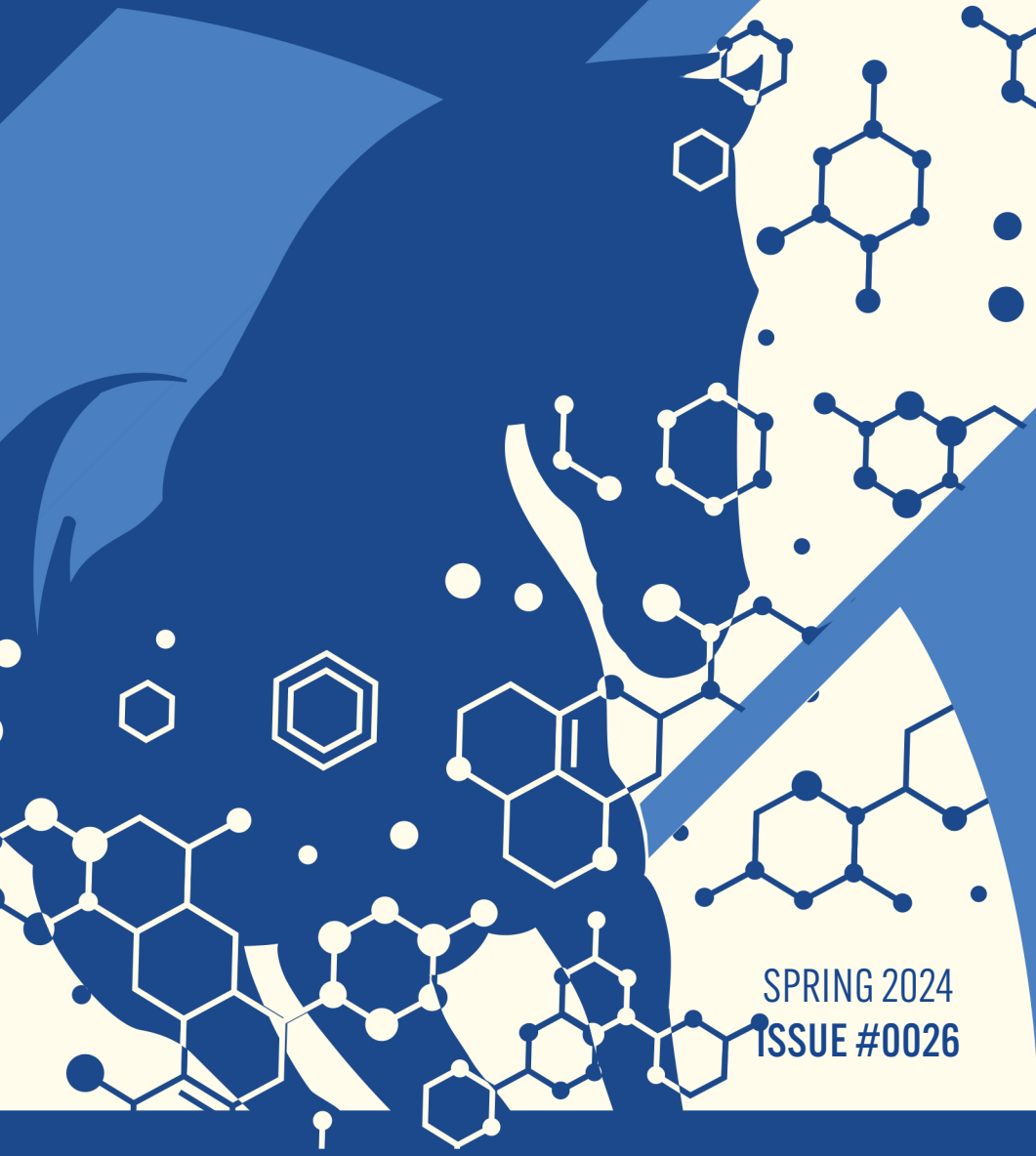


# EQUINE SCIENCE REVIEW



[CA.UKY.EDU/EQUINE](https://ca.uky.edu/equine)  
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**UNDERSTANDING WATER-SOLUBLE CARBOHYDRATES IN CENTRAL KY PASTURES, 3**  
Increased interest in capacity of cool-season grasses to produce different types, amounts of carbohydrates.

