus increasing the possibility of lung cancer.

Still, a host of factors in the human environment affects the sensitivity of these receptors, making it important to develop tools to identify hyperstimulation in individual patients. Dr. Schuller's research can be used to help design lung cancer prevention and treatment strategies based on that hyperstimulation.

Finding Pre-cancerous Markers for Prevention

One in four deaths in the United States is attributed to cancer, which is a multi-year, multi-step, and multi-path disease process. The complexity of cancer is outdone only by the complexity in finding a cure for it. Dr. Wang's part in this pursuit is to locate pre-cancerous markers and target them with dietary compounds to prevent cancerous cells from forming.

His research team has discovered that bladder cancer cell death is affected by reactive oxygen species (ROS), which are natural byproducts of the body's oxygen metabolism. ROS also play an important role in cell signaling, and Dr. Wang believes that ROS help activate a specific pathway affected by histone deactylase (HDAC) inhibitors, which are compounds being tested to treat cancer. He is determining the precise molecular target of FK228, an HDAC inhibitor that may be used in the future as a cancer treatment.

Likewise, catechins found in green tea appear to target a gene overexpressed in breast cells exposed to environmental carcinogens. Dr. Wang found that expression of the *HSD11B2* gene was reduced in the presence of green tea catechins, making green tea a promising focus as a natural mode of cancer prevention.



HWA-CHAIN ROBERT WANG

Associate Professor Comparative Medicine Department

PhD, University of Virginia BVM, National Chung-Hsing University, Taiwan

1 refereed publication in 2009

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



XUEMIN XU

Professor Pathobiology Department

PhD, Tokyo Institute of Technology, Japan

2 refereed publications in 2009

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

Determining the Cause of Alzheimer's Disease

Abnormal accumulation of beta-amyloid peptide in the brain is believed to be a primary cause of Alzheimer's disease, but scientists have been unable to determine whether this accumulation is due to overproduction of the peptide or the brain's failure to clear it.

Dr. Xu's research has shown that a cellular system involving a specific, undetermined enzyme is responsible for the clearance of beta-amyloid peptide. This enzyme is sensitive to inhibitors of calpain, a protease responsible for calcium regulation, and Dr. Xu's goal is to identify this enzyme in order to better understand the mechanism underlying the beta-amyloid peptide's abnormal accumulation.

The information obtained from these studies will be important for the development of methods for prevention and cure of Alzheimer's disease.

Replication of Bovine Coronavirus and SARS

Drugs that interfere with specific proteingenome interactions are now being tested for several viral pathogens, including HIV, hepatitis B and C, and influenza viruses. Once developed, they can be used in combination with other virus-specific drugs for antiviral therapy.

In Dr. Brian's laboratory, coronavirus and its 2'-O-metyltransferase protein are the focus. This protein was found to bind to a specific replication element in the bovine coronavirus genome. This past year, Dr. Brian mapped interaction sites and tested the effects of certain viral mutations on virus replication.

His studies will pinpoint potential targets for inhibiting virus replication of both bovine coronavirus and its close relative that causes severe acute respiratory syndrome, better known as SARS, in humans.



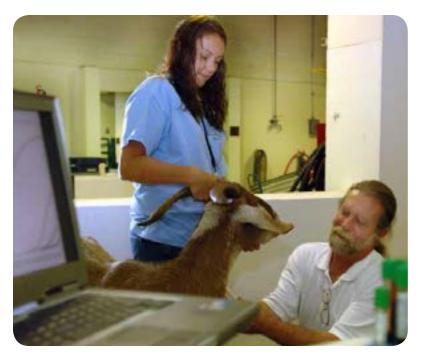
DAVID BRIAN

Professor Pathobiology Department

DVM, PhD, Michigan State University

2 refereed publications in 2009

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



ROBERT L. DONNELL

Associate Professor Pathobiology Department

DVM, PhD, University of Tennessee

3 refereed publications in 2009

Tracking the Threat of Malignant Catarrhal Fever

Dr. Donnell continues to survey the prevalence of malignant catarrhal fever in Tennessee. The virus threatens the state's livestock industry through goats and deer, two common Tennessee species known to harbor the disease. This threat has already become a reality to some cattle and sheep farms.

Clinical signs of the infection are nasal and corneal discharge, fever, skin lesions, and diarrhea, and although outbreaks are rare, the mortality rate for diseased animals is as high as 90%.

Dr. Donnell has worked to develop and import reliable diagnostic capabilities to test relevant species. The prevalence discovered from the results of diagnostic testing are being used to determine which producers, wildlife managers, and diagnosticians should be educated and advised regarding the incidence and risk for the disease and how to combat it.

Finding Effective Ways to Diagnose Insulin Resistance in Horses

In horses, diagnosing insulin resistance is important because this resistance predisposes the animal to laminitis, a condition that causes the hoof to separate from the bone, potentially resulting in permanent lameness, forced retirement, or euthanasia.

Insulin resistance is often diagnosed by measuring glucose and insulin concentrations within a single blood sample. Reference ranges are available for these variables, but the limits of variability have not been determined for horses.

Dr. Frank hypothesizes that blood insulin concentrations are affected by factors other than insulin resistance, and these must be identified and quanitified. He focused this past year on measuring hour-to-hour, day-to-day, and month-to-month variability in blood glucose and insulin levels in healthy and insulin-resistant horses. In addition, he assessed the effects of diet by collecting and analyzing pasture grass and hay samples.

His ultimate goal is to improve the accuracy of diagnostic testing for insulin resistance in horses.



NICHOLAS FRANK

Associate Professor Large Animal Clinical Sciences Department

DVM, PhD, Purdue University

13 refereed publications in 2009

In addition to center funds, Dr. Frank's research is supported by Lloyd, the American Quarter Horse Association, Grayson-Jockey Club Research Foundation, SmartPak Equine, and the American College of Veterinary Internal Medicine.



STEPHEN OLIVER

Professor Animal Science Department

PhD, The Ohio State University

9 refereed publications in 2009

In addition to center funds, Dr. Oliver's research is supported by Fort Dodge Animal Health Global Research, DeLaval, Pfizer Animal Health, the State of Tennessee, Epitopix, ImmuCell, the University of Tennessee Research Foundation, and USDA.

Curing Mastitis by Manipulating the Cause

Mastitis is an inflammatory condition in cows that can last for months or even years, negatively affecting milk production by causing abnormal milk or lowering production quantity. A specific type of mastitis—

Streptococcus uberis mastisis—has been the focus of Dr. Oliver's research for over a decade.

