It’s All About the Science

2009-2010 Research Report

LSU SVM Transforms Lives
Faculty and student research that leads to new knowledge and can be applied to practical problems is a central characteristic of great universities. This is the first objective of the LSU Flagship Agenda, an essential part of economic growth, and a reason why LSU has become a Top Tier University. Active research laboratories are vital for the growth and maintenance of quality graduate programs, and graduate students add intellectual energy to the research laboratory; the two are inseparable.

Since its inception, the LSU SVM has had extramurally funded, internationally recognized research programs. The School leadership has made a conscious effort to make research—and in particular scholarship sponsored by extramural grants and contracts—a top priority. Research faculty are selected for their scholarly activity in biomedical research and potential for funding from federal agencies such as the National Institutes of Health (NIH), the United States Department of Agriculture, and the National Science Foundation, as well as animal health foundations such as the Morris Animal Foundation and the Grayson Jockey Club. Acquisition of extramural research grants and contracts has increased three-fold over this time. Currently, grants and contracts held by SVM faculty total more than $47.5 million (80% is from federal agencies). For 2009-10, 119 proposals were submitted for a total of $58.3 million. Two of our three departments—Pathobiological Sciences and Comparative Biomedical Sciences—are consistently listed in the top 10 departments within the University based on research expenditures.

Our faculty have broad impact on the regional research enterprise and collaborate with the LSU Colleges of Science, Agriculture, and Engineering; the Pennington Biomedical Research Center; the LSU Health Sciences Centers; and the Tulane University School of Medicine. Two of our faculty serve as principal investigators on multi-institutional grants from the NIH. The Center for Experimental Infectious Disease Research [CEIDR] ($9.6 million) and the IDeA Network for Biomedical Research Excellence [INBRE] ($17 million) are funded through the National Center for Research Resources. We hold NIH training grants with the Tulane National Primate Research Center (TNPRC) for first- and second-year DVM students, and graduate veterinarians in experimental pathology and medicine and the TNPRC are part of the CEIDR. These training grants and our research programs in general are consistent with the philosophy of One Medicine/One Health.

Our research strengths can be categorized into Infectious Disease, Vector Biology, and Molecular Medicine. The latter group is a collection of laboratories that work on cell and molecular biology aspects of a number of human diseases. While each of these categories touches animal as well as human health, the Equine Health Studies Program is a single-animal-species-centered research program in the SVM. I hope that this brief description of research activities in the School of Veterinary Medicine conveys the growing level of quality, excitement and energy that exists in our laboratories and clinics.

Thomas R. Klei, PhD
ON THE COVER

LEFT: Dmitry Chouljenko, graduate student in the Department of Pathobiological Sciences, uses a Zeiss Axio Observer Z1 Live Imaging research microscope with differential interference contrast, fluorescence imaging, and Axiovision software.

CENTER: Image of fish gills magnified 200 times using the LSU SVM’s scanning electron microscope.

RIGHT: Marxa Figueiredo, PhD, associate professor in the Department of Comparative Biomedical Sciences, investigates gene therapy modalities for prostate and head and neck cancer.

ON THE BACK COVER

From left, researchers with a minimum of $1 million in grant funding are Drs. Gary Wise, Shisheng Li, Samithamby Jeyaseelan, Masami Yoshimura, Kevin Macaluso, Fang-Ting Liang, Joseph Francis, and Steven Barker. Not pictured are Drs. Konstantin G. Kousoulas and Thomas Klei.

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On http://www.facebook.com/, search for “LSU School of Veterinary Medicine” and become a fan.
For Twitter, go to http://twitter.com/LSUVetMed and click “Follow.”
Want to know more about cancer, cardiovascular disease, infectious disease, intestinal disease, laminitis, neurologic disease, renal disease, retinal disease, and uveitis? Researchers at the LSU School of Veterinary Medicine conduct investigative studies on these and more. Findings are often directed from theory to application in either human or veterinary medicine. Because many of the studies elucidate the fundamental, often sub-cellular, mysteries of these processes, the results have relevance to the health of both people and animals. The extramurally funded research program has grown quickly, and the LSU SVM is committed to investing in its facility and technology to ensure that we continue to transform lives.

Extramural Research Funding

There could be no investigations without funding. Total extramural funding for the LSU SVM’s research programs in 2009-10 was $45.1 million (a 25% increase over 2008-09). The majority of these dollars come from the federal government, followed by state, foundation, and industry funds. These funds contribute to biomedical research in the areas of infectious disease, cancer biology, molecular medicine, equine research, small animal research, wildlife research, and research training.

During the 2003-04 fiscal year, the LSU SVM spent a little more than $3 million on research expenditures and submitted about 90 proposals. We now spend almost $7 million and submit almost 140 proposals. In 2003-04, we requested a little more than $30 million in research funds; that number in 2009-10 was approximately $58.3 million. As our research program has improved throughout the years, we have applied for more research dollars and have increased the amount that we receive and spend, which directly affects the Louisiana economy.

Research by Academic Department

Comparative Biomedical Sciences

CBS has been consistently ranked in the top 10 departments for research productivity on the LSU campus. The common thread that unites the department’s research is cell and molecular biology. The research is diverse and impacts human medicine; it is relevant at all levels. Researchers are investigating DNA repair, prostate cancer, and cardiovascular physiology. Additional areas of research with direct applications to human and veterinary patient care include stem cell biology for tissue regeneration; multiple sclerosis and the role of specific proteins in T-cell activation; and alcoholism and the action of alcohol on signal transduction pathways.
Other areas that utilize cell and molecular techniques are in development and physiology, including studies on the molecular basis of tooth eruption, the molecular genetics of deafness in Dalmatians and other breeds, and analysis of zebrafish development in relation to environmental health science. Also, the development and anatomy of the bowhead whale is being elucidated, and the functional anatomy of its digital end organs is being studied.

**Pathobiological Sciences**

PBS is currently ranked #1 in research productivity at LSU. The research emphasis is on infectious diseases, with strong programs in viral and bacterial pathogenesis, immunity and resistance to infectious agents, vector-borne diseases, and the use of Geographic Information Systems to study disease distribution and risk factors.

Close association with the National Hansen’s Disease Center (with its internationally recognized programs exploring tuberculosis and leprosy), the Pennington Biomedical Research Center, and the Tulane National Primate Research Center provides additional opportunities for collaborative research and graduate training. Several faculty hold joint appointments in the LSU AgCenter Veterinary Science Department, and the aquatic animal disease faculty work closely with the LSU Aquaculture Research Station.

**Veterinary Clinical Sciences**

VCS instructs veterinary students, interns, and residents in the art and science of veterinary medicine, undertakes clinical research for the benefit of both animals and humans, and provides specialized care for animal patients from Louisiana and surrounding states.

VCS faculty are engaged in a wide variety of research endeavors, with major funding in equine laminitis and orthopedics. Research primarily relates to animal disease, though some research has implications in human medicine (e.g., research in glaucoma, orthopedics, and oncology). In many areas the research conducted enables us to offer cutting-edge treatment to our patients. For example, research in renal disease has made LSU one of only three schools of veterinary medicine to offer hemodialysis and one of only two to offer renal replacement therapy. Collaboration between faculty often helps translate the results of basic research into practical applications. Cardiovascular research and oncology are two areas with strong collaborative endeavors.

The research interest of faculty with active laboratories is listed by department. The major research cluster, if any, to which their activities fit is included at the end. These include infectious disease (ID), cancer biology and therapy (CB), molecular medicine (MM), vector biology (VB), respiratory pathobiology (RP), the Equine Health Studies Program (EHSP), and clinical studies (CS).

**Comparative Biomedical Research**

Steven A. Barker, PhD: Analytical toxicology and the neurochemistry of hallucinogens. MM

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**2009-2010 Total Active Research Funding by Source**

- **Federal** 79.60%
- **State** 12.58%
- **Industry** 1.38%
- **Other** 5.38%
- **Foundations** 1.07%

Total Extramural Funding: $45.1 M
(25% increase over 2008-09)

Extramural Sources: National Institutes of Health, United States Department of Agriculture, Department of Defense, National Science Foundation, Department of Education, Foundations, Industry.
Hermann H. Bragulla, DVM, PhD: Morphology and development of skin and cornified structures (e.g., claws); baleen in whales; whale ears.

