



**VETERINARY MEDICINE  
& BIOMEDICAL SCIENCES**  
TEXAS A & M UNIVERSITY



# Graduate Student Handbook

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## 2012-2013

A resource guide for students pursuing a Master or Doctoral degree program in the College of Veterinary Medicine & Biomedical Sciences at Texas A&M University.

Office of Research and Graduate Studies

College of Veterinary Medicine & Biomedical Sciences

Veterinary Medicine Administration Building (VMA), Room 101

(979) 845-5092

<http://vetmed.tamu.edu/graduate>

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\* This edition of the CVM Graduate Student Handbook is abbreviated with only CVM related information for optimized size. Additional information found in the edition distributed at the New Graduate Student Orientation can be found through the additional links on the Student Resources website.

# College of Veterinary Medicine & Biomedical Sciences

## Overview

### Our Mission

At the Texas A&M College of Veterinary Medicine & Biomedical Sciences (CVM), we support collaboration and teamwork that develops today's discoveries into proactive solutions for the benefit of animal, environmental, and public health, through our teaching, research, and service.

### One Health Initiative

We are committed to the One Health Initiative, and we embrace our responsibility to the health of animals, humans, and the environment.

### Our Signature & Highlighted Programs

Our college's strategic plan has been developed around the concept of "signature programs," areas central to veterinary medicine and biomedical research wherein the college plans to build the nation's number one programs. Some of the programs are college-wide, while others fields have been identified by the faculty for signature program status-fields identified as exceptionally productive programs. Many of these programs represent collaborations in the CVM, across campus, across Texas, and throughout the nation and the world.

#### *Teaching*

- Doctor of Veterinary Medicine (DVM) Professional Program
- Biomedical Sciences (BIMS) Undergraduate Program
- Graduate Studies MS and PhD degrees
- Veterinary Medical Teaching Hospital (VMTH)


#### *Research*

- Biomedical Genomics
- Cardiovascular Sciences/Michael E. DeBakey Institute
- Infectious Diseases and Biodefense
- Neurosciences
- Reproductive Biology
- Toxicology, Oncology, and Environmental Health Sciences
- Veterinary Clinical Research

#### *Service*

- TAMU VET (Veterinary Emergency Team)
- Gastrointestinal Laboratory
- Schubot Exotic Bird Health Center
- Winnie Carter Wildlife Center
- Stevenson Companion Animal Life-Care Center
- The Texas Department of Criminal Justice (TDCJ) Senior Veterinary Rotation
- Center for Executive Leadership in Veterinary Medici

## Office of the Dean

		D.V.M. Auburn University B.S. University of Florida - Gainesville	<b>Carl B. King Dean of          Veterinary Medicine</b>
<a href="#">Eleanor Green</a>			
Office of the Dean Key Administrators			
Name	Title	Phone	E-mail Address
Eleanor Green	Dean	979-845-5053	<a href="mailto:EGreen@cvm.tamu.edu">EGreen@cvm.tamu.edu</a>
John Scroggs	Chief of Staff	979-845-8612	<a href="mailto:scroggs@tamu.edu">scroggs@tamu.edu</a>
Dianne Cornett	Assistant to the Dean	979-845-5053	<a href="mailto:DGCornett@cvm.tamu.edu">DGCornett@cvm.tamu.edu</a>
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Belinda Hale	Assistant Dean for Finance	979-845-5097	<a href="mailto:BHale@cvm.tamu.edu">BHale@cvm.tamu.edu</a>
Dana McMahan	Business Coordinator	979-845-5989	<a href="mailto:DMcMahon@cvm.tamu.edu">DMcMahon@cvm.tamu.edu</a>

## College Resources

### College of Veterinary & Biomedical Sciences Website

<http://vetmed.tamu.edu>

### College of Veterinary & Biomedical Sciences Calendar

<http://vetmed.tamu.edu/calendar>

### Medical Sciences Library

<http://msl.library.tamu.edu/>

As one of the libraries in the TAMU Libraries umbrella, the Medical Sciences Library has a wealth of information resources. It is one of the large veterinary medicine libraries in North America, and the resources are enriched as it also serves the Texas A&M University Health Science Center.

### Technology Access and Support

<http://vetmed.tamu.edu/support>

# Graduate Studies in the CVM

## Overview

The Graduate Studies programs in the CVM offers Master of Science and Doctor of Philosophy degrees that prepare students for further study as well as careers in academia, the pharmaceutical industry, state and federal research institutions, and private industry.

A major objective of graduate education in the CVM is to emphasize critical thinking, creativity, analysis, and good scientific judgment. The graduate faculty accomplishes this by fostering an atmosphere in the classroom and laboratory that is investigatory, challenging, confidence-building, and scholarly. They also help students develop their abilities to understand and critically evaluate the scientific literature in fields both within and outside their own personal research interests through lab meetings, journal clubs, classroom discussions of the primary literature, and individual discussions. The CVM has a vibrant research environment with state of the art equipment and technology. Our students are immersed in this stimulating environment and are poised to become successful researcher here with the strong mentorship of their faculty advisor.

Students are expected to take responsibility for their own learning, too, and are actively encouraged to attend seminars and participate in research symposia on campus as well as present at scientific meetings regionally, nationally, and internationally. The Associate Dean and team in the Office of Research and Graduate Studies support the CVM GSA Annual Research Symposium and additional graduate student enhancement activities, and many other opportunities exist for the presentation of each student's research to peers through oral or poster presentations.

## Programs of Study

**Biomedical Sciences** – offered by each Department in the CVM (MS Non-Thesis and Thesis Options, PhD)

**Epidemiology** – Department of Veterinary Integrative Biosciences (MS Thesis Option)

**Laboratory Animal Medicine** – Department of Veterinary Pathobiology (MS Thesis Option)



**Science & Technology Journalism** – Department of Veterinary Integrative Biosciences (MS Non-Thesis and Thesis Options)

**Veterinary Pathobiology** – Department of Veterinary Pathobiology (PhD)

**Veterinary Public Health** – Department of Veterinary Integrative Biosciences (MS Thesis Option)

*The College of Veterinary Medicine graduate faculty also mentors many students pursuing a degree in the interdisciplinary programs of [Genetics](#), [Neuroscience](#), and [Toxicology](#) (with the Department of Physiology and Pharmacology awarding the PhD in Toxicology).*

## Graduate Studies Administration & Department Contacts

	<p>Ph.D. Disease Genetics, University of Agricultural Sciences, Sweden  M.V.Sc. Animal Breeding &amp; Genetics, College of Vet &amp; Animal Sciences, Bikaner, India  BVSc&amp;AH Veterinary Degree, College of Vet &amp; Animal Sciences, Bikaner, India</p>	<p><b>Professor and Associate Dean for Research &amp; Graduate Studies</b></p>
	<p>Ph.D. Biochemistry, London University, UK  B.Sc. Microbiology, London University, UK</p>	<p><b>Professor and Assistant Dean for Graduate Studies</b></p>

Bhanu Chowdhary	Professor and Associate Dean for Research and Graduate Studies	979-845-5092	<a href="mailto:BChowdhary@cvm.tamu.edu">BChowdhary@cvm.tamu.edu</a>
Jane Welsh	Professor and Assistant Dean for Graduate Studies	979-462-4974	<a href="mailto:JWelsh@cvm.tamu.edu">JWelsh@cvm.tamu.edu</a>
Ashley Seabury	Program Coordinator for Research and Graduate Studies	979-845-6820	<a href="mailto:AGustafson@cvm.tamu.edu">AGustafson@cvm.tamu.edu</a>
David Kessler	Senior Academic Advisor for Research and Graduate Studies	979-845-6161	<a href="mailto:DKessler@cvm.tamu.edu">DKessler@cvm.tamu.edu</a>
Robin Benbow	Administrative Assistant for Research and Graduate Studies	979-845-5092	<a href="mailto:RBenbow@cvm.tamu.edu">RBenbow@cvm.tamu.edu</a>

### Veterinary Integrative Biosciences

<http://vetmed.tamu.edu/vibs>

107 VMA

979-845-2828

Our faculty and students are engaged in biomedical genetics, neuroscience, reproductive biology, toxicology, epidemiology, and public health.

#### Faculty Advisor

C. Jane Welsh, PhD

Professor

204 VRB

979-862-4974

[JWelsh@cvm.tamu.edu](mailto:JWelsh@cvm.tamu.edu)

#### Staff Advisor

Dana Parks

Assistant to the Department Head

107 VMA

979-845-3268

[DParks@cvm.tamu.edu](mailto:DParks@cvm.tamu.edu)

## **Veterinary Large Animal Clinical Sciences**

<http://vetmed.tamu.edu/vlcs>

204 LAH

979-845-9127

Areas of emphasis in the Department currently include: Equine reproduction, Large and small ruminant reproduction, Equine infectious diseases, Clinical epidemiology and patient-based studies, and Spatial analysis of health outcomes.

### *Faculty Advisor*

Noah Cohen, DVM, PhD

Professor

255 LAH

979-845-0741

[NCohen@cvm.tamu.edu](mailto:NCohen@cvm.tamu.edu)

### *Staff Advisor*

Rachael Sears

Office Associate for Administration & Graduate Studies

204 LAH

979-845-4731

[RSears@cvm.tamu.edu](mailto:RSears@cvm.tamu.edu)

## **Veterinary Pathobiology**

<http://vetmed.tamu.edu/vtpb>

119 VMS

979-845-5941

A major strength of the department is the number of diverse yet overlapping [research programs](#) in host/pathogen interactions and genetics of disease susceptibility and resistance. The graduate faculty are usually associated with more than one program, and several are also members of intercollegiate programs in [Genetics](#), [Virology](#) and in [Toxicology](#).

### *Faculty Advisor*

Patricia Holman, PhD

Research Associate Professor

318 VMA

979-845-4202

[PHolman@cvm.tamu.edu](mailto:PHolman@cvm.tamu.edu)

### *Staff Advisor*

Stevie Bundy

Graduate Administrative Secretary

119E VMS

979-845-2851

[SBundy@cvm.tamu.edu](mailto:SBundy@cvm.tamu.edu)

## **Veterinary Physiology and Pharmacology**

<http://vetmed.tamu.edu/vtpp>

332 VMA  
979-845-7261

The programs of study are focused on both veterinary and human physiology and pharmacology utilizing the unique aspects of each species to enhance our insights and understandings into basic processes in all other species.

### *Faculty Advisor*

Charles Long, PhD  
Associate Professor  
122 RSL  
979-845-2331  
[CLong@cvm.tamu.edu](mailto:CLong@cvm.tamu.edu)

### *Staff Advisor*

Yvonne Kovar  
Business Associate  
332 VMA  
979-845-7263  
[YKovar@cvm.tamu.edu](mailto:YKovar@cvm.tamu.edu)

## **Veterinary Small Animal Clinical Sciences**

<http://vetmed.tamu.edu/vscs>

2031 VSAH  
979-845-9053

Scholarly programs of the faculty are centered mainly on the study of the spontaneously occurring diseases of the patients presented to the Small Animal Clinic. Investigative programs are active in anesthesiology, animal behavior, cardiology, clinical nutrition, dermatology, feline internal medicine, gastroenterology, general surgery, G.I. Lab, internal medicine, neurology/neurosurgery, oncology, ophthalmology, and orthopedic and soft tissue surgery.

### *Faculty Advisor*

Jörg Steiner, PhD  
Professor  
B025 VSAH  
979-845-2351  
[JSteiner@cvm.tamu.edu](mailto:JSteiner@cvm.tamu.edu)

### *Staff Advisor*

Tricia Maginn  
Business Coordinator  
2031C VSAH  
979-845-9052  
[TMaginn@cvm.tamu.edu](mailto:TMaginn@cvm.tamu.edu)



## General Degree Information & Policies

### Degree Requirements

#### Master of Science (MS) Degrees

**Thesis Option:** A minimum of 32 semester credit hours of approved courses and research is required for the Thesis Option MS degree. Ordinarily, the student will devote the major portion of his or her studies in one or two closely related fields of interest.

**Non-Thesis Option:** A minimum of 36 semester credit hours of approved coursework is required for the Non-Thesis Option MS degree.

In accordance with University rules, there are limitations on the courses students pursuing an MS degree are allowed to use toward completion of their degree, including:

- Any combination of courses numbered 684, 685, 690, 691, and 695 cannot exceed 12 hours of the total credits applied to the student's degree.
- Thesis Option students may earn a maximum of 8 semester credit hours in the combination of courses numbered 684(Professional Internship) and 691 (Research).
- A maximum of 8 semester credit hours of 685 (Directed Studies) may be used for a MS.
- Up to 3 semester credit hours of 690 (Theory of Research) or 695 (Frontiers in Research) each may be used toward completion of the degree.
- A maximum of 2 semester credit hours of Seminar (681) may be applied to the degree.
- Non-Thesis Option (NTO) students cannot enroll in courses numbered 691 (Research) for any reason, and courses numbered 691 will not be used for credit toward a Non-Thesis Option Master of Science degree. NTO student may use a maximum of 4 hours of 684.
- Students are allowed to take a maximum of 9 credit hours at the 300 and 400 levels.

#### Doctor of Philosophy (PhD) Degrees

**64-Hour PhD:** Those students who completed a Master's, Doctor of Veterinary Medicine (DVM), or Doctor of Medicine (MD) degree at an institution in the United States must earn a minimum of 64 hours of approved coursework for a PhD.

**96-Hour PhD:** A minimum of 96 hours is required on the degree plan for PhD students who have completed a baccalaureate degree but not a master's degree.