His research resulted in the discovery of a novel bacterial protein, the *S. uberis* Adhesion Molecule (SUAM), which is a factor in the development of *S. uberis* mastitis. Collectively, experiments from his laboratory have proven that SUAM facilitates the adhesion of *S. uberis* to mammary cells.

This year, Dr. Oliver continued to focus on the role of *S. uberis* adhesion to and entry into specific bovine mammary cells. He believes that both adherence and internalization are important in the early stages of intramammary infection. The long-term goal of this study is to develop a genetic system for *S. uberis* chromosomal manipulation in order to control this bacterial infection.

His research could positively affect Tennessee's dairy industry by giving dairy owners treatment options and ensuring continued high quality of Tennessee's milk.

Reducing Stress, Reducing the Occurrence of Pneumonia and Mastitis in Cattle

Stress negatively affects the body's ability to defend itself, thereby increasing the number and severity of infections. Norepinephrine, a stress hormone, may modify the body's response to infection, and Dr. Pighetti hypothesizes that it does so by providing an environment primed for exaggerated inflammatory responses.

Dr. Pighetti's research team plans to identify genes regulated by norepinephrine in two bacteria commonly isolated from cattle. These two bacteria, *Klebsiella pneumoniae* and *Mannheimia hemolytica*, are associated with pneumonia and mastitis, respectively, both economically devastating conditions for the cattle industry.

She also seeks to identify how norepinephrine influences the expression of interleukin-6, a protein that supports inflammatory response to infection. Identifying the influence of norepinephrine on these mechanisms will also identify critical control points that can be targeted for therapeutic intervention.

Outcomes of these studies could directly contribute to providing solutions for improving cattle health and productivity.



GINA M. PIGHETTI

Associate Professor Animal Science Department

PhD, Pennsylvania State University

1 refereed publication in 2009



Efficiency of Killer T Cell Response to HSV-1 Eye Infections

BARRY ROUSE

Distinguished Professor Pathobiology Department

BVSc, DSc, University of Bristol, England PhD, University of Guelph, Canada

3 refereed publications in 2009

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

The Tyrannosaurus Rex thrived by adapting to its environment and evolving into the largest carnivore of its time. Like the T-Rex, killer T cells expand and adapt in response to viral pathogens in order to help the body fight infection. Eye infections caused by herpes simplex virus-1 (HSV-1) are particularly affected by CD8 T cells, which are induced and maintained by a number of cytokines. Much like the T-Rex roar, cytokines are signaling molecules used in cellular communication. The IL-21 cytokine plays a pivotal role in efficient CD8 T cell response, but its exact mechanism of action is not well understood.

Dr. Rouse's research group has been working toward determining how IL-21 promotes CD8 T cell response in HSV-1. They hypothesize that IL-21 works by dominating cells that suppress the immune system: regulatory T cells (cells that keep the immune system in check and prevent it from attacking healthy cells in the body).

Research on how IL-21 supports killer T cell response could lead to treatments and new medications that boost the body's immune response to HSV-1 eye infections.

Memory Cell Protection from the Influenza Virus

Common knowledge dictates that once a person has had chicken pox, that person will never get chicken pox again. The reasons chicken pox is a one-time infection are memory B and T cells, which play a key role in long-term resistance to previously-encountered infection. These memory cells disperse throughout the body, creating long-lasting cell populations.

Dr. Sangster, seen at right with graduate student Hye Mee Joo, is interested in how memory B cells (B_{Mem}) protect us from specific forms of the influenza virus. He found recently that a relatively high amount of virus-specific B_{Mem} cells are established and maintained in the lung after influenza infection, thereby providing resistance to future respiratory infections.

Future studies in this area may have important implications for influenza vaccine development, which has become even more in demand in the last two decades with the increasing aging population. In 2005, 62,000 people were hospitalized because of influenza, and 58% of those people were over the age of 65. The development of better vaccines would lower the physical and financial strain of influenza on all populations, but particularly the elderly.



MARK SANGSTER

Assistant Professor Microbiology Department

PhD, University of Western Australia

2 refereed publications in 2009

In addition to center funds, Dr. Sangster's research is supported by POM Wonderful and the University of Rochester.



F. NEAL SCHRICK

Professor Animal Science Department

PhD, Clemson University

3 refereed publications in 2009

In addition to center funds, Dr. Schrick's research is supported by a private foundation.

Tightening the Belt on E+ Fescue

Geographically, Tennessee is considered to be in the center of a lot of things: the Bible Belt, the Mason-Dixon boundaries, and—the fescue belt? That's correct. Tall fescue is the predominant forage grass in Tennessee, but many pastures are infected with fungal endophytes. These E+ grasses decrease fertility in female beef cattle and affect the fertilization potential of sperm in males, making E+ fescue a serious concern on Tennessee farms.

Although much research exists on how E+ fescue affects female cattle, most male-focused research has been limited to observation until now. Dr. Schrick's investigation of E+ fescue concentrates on differing gene expression between bulls consuming E+ fescue and those consuming E-. Just recently, his research group has learned that poor embryo quality and lower pregnancy rates are associated with the lower-quality semen resulting from grazing on E+ fescue.

Once the differences between normal and abnormal sperm are discerned, Dr. Schrick plans to pursue development of techniques to separate the normal sperm from the abnormal sperm in an attempt to provide Tennessee producers with a practical and economical way to improve pregnancy rates and/or embryo quality in their herds.

Publications and Presentations



Seung Joon Back (p. 12)

