The Department of Veterinary Integrative Biosciences (VIBS) offers graduate degree programs aimed at educating students to advance biomedical science through original research and to disseminate that knowledge for the protection and promotion of animal and human health. The department awards 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 department 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.

Students prepare degree plans that fit their area of study and professional or research goals in consultation with a committee of graduate faculty members led by a faculty mentor/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.

**Faculty**

Abbott, Louise, Professor  
Vet Integrative Biosciences  
DVM, Washington State University, 1988  
PhD, University of Washington, 1982

Arosh, Joe, Associate Professor  
Vet Integrative Biosciences  
DVM, Universite Laval, 2004  
PhD, Laval University, 2003

Arosh, Sakhila, Assistant Professor  
Vet Integrative Biosciences  
PhD, University of Madras, 2002

Budke, Christine, Associate Professor  
Vet Integrative Biosciences  
PhD, Philosophisch-Naturwissenschaftliche Fakultat der Universitat Basel, 2005  
DVM, Purdue University, 2001

Burghardt, Robert, Professor  
Vet Integrative Biosciences  
PhD, Wayne State University, 1976

Cai, Jing, Assistant Professor  
Vet Integrative Biosciences  
PhD, University of Hong Kong, 2006

Chiu, Weihsueh, Professor  
Vet Integrative Biosciences  
PhD, Princeton University, 1998

Cotran, Ernest, Clinical Professor  
Vet Integrative Biosciences  
PhD, University of Oklahoma, 1982

Cummings, Kevin, Assistant Professor  
Vet Integrative Biosciences  
PhD, Cornell University, 2010

Curley, Kevin, Instructional Assistant Professor  
Vet Integrative Biosciences  
PhD, Texas A&M University, 2012  
DVM, Cornell University, 1996

Frank-Cannon, Tamy, Clinical Assistant Professor  
Vet Integrative Biosciences  
PhD, Texas A&M University, 2005  
DVM, Texas A&M University, 1996

Gastel, Barbara, Professor  
Vet Integrative Biosciences  
MD, John Hopkins University, 1978

Hamer, Sarah, Assistant Professor  
Vet Integrative Biosciences  
DVM, Michigan State University, 2011  
PhD, Michigan State University, 2010

Herman, Cheryl, Clinical Associate Professor  
Vet Integrative Biosciences  
DVM, University of Saskatchewan, 1987

Hiney, Jill, Research Assistant Professor  
Vet Integrative Biosciences  
PhD, Texas A&M University, 1996

Hoffman, Anton, Clinical Professor  
Vet Integrative Biosciences  
PhD, Texas A&M University, 1992  
DVM, Texas A&M University, 1986

Johnson, Gregory, Professor  
Vet Integrative Biosciences  
PhD, University of Wyoming, 1997
Johnson, Larry, Professor
Vet Integrative Biosciences
PhD, Colorado State University, 1978

Klemm, William, Senior Professor
Vet Integrative Biosciences
PhD, University of Notre Dame, 1963

Ko, Gladys, Associate Professor
Vet Integrative Biosciences
PhD, Kent State University, 1996

Kornegay, Joe, Professor
Vet Integrative Biosciences
PhD, University of Georgia, 1982

Langford, Candice, Research Assistant Professor
Vet Integrative Biosciences
PhD, Texas A&M University, 2006

Li, Jianrong, Associate Professor
Vet Integrative Biosciences
PhD, University of Hawaii, 1997

Li, Qinglei, Assistant Professor
Vet Integrative Biosciences
PhD, Harbin Medical University, 2001

Murphy, William, Professor
Vet Integrative Biosciences
PhD, University of Tulsa, 1997

Phillips, Timothy, Professor
Vet Integrative Biosciences
PhD, University of Southern Mississippi, 1975

Pine, Michelle, Clinical Associate Professor
Vet Integrative Biosciences
PhD, Texas A&M University, 2002
DVM, University of Missouri-Columbia, 1991

Porter, Weston, Associate Professor
Vet Integrative Biosciences
PhD, Texas A&M University, 1997

Raudsepp, Terje, Associate Professor
Vet Integrative Biosciences
PhD, Swedish University of Agricultural Sciences, 1999

Rijnkels, Monique, Research Assistant Professor
Vet Integrative Biosciences
PHD, Leiden University, 1997

Roy Sarkar, Research Assistant Professor
Vet Integrative Biosciences
PHD, Purdue University, 2008

Ruoff, Lynn, Clinical Associate Professor
Vet Integrative Biosciences
DVM, Colorado State University, 1975