### Curriculum

Each program of study for a graduate degree from the CVM tailors the curriculum in a way that provides a framework of fact and theory upon which students can build a knowledge base that allows them to be competent in their chosen field. Please consult your advisor and departmental guidelines when choosing coursework for your degree plan.

## Graduate Advisory Committee

### Chairperson

The chairperson of the student's Advisory Committee will guide the student in selecting appropriate coursework, approve all courses on the student's degree plan, and assist the student in meeting all deadlines. During the admissions process, the applicant to the Thesis Option MS and PhD degree programs will have identified the faculty mentor who serves as a chairperson of that student's Advisory Committee for their degree. Students entering the Non-Thesis Option MS in Biomedical Sciences must choose a faculty mentor/chairperson for their Advisory Committee before the end of the first semester of coursework. The chair or a co-chair of the student's Advisory Committee must be from the student's declared department.

### Committee Members

A student pursuing a **Master of Science degree** (Thesis and Non-Thesis Options), in consultation with the faculty mentor, will establish an Advisory Committee comprised of *no fewer than three members* of the graduate faculty representative of the student's fields of interest, with one of those members being the chairperson. The **Doctoral** student, in consultation with the faculty mentor, will form an Advisory Committee comprised of *no fewer than four members* of the graduate faculty representative of the student's fields of interest. *At least one of the* committee members must have an appointment to a department other than that through which the student is pursuing a degree. If a student is pursuing a graduate degree through an interdisciplinary program (Genetics, Neuroscience, Toxicology, etc.) then the outside committee member must have an appointment to a department other than that of the chairperson.

### Examinations

**Thesis Option:** Besides completing the minimum 32 semester credit hours of coursework, a Thesis Option student must submit a Thesis proposal and successfully pass the Thesis Defense/Final Exam. The Thesis proposal must be completed in a timely manner that allows for all necessary approvals and requirements to be met before the deadline set by the Office of Graduate Studies. A final exam is comprehensive and covers the thesis material and all coursework approved for the student's degree plan. The exam format is determined by the student's advisory committee. Some students may be eligible for an exemption and should consult the chair of the committee for further guidance. Information about the completing the Thesis is available in the Office of Graduate Studies section of this handbook.

**Non-Thesis Option:** Students pursuing the Non-Thesis Option are not required to complete a Thesis, but a final exam is required for all students completing this concentration. The exam will be comprehensive, covering the range of coursework approved for the student's degree plan, and the student's advisory committee determines the format of the exam.

**PhD:** To earn the PhD, students must successfully complete a required preliminary exam, a final exam, and the dissertation. A preliminary examination will be scheduled no earlier than a time in which the student is within 6 semester credit hours of completing all coursework approved for the degree plan. The preliminary exam will have a written and oral component unless otherwise approved. A student must successfully complete the final examination and dissertation within four calendar years of passing the preliminary examination. Please review the Graduate Catalog and department policies for further information about examinations and the dissertation.

## Graduate Faculty Members & Research Interests

### Veterinary Integrative Biosciences

**Abbott, Louise C.** – Developmental neurobiology of the mammalian nervous system; neuroanatomy; neurochemistry; specific neurologic disorders including cerebellar ataxia and spatial learning and memory; developmental neurotoxicology with special interest in mercury toxicity and autism; environmental influences on muscle development and the pathogenesis of neurodegenerative diseases with special interest in Alzheimer's disease; programmed cell death (apoptosis) in the developing and adult nervous system.

**Arosh, Joe** – Central role of prostaglandins on molecular and cellular aspects of reproductive processes, gynecologic diseases and endocrine cancers.

**Banu-Arosh, Sakhila K.** – Endocrine toxicology; endocrine oncology; reproductive toxicity of chromium-VI on ovarian development and function, pregnancy, and fetal development; vitamin C and nitrooxidants' intervention on heavy metal-induced toxicity; prostaglandin E2 biosynthesis, signaling and transport on mammary gland cancer development.

**Bazer, Fuller W.** (Joint Appointment) – Reproductive physiology; reproductive endocrinology; uterine biology; pregnancy; reproductive immunology; and fetal-placental development.

**Bratton, Gerald R.** – Gross anatomy; neuroanatomy; nutritional influences on lead intoxication; metal effects on reproductive function; localization of central nervous system neurons and their peripheral distribution.

**Budke, Christine** – Epidemiology; burden of disease indicators; zoonotic diseases (larval cestodes); transmission dynamics of parasitic diseases; international veterinary medicine and public health.

**Burghardt, Robert C.** – Cellular signaling and signal transduction; reproductive physiology; uterine biology, pregnancy and parturition; development/application on non-invasive imaging tools using biosensors and biomarkers; in vitro toxicology.

**Cai, James** – population genomics: theory, methods and applications; Evolutionary interpretation of genotype-phenotype map; scientific computing, algorithms, and software tools; genetic disorders and complex traits, interaction network, alternative splicing, and the evolution of gene expression.

**Chapkin, Robert S.** (Joint Appointment) – Chemoprevention; dietary effects on chronic inflammation, T-cell biology and colon cancer; plasma membrane microdomain organization and protein trafficking; functional genomics and systems biology.

**Chowdhary, Bhanu** – Comparative genomics of domesticated animals; molecular cytogenetics; equine genome analysis; physical and comparative gene mapping; disease genetics; molecular analysis of equine fertility; functional analysis of the equine genome.

**Cothran, Ernest (Gus)** – Heredity basis of equine congenital defects and economically significant traits in domestic animals (mainly the horse); interrelationships of inbreeding,

genetic polymorphism, and reproductive performance in horses; population genetics of feral horses; comparative aspects of genetics variation in horses under human selection and under natural selection; genetic aspects of captivity; genetics of domestication. Management of genetic polymorphism in small populations and conservation of rare breeds; genetic relationship among domestic horse breeds; changes in gene regulation based upon environmental factors; gene mapping of the horse.

**Cummings, Kevin** – My research focuses on the use of analytic and molecular epidemiology to study Salmonella and other foodborne pathogens at the pre-harvest level. Work is targeted at minimizing zoonotic transmission of pathogens that threaten food safety, as well as reducing disease burden among veterinary species. Additional areas of interest include emerging infectious diseases, antimicrobial resistance, and hospital biosecurity.

**Dees, W. Les** – neuroendocrinology; reproductive physiology; puberty and sexual maturation.

**Gastel, Barbara** – science journalism; medical journalism; science editing; scientific writing; international scientific communication.

**Geller, Susan C.** (Joint Appointment) – bioinformatics; statistics; commutative algebra I k-theory I cyclic homology.

**Ing, Nancy H.** (Joint Appointment) – molecular endocrinology, steroid regulation of gene expression, functional genomics, uterine and testis function.

**Ivanek-Miojevic, Renata** – Epidemiology and ecology of infectious and foodborne diseases; Addressing methodological research needs in epidemiology and ecology; Research at the interface between empirical and theoretical approaches to identify measures that would protect public and animal health; Analytical epidemiology; Mathematical modeling; Spatial epidemiology; Public health; Food safety; Risk assessment; Microarray analysis; Listeria monocytogenes; Escherichia coli; Salmonella spp.

**Johnson, Greg A.** – reproductive physiology; molecular, cellular, and physiological mechanisms that influence uterine function, conceptus development, and implantation/placentation in mammals.

**Johnson, Larry** – toxicology; histology; spermatogenesis; gamete physiology; gene expression of Sertoli cells; aging of the testis; seasonal reproductive changes; infertility in males and promotion of science in youth.

**Klemm, William R.** – neurobiology; neurophysiology; neuropharmacology; brain mechanisms of catalepsy; electroencephalography and cognition; educational technology.

**Ko, Gladys Y.-P.** – Integrating major research fields in neuroscience, pharmacology, neurotoxicology, chronobiology, cell and molecular biology, and signal transduction; research projects focusing on circadian regulation of ion channels and their functions in retina photoreceptors and cardiomyocytes, circadian regulation of metabolism and synaptic plasticity, and the roles of micro RNAs in circadian rhythms; techniques used in the lab including electrophysiological recordings, biochemical and pharmacological assays, and various techniques in molecular biology and morphology.

- Li, Jianrong** – mechanisms underlying the effects of neuroimmune molecules in the mammalian central nervous system on oligodendrocyte development, myelination, demyelination and/or remyelination. Interactions among oligodendrocytes, microglia, neurons and astrocytes under physiological and pathophysiological conditions, and identification of key targets for therapeutic approaches.
- Li, Qinglei** – female reproductive tract development; regulation of ovarian/uterine function; TGFbeta signaling pathway; gonadal tumor development.
- Lupton, Joanne** (Joint Appointment) – cell biology; digestive anatomy; physiological effects of dietary fibers; serum lipids; colonic physiology and morphology.
- McDonald, Thomas** (Joint Appointment) – complex mixture interactions; environmental sampling and remediation.
- McMurray, David N.** (Joint Appointment) – cell biology; immunology; infectious disease resistance; effect of nutrition on immunity; and experimental tuberculosis.
- Murphy, William** – Feline genomics; mammalian comparative genomics and genome evolution; mammalian molecular phylogenetics; sex chromosome genes and hybrid sterility.
- Pine, Michelle D.** – neurotoxicology; neuroendocrinology; the mechanism underlying the effects of pesticides (particularly synthetic pyrethroids) on neurodevelopment.
- Porter, Weston W.** – role of transcription factors in mammary gland development and breast cancer; stromal-epithelial interactions; environmental influences on development and breast cancer; mouse models.
- Ramanathan, Balaji** – Antiviral immunity, Innate immunity, Cancer, Drug discovery (Nanotechnology) and Stem cell research.
- Raudsepp, Terje** – reproduction genomics (horse); organization, function & evolution of mammalian sex chromosomes; animal cytogenetics & gene mapping.
- Reagor, John C.** (Joint Appointment) – clinical toxicology; nutritional toxicology; metal toxicology.
- Riggs, Penny K.** (Joint Appointment) – Functional genomics; skeletal muscle genomics (beef cattle); epithelial differentiation & inflammation; gene and genome structure & regulation, animal models of carcinogenesis.
- Russell, Leon H.** – epidemiology; medical mycology; zoonotic diseases (rabies); food toxicology.
- Samollow, Paul B.** – Comparative functional genomics; structural organization of genetic material and its relationship to patterns of gene regulation and expression within and among species. Population genomics: genetic and ecological processes that influence the distribution of genetic diversity within and among population subdivisions in nature, and their roles in promoting population structuring, isolation, and speciation. Research in my laboratory focuses primarily on the structure and function of the newly sequenced genome of the gray,

short-tailed opossum, *Monodelphis domestica*, a small South American marsupial that serves as the world's primary laboratory marsupial model for genomic, biomedical, and evolutionary research. Interest areas include linkage and physical map construction, EST discovery and documentation, genome annotation, epigenetic determinants in sex-specific patterns of meiotic recombination, the marsupial MHC and other immune-related gene families, QTL mapping, and comparative vertebrate genome structure.

**Skow, Loren C.** – Comparative genomics of mammals with emphasis on organization and evolution of the mammalian genome; molecular analysis of the major histocompatibility complex of hoofed animals; genetic mechanisms of inherent resistance to infectious diseases.

**Tiffany-Castiglioni, Evelyn** – cell biology; cellular mechanisms of neurotoxicity; functions of neuroglia; astroglial response to disease and trauma.

**Welsh, C. Jane** – Understanding the mechanisms involved in autoimmune diseases, neuroimmunology, neurovirology, psychoneuroimmunology, cell biology, viral infections of the central nervous system, animal models of multiple sclerosis, effects of stress on viral pathogenesis, cerebrovascular endothelial cells and blood-brain barrier function, therapies for multiple sclerosis, factors involved in susceptibility to multiple sclerosis.

**Welsh Jr., Thomas H.** (Joint Appointment) – endocrine physiology; investigate growth; stress; and reproductive biology; especially interactions of adrenal; reproductive and immune systems.

## **Veterinary Large Animal Clinical Sciences**

**Arnold, Carolyn** – Soft tissue surgery with an emphasis in upper airway and reproductive surgery and wound healing.

**Bissett, Wesley T.** – Investigation of the spatial distribution of adverse effects associated with exposure to industrial pollutants with an emphasis on genotoxicity in food animals and marine species. Investigation of adverse responses in sentinel species in close proximity to industrial and Superfund sites.

**Blanchard, Terry L.** – Stallion and mare fertility and infertility.

**Brinsko, Steven P.** – Equine reproduction; sperm membrane function; and semen preservation.

**Carter, G. Kent** – Equine lameness. Chaffm, M. Keith -Equine internal medicine; equine respiratory disease; equine pediatrics; equine ultrasonographic imaging; *Rhodococcus equi* foal pneumonia; equine infectious disease; equine gastrointestinal disease; equine urogenital disease; and equine neurologic disease.

**Cohen, Noah D.** – Equine epidemiology; equine infectious diseases; clinical epidemiology; genetic and molecular epidemiology.

**Dabareiner, Robin M.** – Joint pathology; degenerative joint disease; navicular diseases; corrective shoeing; microvascular pathology; equine lameness and gastrointestinal disease, i.e., colic; osteoarthritis; and western performance events.

**Dinges, Lewis R.** – Beef cattle production medicine.

**Dominguez, Brandon** – Third-party assessment of food animal health and welfare; prevention and control of disease in populations; surveillance of diseases between the domestic/wildlife interface, biosecurity in emergency response.