- **Baek SJ**, Sukhthankar M. Green tea catechins in colorectal cancer. In: McKinley H, Jamieson M, eds. *Handbook of Green Tea and Health Research*. New York: Nova Science Publishers;2009:325–346.
- **Baek SJ**, McEntee MF, Legendre A. Chemopreventive compounds and canine cancer [review]. *Veterinary Pathology*. 2009;46:576–588.
- Choi HJ, Chung YS, Kim HJ, Moon UY, Choi YH, Van Seuningen I, **Baek SJ**, Yoon HG, Yoon JH. Signal pathway of 17b-estradiol-induced MUC5B expression in human airway epithelial cells. *American Journal of Respiratory Cellular and Molecular Biology*. 2009;40:168–178.
- Fry MM, Kirk CA, Liggett JL, Daniel GB, **Baek SJ**, Gouffon JS, Chimakurthy PM, Rekapalli B. Changes in hepatic gene expression in dogs with experimentally-induced nutritional iron deficiency. *Veterinary Clinical Pathology*. 2009;38:13–19.
- Cekanova M, Lee SH, Sukhthankar M, Donnell R, Eling TE, Fischer SM, and **Baek SJ**. Nonsteroidal anti-inflammatory drug-activated gene-1 expression inhibits urethane-induced pulmonary tumorigenesis in transgenic mice. *Cancer Prevention Research*. 2009;2:450–458.
- Iguchi G, Chrysovergis K, Lee SH, **Baek SJ**, Langenbach R, Eling TE. A reciprocal relationship exists between nonsteroidal anti-inflammatory drug-activated gene-1 (NAG-1) and cyclooxygenase-2. *Cancer Letters*. 2009;282:152–158.
- Sukhthankar M, Choi CK, English AE, Kim JS, **Baek SJ**. A potential proliferative gene, NUDT6, is down-regulated by green tea catechins at the posttranscriptional level. *Journal of Nutritional Biochemistry*. In press.
- Peretich A, Cekanova M, Hurst S, **Baek SJ**, Dhar M. PPAR agonists down-regulate the expression of Atp10c mRNA during adipogenesis. *The Open Obesity Journal*. In press.
- Kambe S, Yoshioka H, Kamitani H, Watanabe T, **Baek SJ**, Eling TE. The Cox inhibitor, sulindac sulfide, suppresses the growth of glioblastoma cells by multiple mechanisms: inhibition of EP4 expression. *Cancer Prevention Research*. In press.
- **Baek SJ**. Special seminar. Presented at: University of Alabama at Birmingham, Division of Hematology/Oncology; April 14, 2009.
- **Baek SJ**. Proapoptotic protein NAG-1 suppresses inflammation. Presented at: 2nd World Cancer Congress; June 22, 2009; Beijing China.
- Sukhthankar M, Cekanova M, **Baek SJ**. Green tea catechins: Suppression of a novel potential cell proliferator, NUDT6, in human colorectal cancer. Poster presented at: American Association for Cancer Research 100th Annual Meeting; April 18, 2009; Denver, CO.
- Lee S-H, Krisanapun C, **Baek SJ**. Capsaicin activates anti-tumorigenic protein NAG-1 through PKC-, GSK3 beta, and C/EBP beta-mediated pathway. Presented at: American Association for Cancer Research 100th Annual meeting; April 2009; Denver, CO.
- Krisanapun C, Lee S-H, Perez-Albela L, Sams C, Peunvicha P, **Baek SJ**. Anti-proliferative activity of apigenin in colorectal and breast cancer cells. Presented at: American Association for Cancer Research 100th Annual Meeting; April 2009; Denver, CO.



David Brian (p. 19)

Gustin KM, Guan B-J, Dziduszko A, **Brian DA**. 2009. Bovine coronavirus p28 (nsp1) is an RNBA binding protein that binds terminal genomic cis-replication elements. *Journal of Virology*. 83:6087–6097.

Raman S, Guan B-J, **Brian DA**. Cis-replication element stem-loop III in the bovine coronavirus 5' UTR is a binding target for viral nucleocapsid protein in the positive strand and cellular proteins in the negative strand. *Journal of Virology*. In press.



Mei-Zhen Cui (p. 13)

Tan M, Hao F, Xu X, Chisolm G, **Cui M-Z**. Lysophosphatidylcholine activates a novel PKD2-mediated signaling pathway that controls monocytic THP-1 cell migration. *Arteriosclerosis*, *Thrombosis and Vascular Biology*. 2009;29:1376–1382.

Mao G, Tan J, **Cui M-Z**, Chui D, Xu X. The GxxxG motif in the transmembrane domain of AβPP plays an essential role in the interaction of CTFb with the γ-secretase complex and the formation of Ab. *Journal of Alzheimer's Disease*. 2009;17:1–10.

Hao F, Tan M, Wu D, Xu X, **Cui M-Z**. Lysophosphatidic acid induction of Interleukin 6 secretion from human aortic smooth muscle cells. Presented at: Arteriosclerosis, Thrombosis and Vascular Biology Annual Conference; April 29-May 1, 2009; Washington, DC.



Madhu Dhar (p. 14)

Peretich AL, Cekanova M, Hurst S, Baek SJ, **Dhar M**S. PPARgamma agonists down-regulate the expression of Atp10c mRNA during adipogenesis. *The Open Obesity Journal*. In press.

Peretich AL, Abbott LL, Andrews FM, **Dhar M**S. Age-dependent regulation of sodium-potassium ATPase and sodium-hydrogen exchanger mRNAs in equine nonglandular mucosa. *American Journal of Veterinary Research*. In press.

Hurst S, Peretich A, Minkin S, Dunlap J, Biggerstaff J, **Dhar M**. In vitro silencing of a putative phospholipid translocase results in an increase in glucose uptake in 3T3 L1 adipocytes. Presented at: Experimental Biology meeting; April 17-22, 2009; New Orleans, LA.

Andrews FM, Peretich AL, Abbott LA, **Dhar MS**. Age-dependent regulation of sodium-potassium adenosinetriphosphatase and sodium-hydrogen exchanger mRNAs in equine nonglandular mucosa. Experimental Biology meeting; April 17-22, 2009; New Orleans, LA.



Robert Donnell (p. 20)

Leland S, Nagarajan P, Polyzos A, Thomas S, Samaan G, **Donnell R**, Marchetti F, Venkatachalam S. Heterozygosity for a Bub1 mutation causes female-specific germ cell aneuploidy in mice. *Proceedings of the National Academy of Sciences*. 2009;106:12776–12781.

Cekanova M, Lee S-H, Donnell RL, Sukhthankar M, Eling TE, Fischer SM, Baek SJ. Non-steroidal anti-

- inflammatory drug-activated gene-1 (NAG-1) expression inhibits urethane-induced pulmonary tumorigenesis in transgenic mice. *Cancer Prevention Research*. 2009;2:450–458.
- Nagarajan P, Onami T, Rajagopalan S, Kania S, **Donnell R**, Venkatachalam S.Role of chromodomain helicase DNA binding protein 2 in DNA damage response signaling and tumorigenesis. *Oncogene*. 2009; 28:1053–62.



Nicholas Frank (p. 21)

Frank N. Insulin resistance and equine metabolic syndrome. In: Reed S, Bayly W, Sellon D, eds. *Equine Internal Medicine*. 3rd ed. St. Louis, MO:Elsevier. In press.

