



College of Veterinary Medicine

Report on Areas of Research, Scholarly and Creative Activities, and Discovery (RSCAD) Strength

May 22, 2014

The College of Veterinary Medicine has RSCAD strength in three thematic areas, animal health infectious disease, comparative biomedical science, and food safety and security. Our specific areas of strength are summarized below.

A. Area of Strength:	Infectious Disease – Select Agent Research
B. Scope and Context:	The scope of this research strength is investigations of high-consequence existing or emerging transboundary pathogens, such as African swine fever virus, classical swine fever virus, and Rift Valley fever virus.
C. Current or Emerging Strength:	<input type="checkbox"/> Current <input type="checkbox"/> Emerging <input checked="" type="checkbox"/> Both
D. Criteria of Strength:	1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19
E. Narrative:	This is a college research strength because several investigators are working with national (DHS and USDA Plum Island Animal Disease Center) and international (CSIRO Australian Animal Health Laboratory; The Pirbright Institute, UK) government laboratories in well-funded collaborative research, supported by BSL-2, BSL-3, ABSL-3 and BSL-3Ag large-animal facilities, and the existence of a college-administered, DHS-funded Center of Excellence in Emerging and Zoonotic Animal Disease.
F. Keywords/Tag words:	Select agents, Rift Valley fever virus, African swine fever virus, Classical swine fever virus, Center of Excellence in Emerging and Zoonotic Animal Disease, Biosecurity Research Institute

A. Area of Strength:	Viral Pathogenesis of Endemic and Emerging Diseases
B. Scope and Context:	The scope of this research strength is major viral diseases of livestock and humans. Studies are performed at the molecular, cellular, and organismic levels including the development of novel animal models.
C. Current or Emerging Strength:	<input type="checkbox"/> Current <input type="checkbox"/> Emerging <input checked="" type="checkbox"/> Both
D. Criteria of Strength:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
E. Narrative:	A college research strength because several investigators are engaged in the development and use of infectious clones. Activities are supported by BSL-2 and BSL-3 facilities as well as state-of-the-art flow cytometry, and confocal and electron microscope facilities.
F. Keywords/Tag words:	Influenza, Porcine epidemic diarrhea virus, Porcine reproductive and respiratory syndrome virus, Norovirus, Porcine circovirus 2, Swine diseases, Cattle diseases, Biosecurity Research Institute

A. Area of Strength:	Bacterial Pathogenesis of Endemic and Emerging Diseases
B. Scope and Context:	The scope of this research strength is investigations of major virulence factors, including structure and function studies, role in pathogenesis, mechanisms of action, and host responses to virulence factors.
C. Current or Emerging Strength:	<input type="checkbox"/> Current <input type="checkbox"/> Emerging <input checked="" type="checkbox"/> Both
D. Criteria of Strength:	1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19
E. Narrative:	A college research strength because several investigators are engaged in multidisciplinary regional, national and international research collaborations to study bacterial pathogens and pathogenesis in both humans and domestic food animals. Many of these pathogens are zoonotic agents, and thus this research is also integrated with other programs. This research area is well-supported by funds and partnerships with the NIH, USDA, and human and animal health industries.
F. Keywords/Tag words:	Bacterial pathogenesis, Innate immunity, Host-pathogen interaction, Food safety, <i>E. coli</i> , <i>Fusobacterium necrophorum</i> , <i>Mannheimia haemolytica</i> , <i>Mycoplasma bovis</i> , <i>Salmonella</i>

A. Area of Strength:	Vaccine Development and Field Efficacy
B. Scope and Context:	The scope of this research strength is the development of classical and novel approaches for livestock vaccines with applications to humans and small animals; development of vaccine challenge models; and clinical field studies for validation of efficacy.
C. Current or Emerging Strength:	<input type="checkbox"/> Current <input type="checkbox"/> Emerging <input checked="" type="checkbox"/> Both
D. Criteria of Strength:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
E. Narrative:	A college research strength because several investigators are engaged in the development and use of infectious clones, subunit and vectored vaccines, and field validation and application of commercial products. Activities are supported by BSL-2 and BSL-3 facilities, the Beef Cattle Institute, and partnerships with industry.
F. Keywords/Tag words:	Swine diseases, Livestock diseases, Zoonotic diseases, Food safety, Cattle diseases, Vaccine, Immunity, Adjuvants, Beef cattle health and well-being, Beef cattle production practices, Beef Cattle Institute, Biosecurity Research Institute