Russell, Ian, Professor
Vet Integrative Biosciences
PHD, Indiana University, 2014

Russell, Leon, Senior Professor
Vet Integrative Biosciences
PhD, Texas A&M University, 1965
DVM, University of Missouri, 1956

Rusyn, Ivan, Professor
Vet Integrative Biosciences
PhD, University of North Carolina at Chapel Hill, 2000
MD, Ukrainian State Medical University, 1994

Samollow, Paul, Professor
Vet Integrative Biosciences
PhD, Oregon State University, 1979

Skow, Loren, Professor
Vet Integrative Biosciences
PhD, Texas A&M University, 1976

Snell, James, Senior Lecturer
Vet Integrative Biosciences
DVM, Texas A&M University, 1977

Tarpley, Raymond, Senior Associate Professor
Vet Integrative Biosciences
DVM, Texas A&M University, 1971

Tayce, Jordan, Instructional Assistant Professor
Vet Integrative Biosciences
DVM, Texas A&M University, 2008

Taylor, Robert, Research Professor
Vet Integrative Biosciences
PhD, Texas A&M University, 1987

Tiffany-Castiglion, E, Professor
Vet Integrative Biosciences
PhD, University of Texas Medical Branch at Galveston, 1979

Venkatraj, Vijayanagaram, Clinical Assistant Professor
Vet Integrative Biosciences
PhD, New York University, 1992

Welsh, Christabel, Professor
Vet Integrative Biosciences
PhD, London University, 1981

Masters
- Master of Science in Veterinary Public Health - Epidemiology

Courses

VIBS 601 Anatomy
Credits 4. 2 Lecture Hours. 6 Lab Hours.
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 305 or equivalent.
VIBS 602 Histology
Credits 4. 2 Lecture Hours. 6 Lab Hours.
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.
VIBS 603/NRSC 603 Neuroanatomy
Credits 4. 2 Lecture Hours. 6 Lab Hours.
Gross, developmental and microscopic anatomy of nervous system of
selected laboratory and domestic animals.
Prerequisite: Approval of instructor.
Cross Listing: NRSC 603/VIBS 603.
VIBS 604/NRSC 604 Biomedical Neuroendocrinology and Endocrine
Disorders
Credits 3. 3 Lecture Hours.
Gross and functional anatomy and endocrine functions of neuroendocrine
systems, hypothalamus and pituitary. Neuroendocrine control of puberty,
sexual behavior, menstruation, ovulation, pregnancy, labor, lactation,
tests, 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 Listing: NRSC 604/VIBS 604.
VIBS 605 Chemical Hazard Assessment
Credits 3. 3 Lecture Hours.
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.
VIBS 606/NRSC 605 Neuroanatomical Systems
Credits 3. 3 Lecture Hours.
Emphasis 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 Listing: NRSC 605/VIBS 606.
VIBS 607 Applied Epidemiology
Credits 4. 3 Lecture Hours. 3 Lab Hours.
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.
VIBS 608 Epidemiology Methods I
Credits 4. 3 Lecture Hours. 3 Lab Hours.
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.
VIBS 609 Anatomy of Reproductive Systems
Credits 4. 2 Lecture Hours. 6 Lab Hours.
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.)
VIBS 610 Epidemiologic Methods II and Data Analysis
Credits 4. 3 Lecture Hours. 3 Lab Hours.
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.
VIBS 611 Tumor Cell Biology and Carcinogenesis
Credits 3. 3 Lecture Hours.
Basic principles of tumor biology; role of gene-environment interactions;
molecular mechanisms regulating cancer initiation and progression;
therapeutic treatment of cancer.
Prerequisites: BIMS 320/GENE 320 or equivalent; graduate
classification.
VIBS 612 Mammalian Embryology
Credits 3. 3 Lecture Hours.
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.
VIBS 613 Evolutionary Bioinformatics
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Principles and concepts in molecular evolution, population genetics,
and evolutionary genomics; applications of quantitative approaches
(computation, statistics, and mathematics) in analyzing large and complex
biological data sets; algorithm design and development of scientific
software using high-level high-performance computer languages;
emerging techniques for integrative data analysis, and the assumptions,
advantages, and limitations of these techniques.
Prerequisites: BIOL 451 or GENE 320/BIMS 320/BIMS 320/GENE 320 or
equivalent; or approval of instructor.
VIBS 615 Food Hygiene
Credits 4. 3 Lecture Hours. 4 Lab Hours.
Clinical description, pathogenesis, diagnosis, source, epidemiology
and prevention or control of food borne diseases caused by biological,
chemical and natural hazards.
Prerequisite: Graduate classification.
VIBS 616 Advanced Developmental Neurotoxicology
Credits 3. 3 Lecture Hours.
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.
VIBS 617 Cell Biology
Credits 1 to 5. 1 to 5 Lecture Hours.
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.
VIBS 619 Food Toxicology II
Credits 3. 3 Lecture Hours.
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.