**Easterwood, Leslie** – Skin tumors in horses, and equine ophthalmology.

**Eichelberger, Bunita** – Musculoskeletal imaging, magnetic resonance imaging, computed tomography.

**Faries, Jr., Floron C.** – Clinical epidemiology, biosecurity, bovine parasitology, beef herd health management, and veterinary science youth career development.

**Gold, Jenifer R.** – Equine neonatology-specifically sepsis and the HP A axis; equine respiratory disease, equine immunology, emergency medicine and critical care.

**Griffin, Cleet** – Topics and clinical problems related to equine dentistry.

**Griffm, John F., IV.** – MRI of the nervous system and musculoskeletal system.

**Hardy, Joanne** – Gastrointestinal disorders in horses. Equine emergency and critical care. Equine guttural pouch mycosis.

**Hooper, R. Neil** – Soft Tissue Surgery.

**Love, Charles** – Equine reproduction; sperm function; evaluation of fertility; and flow cytometry.

**Martin, Michael T.** – Radiographic survey of dental disorder in miniature horses.

**Mays, Glennon B.** – Infectious disease epidemiology in livestock, theriogenology in livestock, and equine dentistry.

**Moyer, William A.** – Racetrack safety and design; foot problems and shoeing; musculoskeletal injuries; effects of training on injury.

**Norman, Tracy** – Equine internal medicine; equine diagnostic ultrasound.

**Posey, R. Dan** – Beef cattle production medicine; issues associated with sustainable agriculture; instruction and teaching of non-technical competencies, and outcome assessment in teaching.

**Rakestraw, Peter C.** – Post-operative complications of equine colic; gastrointestinal motility; postoperative ileus; upper airway disease in horses; equine pharyngeal cicatrix syndrome; wound healing in horses.

**Romano, Juan** - Pregnancy diagnosis in ruminants and pregnancy loss in ruminants.

**Roussel, Allen J., Jr.** - Paratuberculosis; gastrointestinal motility of domestic animals.

**Schmitz, David G.** – Diagnostic ultrasonography.

**Spaulding, Kathy** – Abdominal ultrasound: vascular anomalies; gastrointestinal abnormalities; biliary disease.

**Swor, Tamara** – Equine gastrointestinal and orthopedic surgery; equine emergency and critical care.

**Thompson, James A.** – Environmental health, reproduction and cancer.

**Varner, Dickson D.** – Fertility probes for stallions; in-vitro preservation of equine spermatozoa; capacitation of equine spermatozoa; assisted reproductive techniques; and subfertility in stallions.

**Washburn, Kevin E.** – Developing and investigating the disposition of extra-label antimicrobials in small ruminants; pharmacokinetics of respiratory antimicrobials; comparison of different treatment modalities for small ruminant caseous lymphadenitis; the value of the HI test for diagnosis of small ruminants with caseous lymphadenitis; diagnosis of transmission of CAEV via colostrum; and antemortem diagnosis of malignant lymphoma in cattle. Investigating infection of swine with *Mycobacterium avium* subspecies paratuberculosis in attempts to create an animal model for human inflammatory bowel disease.

**Watkins, Jeffrey P.** – Equine fracture management including: intramedullary interlocking nail fixation; fracture biomechanics; biomaterials; implant design and testing; arthrodesis techniques; management of infection; and orthopedic applications of stem cell therapy.

**Young, Ben** – Small animal abdominal ultrasonography; MRI of neurologic disease.

## **Veterinary Pathobiology**

**Adams, L. Garry** – Select agents -Intracellular bacterial pathogens -Brucella, Mycobacterium, Salmonella and Mycoplasma; infectious diseases; molecular mechanisms of host-pathogen interaction in immunity and disease; intracellular pathogens; molecular basis of disease resistance; macrophage function; molecular pathogenesis; comparative host-pathogen genomics, transcriptomics and proteomics; pathomics and interactomics; food animals; diagnostics; vaccines: therapeutics; biodefense; homeland security; BSL3 and BSL3Ag.

**Ball, Judith M.** – Our studies focus on the molecular and biochemical aspects of viruses, interactions of viral proteins with host cell moieties and intracellular transport. The overall goal of our work is to identify unique therapeutic targets for viral intervention. We employ a multitude of techniques such as yeast two-hybrid assays, laser-scanning confocal microscopic techniques (single and multiphoton), synthetic peptide chemistry, protein analyses and mutagenesis studies. Our primary interest is rotavirus, the single most important cause of pediatric, life-threatening gastroenteritis that annually claims ~610,000 young lives worldwide and results in hospitalization of 1 in 60 children in the U.S. at an annual cost of one billion dollars. We also study other viral systems that impact human and animal health



with a focus on dissecting the association viral proteins with plasma membrane microdomains, such as caveolae.

**Bazer, Fuller W.** (Joint Appointment) – Reproductive biology with emphasis on uterine biology and pregnancy. Mechanisms of action of pregnancy recognition signals from the conceptus to the maternal uterus, including interferon tau and estrogen from ruminant and pig conceptuses, respectively, are studied at the molecular and cellular levels. The roles of uterine secretions as transport proteins, regulatory molecules, growth factors and enzymes and endocrine regulation of their secretion is another major research interest. The endocrinology of pregnancy, especially the roles of lactogenic and growth hormones in fetal-placental development and uterine functions are being studied. The mechanism(s) of action and potential therapeutic value of conceptus interferons and uterine-derived hematopoietic growth factors are areas of research with both pigs and sheep as models for human disease.

**Berghman, Luc** (Joint Appointment) – Major long-term goals are (1) to acquire fundamental new knowledge of avian immune system and (2) to apply this new knowledge toward the development of novel immuno-biotechnological tools, such as vaccines, immunoassays and diagnostics. Basic avian immune studies include the study of cellular and humoral interactions, especially those involving the chicken professional antigen-presenting cells (APC)s (macrophages, dendritic cells and B-cells). This includes immunohistochemical micro-anatomical studies and the study of gene expression profiles. Immuno-biotechnological applications include the development of monoclonal antibodies (a routine procedure and hallmark of our lab), polyclonal antibodies and chicken egg yolk antibodies for diagnostic, prophylactic and therapeutic purposes. Current projects feature the development of antibody-targeted, "smart" vaccines and vectored vaccines, and the development of immunodiagnostic and analytical tools for the detection of a wide variety of molecules and microorganisms.

**Brightsmith, Donald J.** – Avian diseases; avian ecology; geophagy (consumption of soil); avian conservation; disease threats from the live bird trade; diets of wild and captive exotic birds; role of infectious diseases in wild and endangered bird populations. Specialization in psittacines (parrots, macaws, parakeets and allies).

**Caldwell, David J.** (Joint Appointment) – Avian immunology; gut immunology in commercial poultry; immunopotential of the innate immune system in poultry; immunity to important poultry pathogens such as Salmonella and Coccidia.

**Clubb, Fred** – Electron microscopic evaluation of myocardial and renal biopsies; qualitative and quantitative evaluation of implantable cardiovascular devices for nonGLP and GLP\preclinical trials.

**Conover, Gloria M.** – Our research is focused on the cell biology of muscle disease. Mutations in desmin have been identified in humans as causative for dilated and restrictive cardiomyopathies. Our goal is to decipher the molecular and regulatory mechanisms underlying how inherited single missense mutations in desmin lead to cardiac and skeletal muscle dysfunction. In particular, we are interested in studying the effect that these mutations have on sarcomere protein function and actin cytoskeletal dynamics. We use advanced cell

biological and biochemical approaches to investigate the histological, physiological and ultrastructural impact that these mutations confer in live muscle cells.

**Corapi, Wayne V.** – Diagnostic pathology and infectious diseases of domestic animals, particularly viral diseases and the immune response to viral infections.

**Craig, Thomas M.** – Primary interest is in the epidemiology and control of internal parasites of grazing animals, including improved diagnostics, evaluation of and sustainable use of anthelmintics. Anthelmintic resistance is an increasing problem. Identifying the problem before it occurs by looking at both the worm and the hosts are important aspects of this research. Exploitation of the parasite at times of vulnerability by management is an area of interest. Research in arthropod borne protozoan infections including pathogenesis and the epidemiology of parasites of man and domesticated animals is also something I do.

**Criscitiello, Michael** – I am interested in diverse mechanisms by which adaptive immunity can be mediated: novel receptors, novel cells, novel lymphoid architectures, novel paratopes and novel systems for repertoire generation and selection. These have been devised by natural selection and battle-tested in the myriad of vertebrate adaptive immune systems. By studying unconventional comparative models such as shark, shrimp, cattle and frog, hypotheses of immune system origins and natural history are tested while discovering new ways of achieving lymphocyte repertoires that protect against pathogens while limiting autoimmunity and hypersensitivity.

**Cyr, Tracy** – As a Med/Vet Entomologist, my research interests focus on vector borne diseases affecting humans and animals. I especially enjoy involving students in short-term directed scientific research projects with both field and lab components. My research studies include avian hemoprotozoan parasites and their insect vectors, epidemiology of fly vectors of EHD in white-tailed deer, and the utilization of molecular methods to identify flies of forensic importance.

**Dai, Susie Y.** – My research interests focus on several aspects: 1) Proteomics and interactomics in cancer and bioenergy. 2) Protein structure dynamics and structure-function relationship study with a focus in nuclear receptor and cellulase enzymes. 3) Biomonitoring programs which include analyzing veterinary drugs, mycotoxins, etc., in feed and food. We utilize a variety of techniques including shotgun proteomics, hydrogen deuterium exchange mass spectrometry and mass-spec based multiple target analysis. The major goals of the lab are: 1) Establish systems biology approaches to characterize and elucidate protein-protein interaction and mechanistic study of protein functions with the ultimate goal for novel therapies in cancer and breakthroughs for bioenergy production. 2) Develop methods for food and feed safety monitoring programs in a high throughput, multiple residue based fashion.

**Davis, Donald S.** – Infectious and parasitic diseases of native, exotic and/or feral wildlife captive or free-ranging, particularly those shared with traditional domestic livestock, farmed/ranched ungulates, and/or humans, with emphasis on experimental, controlled infections to evaluate improved diagnostics vaccines suitable for wildlife, and the systems to deliver chemotherapeutic agents or vaccines to wildlife. Development of handling and restraint

facilities appropriate for captive wildlife, and natural (genetic) disease resistance in wildlife. Brucellosis, tuberculosis, anthrax, hemaprotazon, trematodes, and nematodes.

**Derr, James N.** – Molecular genetics of mammals including; characterization of genetic traits and disease, population and conservation genetics, and the evolution of genes and genomes at the nucleotide level in domestic and wild populations.

**Dindot, Scott V.** – My laboratory is interested in understanding the epigenetic and genetic mechanisms of gene regulation and their role in development and disease. We utilize genome-wide epigenomic and genomic profiling approaches to identify regulatory elements within the genome that are essential for proper gene expression. We combine these approaches with genetic analyses in mouse and fruit fly model systems to further elucidate the functional interplay between epigenetics, genetics, and gene regulation. In particular, my laboratory is interested in (he study of genomic imprinting in domestic animals and model organisms. The long-term goals of my laboratory are to identify variable or dysregulated epigenetic modifications that are causal for phenotypic variation, disease, and disease susceptibility. Other work in my laboratory is to develop customized genomic tiling arrays to investigate the role of gene copy number variation in phenotypic variability in domestic animals and to identify pathologic rearrangements in the genomes of domestic animals to develop alternate models for human genetic conditions.

**Edwards, John F.** – Diagnostic pathology, infectious diseases of domestic livestock particularly of cattle and horses; in utero teratogenicity (viral and toxic), pathology of the reproductive system and infertility; diseases of the fetus and neonate; food safety of red meat species, pathology of animals at slaughter.

**Esteve-Gassent, Maria** – Understanding how *B. burgdorferi*, the causative agent of Lyme disease can spread from the site of the tick bite to other organs such as joints and heart. To do these studies we are incorporating the tick model together with the mouse model of Lyme disease.

**Ficht, Thomas A.** – Mechanisms of invasion and survival of intracellular bacteria within host cells; study of bacterial and host gene expression during infection and its use in the development and application of biosignatures; development of improved vaccines using genetic approaches to attenuate survival and identify therapeutic targets; development of subunit vaccines. Characterization of bacterial population structures through genomic analysis.

**Holman, Patricia J.** – Molecular mechanisms driving interactions between *Babesia* spp. and their hosts; characterization of potential vaccine or drug targets for babesiosis; molecular phylogeny of the hemoparasites; genetic basis of bovine resistance/susceptibility to ectoparasitism; development of molecular diagnostic tests for piroplasms.

**Jeter, Elizabeth** – Animal Shelter Medicine Participates in the veterinary student rotations at the Brazos Valley Animal Shelter.

**Johnson, Mark C.** – Professional courses in pathology and service/teaching responsibilities including clinical pathology hospital service. Diagnostic and investigative immunopathology with emphasis on immunohistochemistry and immunocytochemistry interpretations for characterization of lymphoma and other neoplasia.

**Kier, Ann B.** – Understanding the actions of intracellular lipid binding proteins in fat and carbohydrate metabolism: using biochemical, structural and molecular biological approaches, how these proteins affect lipid and sugar absorption and metabolism, and how they may serve as ligands for second messengers or activators for nuclear transcription factors. As well as in vitro studies, fat and sugar absorption, trafficking, and pathology are studied in genetically altered mice over expressing the respective proteins or in gene deleted mice in which these proteins are not expressed. Collaborative research: pathology of transgenic mice.

