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1905-2015

# *lifelines*

News from the  
College of Veterinary Medicine  
at Kansas State University

February 2015

Vol. 10 No. 2

## Under the Electron Microscope

Nanotechnology Innovation Center of Kansas State (NICKS) offers campuswide access to facility



TEM — transmission electron microscopy

The Nanotechnology Innovation Center of Kansas State (NICKS) hosts an electron microscopy (EM) facility located within the College of Veterinary Medicine on Denison Avenue. This facility can be used to help improve the scientific output of Kansas State University researchers, while providing faculty, students and staff with guidance for EM research.

The facility can conduct both transmission electron microscopy (TEM) and scanning electron microscopy (SEM).

- For TEM, there is a FEI Tecnai G2 Spirit BioTWIN that provides a 0.34 nm resolution, 120Kv and a GATAN digital imaging system with a HAADF detector for STEM imaging and an Oxford detector <135 eV for elemental analysis.

- For SEM, there is a Hitachi S-3500N scope that provides a 3.0 nm resolution and also equipped with an Oxford detector <135 eV for elemental analysis.

“Our new EM facility has all the necessary equipment for proper sample fixation, processing, sectioning and visualization for TEM and SEM,” said Dr. Nancy Monteiro-Riviere, university distinguished professor and director of NICKS. “The

EM facility also offers analysis for a variety of samples from biological tissues, body fluid, bacteria, viruses and samples from other scientific fields. Applications include cell biology, structural biology, soft matter and nanomaterials, nanoparticles and other fields of nanotechnology where one requires nano level imaging.”

Specific technical expertise is listed below:

- Study of morphological changes in cells and organelles under certain disease or experimental conditions. Viral and/or bacterial deposits under infectious conditions in animals and/or plant tissue, bacterial, fungal, algae, cultured cell lines, and artificial cell matrices.

- Subcellular localization of pathology related protein or interested biomolecules inside the cell using immunolabeling of ultrathin frozen and plastic embedded sections.

- Elemental analysis of metal accumulation inside cells using X-ray dispersive spectroscopy.

- Provides analytical support for characterization (DLS, Zeta measurements) and interaction of nanoparticles in cells, tissues and biological fluids for drug delivery. The NICKS Center has other specific centralized instrumentation needed for nano research which is also available.

- Protein dynamics such as protein miss-folding, aggregation, amyloid formation, protein corona complex and protein interactions with nanoparticles and other molecules, Liposomes and lipid self-assembled nanostructures and other biological material using negative staining.

- Nanocharacterization, an elemental analysis using STEM and X-ray dispersive spectroscopy of metallic nanoparticles,

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Hopeful research for heart patients

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KANSAS STATE UNIVERSITY

College of Veterinary Medicine

More stories + video reports online at:  
[www.vet.k-state.edu/development/lifelines/1502.html](http://www.vet.k-state.edu/development/lifelines/1502.html)

## Dr. David Renter announces new Center for Outcomes Research and Education



*The new Center for Outcomes Research and Education will focus on demonstrating the value of animal health interventions including treatment, prevention or diagnostic activities intended to improve health.*

The College of Veterinary Medicine at is announcing the establishment of a new center of excellence thought to be the first of its kind in animal health. On Feb. 25, the Center for Outcomes Research and Education (CORE) will be publicly launched under the guidance of veterinary epidemiologist Dr. David Renter. With a goal of improving effectiveness and efficiency in animal health care and its associated impacts on human health, the CORE will focus on demonstrating the value of animal health interventions – including treatment, prevention or diagnostic activities intended to improve health.

“By providing structured, applied research and educational programs that explicitly define and incorporate the societal and economic values inherent to health interventions, the CORE will be a unique resource for the veterinary profession and others focused on enhancing animal health” said Dr. Renter, a professor in the Department of Diagnostic Medicine/Pathobiology and director of CORE. “The CORE will provide leadership and infrastructure for effective collaboration among practicing veterinarians, industry partners, government agencies, and others in academia, so we can determine optimal animal health approaches for different situations. This type of outcomes research approach is already well-integrated into some human health programs, but a center like this is new in animal health.”

The discipline of outcomes research involves applied clinical- and population-based research that seeks to study and optimize the end results of health care practices and interventions in terms of benefits to the patient and society. Often there is a focus on the evaluation of economic factors, comparative clinical effectiveness, and health-related quality of life assessments. “We will generate and synthesize evidence on health interventions and train people on how to best utilize that evidence to influence health care decisions” Dr. Renter said.

The CORE will involve several faculty at Kansas State University with existing collaborative programs, as well as experts at other institutions. “We have some truly world-class faculty already working together on these types of issues” said Dr. Renter “The CORE will allow us to enhance that work, increase our visibility, provide more focused leadership, and be much more responsive to stakeholders in the animal health community.