A. Area of Strength:	Mechanisms, Management and Consequences of Antimicrobial Resistance
B. Scope and Context:	The scope of this research strength is antimicrobial resistance in livestock, companion animal and zoonotic pathogens. Research includes diagnostic surveillance, pharmacodynamic and population-based models, epidemiology of both genetic and phenotypic resistance, and impacts of antimicrobial use.
C. Current or Emerging Strength:	<input type="checkbox"/> Current <input type="checkbox"/> Emerging <input checked="" type="checkbox"/> Both
D. Criteria of Strength:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
E. Narrative:	A college research strength because several investigators and collaborative teams are engaged in studies of the interactions between antimicrobial use and selection for resistant organisms in livestock and companion animals. A unique strength is the expertise, facilities, and industry partnerships to conduct studies across the breadth of in vitro, laboratory animals and large populations of animals. Unique collaborations involve regulatory aspects, human health, and production agriculture.
F. Keywords/Tag words:	Livestock diseases, Zoonotic diseases, Food safety, Cattle diseases, Beef cattle production practices

A. Area of Strength:	Antiviral Development
B. Scope and Context:	The scope of this research strength is identification of virus or cellular targets for antiviral drug development for coronavirus and calicivirus infections in humans and companion animals; development of in vitro high-throughput screening assays for antiviral compounds; characterization and mechanism of action of antiviral drugs; and in vivo safety and efficacy studies.
C. Current or Emerging Strength:	<input type="checkbox"/> Current <input type="checkbox"/> Emerging <input checked="" type="checkbox"/> Both
D. Criteria of Strength:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
E. Narrative:	A college research strength because several investigators collaborate to conduct studies of host-virus interactions that may lead to the identification of potential antiviral targets, screening and characterization of antiviral compounds and in vivo target validation and efficacy using animal models for coronavirus and calicivirus infections. Special emphasis is on feline infectious peritonitis and systemic, virulent feline calicivirus infection in cats and norovirus infection in humans. A unique strength is collaboration of researchers across multiple disciplines and industry partnership to conduct studies that encompass in vitro studies, antiviral drug design, chemical synthesis and selection of antiviral compounds, and animal models.
F. Keywords/Tag words:	Antiviral drug, Feline infectious peritonitis, Feline calicivirus, Human norovirus

A. Area of Strength:	Diagnostic Assay Development, Validation and Application
B. Scope and Context:	Veterinary diagnostics play an important role in the development of the one-health concept. New diagnostic tests, particularly rapid, automated and high-throughput tests, are needed for the detection of existing pathogens as well as emerging diseases, which continually threaten livestock and companion animal populations. Diagnostics are also essential for the detection of zoonotic pathogens in animal and human hosts. Diagnostic testing includes traditional approaches to whole pathogen genome sequencing and bioinformatics. Future vaccines will incorporate diagnostic tests to differentiate infected from vaccinated animals (DIVA).
C. Current or Emerging Strength:	<input type="checkbox"/> Current <input type="checkbox"/> Emerging <input checked="" type="checkbox"/> Both
D. Criteria of Strength:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
E. Narrative:	The Kansas State Veterinary Diagnostic Laboratory (KSVDL) is a full service, fully accredited veterinary diagnostic laboratory. In addition to offering routine diagnostic services to clients, the laboratory is actively engaged in diagnostic test development. Also supporting test development is a group of faculty members distributed between several departments and disciplines. One example is the development of novel approaches for the detection of food-borne, foreign animal and emerging pathogens. Test development is supported by a well-developed infrastructure in immune techniques, biochemistry, molecular biology, test validation, and epidemiology.
F. Keywords/Tag words:	Veterinary diagnostic testing, Zoonotic and emerging diseases, Rabies, Food-borne pathogens and food safety, Molecular diagnostics, Immune-based diagnostics, Bioinformatics, Pathogen genome sequencing, KSVDL