**Lawhon, Sara** – My work seeks to understand, on a molecular level, the interactions between the intestinal pathogen, *Salmonella enterica*, and mammalian hosts. I am particularly interested in how *Salmonella* spp. regulate their genes in response to environmental signals present in the gastrointestinal tract, the pathogenic mechanisms by which *Salmonella* spp. induce enteritis and diarrhea in mammalian hosts, and how the host responds to *Salmonella* infection. I am also interested in how *Salmonella* spp. survive in the external environment and are transmitted within populations of cattle and other mammals. As an outgrowth of my clinical interests, my research program has also begun to focus on understanding the carriage of *Staphylococcus* in veterinary species and the role of methicillin resistance on survival and virulence of commensal and pathogenic *Staphylococcus*.

**Leibowitz, Julian L.** – Replication and gene expression of corona viruses, particularly mouse hepatitis virus (MHV) and the SARS corona virus; the structure and function of the MHV and SARS corona virus untranslated regions (UTRs); the interaction of MHV and SARS coronavirus UTRs with host cell proteins; virus-host interactions; molecular pathogenesis of MHV induced hepatitis, demyelination (a model of multiple sclerosis), and pneumonia (a model for SARS); platforms for the development of anti-virals for SARS coronavirus; intracellular signaling and patterns of gene expression during corona virus infection.

**Libal, Melissa C.** – Epidemiology of infectious disease, antimicrobial sensitivity testing, bacterial antimicrobial resistance.

**Logan, Linda** – Has a longstanding interest in tropical diseases of livestock. Trans-boundary diseases, vector-borne diseases and blood borne parasites have been the areas in which I have had the greatest research interest and experience. My interests more recently have focused on regulatory medicine, international livestock disease control and international agricultural trade. I have worked collaboratively with international organizations to build stronger laboratory and epi-surveillance capacity building for livestock and zoonotic diseases in Africa and the Middle East and Central Asia.

**Lupiani, Blanca** – Research in my laboratory focuses on better understanding the ecology and evolution of avian influenza and avian paramyxoviruses. By carrying out surveillance and characterization of viruses isolated from wild bird populations from the wintering grounds of the Central Flyway (Texas Coast), we are able to better understand how these viruses are maintained in nature and how they evolve to adapt to new hosts. Molecular characterization of the viruses, together with ecological data are used for epidemiological and modeling studies. Another aspect of my research includes the study of molecular mechanisms of pathogenesis of avian influenza viruses. Using reverse genetics, specific mutations are introduced in the avian influenza virus genome in order to study their role in virus pathogenesis as well as to determine gene function. Using genomic approaches the host/virus

interaction is also being studied. We are also interested in understanding molecular mechanisms of pathogenesis of Marek's disease virus, a chicken oncogenic alphaherpesvirus, and in the development of improved vaccines to control this important poultry pathogen.

**Mansell, Joanne** – Comparative pathology with particular interest in dermatopathology. The effects of systemic disease on skin. The use of immunohistochemistry in neoplastic and inflammatory skin disease.

**Mora, Miguel** – My main research area is in wildlife toxicology. My laboratory conducts basic and applied research on the effects of contaminants on animal populations, with particular emphasis on birds. We conduct field and laboratory studies to determine the effects of persistent bioaccumulative toxicants, metals and other environmental pollutants on wildlife.

**Musser, Jeffrey** – Dairy production medicine, mastitis prevention and control, and quality milk production; pharmacokinetics in exotic and food animals and drug residue prevention.

**Mwangi, Waithaka** – Research is focused on development of biotherapeutics for livestock and humans. Studies are directed at optimizing *in vivo* antigen presentation by dendritic cells following immunization to enhance vaccine efficacy. In addition, strategies for induction and maintenance of memory cellular immune responses in outbred species are being evaluated. We are interested in defining key molecular processes involved in the development and regulation of innate immunity in an outbred species model and the influence of these processes on the development of adaptive immune responses to gain knowledge needed for adjuvant development. Interaction between dendritic cells and food animal pathogens, especially zoonotics, is an area under development and is expected to define correlates of protection needed for vaccine design. Major efforts are directed at generating efficacious vaccines for induction of protection against Bovine Viral Diarrhea Virus (BVDV) in neonates, *Clostridium perfringens*, and development of cross-protective vaccine against Foot and Mouth disease virus and Porcine Reproductive and Respiratory Syndrome Virus (PRRSV).

**Nabity, Mary** – Renal pathology and its relation to the urine proteome: evaluation of changes in urine proteins with naturally progressive renal disease, and identification of novel clinical biomarkers for early detection and progression of renal disease.

**Omran, Tawfik** – Immunopathogenesis and host immune response to infectious and noninfectious disease; signal transduction in inflammation. Specific interests include Lyme Disease (*Borrelia burgdorferi*) infection, pathogenesis, and vaccine studies in humans and animal models.

**Payne, Susan** – Molecular aspects of retroviral replication, pathogenesis, and evolution focusing on equine infectious anemia virus as a model system. Specific studies include: evolution of virulence during rapid virus passage, modification of cell signaling pathways mediated by viral glycoproteins, effects of proinflammatory cytokines on virus replication and disease, detailed mapping of EIA V virulence determinants.

**Pool, Roy** – Histopathologic diagnosis and investigations into the pathogenesis of spontaneous bone and joint diseases of domestic mammals with special interest in the diagnosis of bone

and joint tumors and in the diagnosis and pathogenesis of musculoskeletal disorders of athletic horses.

**Porter, Brian F.** – Comparative neuropathology; diseases of special interest include necrotizing meningoencephalitis of pug dogs and GM2 gangliosidosis in Jacob sheep; wildlife disease and environmental conservation.

**Reddy, Sanjay** – The long-term goal of my laboratory is to understand the molecular basis of pathogenesis of Marek's disease virus (MDV), a potent oncogenic herpesvirus that causes T-cell tumors in chickens. MDV codes for a protein (Meq), which shares significant resemblance with the Jun/Fos family of transcriptional factors. We have shown that this gene plays a critical role in latency and transformation of T-lymphocytes. Understanding the basic mechanism of viral pathogenesis will aid in the development of improved vaccine. We are also interested in other important poultry disease like avian influenza.

**Rice-Ficht, Allison C.** – Microencapsulation research and vaccine delivery vehicles; use of proteins and protein composites in controlled release for vaccines and pharmaceuticals. Mechanisms of protein folding directed by alpha crystallins and other small heat shock proteins. Mechanisms of genetic polymorphism and diversity among Mycobacterium avium paratuberculosis isolates; innate immunity and host gene expression in response to paratuberculosis infection.

**Rivera, Gonzalo M.** – The long-term goal of our research is to understand how extracellular signals control actin dynamics and cell motility. We are particularly interested in regulation mediated by signals that alter tyrosine phosphorylation and inositol phospholipids. Current research projects are aimed at elucidating the role of Src homology 2 (SH2) and SH3 domain-containing adaptor proteins in actin-driven protrusion formation, adhesion turnover and cell migration. These adaptors can bind tyrosine phosphorylated proteins via SH2 domain-mediated interactions and engage, through their SH3 domains, proline-rich effectors involved in cytoskeletal remodeling. It is hypothesized that the SH2/SH3 domain-containing adaptors play a critical role in cell migration by modulating, in space and time, the activation of key effectors involved in protrusion and adhesion dynamics. Our recent data also suggest that the SH2/SH3 domain-containing adaptors may be a critical link between signaling mediated by tyrosine phosphorylation and inositol phospholipids to the actin cytoskeleton. To test these hypotheses we employ a combination of genetics, cell biology and proteomic approaches coupled to high resolution imaging of living cells.

**Russell, Karen E.** – Platelet pathophysiology and the interaction of platelets with infectious agents, with an emphasis on the thrombocytopenia associated with Equine Infectious Anemia Virus. Investigation of platelet activation markers in veterinary species. Investigation of total and free (ionized) magnesium concentrations in veterinary species.

**Scanlan, Charles M.** – Ecology and pathogenesis studies of selected foodborne pathogens of food-producing animals and poultry and their potential role in human foodborne infections. Specific pathogens include selected Escherichia coli and Salmonella serovars, Campylobacter jejuni, Clostridium difficile and Clostridium perfringens. Investigations with a defined porcine culture with 15 bacterial species to prevent enteric bacterial infections in neonatal

piglets are being conducted. These investigations are a component of the commercialization process for this product.

**Seabury, Christopher M.** – Mammalian genetics, with emphasis on bovine and cervid genomics, population genetics, and animal disease genomics; utilization of population and quantitative genetics to elucidate host loci and relevant variation influencing differential susceptibility to disease among mammalian species.

**Smith III, Roger** – Application of flow cytometry to study of animal disease and clinical veterinary medicine; core flow cytometry laboratory.

**Snowden, Karen F.** – Parasites of public health importance, host-parasite interactions, development of animal models for the study of parasitologic diseases and treatments, and development of molecular and immunologic methods for parasitologic diagnosis.

**Steiner, Jorg** (Joint Appointment) – Studies in small animal and comparative gastroenterology as it relates to etiology, pathophysiology, diagnosis, and treatment of gastrointestinal disorders, using technologies such as protein purification, immunoassay development and validation, molecular genetics, and proteomics.

**Stoica, George** – Mechanism(s) of retro viral-induced neurodegeneration. Pathogenesis of brain and bone metastases of mammary gland tumors; application of flow cytometry in the study of tumors; lectin and immunohistochemistry; chemical carcinogenesis; animal models for retro virus-induced neoplasia. Genetic alterations in tumors of the nervous system. Investigation into the mechanism(s) of neurodegeneration associated with Ataxia telangiectasia disease in a mouse animal model. Application of non-invasive technologies in biomedical science. Use of molecular markers in non-invasive optical imaging technologies.

**Tizard, Ian R.** – Comparative avian and mammalian immunology and the evolution of the immune system. Avian diseases. Avian phylogeny. Role of infectious diseases in wild and endangered bird populations.

**Waghela, Surya** – Immunoparasitology; infectious diseases; emerging and foreign animal diseases, especially tick-borne diseases; use molecular biology techniques to develop better diagnostic tests and immunogens for infectious diseases in ruminants of tropical areas of the world; development of biopharmaceuticals and biosensors; engineer recombinant antibodies for diagnosis and prevention of infectious diseases.

**Wagner, G. Gale** – The molecular basis of virulence of protozoal parasites, including identification of functional antigens for serodiagnosis and immunization. Host-parasite interrelationships, especially the role of the vector (if involved) in promoting infection, and in the prevalence and incidence of infections in areas of low vector populations.

**Weeks, Bradley R.** – Diagnostic anatomic pathology; collaborative research of inflammatory and neoplastic gastrointestinal disease, and cardiovascular disease. Veterinary medical education, particularly general pathology.

**Wells, Gregg B.** (Joint Appointment) – Role of protein structure in disease, particularly in neurological disease; structure and function of the superfamily of neurotransmitter-gated ion

channels that includes nicotinic acetylcholine, serotonin 5HT<sub>3</sub>, glycine, and GABA<sub>A</sub>,C receptors from eukaryotes and prokaryotes; interpreting electrophysiological properties of ligand gated ion channels in terms of structure and thermodynamics; computational models of functions of mechanotransduction channels and calcium and potassium ion channels to explain electrophysiological function of cochlear hair cells; clinical neuropathology.

**Welsh, C. Jane** (Joint Appointment) – Mechanisms by which viruses cause autoimmune diseases. Multiple sclerosis (MS) and Theiler's virus-induced demyelination (TVID) as a model of MS. Blood-brain barrier function. The role of stress in the neuropathogenesis of TVID. Novel therapies for the treatment of MS.

**Womack, James E.** – Comparative mammalian genomics with emphasis on bovids and laboratory animals. Study of evolution of gene families and genomic variation underlying disease resistance. Investigation of genetic mechanisms in innate immunity with focus on livestock, select agents, and agricultural biosecurity.

**Zhang, Shuping** – My research focuses on the mechanisms of pathogenesis, with particular emphasis on pathogen-host interactions between Salmonella and avian/bovine/murine host species. My laboratory has established and utilized different in vivo and in vitro infection models to characterize the host immune responses to Salmonella enterica, Mycobacterium paratuberculosis, and Cryptococcus neoformans at the cellular and molecular levels. A second line of research is data and need driven clinical investigations. My clinical/diagnostic laboratory has been routinely analyzing cases of infectious diseases; characterizing clinical bacterial, fungal, and viral isolates; and developing new diagnostic tests. As the Director of the Clinical Microbiology Laboratory, I also provide consultations to clinical faculty, clients, and residents.

**Zhu, Guan** – Molecular biology, biochemistry and pathogenesis of parasitic protists; biosynthesis and metabolism of primary and secondary metabolites (lipids, carbohydrates, and polyketides, etc.) in apicomplexan parasites (Cryptosporidium, Eimeria and Toxoplasma); molecular interactions between parasites and host cells; DNA replication and regulations associated with the complex life cycle of apicomplexans; discovery and validation of molecular targets for the drug development against parasites; molecular phylogeny and evolution of apicomplexans.

## **Veterinary Physiology and Pharmacology**

**Bailey, E. Murl** – toxicology; veterinary toxicology; toxic plants; wildlife, and environmental toxicology; anesthesiology; pharmacology; experimental surgery; clinical medicine; emergency medicine, bioterrorism, weapons of mass destruction.

**Blue-McLendon, Alice** – veterinary physiology, avian reproductive physiology, medicine of exotic animals, management of exotic animals teaching and research projects.

**Cudd, Timothy A.** – Dr. Cudd is an active researcher in the field of Fetal Alcohol Spectrum Disorders (FASD) which is the full collection of fetal abnormalities that can occur when a woman abuses alcohol during pregnancy. It is estimated that 2-5% of children born in the



United States are affected resulting in significant societal costs. Specifically, Dr. Cudd uses sheep to model this condition and is interested in identifying the basic pathological mechanisms responsible for causing these disorders, how to better identify these disorders in children and ways to prevent or reduce the negative impact of prenatal alcohol exposure.