VIBS 620/GENE 620 Cytogenetics
Credits 3. 3 Lecture Hours.
Examination and analysis of variation in chromosome structure, behavior and number; developmental and evolutionary effects of this variation.
Prerequisite: GENE 603.
Cross Listing: GENE 620.

VIBS 621/NRSC 621 Fundamental Neuroanatomy
Credits 4. 4 Lecture Hours.
A comprehensive review of the neuroanatomical determinants of function; rigorous neuroanatomical foundation relevant for research investigating changes in neural pathways and/or networks involved in sensory and motor functions, learning and memory, perception, selective attention, as well as recovery of function following brain damage.
Cross Listing: NRSC 621/VIBS 621.

VIBS 622 Endocrine Toxicology
Credits 4. 4 Lecture Hours.
Impacts of endocrine toxicity on endocrine system; prevalence, environmental and occupational use and disposal of environmental endocrine disrupting chemicals (EDCs); structure, toxicokinetics and mechanism of action of EDCs; effects of EDCs on the development and function, disorders and diseases of the endocrine and reproductive organs.
Prerequisite: Graduate classification; approval of instructor.

VIBS 624/VTPP 624 Endocrinology
Credits 4. 3 Lecture Hours. 3 Lab Hours.
Neuroendocrine control of puberty menstruation, ovulation, pregnancy, labor, lactation, female reproductive cycles, male reproductive functions, thyroid and parathyroid, adrenal and kidney, diabetes, obesity, sleep, memory, learning and aging, and their endocrine disorders; overview on biosynthesis, transport and signaling of peptide and neuropeptide hormones, steroids and prostaglandins.
Prerequisite: Graduate classification.
Cross Listing: VTPP 624/VIBS 624.

VIBS 627 Optical Microscopy and Live Cell Imaging
Credits 3. 2 Lecture Hours. 3 Lab Hours.
Principles and practice of optical microscopy for life sciences; applications with fixed samples and live cells using digital microscopy, confocal and multiphoton microscopy, TIRF and laser capture microscopy equipment; applications with fluorescence probes of cellular function.
Prerequisite: Approval of instructor.

VIBS 633 Animal Diseases in Comparative Medicine
Credits 3. 3 Lecture Hours.
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.

VIBS 640/NRSC 640 Neurobiology
Credits 1 to 5. 1 to 5 Lecture Hours.
Biology of the mammalian central nervous system with emphasis on cellular and molecular interactions; contemporary research topics in areas such as neuron-glial 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 Listing: NRSC 640/VIBS 640.

VIBS 650 Education in a Veterinary Medical and Biomedical Environment
Credits 1 to 3. 1 to 3 Lecture Hours.
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.

VIBS 655 Methods of Specialized Journalism
Credits 3. 3 Lecture Hours.
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.

VIBS 657 Issues in Science and Technology Journalism
Credits 3. 3 Lecture Hours.
Current issues, fundamental concepts in science and technology journalism, communication theory, science and journalism components, philosophy and literature of the field.

VIBS 658 Research Methods in Science and Technology Journalism
Credits 3. 3 Lecture Hours.
Research methods including theory, hypothesis formulation, design, data collection, data analysis, measurement and report writing. Qualitative and quantitative methods. Research topics.

VIBS 660 Reporting Science and Technology
Credits 3. 3 Lecture Hours.
Gathering, writing and editing complex information, translation techniques, interpretation and analysis, literary and organizational devices and measurement of readability.

VIBS 663 Biomedical Reporting
Credits 3. 3 Lecture Hours.
Sources of biomedical information, specialized information-gathering skills, key biomedical vocabulary/concepts, audiences, outlets, translation/interpretation, research, ethical issues.

VIBS 664 Risk and Crisis Reporting
Credits 3. 3 Lecture Hours.
Assessment and analysis of environmental and health risk, analytical procedures, interpretation of risk factors, reporting science crisis events.