- Frank N. Endocrinology. In: Equine Medicine and Surgery. 6th ed. In press.
- **Frank N**. Hyperlipidemia. In: Lavoie J-P, Hinchcliff K, eds. *Blackwell's Five-Minute Veterinary Consult: Equine*. 2nd ed. Hoboken, NJ: Wiley Blackwell;2009.
- **Frank N**. Equine metabolic syndrome and insulin resistance. In: Lavoie J-P, Hinchcliff K, eds. *Blackwell's Five-Minute Veterinary Consult: Equine*. 2nd ed. Hoboken, NJ: Wiley Blackwell;2009.
- **Frank N.** Insulin resistance and equine metabolic syndrome. In: Robinson NE, Sprayberry K, eds. *Current Therapy in Equine Medicine*. 6th ed. St. Louis, MO:Elsevier;2009:727–731.
- **Frank N**. Equine metabolic syndrome. In: Smith BP, ed. *Large Animal Internal Medicine*. 4th ed. St. Louis, MO: Mosby;2009:1352–1355.
- Kalck KA, **Frank N**, Elliott SB, et al. Effects of low-dose oligofructose treatment administered via nasogastric intubation on induction of laminitis and associated alterations in glucose and insulin dynamics in horses. *American Journal of Veterinary Research*. 2009;70:624–632.
- Geor R, **Frank N**. Metabolic syndrome from human organ disease to laminar failure in equids. *Veterinary Immunology and Immunopathology*. 2009;129:151–154.
- Toth F, **Frank N**, Martin-Jiménez T, Elliott SB, Geor RJ, Boston RC. Measurement of C-peptide concentrations and responses to somatostatin, glucose infusion, and insulin resistance in horses. *Equine Veterinary Journal*. In press.
- Toth F, **Frank N**, Geor RJ, Boston RC. Effects of pretreatment with dexamethasone or levothyroxine sodium on endotoxin-induced alterations in glucose and insulin dynamics in horses. *American Journal of Veterinary Research*. In press.
- Toth F, **Frank N**, Elliott SB, Perdue K, Geor RJ, Boston RC. Optimisation of the frequently sampled intravenous glucose tolerance test to reduce urinary glucose spilling in horses. *Equine Veterinary Journal*. In press.
- Toth F, **Frank N**, Boston RC. Effects of endotoxemia and carbohydrate overload on glucose and insulin dynamics and the development of laminitis in horses. *Equine Veterinary Journal*. In press.
- Carter RA, McCutcheon LJ, George LA, Smith TL, **Frank N**, Geor RJ. Effects of diet-induced weight gain on insulin sensitivity and plasma hormone and lipid concentrations in horses. *American Journal of Veterinary Research*. In press.
- Gomez F, **Frank N.** Effects of clinical endotoxemia on glucose metabolism in horses. Presented at: Comparative & Experimental Medicine and Public Health Research Symposium; June 2009; Knoxville, TN.

- Chameroy K, **Frank N**, Elliott SB, Tadros L. Effects of levothyroxine sodium on body condition, blood measures of metabolic status, and glucose dynamics in horses with Equine Metabolic Syndrome (EMS). Presented at: Comparative & Experimental Medicine and Public Health Research Symposium; June 2009; Knoxville, TN.
- Tóth F, **Frank N**, Elliott SB, Perdue K, Geor RJ, Boston RC. Optimization of the frequently sampled intravenous glucose tolerance test to reduce urine glucose spilling in horses. Presented at: Comparative and Experimental Medicine & Public Health Research Symposium; June 2009; Knoxville, TN.
- Chameroy K, **Frank N**, Elliott SB, Boston RC. Effects of a supplement containing chromium and magnesium on insulin sensitivity in horses with Equine Metabolic Syndrome. Presented at: American College of Veterinary Internal Medicine 27th Annual Forum; June 2009; Montréal, Canada.
- Chumbler NS, Tóth F, Elliott SB, **N Frank**. Effects of sampling time and hay feeding on blood glucose, insulin, and adrenocorticotropin hormone (ACTH) concentrations in horses. Presented at: American College of Veterinary Internal Medicine 27th Annual Forum; June 2009; Montréal, Canada.
- **Frank N**, Elliott SB, Tóth F, Chameroy K, McClamroch R, Etheridge EA. Effects of season and pasture grass composition on blood hormone and metabolite concentrations in horses with pituitary pars intermedia dysfunction. Presented at: American College of Veterinary Internal Medicine 27th Annual Forum; June 2009; Montréal, Canada.
- **Frank N**. Feeding considerations for the laminitic horse. Presented at: 7th Annual Mid-Atlantic Nutrition Conference; March 2009; Timonium, MD.
- **Frank N**. Equine metabolic syndrome: obesity, insulin resistance, and laminitis in horses. Invited nutrition presentation at: 21st Equine Science Society Symposium; May 2009; Keystone, Colorado.
- **Frank N**. Obesity, insulin resistance, and laminitis in horses. Presented at: Southern States Advanced Equine Feedmaster Program; January 2009; Raleigh, NC.
- **Frank N**. Colic: recent advances in causes and prevention of gastric and colonic ulcers. Presented at: Southern States Advanced Equine Feedmaster Program; January 2009; Raleigh, NC.
- **Frank N**. Risk factors and causes of laminitis in horses. Presented at: Purina Mills 4th Annual Equine Science University Horse Owner's Workshop; January 2009; Murfreesboro, TN.



Stephen Kania (p. 15)

- Bemis DA, Jones RD, Frank LA, **Kania SA**. Evaluation of susceptibility test breakpoints used to predict mecA-mediated resistance in *Staphylococcus pseudintermedius* isolated from dogs. *Journal of Veterinary Diagnostic Investigation*. 2009;21:53-58.
- McPherson L, Newman SJ, McLean M, McCain S, Vemulapalli R, **Kania S**, Dubielzig RR. Intraocular sarcomas in two rabbits. *Journal of Veterinary Diagnostic Investigation*. 2009;21:547–551.
- Newman S, Bemis DA, **Kania SA**, Abd-Eldaim M, Bryant M. Isolation of propionibacterium acnes from a case of placentitis and abortion in a cow. *Journal of Veterinary Diagnostic Investigation*. 2009;21:274–277.
- Nagarajan P, Onami TM, Rajagopalan S, **Kania S**, Donnell R, Venkatachalam S. Role of chromodomain helicase DNA-binding protein 2 in DNA damage response signaling and tumorigenesis. *Oncogene* 2009; 28:1053–62.
- Wilkes RP, Kania SA. Use of interfering RNAs targeted against feline herpesvirus 1 glycoprotein D for

- inhibition of feline herpesvirus 1 infection of feline kidney cells. *American Journal of Veterinary Research*. 2009;70:1018–1025.
- Yeargan MR, Lyons ET, **Kania SA**, Patton S, Breathnach CC, Horohov DW, Howe DK. Incidental isolation of Setaria equine microfilariae in preparations of equine peripheral blood mononuclear cells. *Veterinary Parasitology*. 2009;161:142–145.
- Lusby AL, Kirk CA, **Kania SA**, Abd-Eldaim M, Bartges JW. Validation of an ELISA assay for measuring serum adiponectin in domestic cats. *Suez Canal Veterinary Medicine Journal*. 2009;14.
- Black C, Solyman S, Eberlein L, Bemis D, **Kania SA**. Identification of a predominant multilocus sequence type and pulsed-field gel electrophoresis cluster in clinical isolates of mecA-containing, methicillin-resistant *Staphylococcus pseudintermedius*. *Veterinary Microbiology*. In press.