**Fajt, Virginia** – Clinical pharmacology, antimicrobial therapy and dose design, pharmacokinetics and pharmacodynamics, food animal therapeutics, evidence-based medicine, teaching and outcomes assessment in pharmacology.

**Golding, Michael C.** – epigenetic mechanisms that control retroviral elements and other parasitic DNA within the mammalian genome; applications using retroviral vectors to make transgenic animals; function of non-coding RNAs.

**Han, Guichun** – Cardiovascular physiology; vascular physiology and pharmacology, especially signaling pathways for estrogen and selective estrogen receptor modulator (SERM) effects on coronary artery; molecular mechanisms of estrogen receptors in vascular remodeling and hypertension.

**Heaps, Cristine** – Cardiovascular physiology and pathophysiology; effects of coronary artery disease and exercise training on smooth muscle and endothelial function in the coronary circulation.

**Herman, James** – evaluation of student and instructor performance; optimization of curricula and the learning environment; modeling behavior of complex systems; application of technology to the classroom.

**Hinrichs, Katrin** – equine reproductive physiology; oocyte maturation; fertilization; nuclear transfer; early developmental biology of equine embryos; and assisted reproductive techniques.

**Hood, David M.** – physiopathology of the digital cutaneous circulation.

**Hunter, Jon F.** – experiential learning in the physiology laboratory teaching environment; preparing undergraduate students for professional and graduate programs and careers in the allied health professions; development of products and the application of technology to enhance teaching and learning.

**Ivanov, Ivan V.** – Clinical pharmacology, antimicrobial therapy and dose design, pharmacokinetics and pharmacodynamics, food animal therapeutics, evidence-based medicine, teaching and outcomes assessment in pharmacology.

**Jones, Daniel H.** – veterinary and environmental toxicology.

**Kraemer, Duane C.** – gamete and embryo physiology; embryo transfer, cloning, genetic engineering of mammals; preservation of endangered animals; contraception in animal pests.

**Laine, Glen A.** – emergency and critical care medicine in trauma patients; biophysics and bioengineering; quantitative analysis of biological systems; fluid resuscitation; abdominal compartment syndrome; myocardial and pulmonary edema; cardiopulmonary bypass; lymphatic function; edema formation and interstitial fibrosis.

**Long, Charles** – developmental biology, gamete and embryo physiology, embryonic stem cells, assisted reproductive technologies, animal transgenics, somatic cell nuclear transfer, epigenetics and control of gene expression, RNA interference.

**Quick, Christopher M.** – cardiovascular engineering, modeling and simulation; interstitial fluid balance; lymphatic function, arterial hemodynamics and pulse wave phenomena; coordination of vascular adaptation in vascular networks.

**Safe, Stephen H.** – toxicology and molecular biology of estrogenic and antiestrogenic compounds; molecular mechanisms of estrogen receptor and Ah receptor action and their crosstalk in breast cancer cells, PPAR $\gamma$  agonists and inhibition of cancer cell growth.

**Schroeder, Friedheim** – intracellular lipid transfer proteins; lipid metabolism; multiphoton imaging of intracellular lipid transport and targeting in living cells and tissues of gene targeted animals.

**Scott, Maya** – Clinical pharmacology; therapeutic drug monitoring; pharmacology instruction; small animal therapeutics; adverse drug events; in vitro-in vivo correlation of drug-induced toxicity.

**Stallone, John** – vascular physiology and pharmacology; endocrinology; hypertension; gonadal steroid hormone regulation of vascular function, especially eicosanoid and nitric oxide interactions between vascular smooth muscle and endothelium.

**Stewart, Randolph** – cardiovascular physiology; lymphatic function; microvascular physiology; interstitial and cavity fluid balance.

**Tian, Yanan** – epigenetic mechanisms of gene-environment interactions with emphasis on signaling cross-talk between nuclear receptor (PXR and AhR)-regulated detoxification pathways and NF-KB-regulated inflammatory pathways.

**Wasser, Jeremy S.** – cardiovascular physiology; biological applications of magnetic resonance spectroscopy; comparative physiology of acid-base balance; mechanisms of hypoxia tolerance.

**Westhusin, Mark E.** – gamete physiology; developmental biology; embryo physiology; assisted reproductive techniques; in vitro fertilization; embryo transfer; cloning animals by nuclear transplantation, genetic engineering in animals, epigenetics and control of gene expression, RNA interference.

**Wilson, Shannon** – Fetal Alcohol Spectrum Disorders (FASD) mechanisms; neuroimaging and nutritional interventions for FASD; clinical medicine; pharmacology; pathophysiology; teaching methods and learning in the professional program.

**Zhou, Beiyan** – molecular genetics; genetic mapping of loci!genes underlying economic traits in poultry; molecular mechanisms of host defense against pathogens; identification and characterization of avian genes associated immunity; and phenotypic definition of genetic resistance to avian diseases.

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## **Veterinary Small Animal Clinical Sciences**

**August, John R.** – feline internal medicine; distance education; educational technology.

**Barr, James W.** – Mechanical ventilation; coagulation; fluid therapy; cytokine response in sepsis.

**Barton, Claudia L.** – oncology; small animal reproduction; aspiration cytology.

**Bauer, John E.** – nutrition; lipid biochemistry; disorders of lipid metabolism; obesity; weight management.

**Beaver, Bonnie V.** – normal and abnormal domestic animal behavior; human-animal interrelationships; animal welfare.

**Black, Dorothy M.** – sepsis; infectious disease; coagulation; critical case management.

**Carroll, Gwendolyn L.** – anesthesiology; assessment of pain and stress; feline osteoarthritis; rehabilitation and recovery.

**Cook, Audrey** – endocrinology; gastroenterology; endoscopy and interventional radiology.

**Crist, M.A.** – anesthesiology; physical medicine; rehab; pain management; dentistry; nutrition.

**Davidson, Jacqueline R.** – physical rehabilitation; pain management; soft tissue surgery; orthopedic surgery.

**Diesel, Alison** – Inflammatory skin conditions in animals, particularly feline allergic skin disease; skin associated side effects of radiation therapy.

**Dodd, Johnathon** – dentistry.

**Dziezyc, Joan** – ophthalmology; ophthalmic surgery; ocular ultrasonography; ocular inflammation.

**Eckman, Stacy L.** – feline medicine; zoonotic diseases of companion animals; preventative medicine.

**Fossum, Theresa W.** – cardiovascular surgery; myocardial ischemia and angiogenesis; cardiac assist devices; cardiopulmonary bypass; hypertension; canine chronic degenerative valve disease; canine cardiomyopathy.

**Gordon, Sonya G.** – canine chronic degenerative valve disease; cardiovascular imaging; interventional cardiology; cardiac clinical trials.

**Griffin, Sarah C.** – emergency medicine; feline medicine; preventative medicine.

**Hartsfield, Sandee M.** – Anesthesiology; cardiopulmonary effects of anesthetics; anesthetic equipment.

**Heatley, J. Jill** – fluid therapy; emergent & critical care; electrolytes of nondomestic species; wildlife population health biomonitoring.

- Hobson, H. Phil** – upper respiratory system; reconstructive surgery; urogenital surgery.
- Hoppes, Sharman M.** – avian and exotic analgesia; proventricular dilation disease; aflatoxins in birds.
- Howe, Lisa M.** – upper respiratory disease; soft tissue surgery; prepubertal gonadectomy.
- Hulse, Donald A.** – comparative orthopedics; biodegradable implants; biomechanics of fracture fixation.
- Kerwin, Sharon C.** – Orthopedic and neurosurgery; canine and feline lameness; osteoarthritis, fracture fixation, spinal surgery, and intervertebral disk disease.
- Lees, George E.** – Urinary tract diseases and renal pathology in companion animals; canine hereditary nephritis.
- Levine, Jonathan M.** – Neurology/neurosurgery; spinal cord injury; intervertebral disk herniation; Neuro-oncology.
- Loria Lepiz, Mauricio** – anesthesiology; cardiovascular & respiratory physiology; monitoring technology-anesthesia and critical care.
- Martinez, Elizabeth A.** – anesthesiology; cardiopulmonary physiology; neuromuscular blocking agents.
- Matthews, Nora S.** – anesthesiology; analgesics; equine cardiovascular physiology; donkeys and mules.
- McDonald, Darryl** – soft tissue surgery; reconstructive surgery; surgical oncology; external skeletal fixation.
- Miller, Matthew W.** – cardiology; cardiomyopathies; interventional catheterization; vascular stenting; ventricular assist devices; catheter based therapy of vascular malformations; hemorrhagic shock, animal models of cardiac disease.
- Nelson, David A.** – cardiothoracic surgery; thoracoscopic surgery; cardiopulmonary bypass; cardiovascular assist device development; effects of time varying electromagnetic fields on bone healing; anti-coagulation therapy.
- Patterson, Adam P.** – Dermatology; allergic skin disease; otitis; cutaneous infections; autoimmune skin disease.
- Peycke, Laura E.** – soft-tissue surgery; gastrodilatative volvulus.
- Saunders, Ashley B.** – Congenital heart disease; interventional cardiology; transesophageal echocardiography; heart failure management.
- Saunders, W. Brian** – joint replacement; arthroscopy; molecular aspects of osteoarthritis and fracture repair; cell-matrix interactions; MMPs.

**Steiner, Jörg M.** – small animal and comparative gastroenterology as it relates to etiology, pathophysiology, diagnosis, and treatment of gastrointestinal disorders.

**Stickney, Mark J.** – elective surgery; pain management; mammary cancer; electrosurgery and laparoscopic surgery.

**Suchodolski, Jan S.** – comparative gastroenterology; intestinal microbial ecology; molecular microbiology.

**Willard, Michael D.** – gastroenterology; internal medicine; fiberoptic and rigid endoscopy.

**Wilson, Heather M.** – Congenital heart disease; interventional cardiology; transesophageal echocardiography; heart failure management.

**Witsberger, Tige H.** – Orthopedic surgery; fracture fixation; arthroscopy; minimally invasive surgery (laparoscopy and thoracoscopy); intervertebral disk herniation.

**Zoran, Debra L.** – nutrition; GI; feline medicine.

## Graduate Courses in the CVM

### Department of Veterinary Integrative Biosciences

L. C. Abbott, J. A. Arosh, S. K. Banu, F. W. Bazer, G. R. Bratton, C. M. Budke, R. C. Burghardt, J. Cai, B. P. Chowdhary, E. G. Cothran, E. M. Crouch, K. J. Cummings, W. L. Dees, R. H. Finnell, G. T. Fosgate, B. J. Gastel, S. C. Geller, S. A. Hamer, P. G. Harms, A. G. Hoffman, M. A. O. Höök, N. H. Ing, R. Ivanek Miojevic, L. A. Jaeger, G. A. Johnson, L. Johnson, W. R. Klemm, G. Y. Ko, F. H. Landis, J. Li, Q. Li, J. R. Lupton, D. N. McMurray, R. B. Mouneimne, W. J. Murphy, B. Norby, T. D. Phillips, M. Pine, W. W. Porter, T. Raudsepp, J. C. Reagor, L. H. Russell, Jr., P. B. Samollow, H. M. Scott, L. C. Skow, M. R. Slater, J. R. Snell, J. M. Steiner, E. Tiffany-Castiglioni (Head), A. R. Villalobos, M. P. Ward, C. J. Welsh\*, T. H. Welsh, Jr.

\* Graduate Advisor

The departmental graduate programs are aimed at educating students to be able to advance biomedical science through original research and to disseminate that knowledge for the protection and promotion of animal and human health. The department offers both MS and PhD degrees in Biomedical Sciences (with major specialty areas of cell/molecular biology, developmental biology/embryology, epidemiology, reproduction and neuroscience). MS degrees are also offered in Veterinary Public Health-Epidemiology and Science and Technology Journalism.

Many of the faculty participate in University-wide graduate training programs in Neuroscience, Reproductive Biology, Food Science and Technology, Genetics, Toxicology and Biotechnology.

In addition to the specialty area research training, students have the opportunity to learn anatomy and public health practices in a variety of domestic species and wild, aquatic and laboratory animals. The training in microscopic anatomy includes histology, histochemistry, cytology and ultrastructure (transmission and scanning electron microscopy). The training in public health emphasizes epidemiology, food safety, food toxicology and control of zoonotic diseases.

The Master of Science in Veterinary Public Health-Epidemiology is designed to serve the needs of veterinarians wishing to go into some aspects of government service, military veterinary personnel seeking advanced training in public health and students with a career goal of academia or research. The Master of Science in Science and Technology Journalism (MS/STJR) is a distinctive program to prepare students for careers as science and technology writers, reporters and editors in the public media, government, industry, academia and other sectors. It also can serve as a foundation for doctoral study.

Study programs are prepared in consultation with the student and a committee of graduate faculty members and its chairperson. The general procedural rules are those specified in this catalog. More detail on core course requirements, degree plans, and administrative matters is available in the department's "Guidelines and Policies" manual.

### Veterinary Integrative Biosciences (VIBS)

**601. Anatomy. (2-6). Credit 4 each semester.** Topographical dissection of one of the following domestic animals: horse, ox, dog or cat. May be taken more than once but not to exceed 12 hours of credit toward a graduate degree. Prerequisite: VIBS 912 or VIBS 305 or equivalent.