A. Area of Strength:	Epidemiology and Ecology of Disease
B. Scope and Context:	The scope of this research strength includes the epidemiology of pathogens and syndromes in food animal production systems and companion animal species including food safety pathogens, production-limiting diseases, bovine respiratory disease complex, internal and external parasites, and swine infectious diseases. Experimental, observational, and synthesis research methods are used to study host, pathogen, environment, and management factors that contribute to risks in animal well-being, production, and/or human health.
C. Current or Emerging Strength:	<input type="checkbox"/> Current <input type="checkbox"/> Emerging <input checked="" type="checkbox"/> Both
D. Criteria of Strength:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
E. Narrative:	A college research strength because several well-funded investigators and collaborative teams within the college are engaged in research initiatives with local, state, national, and international impacts. The college has unique expertise and capabilities to conduct real-world studies of host-pathogen-environment interactions thereby enabling valid research results including the elucidation of mechanisms of pathogen dissemination, maintenance, and evolution within and among hosts and the environment. For food animal research, the unique blend of expertise in epidemiology and production practices, combined with access to production systems and large populations of animals, result in extremely unique research abilities and resources including the Beef Cattle Institute. Extensive collaborations with veterinary practitioners, producers, pet owners, and regulatory and industry partners enable unique research capabilities and impactful results.
F. Keywords/Tag words:	Livestock diseases, Zoonotic diseases, Food safety, Cattle, Swine, Horses, Dogs, Cats, Parasites, Pathogens, Beef Cattle Institute

A. Area of Strength:	Therapeutic Interventions for Disease
B. Scope and Context:	Therapeutic intervention research involves in silica, in vitro, and in vivo pharmacodynamic/pharmacokinetic modeling. This work utilizes both challenge models and small and large population natural-occurring disease models. There is also a focus on the case definitions used to identify animals for disease intervention and how these definitions affect therapeutic outcomes.
C. Current or Emerging Strength:	<input type="checkbox"/> Current <input type="checkbox"/> Emerging <input checked="" type="checkbox"/> Both
D. Criteria of Strength:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
E. Narrative:	A college research strength because several investigators and collaborative teams are engaged in studies of therapeutic intervention of small and large animal diseases. The college has a unique capability to conduct investigations across the continuum from in vitro work to large population interventions. A relationship with veterinary practitioners and the food animal industries allows research to be conducted under field conditions, resulting in externally valid results. For food animal interventions, the blend of expertise in production practices with the expertise in clinical pharmacology allows response to critical research needs. For companion animals, clinicians have access to clients and patients that allows evaluation of existing and novel therapeutic interventions, again combined with the college strength in clinical pharmacology.
F. Keywords/Tag words:	Cattle, Swine, Exotics, Wildlife, Zoo, Dogs, Cats, Horses, Food animal, Bovine respiratory disease, Enteric disease, Pharmacology, Clinical pharmacology, Parasitology

A. Area of Strength:	Immune Mechanisms in Health and Disease
B. Scope and Context:	Immunity is important for recovery from disease and for protection following vaccination. In addition, aberrant immune responses, such as inflammation, contribute to clinical disease. Diagnosing the immune status provides important information on the outcome following infection and animal models of immune protection and immunopathogenesis are often used. Because several infectious diseases lack vaccines, understanding mechanisms of protection is needed to develop additional therapeutic approaches.
C. Current or Emerging Strength:	<input type="checkbox"/> Current <input type="checkbox"/> Emerging <input checked="" type="checkbox"/> Both
D. Criteria of Strength:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
E. Narrative:	A college research strength because several research teams are involved in the analysis of innate and adaptive immune responses in livestock, companion animals and humans. These activities are supported by a state-of-the-art flow cytometry facility that supports research and diagnostics. Researchers are engaged in vaccine development, diagnostics and disease modeling. One unique asset is the availability of a severe combined immunodeficiency (SCID) pig that lacks an adaptive immune response.
F. Keywords/Tag words:	Livestock diseases, Zoonotic diseases, Food safety, Immune models, Adaptive immunity, Innate immunity, Adjuvants, Flow cytometry, Host defense peptides, Interferons