Stephen Oliver (p. 22)

Gillespie BE, Headrick SI, Boonyayatra S, **Oliver SP**. Prevalence of coagulase-negative Staphylococcus species from three dairy research herds. *Veterinary Microbiology*. 2009;134:65–72.

Andrew SM, Moyes KM, Borm AA, Fox LK, Leslie KE, Hogan JS, **Oliver SP**, Schukken YH, Owens WE, Norman C. Factors associated with the risk of antibiotic residues and intramammary pathogen presence in milk from heifers administered prepartum intramammary antibiotic therapy. *Veterinary Microbiology*. 2009;134:150–156.

- Sawant AA, Gillespie BE, **Oliver SP**. Antimicrobial susceptibility of coagulase-negative Staphylococcus species isolated from bovine intramammary infections. *Veterinary Microbiology*. 2009;134:73–81.
- **Oliver SP**, Patel DA, Callaway TR, Torrence ME. Developments and future outlook for preharvest food safety. *Journal of Animal Science*. 2009;87:419–437.
- Patel DA, Almeida RA, Dunlap JR, **Oliver SP**. Bovine lactoferrin serves as a molecular bridge for internalization of *Streptococcus uberis* into bovine mammary epithelial cells. *Veterinary Microbiology*. 2009;137:297–301.
- **Oliver SP,** Boor KJ, Murphy S, Murinda SE. Food safety hazards associated with consumption of raw milk. *Foodborne Pathogens & Disease*. In press.
- Stenske KA, Bemis DA, Gillespie BE, D'Souza DH, **Oliver SP**, Draughon FA, Matteson KJ, Bartges JW. Comparison of clonal relatedness and antimicrobial susceptibility of fecal *Escherichia coli* from healthy dogs and their owners. *American Journal of Veterinary Research*. In press.
- Stenske KA, Bemis DA, Gillespie BE, **Oliver SP**, Draughon FA, Matteson KJ, Bartges JW. Prevalence of urovirulence genes cnf, hlyD, sfa/foc, and papGIII in fecal *Escherichia coli* from healthy dogs and their owners. *American Journal of Veterinary Research*. In press.
- Callaway TR, **Oliver SP**. On-farm strategies to reduce foodborne pathogen contamination. *Foodborne Pathogens & Disease*. In press.
- **Oliver S**. Raw milk vs. pasteurized milk: the debate continues...factors in emerging infectious diseases in the Southeast. Invited seminar presented at: Southeast Center for Emerging Biologic Threats Annual Meeting; June 2009; Atlanta, GA.
- Oliver S. Assessing milk quality: implications to dairy producers. Invited seminar presented at: 2009 National

- Mastitis Council Regional Meeting and Mid-Atlantic Consortium Conference; May 2009; Wilkes-Barre, PA.
- **Oliver S**. Milk quality and sustainability of the dairy industry in the Southeast. Presented at: Southern Dairy Conference; January 2009; Atlanta, GA.
- **Oliver S**. Foodborne pathogens in milk: public health implications. Presented at: Southern Dairy Conference; January 2009; Atlanta, GA.
- Prado ME, **Oliver SP**. SUAM: An important *Streptococcus uberis* virulence factor. Presented at: American College of Veterinary Internal Medicine Forum & Canadian Veterinary Medical Association Convention; June 2009; Montreal, Canada.
- Moore GE, Prado ME, Bouchard AP, Dunlap JR, Lewis MJ, **Oliver SP**. 2009. Biofilm production by *Streptococcus uberis* isolated from dairy cows with mastitis [abstract]. In: *Proceedings of the Comparative & Experimental Medicine and Public Health Research Symposium*; June 2009; Knoxville, TN. p. 24.
- Gillespie BE, Boonyayatra S, Lewis MJ, Saxton AM, **Oliver SP**. Bulk tank milk quality of nine dairy farms in Tennessee over a 12 month period [abstract]. In: *Proceedings of the Comparative & Experimental Medicine and Public Health Research Symposium*; June 2009; Knoxville, TN. p. 23.
- Gillespie BE, Lewis MJ, Maxwell ML, Saxton AM, **Oliver SP**. An overview of milk quality in Tennessee [abstract]. In: *Proceedings of the Comparative & Experimental Medicine and Public Health Research Symposium*; June 2009; Knoxville, TN. p. 24.
- Almeida RA, **Oliver SP**. Pathogenesis of chronic *Escherichia coli* mastitis [abstract]. In: *Proceedings of the Comparative & Experimental Medicine and Public Health Research Symposium*; Comparative and Experimental Medicine and Public Health Research Symposium; June 2009; Knoxville, TN. pp. 19–20.
- Almeida RA, Headrick SI, Lewis MJ, Gillespie BE, Bauer LM, Johnson DL, Lamar KC, **Oliver SP**. Chronic *Escherichia coli* experimental intramammary infections in primiparous dairy cows during the periparturient period. In: *Proceedings of the Comparative & Experimental Medicine and Public Health Research Symposium*; June 2009; Knoxville, TN. p. 19.
- Chen X, Almeida RA, Luther DA, Kerro Dego O, **Oliver SP**. sua gene deletion mutagenesis in *Streptococcus uberis* UT888 using a thermosensitive replicative plasmid. In: *Proceedings of the Comparative & Experimental Medicine and Public Health Research Symposium*; June 2009; Knoxville, TN. p. 25.
- Kerro Dego O, Almeida RA, Luther DA, Chen X, **Oliver SP**. Presence of ISS1-like element in wild type *Streptococcus uberis* strains isolated from cases of bovine mastitis. In: *Proceedings of the Comparative & Experimental Medicine and Public Health Research Symposium*; June 2009; Knoxville, TN. p. 26.
- Elliott AA, **Oliver SP**, Pighetti GM. Responses of different CXCR1 genotypes after experimental challenge with *Streptococcus uberis*. In: *Proceedings of the Comparative & Experimental Medicine and Public Health Research Symposium*; June 2009; Knoxville, TN. p. 25.
- **Oliver SP**, Headrick SI, Lewis MJ, Gillespie BE, Bauer LM, Johnson DL, Lamar KC, Almeida RA. Chronic *Escherichia coli* experimental intramammary infections in primiparous dairy cows during the periparturient period. Presented at: Annual Meeting of National Mastitis Council—Technology Transfer Session; January 2009; Charlotte, NC.
- **Oliver SP**. How milk quality is assessed. Available at: http://www.extension.org/pages/How_Milk_Quality_is_ Assessed. Accessed July 27, 2009.