Henrique Cheng, DVM, MVSc, PhD: Cellular and molecular signals controlling stem cell differentiation. MM

Ji-Ming Feng, PhD: Molecular regulations of calcium signal in T-cells and their roles in autoimmune diseases. MM

Marxa L. Figueiredo, PhD: Cancer biology with a focus on gene therapy strategies for prostate and head and neck cancers. CB, ID

Joseph Francis, BVSc, PhD: Brain mechanisms regulating cardiovascular function. MM

Shireen Abdelgawad Hafez, BVSc, PhD: Molecular regulation of osteogenesis. MM

Daniel J. Hillmann, DVM, PhD: Development and anatomy of the bowhead whale.

Kevin M. Kleinow, DVM, PhD: Mechanistic and applied aspects of aquatic animal toxicology, physiology, and pharmacology. MM

Shisheng Li, PhD: DNA damage and repair mechanisms. MM

Arthur L. Penn, PhD: Role of inhaled air pollutants in cardiovascular and respiratory diseases. RP, MM

Inder Sehgal, DVM, PhD: Mechanisms for prostate cancer metastasis. MM, CB

George M. Strain, PhD: Deafness; epilepsy; experimental neurology; autonomic nervous system. MM, CS

Gary E. Wise, PhD: Molecular basis of tooth eruption. MM

Shaoamian Yao, PhD: Molecular regulation of bone resorption and formation; purification and differentiation of stem cells. MM

Masami Yoshimura, DSc: Molecular and cellular biological aspect of the regulation of cyclic AMP signal transduction. MM

**Pathobiological Sciences**

David G. Baker, DVM, PhD: Parasitic and infectious diseases of laboratory animals. ID

Doo-Youn Cho, DVM, PhD: Developmental pathology; dermatopathology and nervous system pathology.

Shafiqul Chowdhury, DVM, PhD: Molecular virology and recombinant vaccine technology of bovine herpesviruses. ID, RP

Richard K. Cooper II, PhD: Development and molecular production of biopharmaceuticals.

Philip H. Elzer, PhD: Bacterial pathogenesis focusing on host-parasite interactions and immunity. ID

John P. Hawke, PhD: Emerging infectious diseases of cultured marine and freshwater fish. ID

Samithamby Jeyaseelan, DVM, PhD: Pulmonary inflammation; antibacterial host defense. ID, RP

Thomas R. Klei, PhD: Immune-regulatory mechanisms involved in human filariasis. ID, VB

Konstantin G. Kousoulas, PhD: Molecular biology and pathogenesis of herpesvirus and coronaviruses. ID, CB, MM

Fang-Ting Liang, PhD: Pathogenesis of *Borrelia burgdorferi*. ID, VB

Kevin R. Macaluso, PhD: Tick-borne rickettsial diseases; how interactions between arthropods and rickettsiae facilitate pathogen transmission. ID, VB

John B. Malone, Jr., DVM, PhD: Use of earth-observing satellite imagery and Geographic Information Systems to evaluate the suitability of environment for disease agents. ID

James E. Miller, DVM, MPVM, PhD: Epidemiology, control, and genetics of ruminant nematode parasitism. ID

Christopher Mores, ScD: Mechanisms by which arthropod-borne viruses persist in, emerge from, and expand to particular ecologies, transmission cycles, and regions. ID, VB

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**2009-2010 Distribution of Research Funds by Category**

- **Infectious Disease**: 44.99%
- **Molecular Medicine**: 23.82%
- **Equine Research**: 9.35%
- **Research Training**: 7.41%
- **Environmental Toxicology**: 0.47%
- **Small Animal Medicine Research**: 1.91%
- **Other**: 1.01%
- **Wildlife Research**: 0.30%
- **Vaccination**: 9.35%
Daniel B. Paulsen, DVM, PhD, DACVP: Bovine respiratory disease. ID, RP
Rhett W. Stout, DVM, PhD: Pharmacology and toxicology of investigational new drugs; laboratory animal medicine. CS, ID
Ronald L. Thune, PhD: Pathogenesis of infectious diseases of aquatic animals. ID

Veterinary Clinical Sciences
Mark Acierno, DVM, DACVIM: Renal diseases; hypertension; renal replacement technologies. CS
Frank M. Andrews, DVM, DACVIM: Gastric ulcer disease; neurological diseases; Cushings disease in horses. EHSP
Bonnie L. Brugmann, DVM: Mechanisms of multidrug resistance; tumor immunology; regulatory cells. CB, CS
Daniel J. Burba, DVM, DACVS: Equine arthritis; cartilage healing; laser surgery. EHSP
Renee T. Carter, DVM, DACVO: Corneal epithelial defects; retinal degeneration; ciliary cleft collapse. CS
Ann M. Chapman, DVM, DACVIM: Salmonellosis *Lawsonia intracellularis*. ID
Anderson F. da Cunha, DVM, DACVA: Interaction of the Vanilloid receptor with the pain pathway. CS
Susan C. Eades, DVM, DACVIM: Equine laminitis, equine colic, and foal diseases. EHSP
Bruce E. Eilts, DVM, DACT: Equine infertility, assisted reproduction, canine infertility, and canine population control. CS
Frederic P. Gaschen, DVM, DACVIM: Chronic intestinal diseases, food intolerance and food allergy, gastrointestinal motility, and nosocomial (or hospital) infections. CS
Lorrie E. Gaschen, DVM, DDI: Vascular imaging and ultrasound of the gastrointestinal tract and pancreas, MRI studies in structure and function in small and large animals. CS
Tracy L. Giegier, DVM, DACVIM, DACVR: Radiation treatment, planning, and delivery. CS, CB
Amy M. Grooters, DVM, DACVIM: Pythiosis, lagenidiosis, zygomycosis, and molecular mycology. CS
Jill R. Johnson, DVM, DACVIM, DABVP: Cell culture models of disease and clinical epidemiology using GIS, GPS, and remote sensing tools. EHSP
Stephanie W. Johnson, LCSW: Student personality types, learning styles, and the effects on teaching and learning.
Susanne K. Lauer, DVM, DACVS: Fracture healing; external skeletal fixation; physical rehabilitation; cementless total hip replacement; gait analysis; intervertebral disc disease. CS
José Len, MVZ, DACT: Effects of centrifugation on equine sperm and in vitro fertilization in horses. EHSP
Mandi J. Lopez, DVM, PhD: Biomechanics; medical device design; canine cranial cruciate disease; canine hip dysplasia; motion analysis; equine orthopedics. EHSP
Sara K. Lyle, DVM, PhD, DACT: Placentitis; infertility; assisted reproductive technologies in the mare. EHSP
Rebecca S. McConnico, DVM, PhD, DACVIM: Equine and comparative gastrointestinal physiology, pharmacology; disaster medicine. EHSP
Javier G. Nevarez, DVM, PhD: Crocodilian medicine and aquaculture. CS
Dale L. Paccamonti, DVM, DACT: Mare infertility; equine pregnancy and parturition; stallion semen preservation. EHSP
Romain Pariaut, DVM, DACVIM: Mechanisms, diagnosis, and treatment of congestive heart failure; interventional cardiology. CS
Patricia Queiroz-Williams, DVM: Cardiac output and pulse pressure variation in horses; minimal alveolar concentration of inhalants; pain management (all species). CS
Nathalie Rademacher, DR, DACVR: Vascular imaging for pancreatic diseases; cardiogenic pulmonary edema diagnosis; cross-sectional imaging. CS
Laura M. Riggs, DVM, PhD, DACVS: Laminitis and acute inflammation. EHSP
Katrin Saile, DVM: Tracheal collapse and tracheal stenting; gastrointestinal surgery; septic peritonitis. CS
Keijiro Shiomitsu, BVSc, DACVR: Angiogenesis; radiation sensitizer; Intensity Modulated Radiation Therapy. CS, CB
Gary A. Sod, PhD, DVM: Large animal orthopedics. CS
Eric S. Storey, DVM, DACVO: Glaucoma; inherited retinal disease; equine recurrent uveitis. CS
Joseph Taboada, DVM, DACVIM: Student personality types, learning styles, and the effects on teaching and learning.
Thomas N. Tully, Jr., DVM, DABVP: Nutritional research (avian). CS
C. S. Venugopal, BVSc, PhD: Smooth muscle physiology. EHSP, RP
The majority of faculty working in infectious diseases within the LSU School of Veterinary Medicine are in the Department of Pathobiological Sciences (PBS). Additional faculty in the Departments of Comparative Biomedical Sciences (CBS) and Veterinary Clinical Sciences (VCS) have complementary interests in infectious diseases and collaborations with PBS faculty.