“Here at Kansas State University, we already have a number of flagship and well-established research and educational programs in this area, including veterinary medicine, public health, epidemiology, agricultural economics, infectious diseases and animal sciences,” Dr. Renter said. “Several of our existing centers and institutes have goals that align extremely well with the CORE.”

The CORE research and training activities will be funded through a variety of sources, including private sector support and federal grants through USDA as examples. Developing and enhancing public-private partnerships is a key part of CORE’s strategic plan. As an example, Dr. Renter noted Kansas State University’s connections with the Kansas City Animal Health Corridor, a consortium of more than 200 animal health and nutrition companies whose leadership controls over one-third of the world’s animal health business.

Dr. Renter said CORE helps support Kansas State University’s 2025 Vision of becoming a top 50 public research university.

### EM Facility | NICKS offers consultation

polymeric nanoparticles, core shell nanoparticles and soft polymer nanocomposites like soft polymer laced with nanostructures like carbon nanotubes, fullerenes, quantum dot nanoparticles and other nanostructured materials.

Dr. Monteiro-Riviere noted that the EM microscopy facility is scheduled to have the capability for cryo electron microscopy studies.

“The TEM is cryo-compatible and equipped with a low-dose mode for beam-sensitive vitrified sample observation at liquid nitrogen temperatures,” she said. “We still need a few

more additional attachments before we can offer full cryo capabilities. If faculty are interested in using cryo for their research, please let us know so we can outfit the scope with the proper cryo attachments.”

NICKS offers consultation services concerning technical methods, budgeting, SOP preparation and equipment selection. Please contact the EM manager Ravi Thakkar, [ravithakkar@vet.k-state.edu](mailto:ravithakkar@vet.k-state.edu).

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## VIDEO REPORT: Lameness Locator<sup>®</sup> steps up equine capabilities

Horses can now get a leg up at the Veterinary Health Center (VHC) at Kansas State University. The VHC now offers a new, high-tech tool for diagnosing equine performance issues called the “Lameness Locator<sup>®</sup>.”

“The Lameness Locator is a computer-based system that wirelessly is able to give you a ‘quantitative’ — or in other words — it can measure the degree to which a horse is lame,” said Dr. Elizabeth Santschi, professor of equine surgery. “It can be particularly helpful in cases of multiple limb lameness, which can be difficult to perceive and discriminate with just your naked eye.”

The Lameness Locator was purchased by the VHC in late 2014.

Learn more about the Lameness Locator in this month’s video report at: <https://www.youtube.com/watch?v=ZXoQU1C89yA>.



*Fourth-year students work with Dr. Elizabeth Santschi (second from right) to learn how to utilize the new equine Lameness Locator system.*

## HOT TOPIC: Novel treatment promising for heart-failure patients

More than six million Americans live with heart failure often as the consequence of a heart attack or myocardial infarction. A myocardial infarction occurs when an artery carrying oxygenated blood to the heart muscle becomes blocked. The victim suffers acute chest pain and the destruction of heart muscle. With rapid medical attention survival rates are high but the heart remains permanently damaged and unable to pump blood effectively. This compromises muscle oxygen delivery and initiates a cluster of responses that further reduces the ability to supply the leg and arm muscles with blood flow and oxygen. Often this means that the patient is unable to be physically active or mobile, enjoy social events with their family or continue their profession. Tragically, the physical activities demonstrated to improve their cardiovascular and muscle function are hampered by the inability to supply their contracting muscles with the necessary oxygen. A research team at the Clarendburg Cardiorespiratory Laboratory led by Drs. Timothy I. Musch and David C. Poole has been attacking this problem in the laboratory and now, just published in the prestigious American Heart Association journal *Circulation*, their discoveries employing beetroot juice have been shown to be of major benefit to heart failure patients.

Using experimental models of heart failure and exercise their work has revealed the crucial role played by nitric oxide in the provision of blood flow and oxygen delivery to skeletal muscles during exercise (see “Milestones of discovery” inset). In heart failure the enzyme systems (nitric oxide synthases, NOS) that produce endogenous nitric oxide are rendered dysfunctional. This situation occurs, in part, because the low oxygen conditions in patients suffering from heart failure reduce the function of these enzymes. Simply supplying massive amounts of nitric oxide or other vasodilator therapies would not be effective for these patients because this would lead to potentially catastrophic hypotension. What was needed was a strategy to supply nitric oxide selectively to the organs – skeletal muscles – during exercise when their demands for oxygen were the highest.