Gina Pighetti (p. 23)

Scheunemann G, Schrick FN, Fribourg H, Rohrbach N, **Pighetti G**, Saxton A, Oliver J, Riggins J, Waller J. Performance of yearling beef bulls and steers grazing tall fescue pastures. *Journal of Animal Science*. In press.

Pighetti GM. New horizons for boosting immune competence. Invited presentation at: National Mastitis Council Annual Meeting; January 2009; Charlotte, NC.

Pighetti GM. Immune functions and effects on somatic cell counts and milk. Presented at: American Dairy Science Association-Midwest Regional Meeting; March 2009; Des Moines, IO.



Barry Rouse (p. 24)

Sehrawat S, Suryawanshi A, Hirashima M, **Rouse BT**. Role of Tim-3/Galectin-9 inhibitory interaction in viral-induced immunopathology: shifting the balance toward regulators. *Journal of Immunology*. 2009;182:3191–3201.

Rodrigues L, Nandakumar S, Bonorino C, **Rouse BT**, Kumaraguru U. IL-21 and IL-15 cytokine DNA augments HSV specific effector and memory CD8+T cell response. *Molecular Immunology*. 2009;46:1494–1504.

Sarangi PP, Woo SR, **Rouse BT**. Control of viral immunoinflammatory lesions by manipulating CD200:CD200 receptor interaction. *Clinical Immunology*. 2009;131:31–40.

Rouse BT. Immunopathology versus immunity in viral infections. Invited presentation at: The 5th International Veterinary Vaccines and Diagnostics Conference; July 2009; Madison, WI.

Sehrawat S, Hirashima M, **Rouse BT**. Differential effects of galectin-9 ligation with TIM-3 expressed on Th1 and Tregs. Abstract presented at: Immunology 2009 – The American Association of Immunologists Annual Meeting; May 2009; Seattle, WA. Abstract 89.12.

Rouse BT. Point/counterpoint: A review of the conference. Presented at: Immunology of Influenza Virus Infection meeting; July 2009; Athens, GA.



Mark Sangster (p. 25)

Li Z, Wang H, Xue L, Shin DM, Roopenian D, Xu W, Qi CF, **Sangster MY**, Orihuela CJ, Tuomanen E, Cui X, Zhang Q, Morse HC, Morris SW. Activated NF-κB signaling pathways in BCL10 transgenic mice induce marginal zone B cell hyperplasia as a precursor to splenic marginal zone lymphoma. *Blood*. In press.

Zeng J, Joo HM, Wrammert JP, **Sangster MY**, Onami TM. The generation of influenza-specific humoral responses is impaired in ST6Gal I deficient mice. *Journal of Immunology*. 2009;182:4721–4727.

Joo HM, He Y, **Sangster MY**. The state of B cell memory in the lung is profoundly influenced by the nature of immunization. Presented at: Keystone Symposia on Molecular and Cellular Biology: B Cells in Context; March 2009; Taos, NM.

Sundararajan A, Joo HM, **Sangster MY**. Deficient virus-specific IgA production and mucosal B cell memory following murine gammaherpesvirus 68 infection of the respiratory tract. Poster presented at: Keystone Symposia on Molecular and Cellular Biology: Immunologic Memory and Host Defense; February 2009; Keystone, CO.



F. Neal Schrick (p. 26)

Edwards JL, Bogart AN, Rispoli LA, Saxton AM, **Schrick FN**. Developmental competence of bovine embryos from heat-stressed ova. *Journal of Dairy Science*. 2009;92:563–570.

- Aiken GE, Strickland JR, Looper ML, Bush LP, **Schrick FN**. Hemodynamics are altered in the caudal artery of beef heifers fed different ergot alkaloid concentrations. *Journal of Animal Science*. 2009;87:2142–2150.
- Di Croce FA, Saxton AM, Casanova DE, Edwards JL, **Schrick FN**. Genetic parameter estimation for embryo transfer traits. In: Heldman D, ed. *Encyclopedia of Biotechnology in Agriculture & Food Science*. Boca Raton, FL: CRC Press. In press.



Hildegard Schuller (p. 16)

Schuller HM, Al-Wadei HAN. Beta-carotene induced non-genomic signaling and cancer [invited chapter]. In: Haugen L, Bjornson T, eds. *Beta-Carotene: Dietary Sources, Cancer, and Cognition*. Hauppauge, NY: Nova Publishers. In press.

Al-Wadei HAN, **Schuller HM**. Beta-carotene promotes the development of NNK-induced small airway-derived lung adenocarcinoma. *European Journal of Cancer*. 2009;45:1257–1264.

- **Schuller HM**. Is cancer triggered by altered signaling of nicotinic acetylcholine receptors? [Invited review] *Nature Reviews: Cancer.* 2009; 9:195–209.
- Al-Wadei HAN, **Schuller HM**. Nicotine stimulates pancreatic cancer xenografts by systemic increase in stress neurotransmitters and suppression of the inhibitory neurotransmitter γ-aminobutyric acid. *Carcinogenesis*. 2009; 30: 506–511.
- Al-Wadei HAN, **Schuller HM**. Non-genomic inhibitory signaling of beta-carotene in squamous cell carcinoma of the lungs. *International Journal of Oncology*. 2009;34:1093–1098.
- Al-Wadei HAN, **Schuller HM.** Nicotinic receptor-associated modulation of stimulatory and inhibitory neurotransmitters in NNK-induced adenocarcinoma of the lungs and pancreas. *Journal of Pathology*. 2009;218:437–445.
- Al-Wadei HAN, Al-Wadei MH, **Schuller HM**. Prevention of pancreatic cancer by the beta-blocker propranolol. *Anti-Cancer Drugs*. 2009;20:477–482.
- **Schuller HM**. Nicotine addiction and cancer. Presented at: Comparative & Experimental Medicine and Public Health Research Symposium; June 2009; Knoxville, TN.



Hwa-Chain Robert Wang (p. 17)

Choudhary S, **Wang H-CR**. Reactive oxygen species in proapoptotic activity of oncogenic H-Ras for histone deacetylase inhibitor to induce caspases in human bladder cancer cells. *Journal of Cancer Research and Clinical Oncology*. In press.