**NANCY COX TO RETIRE FROM UK, SERVING MORE THAN 20 YEARS AS AGRICULTURE LEADER, 5**  
Nancy Cox is long-time dean of MG-CAFE at UK and first-ever vice president for land-grant engagement.

**UK LAUNCHES NEW "WEATHER ALERT" SMARTPHONE APP, 7**  
Smartphone app aims to serve both KY farming community and residents by providing critical weather updates.

**UK APPOINTS NEW VETERINARY SCIENCE CHAIR AND GLUCK CENTER DIRECTOR, 8**  
UK appoints Brett Sponseller to lead. His wife, Beatrice, joins the team as a clinical professor in the department.

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# ESR

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*Equine Science Review is a Martin-Gatton College of Agriculture, Food and Environment newsletter that highlights important equine work happening at the University of Kentucky.*



*Photo courtesy Dr. Jimmy Henning.*

# UNDERSTANDING WATER-SOLUBLE CARBOHYDRATES IN CENTRAL KENTUCKY PASTURES

In Central Kentucky, many horses graze pastures that consist mainly of cool-season grasses, such as Kentucky bluegrass, orchardgrass, tall fescue and perennial ryegrass. During growth, the plants produce carbohydrates via the process of photosynthesis. In recent years, there has been increased interest in the capacity of different cool-season grasses to produce different types and amounts of carbohydrates.

Researchers at the United States Department of Agriculture-Agricultural Research Service (USDA-ARS) Forage Animal Production Research Unit and at the University of Kentucky Martin-Gatton College of Agriculture, Food and Environment have conducted several studies on carbohydrate accumulation in cool-season grasses. Their main focus has been on a group of carbohydrates referred to as “water-soluble” carbohydrates (WSCs). These types of carbohydrates are comprised of sugars like glucose, fructose and sucrose; as well as fructans (chains of fructose).

WSCs are of particular interest as high concentrations have been associated with exacerbation of insulin resistance in horses. Various research studies suggest that some management strategies can be taken to lower the concentrations of WSCs to which horses are exposed when grazing. Some of these strategies have been reviewed (Watts and Chatterton 2004). This article is a summary of results found when fertilization and different varieties of cool-season grasses were employed, with morning and afternoon sampling. Results were published in the *Journal of Equine Veterinary Science*.

A forage WSC concentration below 10% (on a dry matter basis) has been recommended for

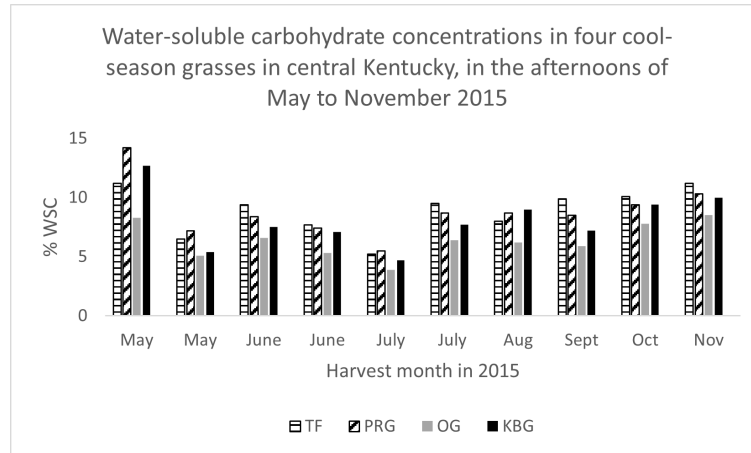


FIGURE 1. WSC CONCENTRATIONS IN TALL FESCUE (TF), PERENNIAL RYEGRASS (PRG), ORCHARDGRASS (OG), AND KENTUCKY BLUEGRASS (KBG), HARVESTED FROM FIELD PLOTS ON MAY 13 AND 27, JUNE 10 AND 24, JULY 8 AND 22, AUGUST 19, SEPTEMBER 15, OCTOBER 13, AND NOVEMBER 3 OF 2015. PLOTS WERE MOWED AFTER EACH HARVEST. ONLY THE RESULTS FROM AFTERNOON HARVESTS OF NITROGEN-FERTILIZED PLOTS ARE SHOWN.