**602. Histology. (2-6). Credit 4.** Molecular phenomena placed in context with tissues, organs and organ systems; cell and tissue structures visualized by light microscopy and electron micrographs for functional relationships; clinical correlations reveal relevance of histology in specific disease states; conceptual thinking exercises facilitate problem-solving skills. Prerequisite: Graduate classification.

**603. Neuroanatomy. (2-6). Credit 4.** Gross, developmental and microscopic anatomy of nervous system of selected laboratory and domestic animals. Prerequisite: Approval of instructor. Cross-listed with NRSC 603.

**604. Biomedical Neuroendocrinology and Endocrine Disorders. (3-0). Credit 3.** Gross and functional anatomy and endocrine functions of neuroendocrine systems, hypothalamus and pituitary. Neuroendocrine control of puberty, sexual behavior, menstruation, ovulation, pregnancy, labor, lactation, testis, thyroid, growth, stress, diabetes, obesity, sleep, memory, learning and aging and their disorders. Overview biosynthesis, transport and signaling of neuropeptides, prostaglandins, peptide and steroid hormones. Prerequisite: Approval of instructor. Cross-listed with NRSC 604.

**605. Chemical Hazard Assessment. (3-0). Credit 3.** Chemical and biological methods for testing hazardous chemicals and complex mixtures; chemical analysis; microbial bioassays; developmental toxicity; enzyme induction; mammalian cell culture. Prerequisite: Graduate classification.

**606. Neuroanatomical Systems. (3-0). Credit 3.** Course emphasis is on major neural systems that govern identifiable physiological functions, behavior and neurodegenerative disease. Whole-brain anatomy is approached from a "systems" perspective, wherein components of defined functional systems are described in terms of their location, inputs and outputs, and physiological /behavioral significance in health and disease. Prerequisite: Approval of instructor. Cross-listed with NRSC 605.

**607. Applied Epidemiology. (3-3). Credit 4.** An introductory course of the application of epidemiological concepts to the study of disease occurrence in populations of lower animals and man. The purpose of epidemiology is to identify the host, agent and environmental determinants and dynamics of disease spread that provide the basis for successful preventive medicine and public health programs.

**608. Epidemiology Methods I. (3-3). Credit 4.** Epidemiology concepts and methods used in the investigation of determinants of health or disease in populations; stressing basic methods for experimental design, conduct and analysis of both observational and experimental studies. Prerequisite: STAT 651 or equivalent.

**609. Anatomy of Reproductive Systems. (2-6). Credit 4.** Gross and microscopic anatomy of the reproductive systems of domestic animals. Prerequisite: VIBS 601 or VIBS 602 or VIBS 910 or equivalent. (Offered in alternate years.)

**610. Epidemiologic Methods II and Data Analysis. (3-3). Credit 4.** Principles and methods for the analysis of data from epidemiologic studies including the purpose of data analysis and role of statistics, sampling distributions, probability distributions, analysis of crude, stratified and matched data, and the use of linear and logistic regression methods. Prerequisites: VIBS 608 and STAT 651 or approval of instructor.

**611. Tumor Cell Biology and Carcinogenesis. (3-0). Credit 3.** Basic principles of tumor biology; role of gene-environment interactions; molecular mechanisms regulating cancer initiation and progression; therapeutic treatment of cancer. Prerequisites: BIMS 320 or equivalent; graduate classification.

**612. Mammalian Embryology. (3-0). Credit 3.** Embryology of domestic mammals; gametogenesis, fertilization, cell proliferation and differentiation, and organogenesis; selected commonly occurring congenital defects of domestic animals used to emphasize embryologic sequences and processes. Prerequisite: Approval of instructor.

**614. Biodegradation and Bioremediation. (3-0). Credit 3.** Processes affecting the biodegradation of organic chemicals in the environment; assessment of the utility of various remedial procedures, including biodegradation and bioremediation; in site specific situations. Prerequisite: Organic chemistry. Cross-listed with SCSC 614.

**615. Food Hygiene. (3-3). Credit 4.** The clinical description, pathogenesis, diagnosis, source, epidemiology and prevention or control of food borne diseases caused by biological, chemical and natural hazards. Prerequisite: Graduate classification.

**616. Advanced Developmental Neurotoxicology. (3-0). Credit 3.** Study of mechanisms of toxicity of substances potentially devastating to the developing brain and spinal cord including lead, mercury and other heavy metals, alcohol, nicotine (smoking), pesticides, flame retardants, and others. Prerequisite: Approval of instructor.

**617. Cell Biology. Credit 1 to 5.** Series of five 1-hour credit modules focusing on selected aspects of structure, function, and signal transduction in eukaryotic cells through critical analysis of recent literature in the field. Each module listed as separate course section; students may enroll in up to five 1-hour module sections per semester. Prerequisite: Approval of instructor.

**618. Food Toxicology. (3-0). Credit 3.** The study of food additives, chemical and microbial contaminants, and naturally occurring toxins associated with foods. Prerequisite: Graduate classification.

**619. Food Toxicology II. (3-0). Credit 3.** Public health implications of toxic factors in foods, their source, nature, occurrence and distributions; emphasis on mycotoxins including their isolation, detection, identification and toxicology; study of state-of-the-art food safety research techniques. Prerequisite: Graduate classification.

**620. Cytogenetics. (3-0). Credit 3.** Examination and analysis of variation in chromosome structure, behavior and number; developmental and evolutionary effects of this variation. Prerequisite: GENE 603. Cross-listed with GENE 620.

**628. Scanning Electron Microscopy. (2-4). Credit 3.** Principles of electron interaction with solids; application of secondary and backscatter electron images. Prerequisite: Approval of instructor one semester prior to registration.

**633. Animal Diseases in Comparative Medicine. (3-0). Credit 3.** The study of major zoonotic diseases, including frequency of occurrence, clinical signs, diagnosis, epidemiology, bioterrorism concerns and the prevention or control in animals and humans. Prerequisite: Graduate classification.

**640. Neurobiology. Credit 1 to 5.** Biology of the mammalian central nervous system with emphasis on cellular and molecular interactions; contemporary research topics in areas such as neuron-glia interactions, neuroimmunology, neuroendocrinology, developmental neurobiology and neurogenetics; extensive readings from primary literature. Prerequisites: Undergraduate or graduate cell biology, genetics and biochemistry or approval of instructor. Cross-listed with NRSC 640.

**650. Education in a Veterinary Medical and Biomedical Environment. Credit 1 to 3.** Philosophical, stylistic and methodological consideration for designing, planning implementing and evaluating effective veterinary medical and biomedical teaching and learning. Orientation for graduate school. Prerequisite: Graduate classification.

**655. Methods of Specialized Journalism. (3-0). Credit 3.** Writing and placement of magazine and journal articles in specialized areas of media content such as agriculture, ecology, science, business, education, natural resources; individual projects directed to student's field of interest.

**657. Issues in Science and Technology Journalism. (3-0). Credit 3.** Current issues, fundamental concepts in science and technology journalism, communication theory, science and journalism components, philosophy and literature of the field.

**658. Research Methods in Science and Technology Journalism. (3-0). Credit 3.** Research methods including theory, hypothesis formulation, design, data collection, data analysis, measurement and report writing. Qualitative and quantitative methods. Research topics.

**660. Reporting Science and Technology. (3-0). Credit 3.** Gathering, writing and editing complex information, translation techniques, interpretation and analysis, literary and organizational devices and measurement of readability.

**662. Reporting Science Policy. (3-0). Credit 3.** Analysis and reporting of legal, political, economic and business issues in science and technology, public policy-making processes and procedures, interdependence of science and technology, and public policy.

**663. Biomedical Reporting. (3-0). Credit 3.** Sources of biomedical information, specialized information gathering skills, key biomedical vocabulary/concepts, audiences, outlets, translation/interpretation, research, ethical issues.

**664. Risk and Crisis Reporting. (3-0). Credit 3.** Assessment and analysis of environmental and health risk, analytical procedures, interpretation of risk factors, reporting science crisis events.



**670. Basic Environmental Toxicology. (3-0). Credit 3.** Introduction to general principles of toxicology; test methods, target organs, toxicity of major classes of toxins/toxicants, and risk assessment for engineer and other non-toxicologists; risk assessment methodology. Prerequisite: VIBS 602 or approval of instructor.

**681. Seminar. (1-0). Credit 1.** Review and discussion of current scientific work in one of the department's areas of specialization (anatomy, cellular and molecular biology, epidemiology, food safety, genetics, informatics, neuroscience, public health concepts, reproduction/developmental biology, toxicology, zoonoses).

**684. Professional Internship. Credit 1 to 4.** A directed internship in an organization to provide students with on-the-job training with professionals in settings appropriate to the student's professional objectives. Prerequisite: Approval by committee chair.

**685. Directed Studies. Credit 1 to 4 each semester.** Research problem in one of the department's areas of specialization (anatomy, cellular and molecular biology, epidemiology, food safety, genetics, informatics, neuroscience, public health concepts, reproduction/developmental biology, toxicology, zoonoses, science and technology journalism).

**689. Special Topics in... Credit 1 to 4.** Selected topics in one of the department's areas of specialization (anatomy, cellular and molecular biology, epidemiology, food safety, genetics, informatics, neuroscience, public health concepts, reproduction/developmental biology, toxicology, zoonoses, science and technology journalism).

**690. Theory of Research. (3-0). Credit 3.** Theory and design of research related to current biomedical problems especially those involving study of animal disease; philosophical perspectives underlying historical advances in research pertaining to the study, prevention and treatment of disease. Prerequisite: Graduate classification. Cross-listed with VTPP 690 and VPAT 690.

**691. Research. Credit 1 or more each semester.** Research reported by writing of thesis or dissertation as partial requirement for MS or PhD degree. Prerequisite: Approval of department head.

### **Department of Veterinary Large Animal Clinical Sciences**

W. T. Bissett, T. L. Blanchard, S. P. Brinsko, G. K. Carter, M. K. Chaffin, N. D. Cohen\*, E. M. Green, C. C. Love, W. A. Moyer, R. D. Posey, J. Romano, A. J. Roussel (Head), D. G. Schmitz, J. A. Thompson, D. D. Varner, M. A. Walker, K. E. Washburn, J. P. Watkins

\* Graduate Advisor

### **Veterinary Large Animal Clinical Sciences (VLCS)**

**622. Equine Disease and Epidemiology. (3-0). Credit 3.** Principles and methods of epidemiology applied to equine health and prevention and control of selected equine infectious diseases. Prerequisites: Enrollment in equine certificate and graduate classification, or approval of instructor.

**685. Directed Studies. Credit 1 to 8 each semester.** Original investigations of problems in the field of large animal surgery, therapeutics, preventive veterinary medicine or radiology. May be repeated for credit. Prerequisites: Approval of instructor.

**691. Research. Credit 1 or more each semester.** Research for thesis.

### **Veterinary Medicine—Interdisciplinary (VMID)**

**601. Veterinary Medicine—Interdisciplinary Study Abroad. Credit 1 to 12.** For students in approved programs abroad. May be repeated for credit. Maximum 6 hours free elective credit in a graduate program. Course will be graded on a satisfactory/unsatisfactory basis. Prerequisite: Attend TAMU the semester before and after program.

**686. Scientific Ethics. (1-0). Credit 1.** Ethical issues of research and methods for resolution of such issues; overview of ethical issues encountered by scientists in the conduct and dissemination of their research, in

their pursuit of resources, in their interactions with the press and the broader public and resulting from the extension and technological application of their findings. Prerequisite: Graduate classification.

**689. Special Topics in... Credit 1 to 4.** Selected topics in an identified area of veterinary medicine. May be repeated for credit. Prerequisite: Approval of instructor.

### Department of Veterinary Pathobiology

L. G. Adams, J. M. Ball, L. R. Berghman, D. J. Brightsmith, D. J. Caldwell, F. J. Clubb, Jr., E. W. Collisson, T. M. Craig, M. F. Criscitiello, T. L. Cyr, D. S. Davis, A. de la Concha, J. N. Derr, S. V. Dindot, J. F. Edwards, M. D. Esteve-Gassent, T. A. Ficht, A. C. R. Ficht, P. J. Holman\*, M. Ihrig, M. C. Johnson, A. B. Kier, S. D. Lawhorn, J. L. Leibowitz, M. C. Libal, L. L. Logan (Head), B. Lupiani, K. J. Mansell, J. M. Musser, W. Mwangi, M. Nabity, J. B. Osterstock, S. L. Payne, S. D. Pillai, R. R. Pool, Jr., B. F. Porter, W. W. Porter, S. K. Ramaiah, S. M. Reddy, G. M. Rivera, A. Rodrigues, K. E. Russell, J. E. Samuel, C. M. Scanlan, C. M. Seabury, R. Smith, III, K. F. Snowden, J. M. Steiner, G. Stoica, R. W. Storts, I. R. Tizard, R. M. Tsolis, S. D. Waghela, G. G. Wagner, B. R. Weeks, C. J. Welsh, J. E. Womack, S. Zhang, G. Zhu, D. B. Zimmer

\* Graduate Advisor

The department offers programs of graduate instruction and research leading to the Master of Science degree in Biomedical Sciences or Laboratory Animal Medicine. The Doctor of Philosophy degree is offered in Veterinary Pathobiology or Biomedical Sciences. Degrees in the Intercollegiate Graduate programs such as Genetics, Toxicology or Biotechnology may also be pursued. Major specialty areas including infectious diseases (virology, bacteriology, parasitology), biodefense and emerging infectious diseases, metabolic diseases, genetics/genomics, neuroscience, cardiovascular science and immunology may be studied for any of the departmentally offered graduate degrees.