- Rathore K, **Wang H-CR**. Precancerous model of human breast epithelial cells induced by NNK and benzo[a] pyrene and role of green tea catechins in its prevention. Presented at: The University of Tennessee/Oak Ridge National Laboratory Graduate School of Genome Science & Technology Annual Retreat; March 6, 2009; Knoxville, TN. Abstract 30.
- Choudhary S, Rathore K, Song S, Wang H-CR. Reactive oxygen species in the ability of pro-apoptotic

- H-Ras to enhance apoptosis induced by histone deacetylase inhibitors [abstract]. In: *Proceedings of the American Association for Cancer Research Annual Meeting*; April 19, 2009; Denver, CO. Abstract 878.
- Choudhary S, **Wang H-CR**. Reactive oxygen species in the ability of pro-apoptotic H-Ras to enhance apoptosis induced by histone deacetylase inhibitors [abstract]. In: *Proceedings of the Comparative & Experimental Medicine and Public Health Research Symposium;* June 2009; Knoxville, TN. Abstract 82.
- Rathore K, **Wang H-CR**. Precancerous model of human breast epithelial cells induced by NNK & benzo[a] pyrene and the role of green tea catechins in breast cancer prevention [abstract]. In: *Proceedings of the Comparative & Experimental Medicine and Public Health Research Symposium*; June 2009; Knoxville, TN. Abstract 88.
- **Wang H-CR**, Song S, Siriwardhana N. Molecular target for dietary prevention of chronic breast cell carcinogenesis. In: *Proceedings of the American Association for Cancer Research Annual Meeting*; April 19, 2009; Denver, CO. Abstract 3.
- **Wang H-CR**. Northern American veterinarian education and licensing. Invited presentation at: Seventh Annual Meeting for Deans of Chinese Veterinary Medical Colleges; May 22, 2009; Yanglin (Xi'an) City, China.
- **Wang H-CR**. US veterinary education, Northern American veterinarian licensing, and UTCVM. Invited presentation at: Northwest Agricultural and Forestry University; May 26, 2009; Yanglin City, China.
- **Wang H-CR**. Northern American veterinarian licensing and UTCVM. Invited presentation at: Jilin University College of Animal Science and Veterinary Medicine; May 28, 2009; Chungchun City, China.
- **Wang H-CR**. US veterinary education and licensing. Invited presentation at: China Agricultural University College of Veterinary Medicine; June 2, 2009; Beijng, China.
- **Wang H-CR**. Reactive oxygen species in selective apoptosis of oncogenic Ras-transformed cells by histone deacetylase inhibitors. Presented at: China Agricultural University College of Veterinary Medicine; June 2, 2009; Beijng, China.

Xuemin Xu (p. 18)

Xu X. Gamma-secretase catalyzes sequential cleavages of the AbetaPP transmembrane domain [review article]. *Journal of Alzheimers Disease*. 2009;16:211–24.

Mao G, Tan J, Cui M-Z, Chui D, **Xu X**. The GxxxG motif in the transmembrane domain of APP plays an essential role in the interaction of CTF β with γ -secretase complex and formation of A β . *Journal of Alzheimer's Disease*. In press.

*Publications and presentations listed are for the 2009 calendar year to the publication date of this report. Some items may be duplicated between individual investigators.

Research Funded Externally

Investigator	PROJECT TITLE	Funding Agency	Project Period	2009 Receipts	2009 Expenditures
	Gene alterations by NSAIDs	American Cancer Society	07/01/06- 06/30/10	\$180,000	\$172,031
Baek, Seung Joon	Development of noninvasive bio- luminescence imaging for cancer diagnosis and therapeutic testing	National Institutes of Health	05/01/07- 04/30/10	*	\$109,916
	PPAR-gamma ligands in colorectal cancer	National Institutes of Health	07/01/06- 05/31/11	\$199,929	\$197,162
Brian, David	Coronavirus RNA replication	National Institutes of Health	06/01/08- 05/31/13	\$355,750	\$395,471
Cui, Mei-Zhen	Lysophosphatidic acid and tissue factor in atherosclerosis	National Institutes of Health	05/01/07- 04/30/09	*	\$12,716
Dhar, Madhu	Characterization of P-type ATPase, an integral membrane	American Kennel Club Canine Health Foundation	05/01/08- 04/30/09	\$12,960	\$11,234
	Levothyroxine as a treatment for insulin resistance	Lloyd	04/01/07- 03/31/09	*	\$35,433
	Effects of resting insulin sensitivity on the acute response to endotoxin in horses	American Quarter Horse Association	10/01/07- 09/30/08	*	\$17,871
	Levothyroxine as a treatment for insulin resistance	Grayson-Jockey Club Research Foun- dation	04/01/07- 03/31/09	*	\$43,001
Frank, Nicholas	Effects of SmartControl IR on insulin sensitivity in obese insulin resistant horses	n SmartPak Equine	06/01/07- 05/31/10	\$25,982	\$11,605
	Improved diagnosis and monitoring of equine endocrine disorders	American College of Veterinary Internal Medicine	01/01/07- 12/31/08	*	\$2,735
	Effects of clinical endotoxemia on glucose metabolism in horses	American College of Veterinary Internal Medicine	01/01/09- 12/31/09	\$12,440	\$2,761
	Molecular pathways that mediate genetic susceptibility to low dose ionizing radiation	UT-Battelle-Oak Ridge National Laboratory	02/15/07- 02/14/09	*	\$14,169
Kania, Stephen	Immune response to viral interleukin 10 in gamma herpesvirus-infected black wildebeest	Morris Animal Foundation	05/01/08- 08/31/08	*	\$1,550
	Reverse transcription free microar- ray analysis	Sci-Tec	10/01/07- 09/30/09	\$20,000	\$14,861
	Bioluminescent assay for gene ex- pression analysis	Private industry	05/01/08- 04/30/10	*	\$23,740