In July 2004, the LSU SVM received a $9.9 million grant to establish a Center of Biomedical Research Excellence (COBRE). In July 2009, this grant was renewed for more than $11.1 million. This Center grant from the National Center for Research Resources provides substantial funds to develop faculty for independent funding by the National Institutes of Health (NIH) traditional mechanisms. The original grant lasted for five years and was competitively renewed for five more years.

The original grant created a Center for Experimental Infectious Disease Research (CEIDR), which constitutes a strategic alliance between the LSU SVM, the LSU College of Science (SCI), and the Tulane National Primate Research Center (TNPRC). Konstantin G. Kousoulas, PhD, professor of veterinary virology and director of the Division of Biotechnology & Molecular Medicine, is the administrator of the COBRE program at the LSU SVM.

The five initial research projects were as follows: “New measles vaccine strategy using VSV vectors,” Cristian Apetrei, PhD, Tulane National Primate Research Center; “Early RSV exposure leads to adult airways disease,” Stephania A. Cormier, PhD, Department of Biological Sciences, SCI; “Host response in HIV-1 and microsporidia co-infection,” Hollie Hale-Donze, PhD, Department of Biological Sciences, SCI; “Monocyte infection in SIV neuropathogenesis,” Marlene Orandle, DVM, PhD, Department of PBS, LSU SVM; and “Contribution of TNF and MCP-1 to retrovirus-induced neurological disease,” Karin E. Peterson, PhD, Department of PBS, LSU SVM.

Since then, eleven other projects have been funded by the COBRE grant, including “Role of CXCL5 in Bacterial Pneumonia,” Samithamby Jeyaseelan, PhD, Department of PBS, LSU SVM; “Pathogenesis of Rickettsia Species,” Kevin Macaluso, PhD, Department of PBS, LSU SVM; “Pathogenesis of *Borrelia burgdorferi*,” Fang-Ting Liang, PhD, Department of PBS, LSU SVM; “Enhancement of Dengue Virus Transmission Due to Mosquito Salivary Proteins,” Christopher Mores, ScD, Department of PBS, LSU SVM; “Regulation of Innate Immunity in Human Metapneumovirus Infection,” Antonieta Guerrero-Plata, PhD, Department of PBS, LSU SVM; and “Mechanisms of XMRV Oncogenesis and Immunogenicity in Prostate Cells,” Marxa Figueiredo, PhD, Department of CBS, LSU SVM.

The COBRE grant provides funding and research capabilities that give assistant and associate professors the opportunity to establish research programs that will effectively compete for independent funding by NIH. Once a faculty member receives his or her own NIH funding for a particular research program, he or she
will be rotated out of COBRE and replaced by other eligible faculty. The overall objective for the COBRE grant renewal is to build upon the substantial accomplishments of the previous funding period and continue efforts toward establishing an independent CEIDR, which relies heavily on the infectious diseases research focus of the LSU SVM, TNPRC, and the greater south Louisiana region.

The COBRE award enhances the LSU SVM, LSU College of Science, Louisiana Agricultural Experiment Station (LAES), and TNPRC’s substantial collaborative efforts on infectious diseases of far-reaching importance for health and disease and prepare for NIH program grant applications. Importantly, it affords an opportunity to forge alliances in a consortium with other infectious disease scientists in south Louisiana, providing an unprecedented opportunity for research and training for all participating units. It is anticipated that research outcomes will be translated to new diagnostics, vaccines, and other treatment modalities for ameliorating human and animal infectious diseases.

“What makes this grant so important is that it continues the momentum we began with the funding of the first COBRE that brought in $9.6 million and will allow us to continue the expansion of our research program in infectious disease as it relates to human health and comparative medicine,” said Thomas Klei, PhD, associate dean for research and advanced studies at the LSU SVM. “It is important to know that this program was jump-started by funding from the Governor’s Biotechnology Initiative begun many years ago by Governor [Mike] Foster, which continues to have an important impact. It is the only grant like this currently at LSU. The ultimate goal is to create an independent Center for Infectious Diseases relying on the strengths of the participating institutions in the greater south Louisiana region.”

http://biommed.lsu.edu/

Left, Dr. Konstantin G. Kousoulas, administrator of the COBRE program at the LSU SVM.

Infectious Disease Research at the LSU SVM


Shafiqul Chowdhury, PhD (PBS). Determinants of bovine herpes virus infectivity and spread; live-attenuated vaccines for bovine herpes and equine herpes viruses.

Philip H. Elzer, PhD (PBS). Immunopathogenesis of Brucella abortus; live-attenuated vaccines against brucella infections.

Frederick M. Enright, DVM, PhD (PBS). Anti-bacterial and anti-viral therapeutics; molecular diagnostics of infectious disease pathogens.

Marxa L. Figueiredo, PhD (CBS). Oncogenic mechanisms of the XMRV retrovirus in prostate cancer.

M. Antonieta Guerrero-Plata, PhD (PBS). Immunopathogenesis of respiratory syncytial virus and pneumoviruses.

John P. Hawke, PhD (PBS). Infectious diseases of aquatic animals; development of diagnostics and vaccines to detect aquatic animal pathogens.

Thomas R. Klei, PhD (PBS). Immunopathogenesis of filariasis; vaccines against filarial nematode infections.

Konstantin G. Kousoulas, PhD (PBS). Molecular genetics of herpes simplex viral infectivity and spread; live-attenuated vaccines against herpes simplex viruses; immunomodulatory vaccines against bovine respiratory coronavirus, West Nile virus, and Chlamyphila psittaci; molecular biology, angiogenesis and tumorigenesis of Kaposi’s sarcoma associated herpesvirus.

Fang-Ting Liang, PhD (PBS). Molecular determinants of Borrelia burgdorferi invasion and virulence; B. burgdorferi immune evasion mechanism and immunopathogenesis.

Kevin R. Macaluso, PhD (PBS). Molecular determinants of Rickettsiae infection of ticks and mosquitoes; Rickettsiae innate immune responses in arthropod vectors and mammals.

Chris Mores, ScD (PBS). Molecular epidemiology of Dengue viruses; determinants of Dengue virus infectivity and spread.

Daniel Paulsen, DVM, PhD (PBS). Pathology of bovine respiratory disease.

Alma F. Roy, PhD (PBS). West Nile virus pathogenicity; veterinary diagnostics of infectious disease agents.

Inder Sehgal, DVM, PhD (CBS). Oncolytic virotherapy for human cancers.

Ronald L. Thune, PhD (PBS). Molecular biology of the pathogenesis of Edwardsiella ictaluri and photobacterium damsela; live-attenuated vaccines for fish pathogens; genomics of spiroplasma.

Thomas C. Tully, DVM (VCS). Vaccines against psittacosis of birds.