The department offers post-doctoral (DVM) Residency/Graduate programs in anatomic pathology, clinical pathology and clinical microbiology. Residents are required to enroll in graduate courses and may pursue either a Master of Science or Doctor of Philosophy degree. Minimum DVM Residency qualifications include a DVM/VMD degree from an accredited college of veterinary medicine and eligibility to obtain a license to practice in the state of Texas. Selection of residents is made on the basis of academic achievement, letters of recommendation and pertinent experience.

The College of Veterinary Medicine and Biomedical Sciences, Texas A&M University and the Comparative Medicine Program through the Department of Veterinary Pathobiology offer a three-year postdoctoral (DVM) Residency/Graduate program in Laboratory Animal Medicine (LAMD). Residency certificate and Master of Science degree in LAMD are awarded following successful completion of the required coursework, scholarly research and a master's thesis. A student may opt to pursue a Doctor of Philosophy degree in a related field (pathology, microbiology, genetics) following completion of the LAMD residency. A primary objective of the program is to provide postdoctoral veterinary training in the management of clinical problems of laboratory animals with an emphasis on comparative and preventive medicine, both individual and population, for a wide variety of species used for teaching and research.

The program offers training to support preparation toward American College of Laboratory Animal Medicine (ACLAM) board certification and to provide individuals with a broad foundation in laboratory animal medicine.

For further information regarding these programs, please contact Dr. Patricia Holman, Graduate Advisor, Department of Veterinary Pathobiology, (979) 845-4202, ([pholman@cvm.tamu.edu](mailto:pholman@cvm.tamu.edu)). Also browsing the following websites may provide additional information: Comparative Medicine Program ([cmp.tamu.edu](http://cmp.tamu.edu)); Veterinary Pathobiology ([vetmed.tamu.edu/vtpb](http://vetmed.tamu.edu/vtpb)); Texas A&M University ([tamu.edu](http://tamu.edu)); Office of Graduate Studies ([ogs.tamu.edu](http://ogs.tamu.edu)); College of Veterinary Medicine and Biomedical Sciences ([vetmed.tamu.edu](http://vetmed.tamu.edu)); and a guide to the Bryan-College Station area ([vetmed.tamu.edu/college/about-the-area](http://vetmed.tamu.edu/college/about-the-area)).

## **Veterinary Microbiology (VTMI)**

**601. Fundamentals of Pathobiology. (5-0). Credit 5.** Encompasses the concepts of pathobiology including bacterial, viral and parasitic diseases, the host response to infectious agents, pathology, and metabolic and genetic diseases; includes animal and human diseases and provides enough background to facilitate students in advanced graduate courses. Prerequisite: Graduate classification.

**614. Fermentation and Gastrointestinal Microbiology. (3-0). Credit 3.** Fermentation and gastrointestinal ecosystems in terms of microorganisms present, their activities and requirements and their interactions in a dynamic system. Prerequisite: Beginning microbiology and/or biochemistry or approval of instructor. Cross-listed with POSC 614 and NUTR 614.

**615. Immunogenetics and Comparative Immunology. (3-0). Credit 3.** Genetic mechanisms used to diversify immune receptors; immunoglobulins, T cell receptors, major histocompatibility complex, natural killer cell receptors, toll-like receptors and many others; selected comparative and veterinary examples of different immune recognition systems; evolution of the immune system; theoretical immune surveillance and vaccine development. Prerequisite: Graduate classification; GENE 320 and VTPB 409, or equivalent, or permission of instructor.

**619. Molecular Methods for Microbial. (2-2). Credit 3.** Underlying principles of molecular methods for microbial detection and characterization in natural and man-made ecosystems; emphasis on method application and data interpretation; emphasis on microbial pathogens and indicator organisms in foods and environment; laboratory covers select protocols. Prerequisite: POSC 429/FSTC 326/SCSC 405/approval of instructor. Cross-listed with SCSC 619/FSTC 619/POSC 619.

**629. Laboratory Quality Systems. (3-0). Credit 3.** Quality systems and method development used within a laboratory; ensuring the integrity of procedures used in lab processes, chain of custody, information management, and international laboratory standards; regulatory requirements for laboratory operation; bio-security precautions; laboratory management. Cross-listed with SCSC 629.

**643. Pathogenic Bacteriology I. (3-4). Credit 4.** Pathogenic bacteria, their cultural and biological characteristics and pathogenicity. Prerequisite: Minimum of 8 hours of undergraduate microbiology.

**645. Host-Agent Interaction. (3-0). Credit 3.** Basic concepts of infection versus disease; molecular approaches to problems in microbiology; inducible host responses, agent escape mechanisms and movement of potential pathogens in the ecosystem. Prerequisite: GENE 431 or equivalent.

**647. Virology. (3-3). Credit 4.** Virus infections in animals and humans; types of infections, mode of transmission, intracellular pathology, epidemiology, isolation and identification of inciting agents; tissue cultivation, animal inoculations and diagnostic tests. Prerequisite: VTPB 438 or equivalent.

**648. Medical Mycology. (3-3). Credit 4.** Actinomycetes, yeasts and molds that are pathogenic to humans and animals; morphology, cultural characteristics, pathogenicity and identification; practice consists of exercises in cultural methods, morphological characteristics, biochemical reactions and diagnosis. Prerequisite: Minimum of 8 hours of undergraduate microbiology.

**649. Immunology. (3-0). Credit 3.** Cellular basis of the immune response; relationships between inflammation and acquired immunity, MHC and cell activation; the role of cytokines in immunoregulation and hypersensitivity, vaccines, and the mechanism of immunity to viruses, bacteria and parasites. Prerequisite: VTPB 409 or equivalent. Cross-listed with POSC 649.

**650. Experimental Immunology. (3-3). Credit 4.** Familiarization, development and integration of techniques into experimental design of immunologic investigation; antibody production, protein purification, immunofluorescence, agar-gel diffusion, immunoelectrophoresis and specialized serologic tests. Cross-listed with POSC 660.

**654. Cell Culture Techniques. (1-6). Credit 3.** Introduction to the theory and practice of cell culture and provides illustrations of its applications; how to maintain a cell culture unit and culture cell lines; how to derive new cell cultures from animal tissues, characterize cultured cells, optimize in vitro conditions and introduce genetic changes into cultured cells. Prerequisite: Approval of instructor.

**662. Advanced Immunologic Concepts. Credit 1 to 5.** Modular course with detailed discussions, workshops and assigned reading/problem solving on advanced topics; structural organization of molecules; genetic regulation; cytokine cascades; pathophysiology of autoimmunity. May be repeated for credit. Prerequisites: VTMI 649; BICH 603 or equivalent; approval of instructor.

**663. Molecular Biology of Viruses. (3-0). Credit 3.** In-depth studies of the biochemistry and the replication strategies of viruses and molecular mechanisms of pathogenesis for selected viral systems. Prerequisite: Graduate classification in pathology, molecular biology, biochemistry, or approval of instructor. Cross-listed with MMPA 663.

**664. Mammalian Genome Modification for Biomedical Research. (3-0). Credit 3.** This course reviews the uses of genetic manipulation in biomedical research and provides students with a working knowledge of the various strategies used to modify mammalian genomes including transgenes, homologous recombination, gene-trapping, RNA interference, cloning, and gene therapy.

**665. Viral Vectors and Gene Therapy. (3-0). Credit 3.** This course will describe various viral vector systems, their development and their use as research tools in biotechnology and gene therapy. The course will consist of a mixture of short lectures and discussion of papers from the literature. Prerequisites: VTMI 663, VTMI 647, PLPA 616, or PLPA 620 or approval of instructor. Cross-listed with MMPA 665 and PLPA 665.

**681. Seminar. (1-0). Credit 1.** Review and discussion of current scientific work and research in field of microbiology and related subjects. Prerequisite: Approval of instructor.

**685. Directed Studies. Credit 1 to 4 each semester.** Problems course in microbiology. Prerequisite: Approval of instructor.

**689. Special Topics in... Credit 1 to 4.** Selected topics in an identified area of veterinary microbiology. May be repeated for credit. Prerequisite: Approval of instructor.

**691. Research. Credit 1 or more with a maximum of 23.** Research for thesis or dissertation.

### **Veterinary Parasitology (VPAR)**

**601. Parasitology. (3-3). Credit 4.** Important helminth parasites of animals and humans; their identification, distribution and life history. Prerequisites: VTPB 487 or equivalent or approval of instructor.

**604. Parasitic Protozoa. (3-3). Credit 4.** Taxonomy, morphology, life cycle, physiology, distribution, genetics, host relations, methods and diagnosis concerned with protozoan parasites affecting vertebrates including humans. Prerequisite: VTPB 487 or ENTO 208 or BIOL 438 or equivalent or approval of instructor.

**605. Molecular and Immunological Parasitology. (3-0). Credit 3.** Basic concepts and recent advancement in molecular biology and molecular immunology of parasitic diseases. Molecular-based host-parasite interactions.

**685. Directed Studies. Credit 1 to 4 each semester.** Special problems concerned with parasites of animals or humans. Prerequisites: VPAR 601 or equivalent; approval of instructor.

**689. Special Topics in... Credit 1 to 4.** Selected topics in an identified area of biomedical parasitology. May be repeated for credit.

**691. Research. Credit 1 or more each semester.** Research for thesis.

### **Veterinary Pathology (VPAT)**

**601. Comparative Pathology. (3-3). Credit 4.** Pathologic processes occurring in diseased cells, tissues and organs of animals and humans; their pathogenesis and morphologic manifestations. Prerequisites: Courses in gross and microscopic mammalian anatomy and physiology and approval of instructor.

**620. Humane, Public Health and Regulatory Aspects of Animal Use. (1-0). Credit 1.** Emphasizes thoughtful and humane use of animals in teaching, research and service; human and animal health benefits of biomedical research; governmental policies regulations, public health implications, management practices, and public relations pertaining to animal use in research and teaching.

**640. Advanced Mechanisms of Disease. (3-0). Credit 3.** Concepts of pathogenesis of disease processes. Prerequisite: DVM degree or approval of instructor.

**641. Systemic Pathology I. (2-4). Credit 4.** Disease manifestations in special organs and tissues and interrelations of pathologic processes in individual and functionally related organs. Prerequisite: DVM degree or equivalent.

**642. Mechanisms of Metabolic Disease. (3-0). Credit 3.** Characteristics and mechanisms of diseases caused either by deficiency, imbalance, excess of specific nutrients or chemicals, or by regulatory disturbances of metabolism. Prerequisite: DVM degree or approval of department head.

**643. Applied Pathology. Credit 1 or more each semester.** Application of information and concepts of anatomic and clinical pathology to the diagnosis of animal disease; gross pathological changes observed in necropsy are correlated with and corrected by histopathologic observations; confirmatory methods of clinical pathology and laboratory medicine used where indicated. May be taken more than once but not to exceed 6 hours of credit toward a graduate degree. Prerequisite: DVM degree or equivalent.

**645. Neoplastic Diseases. Credit 1 to 8.** Theoretical, histopathological and clinical aspects of neoplasia. Diagnosis of neoplastic and related conditions in all species. May be taken more than once but not to exceed 8 hours of credit toward a graduate degree. Prerequisite: DVM degree or equivalent.

**650. Neuropathology of Animals. Credit 1 to 4.** Pathology and pathogenesis of diseases of the central and peripheral nervous systems. Interpretation of gross and microscopic lesions of the nervous system associated with disease processes. May be taken more than once but not to exceed 4 hours of credit toward a graduate degree. Prerequisite: DVM degree or equivalent.

**651. Systemic Pathology II. (1-3). Credit 2.** Continuation of VPAT 641. Disease manifestations in special organs and tissues and interrelations of pathologic processes in individual and functionally related organs. Prerequisite: VPAT 641.

**653. Diseases of Laboratory Animals. (3-0). Credit 3.** Pathology and pathogenesis of spontaneous infectious, parasitic, metabolic and neoplastic diseases of laboratory animals. Prerequisite: VTPB 922 or equivalent.

**681. Seminar. (1-0). Credit 1.** For graduate and special students in veterinary or comparative pathology; presentation and discussion of special topics and research data concerning pathology and pathogenesis of disease. Prerequisite: Approval of instructor.

**685. Directed Studies. Credit 1 to 4 each semester.** Advanced special problems concerned with pathogenesis and pathology of disease. Prerequisite: Approval of instructor.

**689. Special Topics in... Credit 1 to 4.** Selected topics in an identified area of veterinary or comparative pathology. May be repeated for credit.

**690. Theory of Research. (3-0). Credit 3.** Theory and design of research related to current biomedical problems especially those involving study of animal diseases; philosophical perspectives underlying historical advances in research pertaining to the study, prevention and treatment of disease. Prerequisite: Graduate classification. Cross-listed with VIBS 690 and VTPP 690.

**691. Research. Credit 1 or more each semester with a maximum of 23.** Research for thesis or dissertation.

## Department of Veterinary Physiology and Pharmacology

E. M. Bailey, Jr., N. P. Clarke, T. A. Cudd, M. C. Golding, G. Han, C. L. Heaps, J. D. Herman, K. Hinrichs, J. F. Hunter, I. V. Ivanov, D. H. Jones, D. C. Kraemer, G. A. Laine (Head), C. R. Long\*, C. M. Quick, A. J. Roussel, Jr., S. H. Safe\*, F. Schroeder, J. N. Stallone, R. H. Stewart, Y. Tian, C. Walker, J. S. Wasser, M. E. Westhusin, C. Woodman, B. Zhou

\* Graduate Advisor

Graduate programs leading to the Master of Science and Doctor of Philosophy degrees in biomedical sciences or toxicology are designed to prepare the graduate for research, teaching and other related areas. Faculty specialty areas include cardiovascular sciences, reproductive sciences and toxicology. Several departmental faculty members serve on university intercollegiate faculties. There is no departmental requirement for foreign languages. These are considered in the same status as other supplementary areas of study to be included when indicated by the individual needs of students.