Investigator	PROJECT TITLE	Funding Agency	Project Period	2009 Receipts	2009 Expenditures
	Prevalence of tapeworm infection among horses in 4 geoclimatic re- gions of Western Coast States	East Tennessee Clini- cal Research	-06/01/08- 05/31/09	*	\$10,320
Kania, Stephen	Genomic sequencing of methicillin- resistant <i>Staphylococcus pseudinter-</i> <i>medius</i> from canine pyoderma	Morris Animal Foundation	06/01/09- 08/31/09	\$4,000	\$1,895
	RNA interference of feline herpes- virus by synthetic siRNAs in cornial epithelial cells	Winn Feline Founda- tion	01/09/08- 03/31/09	\$0	\$10,226
	Tennessee Quality Milk Initiative	Fort Dodge Animal Health Global Re- search	10/01/07- 12/31/12	\$10,000	\$0
	Efficacy of two experimental post- milking teat disinfectants as evalu- ated in a positive control natural exposure study in dairy cows	DeLaval	02/09/09- 08/31/09	\$79,442	\$18,500
	Efficacy and field safety of Spectramast LC for intramammary treatment of clinical mastitis due to Staphylococcus aureus or Streptococcus uberis	Pfizer Animal Health	08/05/08- 08/09/09	\$26,078	\$8,301
	Tennessee Quality Milk Initiative	State of Tennessee	07/01/08- 06/30/09	\$13,000	\$12,018
Oliver, Stephen	Immunogenicity and efficacy of Escherichia coli bacterial extract	Epitopix	06/01/08- 05/31/09	*	\$210,280
	Effectiveness of Mast Out as an intramammary treatment of subclinical bovine mastitis	ImmuCell	03/28/08- 03/24/09	*	\$13,700
	Continued development of SUAM as a vaccine for the prevention and control of <i>Streptococcus uberis</i> mastitis in dairy cows	University of Ten- nessee Research Foundation	02/01/08- 10/01/08	*	\$15,000
	Efficacy and safety of Draxxin (tulathromycin) in the treatment of clinical mastitis associated with Streptococcus uberis in lactating dairy cattle	Pfizer Animal Health	09/27/07 - 09/23/08	*	\$73,126
	Molecular mechanisms associated with <i>Streptococcus uberis</i> mastitis in dairy cows	USDA	09/01/07- 08/31/10	\$121,425	\$138,805
Rouse, Barry	T-regulatory cells in herpes simplex virus immunity and immunopathology	National Institutes of Health	02/01/06- 01/31/11	\$307,176	\$411,820
	Mechanisms in herpetic keratitis	National Institutes of Health	01/01/08- 12/31/12	\$354,580	\$343,936

Investigator	PROJECT TITLE	Funding Agency	Project Period	2009 Receipts	2009 Expenditures
Caracatan Mada	In vitro analysis of the anti-influenza virus activity of pomegranate juice	POM Wonderful	04/07/08- 10/06/08	*	\$28,828
Sangster, Mark	University of Rochester Center of Excellence in Influenza Research	University of Roch- ester	03/30/07- 03/29/09	\$75,492	\$73,024
Schuller, Hildegard	Estrogen enhances the carcinogenic effects of the nicotine derivative NNK		01/31/08- 01/30/10	\$50,000	\$22,665
Schrick, Frank Neal	Identification of unique biomarkers to manipulate semen for altering sex ratio in cattle	Private foundation	10/01/05- 12/31/09	\$524,670	\$225,432
	Signaling pathway in modulation of cell quiescence	National Science Foundation	06/01/05- 12/31/08	*	\$35,767
Wang, Hwa-Chain Robert	Green tea catechins in precancerous prevention		09/01/08- 08/31/10	\$160,088	\$81,844
	Carcinogenesis cellular model for identifying preventive agents	National Institutes of Health	09/27/07- 08/31/09	\$72,500	\$42,229
	The role of the new zeta-cleavage in Abeta formation		04/01/07- 03/31/12	\$291,305	\$265,048
Xu, Xuemin	Determine the role of the long Abeta-46 in Alzheimer's disease development	Alzheimer's Association	10/01/05- 09/30/09	*	\$32,674
	Vascular risk factors in Alzheimer's disease	American Health As- sistance Foundation		\$133,333	\$25,734
Total	\$3,167,426				

^{*}No-cost extension granted, resulting in no *new* funds in the current year. Expenditure amounts are from carry-over from the previous year.

CENTERS OF EXCELLENCE/CENTERS OF EMPHASIS

ACTUAL, PROPOSED, AND REQUESTED BUDGET

College of Veterinary Medicine

Center of Excellence in Livestock Diseases and Human Health

	FY 2008-09 Actual		FY 2009-10 Proposed			FY 2010-11 Requested			
	Matching	Appropr.	Total	Matching	Appropr.	Total	Matching	Appropr.	Total
Expenditures	279,621	559,242	838,863	308,327	616,653	924,980	281,348	562,695	844,043
Salaries									
Faculty	49,793	99,587	149,380	56,591	113,183	169,774	59,421	118,842	178,263
Other Professional	50,135	100,269	150,404	64,167	128,334	192,501	67,375	134,751	202,126
Clerical/ Supporting	22,778	45,556	68,334	23,500	47,000	70,500	24,675	49,350	74,025
Assistantships	29,954	59,907	89,861	9,758	19,516	29,274	10,246	20,492	30,738
Total Salaries	152,660	305,319	457,979	154,016	308,033	462,049	161,717	323,434	485,151
Longevity	1,510	3,020	4,530	1,523	3,045	4,568	1,599	3,198	4,796
Fringe Benefits	37,896	75,793	113,689	40,428	80,855	121,283	42,449	84,898	127,347
Total Personnel	192,066	384,132	576,198	195,967	391,933	587,900	205,765	411,530	617,295
Non-Personnel									
Travel	9,185	18,369	27,554	6,767	13,533	20,300	7,105	14,210	21,315
Software	0	0	0	0	0	0	0	0	0
Books & Journals	36	71	107	0	0	0	0	0	0
Other Supplies	34,212	68,423	102,635	77,743	155,486	233,229	39,235	78,469	117,704
Equipment	5,634	11,269	16,903	5,667	11,333	17,000	5,950	11,900	17,850
Maintenance	12,165	24,331	36,496	3,782	7,564	11,346	3,971	7,942	11,913
Scholarships	4,943	9,885	14,828	4,871	9,741	14,612	5,114	10,228	15,343
Consultants	333	667	1,000	0	0	0	0	0	0
Renovation	0	0	0	0	0	0	0	0	0
Insurance	86	172	258	0	0	0	0	0	0
Media / Communication	2,128	4,257	6,385	67	133	200	70	140	210
Legal & Professional Fees / Group Arranged Food & Lodging / Specialized Commercial Services / Seminar Conference Registration	6,202	12,404	18,606	4,289	8,578	12,867	4,503	9,007	13,510
Other Services & Expenditures	327	654	981	667	1,333	2,000	700	1,400	2,100
Services	12,304	24,608	36,912	8,509	17,017	25,526	8,934	17,868	26,802
Total Non-Personnel	87,555	175,110	262,665	112,360	224,720	337,080	75,583	151,165	226,748
GRAND TOTAL	279,621	559,242	838,863	308,327	616,653	924,980	281,348	562,695	844,043
Revenue									
New State Appropriation		541,600	541,600		535,900	535,900		562,695	562,695
Carryover State Appropr.		98,395	98,395		80,753				0
New Matching Funds	270,800		270,800	267,950		267,950	281,348		281,348
Carryover from Previous Matching Funds	49,198		49,198	·		40,377	·		0
Total Revenue	319,998	639,995	959,993	308,327	616,653	924,980	281,348	562,695	844,043