Noboku Wakamatsu, DVM, PhD (PBS). Molecular pathology of infectious diseases.
The Equine Health Studies Program (EHSP) at the LSU School of Veterinary Medicine is a premier biomedical center that conducts leading-edge equine disease research, instructs veterinary students and veterinarians in advanced studies programs, and enhances the continuing education of the horse-owning public and equine practitioners. Its goal is to provide state-of-the-art diagnostic and therapeutic capabilities for critically ill and injured horses. The Laboratory for Equine and Comparative Orthopedic Research (LECOR) is a dynamic and growing resource for the EHSP. A multifaceted research laboratory that serves a variety of clinical and research needs, LECOR provides investigators with tools to study orthopedic disease and injuries in species as small as the mouse and as big as the horse. Dr. Mandi Lopez, associate professor of veterinary surgery and director of LECOR, was recruited in 2004 to design and equip the laboratory. Dr. Lopez incorporated a comprehensive spectrum of research capabilities, some of which include analysis of molecular characteristics of disease, orthopedic implant design, tissue regeneration, and motion analysis. Investigations from the cell to the whole animal are possible. Current projects are aimed at orthopedic disease and injury with a focus on joints and long bones.

There is an extensive list of collaborators associated with LECOR that includes investigators from within the LSU SVM to national and international academic institutions and industry. LECOR’s research funding for the numerous projects within the laboratory are provided by a number of sources. “We have been generously supported by the National Institutes of Health (NIH), American Kennel Club, Collie Health Foundation, American College of Veterinary Surgeons Research Foundation, Louisiana Board of Regents, Grayson Jockey Club Foundation, Pall Corporation, Tesa Biomedical, United States Department of Agriculture (USDA), National Science Foundation, and the Equine Health Studies Program, among others,” Dr. Lopez said.
Labs Devoted to Equine Research

**Equine Orthopedics and Biomechanics**

The EHSP has a solid research program that has led to the development of numerous orthopedic implants designed specifically for equine use, which is critical for the advancement of fracture repair. The EHSP is unique in that it is the only veterinary school program in the country that is designing and testing equine specific orthopedic implants.

**Equine Reproduction Laboratory**

The Reproduction Laboratory evaluates and processes semen for transport or storage and collaborates with the Embryo Biotechnology Laboratory (part of the LSU AgCenter's Reproductive Biology Center). This facility has the capabilities for assisted reproduction techniques such as intracytoplasmic sperm injection and nuclear transfer. Collaborative studies also involve the Audubon Center for Research in Endangered Species.

**Equine Molecular Biology Research Laboratory**

This laboratory supports the molecular biology aspects of research conducted by EHSP investigators. It performs research to explain the molecular basis of disease with a view to improved clinical approaches; trains scientists and students at all levels; and develops new instruments and methods in molecular biology.

The complete EHSP Research Report is available at http://www.vetmed.lsu.edu under Publications.
Once upon a time, research done at veterinary medical schools was limited to investigating diseases and abnormal conditions of animals, but those days are long past. Today veterinary schools are at the forefront of ground-breaking advances that benefit not only companion or farm animals but humans as well. And much of this research is being done on a molecular level.

**Prostate and Head and Neck Cancer—Dr. Marxa Figueiredo**

Dr. Marxa Figueiredo, assistant professor in the department of Comparative Biomedical Sciences (CBS), is researching gene therapy modalities for prostate and head and neck cancer. She uses an adenovirus as a vehicle to deliver a therapeutic gene into prostate tumors to target metastatic forms of the disease. She has engineered the virus to affect only cancer cells, not normal ones.

The human gene P27 is a known tumor-suppressor, but when a prostate cancer begins to grow, it usually shuts down P27. “But when the gene is put back into a tumor, it acts as a brake, causing the death of the cancer cells,” she noted. Dr. Figueiredo has created a transgenic mouse model for examining the role of epigenetic changes on cell cycle regulation and prostate cancer progression and has inserted...
the P27 gene into an adenovirus that carries it into the tumor. Dr. Figueiredo has confirmed that when this P27 gene is inserted into an adenovirus and the virus is injected into a tumor, it causes cell death and slows the growth of the tumor. Her future work will be aimed at enhancing the anti-tumor effects of the adenovirus, and she hopes to expand to dog and cat models as well as entering human trials in the future. Dr. Figueiredo’s research at SVM is funded by a five-year National Institutes of Health (NIH) National Cancer Institute (NCI) K01 transition grant for junior investigators.

Prostate Cancer—Dr. Inder Sehgal

Dr. Inder Sehgal is an associate professor in CBS investigating the mechanism and therapies for human prostate cancer metastasis. He has been focused on the role of the urokinase receptor on promoting successful metastasis and is trying to define, through both in vitro studies and using a mouse model, how this happens.

From a more therapeutic standpoint, he has been collaborating with Dr. Konstantin “Gus” Kousoulas, professor of veterinary virology. He has shown that some of Dr. Kousoulas’s oncolytic herpes viruses are very effective in killing proliferating prostate cancer cells in mice. Dr. Sehgal plans to expand this research to use the death of primary cancer cells as a means of inducing immunologic memory to inhibit metastases. His research is supported by an NIH R15 grant.

Diabetes—Dr. Henrique Cheng

Dr. Henrique Cheng is an assistant professor in CBS. He came to the LSU SVM from All Children’s Hospital in St. Petersburg, Fla. Dr. Cheng received his veterinary degree from Faculdade de Ciências Agrárias do Pará in the northern region of Brazil. He received his Master’s degree in 1997 and his Ph.D. in 2002, both from Iowa State University. Dr. Cheng’s research focuses on the molecular mechanisms controlling stem cell differentiation for tissue regeneration. Another area of research is the control of pancreatic hormone secretion and its impact on diabetes. His project entitled, “Role of transient receptor potential melastatin 4 in dental follicle stem cell differentiation,” is supported by an NIH grant.

Effects of Alcohol—Dr. Masami Yoshimura

Dr. Masami Yoshimura, assistant professor in CBS, is studying the effects of alcohol on signal transduction pathways of cyclic adenosine monophosphate, a molecule that regulates various metabolic processes, including sugar and lipid metabolism, cell growth and differentiation, cardiac function, olfaction, and learning and memory; it also mediates the effects of many hormones at the cellular level. Dr. Yoshimura currently has two NIH grants.

DNA Repair—Dr. Shisheng Li

Dr. Shisheng Li, associate professor in CBS, is researching the mechanisms by which the body can repair damage that has occurred to its DNA. Damage to cellular DNA can be caused by a number of factors, both external and internal, and this damage is believed to be linked to tissue damage, aging, autoimmune diseases, and many forms of cancer. Damage can occur when endogenous cellular processes form free radicals and other mutagens as normal metabolic by-products. In order to minimize the effects of such damage, cells have evolved several mechanisms to repair their DNA, and two of these mechanisms are the subject of Dr. Li’s research. Dr. Li and his group focus on the mechanisms of nucleotide excision repair and base excision repair, using a yeast (Saccharomyces cerevisiae) model. “We use the yeast model,” Dr. Li said, “because it is simple, easy to manipulate, and the repair mechanisms are very similar to those of humans.” Dr. Li’s research is supported by grants from the NIH and the National Science Foundation.

Autoimmune Diseases—Dr. Ji-Meng Feng

Dr. Ji-Meng Feng, associate professor in CBS, received his PhD at Beijing Medical University in China and was an assistant research neuroimmunologist at the UCLA School of Medicine. Dr. Feng is interested in the molecular regulations of calcium signal in T-cells and their roles in autoimmune diseases, especially multiple sclerosis (MS), an autoimmune-mediated demyelination disease in humans. In addition, he is also interested in searching the molecular mechanism of lymphoma formation. Dr. Feng’s research is funded by the National Multiple Sclerosis Society.

http://www.vetmed.lsu.edu/van/
http://www.vetmed.lsu.edu/pts/
The Department of Pathobiological Sciences has a strong vector-borne diseases research program that investigates diseases carried and transmitted by insects or other arthropods such as ticks. These diseases can be viral, bacterial, or parasitic, and can affect both humans and animals. All of these studies are funded by significant extramural research grants and contracts from the NIH and USDA.

**Lyme disease—Dr. Fang-Ting Liang**

Dr. Fang-Ting Liang, associate professor, is working on *Borrelia burgdorferi*, the tick-borne bacterium that causes Lyme disease. In humans, the first sign of infection is usually a characteristic “bull’s-eye” rash surrounding a tick bite; untreated, it can spread to other parts of the body and cause neurological disorders and severe arthritis. Lyme is the most common vector-borne human disease in much of the Northern Hemisphere (nearly 30,000 people contracted the disease in 2008 in the U.S. alone).