A. Area of Strength:	Vector-Borne Diseases and Vector Biology
B. Scope and Context:	The scope of this research strength encompasses the interactions between pathogens, tick- and mosquito-borne vectors and the vertebrate host. Tick-borne diseases studied are focused on rickettsial disease agents, <i>Ehrlichia chaffeensis</i> and <i>Ehrlichia canis</i> . Mosquito-borne viruses studied include Japanese encephalitis, West Nile, chikungunya, Western equine encephalitis, Schmallenberg, o'nyong nyong, and yellow fever viruses. This research strength is well-supported by BSL-2, BSL-3, and BSL-3Ag facilities, funding and partnerships with the NIH, USDA, the State of Kansas, human and animal health companies, and collaborations with the USDA Arthropod-Borne Animal Disease Unit focused on bluetongue virus transmitted by <i>Culicoides</i> midges.
C. Current or Emerging Strength:	<input type="checkbox"/> Current <input type="checkbox"/> Emerging <input checked="" type="checkbox"/> Both
D. Criteria of Strength:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
E. Narrative:	Tick-borne pathogen studies encompass longstanding research focused on understanding the diseases caused by tick-borne pathogens of the genera <i>Ehrlichia</i> and <i>Anaplasma</i> causing Ehrlichiosis and Anaplasmosis. In particular, research involves understanding pathogen molecular structure, the development of an animal model to study host immunity against <i>Ehrlichia chaffeensis</i> , and in defining the contributions of tick and macrophage environments on the pathogen molecular structure and host responses. Research strengths focused on virus-mosquito-vertebrate host interactions of zoonotic viruses important to animal and human health are conducted at BSL-2, BSL-3 and BSL-3Ag facilities. The goal of this research is to provide a better understanding of vector susceptibility, the capacity of the virus to be transmitted, and understanding the molecular-genetic basis of virus transmission to facilitate vaccine and diagnostics design and development, and other countermeasures.
F. Keywords/Tag words:	Ehrlichiosis, Anaplasmosis, Ticks, Fleas, Mosquitoes, Alphavirus, Flavivirus, Bunyavirus Orbiviruses, <i>Culicoides</i> midges, Biosecurity Research Institute

A. Area of Strength:	Nanomedicine
B. Scope and Context:	The scope of this research strength is broadly based on exploring the biological interactions of nanomaterials with biological systems using cutting-edge characterization techniques coupled to innovative in vitro, ex vivo, and in vivo animal models. Specific areas of interest include dermal transport of nanomaterials, nanotoxicology and defining and quantitating the role of the protein corona on cellular uptake and biodistribution.
C. Current or Emerging Strength:	<input type="checkbox"/> Current <input type="checkbox"/> Emerging <input checked="" type="checkbox"/> Both
D. Criteria of Strength:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
E. Narrative:	Nanomedicine is a research strength that was greatly enhanced by the establishment of the new Nanotechnology Innovation Center of Kansas State (NICKS) University in the college. This interdisciplinary team bridges research in nanomaterial characterization, cell biology and computational medicine. Newly built facilities include state-of-the-art instrumentation and cell-culture laboratories specifically developed to contribute to the emerging field of nanomedicine, including transmission and scanning electron microscopy. A unique strength of this program is its ability to conduct in vitro studies, as well as in vivo studies in larger animal species more physiologically reflective of human biodistribution, including robust models for human and animal transdermal nanomedicine delivery. Researchers in this group are internationally recognized for expertise in nanotoxicology.
F. Keywords/Tag words:	Nanotechnology, Nanomedicine, Nanotoxicology, Biodistribution, In vitro, Electron microscopy, Nanoparticles, NICKS

A. Area of Strength:	Comparative Pharmacology
B. Scope and Context:	The scope of this research strength includes all aspects of quantitative comparative pharmacology including pharmacokinetics, pharmacometrics, clinical pharmacology, human food safety, interspecies comparisons, in vitro and in vivo extrapolations and transdermal drug delivery. Drugs focused on include antimicrobials, analgesics and nano-therapeutics.
C. Current or Emerging Strength:	<input type="checkbox"/> Current <input type="checkbox"/> Emerging <input checked="" type="checkbox"/> Both
D. Criteria of Strength:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
E. Narrative:	Quantitative comparative and clinical pharmacology is an internationally recognized strength of this college that was bolstered by the establishment of the Institute of Computational Comparative Medicine. The USDA-supported national Food Animal Residue Avoidance and Depletion (FARAD) Program is now headquartered here. In addition to a strong program in clinical veterinary pharmacology focused on antimicrobial and analgesic drugs, research also centers on utilizing the latest mathematical, pharmacometric and bioinformatic approaches to develop novel population and physiological-based mechanistic pharmacokinetic models useful for making interspecies extrapolations. Strength also exists in developing relevant in vitro models of drug delivery across epithelial barriers including the skin and mammary tissue, analytical chemistry focused on drugs, as well as quantitating chemical-mixture and formulation interactions for transdermal delivery. A new focus is on developing computational models of drug-induced antimicrobial resistance and quantitative biodistribution of nano-therapeutics.
F. Keywords/Tag words:	Pharmacology, Pharmacokinetics, Drugs, Antimicrobials, Analgesics, Nanomedicine, Analytical chemistry, Clinical pharmacology, Chemical food safety, Computational medicine, Bioinformatics, FARAD, ICCM