horses at risk for insulin resistance and some other metabolic conditions (Frank et al. 2010). In a study of plots of cool-season grasses (perennial ryegrass, orchardgrass, tall fescue or Kentucky bluegrass) mowed every two to four weeks (Kramer et al. 2020), most samples (harvested at 2” above the soil to mimic grazing) had WSC concentrations below 10% (Figure 1). Orchardgrass had lower WSC concentrations than perennial ryegrass, tall fescue or Kentucky bluegrass on most harvest dates, based on three orchardgrass varieties. Orchardgrass WSC concentrations were consistently below 10% from May to November.

However, in a study done in the Virginia Piedmont (Kagan et al. 2011), one orchardgrass variety had WSC concentrations above 10% when allowed to grow in experimental plots to a hay cutting stage (late April). While the difference between measurements in the two studies may partly reflect differences in the timing of harvest, management or methods used to measure WSCs, it also suggests the value of having forages tested for

WSC concentrations, especially when using a different variety.

Time of grazing is frequently mentioned as a means of controlling the concentrations of WSCs available to horses. The WSCs produced through photosynthesis are constantly utilized through respiration, but during the night, when photosynthesis does not occur, respiration depletes WSCs. The result is a lower WSC concentration in the morning. WSC concentrations have been found to increase from noon to early evening (Lechtenburg et al. 1972). Grazing in the morning may present the least risk to horses prone to metabolic issues.

However, in grasses sampled in early to mid-afternoon, WSC concentrations were not always higher than in the morning (Kramer et al. 2020), suggesting that not enough time had elapsed for WSCs to accumulate appreciably. These results were variable, suggesting that while early afternoon grazing may present a smaller risk than late afternoon grazing, morning grazing is the



safest option for horses at risk for metabolic issues.

The extent to which nitrogen status, or fertilization, affects WSC concentrations in pastures is unclear from the abovementioned studies. When grasses are fertilized, the products of photosynthesis are expected to be utilized for growth instead of accumulating as WSCs. Hence, WSC concentrations are expected to be lower in fertilized than in unfertilized pastures. However, in the Kentucky study mentioned previously, WSC concentrations of about 80% of samples were unaffected by nitrogen (50, 35, and 50 lb/acre in March, May and August). Repeated mowing of plots may have affected the trends observed, as Lechtenburg and colleagues (1972) found that only the first cut of tall fescue exhibited an inverse relationship between fertilizer and fructans. In conclusion, testing of varieties for WSC concentrations, and morning grazing may help to manage the amount of WSCs to which grazing horses are exposed. Additional management strategies, such as consideration of weather patterns, may be helpful as well and are described elsewhere (Watts and Chatterton 2004).

**Acknowledgments:** Authors' joint research was funded by the U.S. Department of Agriculture. USDA is an equal opportunity provider and employer.

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| *Isabelle A. Kagan, PhD, plant pathologist with USDA-ARS and adjunct instructor within UK's Plant and Soil Sciences Department; Laurie M. Lawrence, PhD, professor within UK's Animal and Food Sciences Department; Kelly J. Kramer, graduate student within UK's Plant and Soil Sciences Department at the time of this research; and S. Ray Smith, extension professor within UK's Plant and Soil Sciences Department*

# NANCY COX TO RETIRE FROM UK, SERVING MORE THAN 20 YEARS AS AGRICULTURE LEADER

Nancy Cox — the long-time dean of the Martin-Gatton College of Agriculture, Food and Environment (CAFE) at the University of Kentucky and the first-ever vice president for land-grant engagement — plans to retire in late summer, UK officials announced.

Cox will serve as dean and vice president until a replacement is selected.

Under her leadership, the college has seen tremendous growth in support of the state's signature equine industry. Cox championed the formation of the UK Equine Initiative (now UK Ag Equine Programs) in 2005, recognizing the need for UK to provide more enhanced services to this signature industry. This program is now the largest undergraduate major in the college and a top program nationally.