The Lyme disease organism has an unusual ability to defeat the body’s natural immune response and set up infection, and Dr. Liang’s research focuses on the means by which this occurs. “Developing a specific antibody response is an effective way for the host to eliminate bacterial infection, but *B. burgdorferi* can change its surface antigenic architecture,” he said. “This is a powerful strategy the bacterium uses to avoid elimination by specific antibodies and cause persistent infection. Our goal is to understand how this happens, which we hope will lead to better treatment and prevention options.”

**West Nile virus—Dr. Alma Roy**

Dr. Alma Roy, assistant professor and associate director of the Louisiana Animal Disease Diagnostic Laboratory, works with West Nile virus, which is transmitted from reservoir species of birds to humans, horses, and other animals via mosquito bites.

West Nile virus appeared in North America in 1999 and quickly spread across the continent. At first, certain bird
species such as crows and blue jays were severely affected; although most of those populations have subsequently recovered, West Nile virus infection continues to cause losses among various other species, including California condors, sandhill cranes, flamingoes, and hawks. Dr. Roy’s research has centered upon discovering which species of birds are involved in amplifying the virus in Louisiana, with the goal of improving vaccines against the disease. “The knowledge we have gained through surveillance is helping us better understand the epidemiology of West Nile virus in birds,” she said, “and we are working on developing vaccines that can be used to protect captive populations of birds, such as in a zoo setting.”

Dengue virus—Dr. Christopher Mores
Associate Professor Christopher Mores is an arthropod-borne virus (arbovirus) researcher. Having studied the transmission and emergence of many zoonotic arboviruses, he now focuses on dengue virus. Transmitted by mosquitoes, dengue causes millions of human infections each year in tropical and subtropical regions. Typically a relatively mild febrile illness, more severe manifestations such as dengue hemorrhagic fever or dengue shock syndrome are being seen. Outbreaks of severe disease seem to coincide with periods in which multiple serotypes of the virus circulate in nature.

Dr. Mores investigates the role of competitive effects between co-circulating serotypes of dengue virus in this emerging public health threat. “By better estimating the critical parameters of dengue virus transmission and understanding the relationships and behaviors of those parameters to one another,” Dr. Mores said, “we will be able to devise better surveillance efforts, better plan vaccine trials, and support enhanced policies and procedures for control of disease outbreaks.”

Rocky Mountain spotted fever—Dr. Kevin Macaluso
Dr. Kevin Macaluso, associate professor, studies the transmission of flea- and tick-borne bacterial pathogens, particularly the agents of emerging flea-borne rickettsiosis, *Rickettsia felis*, and Rocky Mountain spotted fever (RMSF), *Rickettsia rickettsii*, respectively.

Dr. Macaluso’s research explores the mechanisms of transmission of rickettsiae by arthropod vectors, specifically, the transmission of *R. rickettsii* from the tick to the vertebrate host and the contributing factors that allow certain rickettsiae to be transmitted only by certain tick species. Although several species of ticks all live in the same geographic area where RMSF occurs, typically only ticks of the genus *Dermacentor* can transmit these organisms to humans, and Dr. Macaluso wants to find out why and how this happens. “We believe the factors that control the transmission are tick-derived instead of being controlled by some bacterial component, so that when we discover the means that allow only specific ticks to transmit the infection, we will be able to devise a means to more effectively prevent RMSF,” he said. Dr. Macaluso’s research activities are supported by extramural funding totaling $2.4 million from the National Institutes of Health, National Institute of Allergy and Infectious Diseases.

Human onchocerciasis—Dr. Thomas Klei
Dr. Thomas Klei, associate dean for research and advanced studies, researches human onchocerciasis, or “river blindness,” a major public health problem in many developing nations. River blindness is caused by the filarial nematode parasite *Onchocerca volvulus* (Ov) and is transmitted by black flies. Onchocerciasis is a serious tropical disease and the second leading cause of infectious blindness in developing countries.

The overall goal of Dr. Klei’s research group is to develop a vaccine against human onchocerciasis, targeting the Ov larvae, which are known to be vulnerable to attack by the host’s immune system. Dr. Klei’s group hopes to identify two recombinant vaccine antigens with the highest probability for success at reducing or potentially eliminating infection, disease, and transmission. “Onchocerciasis has been neglected by researchers for many years,” said Dr. Klei, “but with over 37 million cases of onchocerciasis occurring worldwide and some 120 million people being at risk, it’s a real problem that needs addressing.”

Vector-borne diseases have long had a significant impact on the health of humans and animals worldwide. LSU SVM researchers’ common goal is to improve human lives and livelihoods, both in Louisiana and throughout the world.

Four faculty members at the LSU School of Veterinary Medicine are investigating respiratory diseases. Three are focusing on diseases affecting people and one is conducting research on respiratory disease in cattle. While the studies of this cluster of scientists seems diverse, the basic knowledge gained on the pulmonary systems response to various stressors and their laboratories’ interactions will benefit advances in treatment and control of a variety of human and animal pulmonary disease conditions. Their combined research is supported by more than $3.6 million in grant funds.

**Air Pollutants—Dr. Arthur Penn**

Dr. Arthur Penn is a professor of toxicology in Comparative Biomedical Sciences and director of the Inhalation Research Facility. One area of focus is on respiratory system responses to major combustion-related air pollution events (oil refinery/pipeline explosions and fires, industrial accidents, forest fires). A long-term focus of his laboratory has been on the involvement of environmental stress in adult chronic disease, especially atherosclerosis and asthma. The main environmental stressor studied is “second-hand” cigarette smoke. Recently, Dr. Penn has been investigating the relationship between in utero exposure to “second-hand smoke” (i.e., exposure of pregnant mice to “second-hand smoke”) and the subsequent development of atherosclerosis or asthma in the adult offspring, which are never exposed to smoke after birth. Dr. Penn’s published results show that a) even in the absence of a high-fat diet, in utero exposure to “second-hand smoke” results in significantly accelerated atherosclerosis and that this is associated with increased oxidative stress; and b) that in utero exposure to “second-hand smoke” aggravates adult responses to agents that provoke asthmatic responses.
**Bovine Herpesvirus—Dr. Shafiqul Chowdhury**

Dr. Shafiqul Chowdhury, professor in Pathobiological Sciences (PBS), is investigating molecular virology and recombinant vaccine technology of bovine herpesviruses (BHV). Bovine herpesvirus type 1 (BHV-1) is an important viral pathogen of cattle that can cause severe respiratory tract infection known as infectious bovine rhinotracheitis (IBR), abortion in pregnant cows, and is an important component of the Bovine Respiratory Disease Complex (BRD, “Shipping fever”). BRD is known to cost the U.S. cattle industry at least 1/2 billion dollars annually. IBR disease also causes a substantial drop in milk and meat production in cattle. The long term goal of Dr. Chowdhury’s lab is to understand how BHV-1 and BHV-5 spread within the nervous system and the role of envelope glycoproteins in the regulation of pathogenicity and immunogenicity of BHV-1.

**Neutrophil Recruitment—Dr. Samithamby Jeyaseelan**

Dr. Samithamby Jeyaseelan, associate professor in PBS, studies neutrophil recruitment, the most important initial host innate immune mechanism against bacteria, which is how the immune system eliminates bacteria at the site where disease-causing microbes enter the body. The overall goal of Dr. Jeyaseelan’s research is to understand the molecular and cellular mechanisms responsible for neutrophil recruitment, priming and activation in the lungs. “The challenge in the next decade will be to develop novel approaches to keep neutrophils in the lung for defensive functions while modulating their undesirable effects leading to extensive lung damage,” said Dr. Jeyaseelan. New therapeutic strategies are extremely important since 1) bacterial pneumonia affects more than one million adults with 30,000 deaths per year in the United States alone; and 2) neutrophil influx associated with bacterial pneumonia is the killer in several viral outbreaks, including flu.