A. Area of Strength:	Stem Cell Biotechnology and Physiology, Stem Cells and Regenerative Medicine
B. Scope and Context:	This research strength is centered in the Midwest Institute for Comparative Stem Cell Biology, which exists to further basic and applied research in stem cells and related biotechnology in animals and humans and to extend that discovery through education and commercialization. The institute is uniquely situated to leverage research capabilities through collaboration among Kansas State University, the University of Kansas and the Kansas University Medical Center, and scientists with similar interests at other institutions.
C. Current or Emerging Strength:	<input type="checkbox"/> Current <input type="checkbox"/> Emerging <input checked="" type="checkbox"/> Both
D. Criteria of Strength:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
E. Narrative:	The institute was founded on the discovery of non-controversial stem cells within the umbilical cord by K-State scientists. The Institute has a core of faculty members across the college and has had significant grant funding and commercial licensing success. The basic research discoveries made by its scientists have developed into several novel translational projects and into an on-going clinical trial at the College of Veterinary Medicine under a FDA investigational new animal drug (INAD), a planned clinical trial at KUMC and in the development of a diagnostic test for cancer being evaluated in China. The Institute has a certificate program that trains the next generation of scientists and physician scientists in stem cells and regenerative medicine.
F. Keywords/Tag words:	Stem cells, Regenerative medicine, Intellectual property, Certificate program, Translational research, Midwest Institute for Comparative Stem Cell Biology

A. Area of Strength:	Physiology of the Inner Ear, Animal Models of Human Deafness
B. Scope and Context:	The scope of this research strength is on basic, developmental, and translational research of the inner ear. Investigations include basic research on salt and water transport and its regulation as well as translational research using animal models of human deafness. Disturbances of salt and water transport have been identified as key elements in the etiology of hereditary hearing loss in children that are associated with enlarged vestibular aqueducts and Pendred syndrome.
C. Current or Emerging Strength:	<input type="checkbox"/> Current <input type="checkbox"/> Emerging <input checked="" type="checkbox"/> Both
D. Criteria of Strength:	1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19
E. Narrative:	A college research strength because the investigators are well-funded (NIH), internationally recognized and engaged in collaborative research with national, governmental (NIH NIDCD) and international laboratories.
F. Keywords/Tag words:	Inner ear, Ion transport, Enlarged vestibular aqueduct, Pendred syndrome

A. Area of Strength:	Cell and Molecular Mechanisms Regulating Physiological Function
B. Scope and Context:	Epithelial cell biology and membrane transport physiology are the scope of this research strength. The Epithelial Cell Biology Laboratory focuses on solute transport across epithelial cell layers and associated regulatory cascades that are sensitive to steroid hormones and that contribute to reproductive success. Research in the Membrane Transport Physiology Laboratory is directed at elucidating basic molecular-level structure and function relationships and the sub-cellular regulatory processes that underlie the physiology of epithelial tissues. Particular emphasis is placed on understanding the disruption of these processes in genetic diseases. Basic scientific findings generate significant potential for characterization of therapeutic targets and therapeutic agents, forming the underpinnings for translational medicine.
C. Current or Emerging Strength:	<input type="checkbox"/> Current <input type="checkbox"/> Emerging <input checked="" type="checkbox"/> Both
D. Criteria of Strength:	1, 2, 3, 4, 6, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
E. Narrative:	Multiple international and national collaborations, including with the University of Newcastle (Newcastle-Upon-Tyne, UK), Istituto Giani Gaslini (Genova, Italy), and Yale University (New Haven, CT, USA), contribute to this research strength. Continuing and emergent success in securing extramural funding and in developing undergraduate and graduate students who embark on either careers in health care professions or in post-graduate research and scholarship.
F. Keywords/Tag words:	Cell biology, Developmental biology, Tissue regulation, Molecular structure and function, Disease mechanisms, Translational medicine