In recognition of her leadership in equine safety, in 2020 Cox was appointed co-chair of the Horseracing Integrity and Safety Authority nominating committee. She has worked extensively with equine organizations to help advance and support the industry. She is a member of the Kentucky Thoroughbred Farm Managers Club and serves on the Kentucky Horse Park Foundation Board. She is also a member of the Iroquois Hunt Club.

“Our land-grant mission is central to who and what we are as Kentucky's university. That mission is why we were founded — to serve and advance this state. No one has been more central to that mission over the last two decades than Nancy Cox,” said UK President Eli Capilouto. “For nearly 10 years, as dean of the Martin-Gatton CAFE — and since 2020 as our inaugural vice president for land-grant engagement — Nancy Cox has defined, enhanced and expand-



NANCY COX AND STUART S. JANNEY, III, CHAIRMAN OF THE JOCKEY CLUB AT THE JOCKEY CLUB CHAIRMAN'S DINNER AT THE NATIONAL MUSEUM OF RACING AND HALL OF FAME. PHOTO BY THE JOCKEY CLUB/GREGORY FISHER.

ed the University of Kentucky's land-grant mission.”

“Martin-Gatton College of Agriculture, Food and Environment is at the heart of UK's land-grant mission — educating and preparing young people to better our state, serving in every community of the Commonwealth,” Cox said. “It has been my honor to help lead those efforts for more than 20 years at UK — in research, extension, guiding the college and forging new efforts to expand our land-grant mission through expanded engagement efforts. We have such tremendous people, who are dedicated to this mission and who are leaders in their fields. It has been an honor to serve with and among them during a time of such growth for our university.”

Among numerous accomplishments during her tenure at UK, Cox:

- Directed a comprehensive re-examination of the Cooperative Extension Service to strengthen its capacity and meet Kentucky's growing 21st century needs;
- Led the creation of innovative programs and partnerships,
- such as the Racetrack Safety Program and James B. Beam Institute for Kentucky Spirits;
- Shepherded a more than \$65 million partnership with the federal government to develop a state-of-the-art United States Department of Agriculture forage animal production research facility;
- Helped foster the largest gift in the institution's history — \$100 million from The Bill Gatton Foundation — which will enhance scholarships, academic programming and research;
- Launched the nearly half-billion-dollar capital transformation of the Martin-Gatton CAFE currently underway;
- With the college's administrative team, led the collaborative effort to re-build the Grain and Forage Center of Excellence at the college's Research and Education Center in Princeton, Kentucky; and
- Served as UK's first vice



president for land-grant engagement and initiated a process to thoughtfully think about how the university extends the ethos of the land-grant service and mission throughout every corner of the campus community.

Cox came to UK in 2001 from Mississippi State University to serve as Martin-Gatton CAFE's associate dean of research.

During that time, Cox oversaw the college's \$25 million research enterprise — which has now nearly doubled — and represented UK on the state's agricultural commodity boards. Cox oversaw the investment and renewal of UK's Veterinary Diagnostic Laboratory, which serves a critical animal and public health role in the Commonwealth. She was the founding administrator for several growing equine programs and was central to initiating numerous partnerships with private industry, such as with Alltech. She also routinely served on key federal policy boards and organizations.

Cox developed deep ties with agricultural industry and educational leaders across the state, including Kentucky Farm Bureau,

all major commodity organizations, Kentucky State University and various economic development partners. She began service as dean of the college in 2014. In 2020, Capilouto named her UK's first vice president for land-grant engagement.

During that time, Cox initiated a multi-disciplinary effort called UK Engage, which seeks to involve people across the university community — in agriculture, economic development, journalism, the arts, health and other areas — to facilitate more purposeful and strategic collaborations to serve the state.

One of the initiatives of the UK Engage effort has been the Engagement Academy, an annual, two-day symposium that brings together scholars and community members to focus on campus-wide collaborations. She also launched the competitive engagement grant program last January to award collaborative campus and community projects strengthening the university's ties to the Commonwealth.