**Respiratory Viruses—Dr. Antonieta Guerrero-Plata**

Dr. M. Antonieta Guerrero-Plata, assistant professor in PBS, is researching innate immunity, dendritic cells, and the effect of environmental factors on the pathogenesis of respiratory viruses. Her current projects are in the field of viral immunology since understanding the mechanistic aspects of the immune response to viruses is fundamental to manipulate host responses, improve antiviral immunity or prevent severe disease caused by viral infections. Dr. Guerrero-Plata works with respiratory viral pathogens that are the most important cause of lower respiratory tract infections in children, elderly, and immunocompromised patients (respiratory syncytial virus and human metapneumovirus). The immunity induced by these viruses is not fully protective, of short duration, and reinfections are common throughout life. Therefore, one of her projects seeks to determine the mechanisms used by these viruses to alter the immune response of infected individuals. Another project focuses on understanding the mechanisms underlying the severity and frequency of respiratory viral infections in children exposed to environmental tobacco smoke.

Dr. Javier Nevarez, assistant professor of zoological medicine, is a specialist in the field of alligator health. Under research grants from the Alligator and Fur Council of Louisiana Department of Wildlife and Fisheries (LDWF) and from the USDA's Animal and Plant Health Inspection Service, Dr. Nevarez is working to improve the health of Louisiana's alligators and provide support for Louisiana's alligator industry.

The LDWF manages the American alligator (*Alligator mississippiensis*) as a commercial, renewable natural resource for the state. The Department's alligator program ties the management and conservation of the state's alligators to maintaining Louisiana's wetland ecosystem. This provides benefits not only to the species, but to its habitat and the other species of fish and wildlife associated with alligators.
One of Dr. Nevarez’s projects is focused on the pharmacokinetics of different antibiotics to determine if they can be safely used in alligators. These data will help establish treatment protocols that will improve the health of captive alligators and also take into consideration that their meat is sometimes consumed. Establishing withdrawal protocols such as those mandated for cattle is one of the goals of this project.

Some of the farmed alligators are released to the wild each year, which is another area of concern for Dr. Nevarez. One of his major interests is evaluating how diseases of captive alligators can affect wild populations, so he conducts health surveillance surveys of those farmed animals that are to be released.

As part of the Louisiana alligator program, 12% of alligators hatched in captivity are returned to the wild to maintain the populations. Alligators are released each year from March through August as part of the on-going health surveillance study. “We look at a subset of the alligators that will be released,” Dr. Nevarez said, “and do various tests on them to determine their health status.”

Samples are collected by the LDWF and submitted to the LSU SVM to test the alligators for diseases such as West Nile virus and *Mycoplasma alligatoris*, which can affect the health of captive alligators. In addition, the test subsets are examined grossly for any obvious signs of disease, and samples of blood, lungs, liver, and feces are collected for analysis. These are cultured for bacteria, examined by electron microscopy for viruses, and evaluated for parasites. “The yearly surveillance determines the health status of both wild alligators and captive reared alligators,” said Dr. Nevarez. “This is a proactive program that aims to identify any potential issues before they have an impact on alligator populations.”

The LDWF also sponsors clinical consultation services for the alligator farmers. Any farmers who notice any unusual behavior or signs of illness among their alligators can consult with Dr. Nevarez for diagnostic testing and advice.

Dr. Nevarez received his DVM and his PhD from the LSU School of Veterinary Medicine in 2001 and 2007, respectively. He is currently an assistant professor of zoological medicine in the Department of Veterinary Clinical Sciences and director of the LSU SVM Wildlife Hospital of Louisiana.

http://vcs.vetmed.lsu.edu/
SU has also received a $15 million grant from the National Institutes of Health (NIH) IDeA Networks of Biomedical Research Excellence (INBRE) program. The grant is centered in the School of Veterinary Medicine and the Department of Biological Science in the College of Science. Thomas R. Klei, PhD, associate dean for research and advanced studies, is the current principal investigator and Dr. E. William Wischusen, associate professor of biological sciences, is the program coordinator. The Louisiana program, Louisiana Biomedical Research Network (LBRN), was established in September 2000 with funding from the NIH, National Center for Research Resources. This $15 million grant was matched by a $1.2 million supplement from the Board of Regents. The purpose of this five-year grant is to strengthen the biomedical research infrastructure and workforce within the state. It is designed to connect predominantly undergraduate universities with biomedical research-intensive institutions in Louisiana.

The overall goal of this competitive grant is to facilitate the growth of biomedical research activities in the state. Previous funding enabled the LBRN to establish a strong foundation for interdisciplinary and inter-institutional research, education, training, and mentoring programs. The LBRN programs are poised to increase the biomedical workforce within Louisiana and create a pipeline of needed future research scientists. The INBRE grant will provide research opportunities for an increasingly diverse pool of both graduate and undergraduate students and faculty and will encourage collaborative research activities.

The LBRN was established with Biomedical Research Infrastructure Networks (BRIN) funding by the National Institutes of Health, through the National Center for Research Resources Grant, and the LBRN is committed to raising the research competitiveness of Louisiana researchers. IDeA Networks of Biomedical Research Excellence (INBRE) is the second phase of the BRIN Program, which LBRN initially started. Extensive research is conducted by faculty and undergraduate and graduate students at five primarily undergraduate universities in the state, including Louisiana Tech University, LSU-Shreveport, Southern University,
Researchers and students at these schools are paired with mentors and collaborators at the state’s biomedical research intensive centers, including LSU, the LSU Health Sciences Centers in Shreveport and New Orleans, Pennington Biomedical Research Center, Tulane Medical Center, and Tulane National Primate Research Center. The program also includes an extensive summer research training program for undergraduates and includes students from 23 undergraduate institutions in the state.

### Some Collaborations with LSU Colleges

**Dr. David Baker:** Study with the Department of Chemistry (funded by NIH 2R01) on “Tumor-targeting with New Boronated Porphyrins.”

**Dr. Samithamby Jeyaseelan:** Study with the LSU Health Sciences Center on “Role of IL-17 in Bacterial Pneumonia.”

**Dr. Fang-Ting Liang:** Study with Department of Biological Sciences on “BB0250 of *Borrelia burgdorferi* is a Conserved and Essential Inner Membrane Protein Required for Cell Division.”

**Dr. Mandi Lopez:** Studies with Pennington Biomedical Center, the LSU Health Sciences Center, and the LSU Engineering Department.

**Dr. Noboku Wakamatsu:** Study with the LSU Pennington Biomedical Research Center on “DLys6-LHRH-Curcumin conjugate inhibits pancreatic cancer cell growth in vitro and in vivo.”

### Some Collaborations with Other Universities

**Dr. Susan Eddlestone:** Study with Western College University and North Carolina State University on “Transmission time of *Ehrlichia canis* in dogs” and “Bacteremia Prevalence of *Bartonella* spp, *Anaplasm* spp., *Ehrlichia* spp., *Cytaxozoon* spp, FeliV & FIV in Free-Roaming Cats from Baton Rouge, Louisiana.”

**Dr. Philip Elzer:** Study with the University of Idaho on “Spiroplasma’s involvement in TSEs;” study with the University of Fairbanks, Alaska on “Brucellosis in polar bears and marine mammals”; study with Montana State University on “Brucellosis vaccines for bison”; study with the University of Wyoming on “Recombinant proteins as potential brucellosis vaccines”; study with Texas A&M University on “Brucellosis vaccines in microspheres”; and study with Virginia Tech on “Novel vaccine candidates and antimicrobial drugs for brucellosis.”

**Dr. Joseph Francis:** Study with the University of Florida (led to a subcontract on funded grant application) on “ACE2 in vascular endothelial function.”

**Dr. Samithamby Jeyaseelan:** Study with the University of Pennsylvania (published article) on “Chemokine Regulation in Bacterial Pneumonia.”

**Dr. Mandi Lopez:** Studies with Columbia University, Virginia Tech, and the University of California, Davis.

**Drs. Sara Lyle and Susan Eades:** Study with the University of Kentucky (supported by the LSU Equine Health Studies Program) on “Effect of low dose endotoxin on uterine motility in the non-gravid uterus of the pony mare.”