### Veterinary Physiology and Pharmacology (VTPP)

**605. Systemic Veterinary Physiology I. (5-0). Credit 5.** Aspects of cellular physiology, physiology of excitable membranes, physiology of body fluids, neurophysiology, and the physiology of smooth, cardiac and skeletal muscle; provides a basic understanding of mammalian physiology essential as a framework for advanced graduate studies. Prerequisite: Graduate classification.

**606. Systemic Veterinary Physiology II. (5-0). Credit 5.** In-depth study covering cardiovascular, respiratory, renal physiology, gastrointestinal and endocrine physiology; provides a basic understanding of mammalian physiology essential as a framework for advanced graduate studies. Prerequisite: VTPP 605.

**610. Physiology I. (5-2). Credit 6.** Introduction to physiology: cell physiology, cell signaling, cell cycle, body fluids, translocation of materials, membrane potentials, neurophysiology, autonomic nervous system, thermoregulation, cardiovascular, and muscle physiology. Prerequisites: Enrollment in MS/PhD program in Veterinary Physiology and Pharmacology; approval of instructor.

**612. Physiology II. (5-2). Credit 6.** Blood and lymph, respiration, renal physiology, and acid-based balance, gastrointestinal physiology, metabolism, endocrinology, and reproduction. Prerequisites: Enrollment in MS/PhD program in Veterinary Physiology and Pharmacology; approval of instructor.

**623. Biomedical Physiology I. (3-2). Credit 4.** Physiological principles, review of cellular physiology, and development of an understanding of the nervous system and muscle, cardiovascular, and respiratory physiology; clinical applications related to organ systems. Prerequisites: Graduate classification; BICH 410 and VIBS 305 recommended.

**625. Pharmacology. (3-0). Credit 3.** Introduction to pharmacokinetics and pharmacodynamics; survey of major pharmaceutical classes; uses, mechanisms of action and adverse reactions of selected agents. Prerequisites: Graduate classification; VTPP 423 or Approval of instructor.

**627. Biomedical Physiology II. (3-0). Credit 3.** Continuation of VTPP 623 Fluid balance and acid-base balance; development of an understanding of renal, gastrointestinal, endocrine and reproductive physiology using human and other mammalian models; clinical applications related to organ systems. Prerequisites: Graduate classification; VTPP 623.

**628. Pharmacology I. (4-2). Credit 5.** Pharmacokinetics, pharmacodynamics, CNS pharmacology, autonomic pharmacology, antineoplastic agents, immunopharmacology, recombinant products, fluid and electrolyte therapy, diuretics, pharmacology of the integument. Prerequisite: Approval of instructor.

**629. Pharmacology II. (2-2). Credit 3.** Antimicrobials, endocrine pharmacology, eicosanoids, anti-inflammatory agents, respiratory pharmacology, anticoagulants and hematinics, GI pharmacology, cardiovascular pharmacology. Prerequisite: Approval of instructor.

**630. Pharmacology/Toxicology. (2-2). Credit 3.** Management and treatment of toxicosis, antidotal pharmacology, toxic plants, mycotoxins, chemical toxicants, metals, euthanasia. Prerequisite: Approval of instructor.

- 634. Physiology for Bioengineers I. (3-3). Credit 4.** Cellular anatomy, cellular physiology and biochemistry; systems analysis of digestive, endocrine and musculoskeletal system function including information related to gross anatomy, histology and disease states; quantitative aspects of physiology and engineering applications to clinical medicine. Prerequisite: Biomedical Engineering major or instructor approval.
- 635. Physiology for Bioengineers II. (3-3). Credit 4.** A systems analysis of nervous, cardiovascular, respiratory and urinary function including information related to gross anatomy, histology and disease states; quantitative aspects of physiology and engineering applications to clinical medicine. Prerequisite: VTPP 634.
- 638. Analysis of Genomic Signals. (2-2). Credit 3.** Overview of current high throughput technology for data acquisition and analysis of genomic signals (e.g., mRNA or proteins); emphasis on microarray technology, methods for analyzing microarray data, and approaches to model the underlying phenomena from the systems biology perspective. Prerequisites: BIOL 451 or GENE 320/BIMS 320 or equivalent; STAT 651 or equivalent; or approval of instructor.
- 653. Endocrinology. (3-3). Credit 4.** Physiology, biochemistry and pharmacology of the endocrines. Laboratory emphasizes a number of classical experiments with clinical application. Prerequisite: Approval of instructor.
- 654. Molecular Endocrinology. (3-0). Credit 3.** Structure-function relationships of hormones, their receptors and biologic activities. Prerequisites: VTPP 653 or BIOL 649 and BICH 410 or equivalent or approval of instructor. Cross-listed with ANSC 654.
- 655. Vascular Physiology. (4-0). Credit 4.** Structure and function of blood vessels and vascular beds; molecular and cell biology of endothelium and vascular smooth muscle; microcirculation; capillary exchange; regulation of blood flow by local, neural and humoral signals. Prerequisite: MPHY 901 or approval of department head.
- 656. Physiology of the Heart. (4-0). Credit 4.** Structure and function of the heart; molecular and cell biology of cardiac myocytes; electrophysiology of myocardium, pacemaker cells and conducting tissue; cardiac mechanics; control of cardiac performance; coronary circulation. Prerequisite: MPHY 901 or 604 or approval of department head.
- 657. Cardiovascular Physiology. (3-3). Credit 4.** Physiological considerations of the circulatory system including general and integrative aspects of the heart and blood vessels. Prerequisites: Approval of instructor.
- 658. Anatomy and Physiology of the Equine Foot. (3-0). Credit 3.** In-depth study of the anatomy and physiology of the foot of the horse; includes both gross and histologic anatomy, metabolic and nutrition and biomechanics of the equine foot. Prerequisites: VTPP 323 and VTPP 423.
- 659. Gamete and Embryo Physiology. (2-2). Credit 3.** Physiology of gametes and preimplantation embryos in livestock and laboratory animals; oocyte growth and maturation in-vivo and in-vitro, fertilization in-vivo and in-vitro, embryo transfer, cryopreservation, nuclear transfer, chimera formation, gene transfer.
- 665. Pharmacology. (3-3). Credit 4.** Pharmacokinetic and pharmacodynamic principles of pharmacology, absorption, biotransformation, distribution, excretion, dose-response relationships, adverse reactions, and interactions. Prerequisites: Undergraduate, professional or equivalent course in physiology, pharmacology, biochemistry, introductory calculus.
- 667. Current Topics in Pharmacology. (3-0). Credit 3.** Discussions of literature regarding topics of current research interest; physiochemical or physiologic effects of drugs at sites from molecular to whole body. Prerequisite: Approval of instructor.
- 670. Toxicology. (3-3). Credit 4.** Fundamentals of toxicology including the disease syndromes produced in humans and animals by organic and inorganic chemicals; environmental factors in intoxications. Prerequisites: Advanced standing in biochemistry and physiology; approval of instructor.

**671. Toxicity Testing Concepts. (2-2). Credit 4.** Approval processes for compliance with federal drug and chemical laws. Prerequisites: VTPP 665 and VTPP 670 or approval of instructor.

**672. Toxic Plants and Biotoxins. (2-3). Credit 3.** An examination of the disease syndromes produced in animals and humans by native, ornamental and introduced plants, vertebrate and invertebrate toxins and mycotoxins; field trips for plant identification. Prerequisites: VTPP 670; approval of instructor.

**673. Metabolic and Detoxication Mechanisms. (3-0). Credit 3.** Fate of foreign compounds; their inhibitory and antagonistic action toward normal metabolic processes of the animal body. Prerequisites: BICH 603; approval of instructor and department head.

**674. Natural Products Toxicology. (3-0). Credit 3.** Occurrence, identification and metabolism of naturally occurring toxicants of plant, animal and microbial origin. Prerequisites: CHEM 628; approval of instructor.

**675. Industrial and Environmental Toxicology. (3-0). Credit 3.** Fundamentals of toxicology and risk assessment; effects of selected classes of hazardous chemicals encountered in the workplace or environment on human health will be considered. Prerequisite: Approval of instructor.

**676. Genetic and Molecular Toxicology. (3-0). Credit 3.** Mechanisms of toxicant-induced target organ toxicity with emphasis on molecular control of mammalian and cell growth differentiation. Prerequisite: Graduate course in cell biology and biochemistry.

**677. Fluorescence Detection: Steady State, Time Resolved and Imaging. (4-0). Credit 4.** Fluorescence spectroscopy and confocal/multiphoton microscopy in research; intro of pharmacology, life science, and physical science students to fluorophores, anisotropy, ligand binding, energy transfer, cytometry, lifetime imaging, correlation spectroscopy, immunocytochemistry, and image analysis with an emphasis on instrumental/sample artifacts, fluorescence application, literature evaluation, and communication of rationales to other scientists. Prerequisite: General chemistry and biology course.

**681. Seminar. (1-0). Credit 1.** Review and discussion of current scientific work in physiology and related subjects. Prerequisite: Approval of department head.

**685. Directed Studies. Credit 1 to 4 each semester.** Problems in physiology, pharmacology or toxicology. Prerequisite: Approval of instructor.

**689. Special Topics in... Credit 1 to 4.** Selected topics in an identified area of veterinary physiology and pharmacology. May be repeated for credit. Prerequisite: Approval of instructor.

**690. Theory of Research. (3-0). Credit 3.** Theory and design of research related to current biomedical problems especially those involving study of animal disease; philosophical perspectives underlying historical advances in research pertaining to the study, prevention and treatment of disease. Prerequisite: Graduate classification. Cross-listed with VIBS 690 and VPAT 690.

**691. Research. Credit 1 or more each semester.** Original investigations in veterinary physiology, pharmacology or toxicology to be submitted by writing of thesis or dissertation as partial fulfillment for MS or PhD degree. Prerequisite: Approval of department head.

### **Department of Veterinary Small Animal Clinical Sciences**

J. R. August, J. W. Barr, C. L. Barton, J. E. Bauer, B. V. Beaver, G. L. Carroll, J. Dziezyc, T. W. Fossum, S. G. Gordon, S. M. Hartsfield (Head)\*, H. P. Hobson, L. M. Howe, D. A. Hulse, S. C. Kerwin, G. E. Lees, J. M. Levine, N. S. Matthews, M. W. Miller, K. S. Rogers, A. B. Saunders, W. B. Saunders, J. M. Steiner, J. S. Suchodolski, M. D. Willard, D. A. Williams, H. M. Wilson-Robles, A. M. Wolf, D. L. Zoran

\* Graduate Advisor

### **Veterinary Small Animal Clinical Sciences (VSCS)**

**681. Seminar. (1-0). Credit 1.** Current scientific work in medical and surgical fields in and related to small animal medicine and surgery. May be repeated for credit. Prerequisite: DVM degree or approval of department head.



**685. Directed Studies. Credit 1 to 8 each semester.** Original investigations of problems in field of small animal surgery, therapeutics or radiology. Prerequisite: DVM degree or approval of instructor and department head.

**689. Special Topics in...** Credit 1 to 4. Special topics in an identified area of small animal medicine or surgery. May be repeated for credit. Prerequisite: DVM degree or approval of instructor and department head.

**691. Research. Credit 1 or more each semester.** Research for thesis.

## Graduate Student Association (GSA)

<http://vetmed.tamu.edu/gsa>

### About the Organization

The Graduate Student Association (GSA) of the CVM represents graduate student interests through dialogue with the CVM administration and strives to enhance the quality of graduate education. Membership includes students enrolled in a program of study leading to a graduate degree awarded by a department in the CVM or students whose faculty mentor has an appointment to a department in the CVM. There are no membership fees, and all graduate students are welcome to attend the monthly lunch meetings and participate in service and social events.

Major programs and events sponsored by the GSA include:

- Monthly lunch meetings with guest speakers
  - Fall 2012 Meetings – September 6, October 15, and November 15 at Noon in the Mark Francis Room of the Veterinary Medicine Administration (VMA) Building
- Travel Awards provided to eligible students
  - GSA members may apply for funding to cover the costs of registration and travel to present their own research at scientific conferences. Eligibility information is available on the GSA website.
- Spring Research Symposium & Dinner
  - The GSA co-sponsors a Spring Research Symposium with the CVM Postdoc Association each spring semester for platform and poster presentations by graduate students; a dinner with a keynote speaker follows the symposium
- Participation in the annual CVM Open House
  - GSA sponsors a booth with activities for children during the annual CVM Open House held each spring semester.

### Leadership

**President:** Nicole Mitchell ([NMitchell@cvm.tamu.edu](mailto:NMitchell@cvm.tamu.edu))

**Vice President:** Christine Vuong ([CVuong@cvm.tamu.edu](mailto:CVuong@cvm.tamu.edu))

**Treasurer:** Katie Zychowski ([KZychowski@cvm.tamu.edu](mailto:KZychowski@cvm.tamu.edu))

**Travel Award Secretary:** Sarah Elmore ([SElmore@cvm.tamu.edu](mailto:SElmore@cvm.tamu.edu))

**General Secretary:** Raju Gautam ([RGautam@cvm.tamu.edu](mailto:RGautam@cvm.tamu.edu))