A. Area of Strength:	Cardiovascular and Respiratory Physiology
B. Scope and Context:	The scope of this research strength is chronic heart failure and diabetes, diseases that are endemic in the developed world. Effective treatment is incumbent upon understanding the predations of these conditions on the oxygen transport system (especially organ blood flow and microcirculatory control), development of innovative and accurate models of capillary function and their plasticity to novel therapeutic interventions.
C. Current or Emerging Strength:	<input type="checkbox"/> Current <input type="checkbox"/> Emerging <input checked="" type="checkbox"/> Both
D. Criteria of Strength:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
E. Narrative:	A college and university (Human Ecology) research strength as an interdisciplinary research team works in concert with scientists, administrators and national scientific funding agencies (NIH NHLBI and NIA, AHA, APS, ACSM) and international laboratories (Exeter University, UK; Kobe University, Japan).
F. Keywords/Tag words:	Chronic heart failure, Diabetes, Aging, Oxygen transport, Skeletal muscle microcirculation, Capillary hemodynamics, Vascular control

A. Area of Strength:	Mechanisms Regulating Central Sympathetic Neural Circuitry
B. Scope and Context:	Central sympathetic neural circuits play a critical role in regulating processes essential for mediating physiological responses. Sympathetic nervous system dysfunction has been implicated in numerous pathophysiological states including hypertension, heart failure, sudden cardiac death, and diabetes. The incidence of these disease states increases with advancing age. The determination of central neural mechanisms regulating sympathetic nerve activity is essential for understanding relationships between chronic disease development and age-associated changes in sympathetic nerve function.
C. Current or Emerging Strength:	<input type="checkbox"/> Current <input type="checkbox"/> Emerging <input checked="" type="checkbox"/> Both
D. Criteria of Strength:	1, 2, 3, 4, 5, 6, 8, 9, 11, 12, 13, 14, 15, 16, 18
E. Narrative:	Comparative medicine/translational physiology are identified college research strengths and numerous investigators are engaged in integrative studies focused on understanding mechanisms relating genomic, proteomic, cell and neural signaling, tissue and organ biology, and systemic aspects of physiology. Recent lines of inquiry have expanded the functional repertoire of the sympathetic nervous system by establishing an essential role for this system in regulating, integrating, and orchestrating processes between diverse physiological systems. The basic experimental approach capitalizes on knowledge of central neural sympathetic regulatory principles and strategies to probe the fundamental mechanistic interactions between sympathetic nervous system regulation and pathophysiological states and syndromes. The college is in a unique position to provide information to a critical area of research that lacks fundamental information regarding central neural regulatory mechanisms.
F. Keywords/Tag words:	Sympathetic nerve activity, Electrophysiology, Gene arrays, Central nervous system

A. Area of Strength:	Fundamental Mechanisms of Cancer, Cancer Therapeutics and Cancer Stem Cells
B. Scope and Context:	A strong core of innovative basic scientists and clinicians within the college, and in a broader context, within the Johnson Cancer Research Center make up this area of strength. These scientists have developed novel technologies for detecting and treating cancer, and have leveraged cell-signaling pathway knowledge to develop and test novel cancer therapeutics and tools for drug discovery.
C. Current or Emerging Strength:	<input type="checkbox"/> Current <input type="checkbox"/> Emerging <input checked="" type="checkbox"/> Both
D. Criteria of Strength:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
E. Narrative:	There is an urgent need to develop targeted therapies for cancer that avoid the many severe (and sometimes fatal) off-target effects of currently employed therapeutics. Scientists in this research strength are working toward this end by developing stem or defensive cells that home to tumors as delivery vectors for more targeted therapy. Umbilical cord matrix stem cells have been shown to have intrinsic anti-cancer effects. They and other types of tumor-homing cells have been used to deliver magnetic nanoparticles for hyperthermic therapy and imaging, as well as to secrete anticancer molecules such as cytokines. These therapies have been shown preclinically to be effective in inhibiting the growth of primary as well as metastatic cancer. One clinical therapy is in the pre-investigational new drug phase of testing.
F. Keywords/Tag words:	Mesenchymal stem cells, Stem-cell-based cancer-targeted therapy, Gene therapy, Hyperthermic therapy, Translational research