**Dr. Romain Pariaut:** study with Cornell University (supported by the Morris Animal Foundation) on “Altered intercellular communications, arrhythmias, and Sudden Death in Boxer Dogs.”

**Dr. C.S. Venugopal:** Study with Auburn University’s College of Veterinary Medicine on “Vascular mechanisms of insulin resistance in horses.”

**Dr. Masami Yoshimura:** Study with the University of Colorado at Denver and Health Sciences Center (supported by NIH R01) on “Action of Ethanol on Cyclic AMP Signal Transduction.”

### Some Collaborations with Government Agencies

**Dr. James Miller:** Studies with the USDA on “Natural (non-chemical) methods for controlling internal parasites of sheep and goats”; “Sustainable control of gastrointestinal nematodes in organic and grass-fed small ruminant production systems”; “Efficacy of natural dewormers in the control of gastrointestinal nematodes of small ruminants”; “Integrating free-range poultry with ruminant and agroforestry production in a systems approach”; and “A Systems Approach to Control Gastrointestinal Nematodes in Organic Small Ruminant Production”; and study with the AAZV Mazuri Grant Fund on “Evaluation of the nematode-trapping fungus, *Duddingtonia flagrans*, as an potential alternative control for gastrointestinal nematode parasitism in captive ruminant hoofstock.”

http://www.vetmed.lsu.edu/svm_research.htm

http://www.vetmed.lsu.edu/svm_research.htm
SU School of Veterinary Medicine aquatic pathobiology researchers work with both fresh water and marine fish populations.

Dr. Ronald Thune—Disease Prevention

Dr. Ronald Thune is head of the Department of Pathobiological Sciences (PBS) and a professor of aquatic animal health. His research covers economically important species (specifically farmed channel catfish and marine fish species such as hybrid striped bass) and focuses on disease prevention in commercial aquaculture; he has already patented two vaccines. However, he is trying to build better vaccines by improving the delivery system. Currently, the vaccines are delivered via the water in which the fish live. The hope is to find a way to deliver a vaccine orally when the fish are in ponds.

Dr. Thune is primarily studying two bacteria: *Edwardsiella ictaluri*, which causes enteric septicemia (ESC) in catfish, and *Photobacterium damsela* subsp. *piscicida*, which affects marine fish species in the Mediterranean, Japan, and the U.S. Gulf Coast. ESC is spread by infected fish via water contamination or by cannibalism of dead or infected fish. Birds can also pick up infected fish from one pond and drop them into another. These bacteria are virulent and spread quickly. Dr. Thune is trying to create better vaccines for these bacteria by studying their pathogenesis and how they cause disease.

Dr. Kevin Kleinow—Toxicology

Kevin Kleinow, DVM, PhD, is a toxicologist in the Department of Comparative Biomedical Sciences who specializes in environmental health issues, especially those related to fish. He studies how contaminants in the environment affect fish and how those interactions may affect other organisms, including humans.

Much of Dr. Kleinow’s work with fish has centered on how fish deal with environmental contaminants or drugs. Biotransformation of chemicals to more excretable forms and
transport within and out of the fish are major-components of these studies. The outcome of these processing events is influential in the food chain transfer of chemicals through the aquatic and marine food chains and to humans. During studies examining the bioavailability and fate of chemicals known to be endocrine-disrupting chemicals, Dr. Kleinow noted increased bioavailability and retention of co-exposed dietary chemicals. He noted that the chemicals that elicited this behavior were also surfactants. He correlated that surfactants, when added in significant amounts, increased intestinal bioavailability of oral medicines and inhibited transporters involved in drug excretion. From these observations and uses, Dr. Kleinow postulated that surfactants discharged in the environment—even at low concentrations—would alter the uptake, excretion, retention, and potential toxicity of other chemicals in the environmental food chain.

Subsequent work in his laboratory showed that surfactants change the permeability of membranes in the intestinal wall and places of excretion, such as the biliary tract. Dr. Kleinow added, “It’s sort of like a levee along the river. If the levee is leaking and our pump is big enough, we pump the water back over the other side and there’s no problem. But if the leak becomes too big, the pumps won’t be able to keep up, and we get water over here. And that’s what happens with the surfactant; it progressively increases the permeability so more and more compound gets into the animal from the higher contaminant concentration in the diet in the intestine, increasing bioavailability. In a similar fashion, but with opposite results, surfactants prevent the transporter-mediated concentration of contaminants into the bile necessary for excretion. Leakage back from the bile lowers the amount of contaminant available for excretion. For both venues the net result is increased compound equivalents in the fish. Surfactants themselves, having low relative toxicity as a group and hence widespread use in shampoos, detergents and the like, could facilitate the toxicity of other chemicals potentially much more hazardous to the fish.”

Dr. John Hawke—Diagnostics

Dr. John Hawke, professor in the Department of PBS and section head of Aquatic Diagnostics within the Louisiana Animal Disease Diagnostic Laboratory, is perhaps best known as the discoverer of enteric septicemia of catfish and for describing the causative bacterium, *Edwardsiella ictaluri*, while working at Auburn University, Department of Fisheries and Allied Aquacultures in the late 1970s. He joined the SVM as a research associate in 1985. In September 2010, he received the S.F. Snieszko Award from the American Fisheries Society; this is the highest award in the Fish Health Section presented for the purpose of honoring individuals for outstanding accomplishments in the field of aquatic animal health.

Dr. Hawke is studying two pathogens new to the aquaculture industry in Louisiana: White Spot Syndrome Virus in crawfish, and a newly recognized subspecies of the bacterium *Francisella noatunensis*, which can cause high mortality in farmed tilapia.

White Spot Syndrome Virus (WSSV), so named because of the abnormal calcium deposits it causes on the shells of some species of infected crustaceans, is an important viral pathogen of cultured shrimp worldwide. Prior to 2007, however, no viral disease had ever been reported from crawfish in Louisiana or anywhere else in the United States. Then things changed.

“In the spring of 2007,” said Dr. Hawke, “we started receiving reports of several crawfish farms that were experiencing heavy mortality among their red swamp crawfish and white river crawfish. After we performed postmortem exams on the dead crawfish, we found microscopic evidence of a severe viral infection.”

WSSV in crawfish does not actually produce white spots on the shells, so it is difficult to recognize without laboratory testing. But affected crawfish appear weak and lethargic and cannot walk without losing their balance; as the virus invades multiple organ systems, they eventually die. After a survey revealed that crawfish from over 60 percent of the sites were infected with the virus, WSSV was declared endemic in Louisiana. Fortunately, the economic losses to the state’s $96 million crawfish industry from WSSV have not, to date, been too severe, but Dr. Hawke and the LADDL continue their research to learn more about this new pathogen and to work on developing a rapid test to detect the presence of the virus in crawfish.

Dr. Hawke also studies a bacterial disease of tilapia caused by *Francisella noatunensis*. This microorganism causes granulomatous inflammation of the internal organs and skin and is very closely related to the organism that causes tularemia in humans. So it is very possible that these studies in fish will lead to a better understanding of a disease in humans.

http://www.vetmed.lsu.edu/pbs/
Advanced Studies Program

Offering More than the DVM Degree

The School’s graduate program is an essential component and the lifeblood of the overall research program. Maintaining a solid base of 60 graduate students, the graduate program continues to enhance all aspects of LSU SVM research program. Our graduates are taking leadership roles in academia and industry, nationally and internationally. From the School’s inception, a total of 163 Master’s degrees and 186 PhD degrees have been awarded.

Comparative Biomedical Sciences
Graduate training in CBS offers the opportunity to specialize in one or more disciplines, including cell and molecular biology; cancer cell biology; toxicology, including inhalation toxicology; environmental health science and ecological chemistry; physiology; anatomy; and pharmacology. Faculty research interests and expertise include mechanisms of metastasis in cancer; gene therapy in cancer; cell and molecular biology of tooth eruption; pharmacology and toxicology of aquatic species; environmental and ecological toxicology; cellular ultrastructure; environmental risk assessment; analytical pharmacology and toxicology; diagnostic neurophysiology; pharmacology of pain and inflammation; exercise physiology; xenobiotic metabolism and disposition; neurochemistry; pulmonary pharmacology; cardiovascular disease; and cetacean morphology.