The beauty of inorganic nitrate supplementation via beetroot juice is that it is like a timed-release capsule. Nitrate is absorbed in the gut and then circulates back to the mouth where it is converted into nitrite by facultative bacteria in the



*Drs. David C. Poole and Timothy I. Musch with undergrad and grad students: (back row) Daniel M. Hirai, Hunter Jewett, Scott K. Ferguson, Steven W. Copp, Clark T. Holdsworth, (front row) Gabbi Simms and laboratory manager K. Sue Hageman.*

mouth before being reabsorbed into the bloodstream. This nitrite then targets tissues – primarily contracting skeletal muscles with the greatest oxygen needs – because their very low oxygen pressure (hypoxia) is the precise environment where the nitrate is reduced to nitric oxide; promoting increased blood flow and also improving the way oxygen is used in the mitochondria. In this manner the working muscles function better, produce less lactic acid and exercise capacity is improved. Because the exercise feels easier it is hoped that this strategy will be employed in cardiac rehabilitation programs where patients often drop out because they either fatigue too easily or recover too slowly from their last session.

## Kansas State Postdoctoral Association presents grant-writing workshop



Postdoctoral association members with their guest speaker. Back row, left to right: Drs. Amit Kumar, Tara Marriage, Karen Alviar, Rachel Madera and Sergio Curto Ramos. Front row: Drs. Pavan Rajanahalli, Raghavendra Amachawadi, Mary Lou Marino (the guest speaker), Raman Chandrasekar, Li Lei and William Rutter.

The Kansas State Postdoctoral Association (KPA) recently held its first event, "Funding Opportunities: The Art of Grantsmanship" given by Mary Lou Marino, director of the Office of Research and Sponsored Projects at Kansas State University.

The event was organized by Dr. Raghavendra Amachawadi, KPA's Chair of the Professional and Career Development Committee and Postdoctoral Fellow, Department of Diagnostic Medicine/Pathobiology at the College of Veterinary Medicine. The seminar was well-attended with more than 80 graduate students and postdocs at the presentation. The seminar proceedings were recorded and shared with all the postdocs and faculties at K-State's satellite campuses (Salina and Olathe).

## CVM News Ticker

**Dr. Bob Larson** delivered presentations to the Western Canadian Association of Bovine Practitioners in Saskatoon. Topics: "Using the Producers' Data to Make Decisions," "Developing an Overall Plan for Delivering Veterinary Services to Your Producers," "What is the Impact of BVD to Cow-Calf and Feedlot Producers." He also delivered presentations to the Oklahoma Veterinary Medical Association meeting in Norman on the topics: "Role of momentum in herd fertility – importance of heifer development," "Bulls and other things that can go wrong in beef herd reproduction," "BSE of bulls – considerations for yearlings and mature bulls," "BVD CONSULT – designing herd-specific BVD control programs" and "BRD in stocker and feedlot cattle."

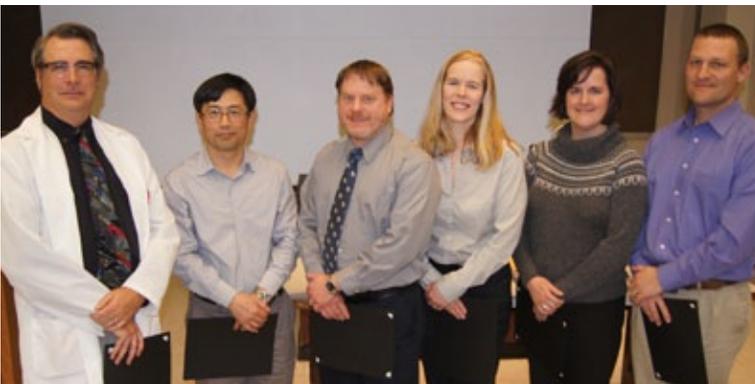
**Dr. Brad White** delivered a presentation to the Calf Health BI Meeting in Denver, Colorado. His topic was "Optimizing calf health prior to weaning."

**Dr. Mike Apley** delivered a presentation to the 2015 Legislative Agriculture Chairs Summit in Tampa, Florida. The seminar title was "Veterinary legal and Legislative Issues - State Agriculture rural leaders."

**Dr. Susan Nelson** was featured in the media educating the public about three different topics: holiday hazards, distemper and "winter brings new challenges to man's best friends."

**Dr. Warren Beard** delivered a presentation to the Winter Park Equine Science Retreat in Winter Park, Colorado, on the topic: "Comparison of arthroscopic and needle lavage for the equine tarsocrural joint."

## Promotions and tenure for faculty



Congrats to (left to right) Dr. Thomas Schermerhorn, who was promoted to professor, Dr. Kyeong-Ok Chang - promoted to professor, Dr. S. Butch KuKanich - promoted to professor, Dr. Katherine Stenske KuKanich - promoted to associate professor with tenure, Dr. Mary Lynn Higginbotham - promoted to associate professor with tenure, and Dr. Chris Blevins - promoted to clinical associate professor.

*lifelines* is published monthly by the Development Office in the College of Veterinary Medicine. The editor is Joe Montgomery, [jmontgom@vet.k-state.edu](mailto:jmontgom@vet.k-state.edu). Read online at [www.vet.k-state.edu/development/lifelines/1502.html](http://www.vet.k-state.edu/development/lifelines/1502.html)

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