VIBS 670 Basic Environmental Toxicology
Credits 3. 3 Lecture Hours.
Introduction to general principles of toxicology; test methods, target organs, toxicity of major classes of toxins/toxicants, and risk assessment for engineers and other non-toxicologists; risk assessment methodology.
Prerequisite: VIBS 602 or approval of instructor.
VIBS 684 Professional Internship  
Credits 1 to 4. 1 to 4 Other Hours.  
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.

VIBS 685 Directed Studies  
Credits 1 to 4. 1 to 4 Other Hours.  
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).  
Prerequisite: Graduate classification.

VIBS 688 Epidemiological Modeling of Infectious Diseases  
Credits 3. 2 Lecture Hours. 2 Lab Hours.  
Concepts of mathematical modeling of infectious diseases; steps and methods for the development and analysis of models.  
Prerequisite: Graduate classification.

VIBS 689 Special Topics in...  
Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours.  
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).  
Prerequisite: Enrollment in third year of professional curriculum or enrollment in graduate studies with approval of instructor.

VIBS 690 Theory of Research  
Credits 3. 3 Lecture Hours.  
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 Listing: VTPP 690 and VPAT 690.

VIBS 691 Research  
Credits 1 to 23. 1 to 23 Other Hours.  
Research reported by writing of thesis or dissertation as partial requirement for MS or PhD degree.  
Prerequisite: Approval of department head.

VIBS 910 Gross Anatomy I  
Credits 4. 2 Lecture Hours. 6 Lab Hours.  
Topographical dissection of the dog and comparative aspects of the domestic cat.  
Prerequisite: Enrollment in first year of professional curriculum.

VIBS 911 Microscopic Anatomy I  
Credits 4. 2 Lecture Hours. 6 Lab Hours.  
Microscopic study of cells, tissues and organ systems of domestic animals.  
Prerequisite: Enrollment in first year of professional curriculum.

VIBS 912 Gross Anatomy II  
Credits 4. 1 Lecture Hour. 8 Lab Hours.  
Comparative anatomy of farm animals; topographic dissection of common farm species.  
Prerequisite: Enrollment in first year of professional curriculum.

VIBS 913 Microscopic Anatomy II  
Credits 4. 2 Lecture Hours. 6 Lab Hours.  
Developmental anatomy of domestic animals with special emphasis on structural congenital defects; functional neuroanatomy and clinical neurology of domestic animals; essential clinical skills for the theory and practice of veterinary neurology.  
Prerequisite: Enrollment in first year of professional curriculum.

VIBS 926 Introduction to Public Health Concepts  
Credit 1. 1 Lecture Hour.  
Basic concepts and issues of public health as they relate to the veterinary medical profession.  
Prerequisite: Enrollment in first year of the professional curriculum.

VIBS 930 Public Health  
Credits 4. 4 Lecture Hours.  
Principles and applications of epidemiology in veterinary medicine and the literature; history, epidemiology, symptoms, prevention and control of diseases transmitted between animals and humans; emphasis on emerging zoonotic diseases presenting occupational hazards for veterinary medicine; safety of foods of animal origin including foodborne illnesses.  
Prerequisite: Enrollment in first year of professional curriculum or enrollment in graduate studies with approval of instructor.

VIBS 948 Didactic Electives in Veterinary Anatomy  
Credits 1 to 12. 1 to 12 Lecture Hours.  
Elective course in veterinary anatomy (with emphasis on neuroscience, cell biology, genetics, reproduction, developmental biology, marine mammal anatomy) for professional students who wish to supplement required curriculum. May be repeated for credit.  
Prerequisite: Enrollment in third year of professional curriculum.

VIBS 985 Directed Studies  
Credits 1 to 4. 1 to 4 Other Hours.  
Directed individual study of a selected problem in veterinary anatomy (with emphasis on neuroscience, cell biology, genetics, reproduction, developmental biology, marine mammal anatomy) or directed individual study of advanced topics in veterinary public health or epidemiology (with emphasis on food safety, toxicology, informatics, or zoonoses). May be repeated for credit.  
Prerequisite: Matriculation in veterinary professional curriculum.

VIBS 989 Special Topics in...  
Credits 1 to 4. 1 to 4 Lecture Hours.  
Selected topics in an identified area of veterinary anatomy (with emphasis on neuroscience, cell biology, genetics, reproductive biology, developmental biology or marine mammal anatomy) or selected topics in veterinary public health, epidemiology, zoonoses, food hygiene and food toxicology.  
Prerequisite: Matriculation in veterinary professional curriculum.