Pathobiological Sciences
This graduate education program attracts candidates with DVM or equivalent degrees and students with bachelor’s or master’s degrees in microbiological, immunological, zoological, and biomolecular sciences. The emphasis is on developing intellectual abilities and research skills through investigations of infectious diseases of food-producing, companion, and aquatic animals, as well as animal models for human disease. Graduate students may choose courses with an emphasis in immunology and molecular virology, bacterial or viral pathogenesis, or parasitology and parasite-induced diseases.

Veterinary Clinical Sciences
This department offers graduate students with a fundamental background in clinical sciences the opportunity to study disease problems in small, large, and exotic animals. Faculty of the department hold concurrent appointments in the Veterinary Teaching Hospital & Clinics where they provide in-depth clinical training to professional students while serving the animal health needs of the hospital’s clientele. Advanced training in clinical sciences prepares graduate students for careers in clinical research and teaching and administration of clinical trials in the private and governmental sectors.

http://www.vetmed.lsu.edu/svm_research.htm
The Student Summer Research Program provides students with a mentored research experience. The program is jointly supported by Merck/Merial and a National Institutes of Health training grant. LSU SVM has received full funding from Merck/Merial since this program was expanded in 2000. Only about half of all veterinary schools receive funding for this program from both Merck/Merial and the National Institutes of Health, and LSU SVM is one of those schools.

Lindsey Pelych is a member of the Class of 2013 from Chantilly, Va., and her project is entitled, “Exercise training and regulation of glycogen synthase kinase 3β in restoration of inflammatory cytokine imbalance present in heart failure.” Her faculty mentor is Dr. Joseph Francis, associate professor in the Department of Comparative Biomedical Sciences.

“We looked at the internal mechanisms in the heart to determine how exercise training reduces hypertension in rats,” said Pelych. The study looked at four groups of rats: the first group was hypertensive and got exercise, the second group was hypertensive and did not get exercise, the third group was non-hypertensive and got exercise, and the fourth was non-hypertensive and did not get exercise. The rats in the exercise groups were put on treadmills for 60 minutes for five days a week at moderate intensity. Pelych took all of the exercised rats’ blood pressures before they ran (a cuff is attached to the rat’s tail), as well as the blood pressures of the rats in the non-exercise groups. All of the data was evaluated after four weeks. This study concluded that rats that didn’t get exercise had high blood pressure, and the rats that did get exercise had lower blood pressure.

Pelych and Dr. Joseph Francis, associate professor in the Department of Comparative Biomedical Sciences and Pelych’s project advisor, also looked at the effects of this study on a cellular level. Hypertension increases inflammation in the heart cells, and this study showed that exercise decreases that inflammation.

http://www.vetmed.lsu.edu/svm_research.htm
Six core facilities, including the Microscopy Center, the FACS laboratory, the Cell and Organ Culture laboratory, the BSL-3 laboratory for select agents, the Division of Laboratory Animal Medicine, and the Division of Biotechnology and Molecular Medicine, provide unique services and equipment for faculty.

Microscopy Center
Within CBS, the Microscopy Center, directed by Dr. Xiaochu Wu, houses a superb array of equipment that includes a laser capture microdissection microscope, a confocal microscope, transmission and scanning electron microscopes, a fluorescent microscope, and a wide array of other imaging instrumentation.

Analytical Systems Laboratories
Analytical Systems Laboratories consist of three laboratories, all under the direction of Dr. Steven Barker. The Laboratory for Drug Residue Studies provides instrumentation and expertise for the performance of drug and biological molecule pharmacokinetics, metabolism, tissue distribution and analytical method development. The Equine Medication Surveillance Laboratory screens over 8,000 urine and blood samples per year and has developed sophisticated methodology for detection and confirmation of drugs and their metabolites. The Analytical Systems Laboratory houses advanced mass spectrometry and other analytical equipment that is used to support the research of LSU SVM faculty and graduate students.

Inhalation Research Facility
An Inhalation Research Facility directed by Dr. Arthur Penn enables studies to be conducted on the effect of various pollutants and other substances on a variety of diseases, including asthma and cardiovascular diseases.

Aquatic Toxicology Laboratories
The Aquatic Toxicology Laboratories include state-of-the-art aquatic animal holding, rearing, exposure, surgical, and preparative areas.

Division of Biotechnology and Molecular Medicine
BioMMED conducts innovative research to determine the molecular basis of various diseases as well as
to develop novel therapeutics for the treatment of cancer and infectious diseases. It provides centralized access to state-of-the-art equipment and advanced training in molecular and cell biology and also oversees three NIH:NCRR funded research cores: The Non-Human Primate Laboratory Core, the Molecular Biology and Immunology Core Laboratories, and a Louisiana undergraduate institution molecular and cell biology training core. BioMMED is comprised of five service-oriented centralized core laboratories: 1) GeneLab; 2) Cellular and Non-Invasive Whole Animal In Vivo Imaging Laboratory; 3) Bioinformatics, Computational, and Visualization Laboratory; 4) Viral Vector Laboratories; and 5) Protein and Antibody Production and Purification Laboratory.

Flow Cytometry Facility
Flow cytometry is a process in which individual cells or biological particles are labeled with fluorescent markers and pass in single file through a fluidic stream. While in this stream, the cells are hit by a laser beam resulting in emitted scattered visible light and fluorescence detection. Physical and chemical properties of cells or particles are then analyzed. Flow cytometric analysis has been performed on cellular elements, chromosomes, tumor cells, bacteria, and fungi. Immunophenotyping, cell cycle analysis, apoptosis studies, and measurements of cellular function are examples of its applications.

Gene Probes and Expression Systems Laboratory
GeneLab undertakes specific research and training projects that require expertise in gene cloning, PCR, DNA sequencing, cDNA library construction, gene expression, and other molecular methods. Computer analysis of DNA sequences as well as consultation on molecular biological research is provided.

Division of Laboratory Animal Medicine
DLAM serves as a central administrative division for the operation of two research animal holding facilities—LSU SVM Laboratory Animal Medicine Facility and the Life Sciences Animal Care Facility. DLAM purchases, maintains, and cares for all teaching and research animals housed within these facilities. The animal care facilities, equipment, and program are accredited by the Association for Assessment and Accreditation of Laboratory Animal Care International. DLAM’s objective is to maintain a fully accredited animal care program supporting teaching, research, and service.

http://www.vetmed.lsu.edu/svm_research.htm

Historically, libraries have been more like warehouses of information where patrons cautiously entered the seemingly endless rows of books and journals. Relying solely on library staff to navigate this maze, people would get what they needed and leave. In time the card catalog allowed people to find information on their own. The internet has opened the library doors, allowing patrons to access information from classrooms, offices, homes, and now even phones!

There is a lot of information online, but quantity does not always equal quality. The mission of the SVM Library continues to be the acquisition, description, dissemination, and preservation of quality information in support of the professional, graduate, and research programs. The Library takes a very active role in discerning the needs of the SVM and obtaining the tools to assist in the recruitment and retention of the highest quality faculty, staff, and students. In response to this shift in information access, the Library has evolved into a central part of the academic community offering patrons the opportunity to discuss common goals.

Though the cost to foster this community is great, the cost of losing it is far greater. Many of you have contributed to the SVM Library’s endowment, and we thank you. These monies are used to complement funding received from the SVM to purchase resources, train library staff, and pursue new opportunities of service to the SVM community. Continuing to grow and strengthen this endowment is essential not only to the success of the SVM Library, but to this sense of community that is the nucleus of the SVM program. The SVM Library staff is grateful for the opportunity to partner in the mission and vision of the SVM and we will continue, with your support, to maintain our high level of service and proactively find new ways to improve upon our long-standing tradition of excellence.

http://www.vetmed.lsu.edu/library/