More recently, Capilouto tasked Cox with co-chairing a workgroup around expanded university partnerships as part of Project Accelerate — an initiative di-

rected by the UK Board of Trustees for the university to find ways to accelerate its efforts in advancing the state.

Prior to her administrative career, Cox taught and conducted research in animal physiology. She received a bachelor's degree from Furman University, a master's degree from the University of Georgia and a doctorate from North Carolina State University.

Capilouto said a national search will be conducted for the position of dean and vice president for land-grant engagement. He hopes a selection will be made by early fall.

"Nancy is irreplaceable as a leader," Capilouto said, "Her legacy and commitment are profound examples for us to follow as we continue our work as stewards of a sacred promise to be Kentucky's university in all that we do."

| *Source: edited news release by University of Kentucky chief communications officer Jay Blanton.*

## GRADUATE STUDENT BUILDS REFERENCE GENOME

On Jan. 31, a new version of the Brown Norway rat genome was released at the National Center for Biotechnology Information (NCBI). This reference was built by Kai Li, a first-year master's student in the laboratory of Ted Kalbfleisch, PhD, associate professor at the Gluck Equine Research Center in collaboration with scientists from the University of Texas Houston, the University of Louisville and the Sanger Institute. On Feb. 27, the annotation of that genome, or placement, and structure of genes on the new genome were released (download details can be found at [https://www.ncbi.nlm.nih.gov/data.../genome/GCF\\_036323735.1/](https://www.ncbi.nlm.nih.gov/data.../genome/GCF_036323735.1/)).

This annotation demonstrated that this new genome was more complete, not only in terms of sequence composition, but also with respect to its ability to accurately characterize the structure of more genes, including an increase over the most recent version of more than 5% of protein coding genes, and 67% of Immunoglobulin/T-cell receptor gene segments. The rat is a very important model organism commonly used to better understand human diseases such as breast cancer and hypertension. This new genome will make it possible for scientists to gain insights into the genetic basis for human health and wellbeing.

What does all of this mean for medical and agricultural research? The sequencing technology and computational power we have today, coupled with the students that we are training make it possible for us to accurately read the genome of nearly any organism. This opens a new frontier where we can begin to think about interpreting genomes comprehensively in terms of the physical and chemical interactions found in their environment, and ultimately how these genomes influence the physical manifestations that we enjoy in the plants, animals, and people in our world.



# UK LAUNCHES NEW “WEATHER ALERT” APP

In a move to boost weather-related awareness and agricultural decision-making, the University of Kentucky Ag Weather Center, in partnership with the UK Department of Biosystems and Ag Engineering, UK Center for Computational Sciences and the Southeastern Center for Agricultural Health and Injury Prevention (SCAHIP), has announced the launch of “Weather Alert.” The smartphone application aims to serve both Kentucky’s farming community and other residents by providing critical weather updates and forecasts.

“We know how tough it can be to keep up with the weather,” said Matt Dixon, UK senior meteorologist with the Martin-Gatton College of Agriculture, Food and Environment. “That’s why we made Weather Alert as simple and straightforward as possible. It doesn’t have any frills, just the info you need.”

The app’s first phase, now complete, offers a user-friendly design with access to current and forecasted weather data, high-resolution radar and timely warning and watch alerts. Users can receive alerts tailored to their specific GPS location or other designated areas, enhancing their ability to make informed management and production decisions.

“As we move into the next phases, the app will incorporate advanced tools from the Ag Weather Center to provide a GPS-enabled, county-by-county agricultural weather product tailored to the needs of the Bluegrass State and beyond,” Dixon said. “The focus will then shift towards enhancing disaster readiness capabilities in its subsequent phase, maintaining a county-centric approach.”

Weather Alert is available at no cost and free from advertisements, ensuring a seamless and efficient user experience.

“The Weather Alert app



PHOTO BY ADOBE STOCK.

has provided real-time weather information for our extension agents, producers, families and communities to make decisions and be proactive with weather-related events,” said Laura Stephenson, PhD, associate dean and director of the Kentucky Cooperative Extension Service. “We encourage everyone, especially those in agricultural sectors, to download this free app to stay prepared and informed about weather conditions.”

While primarily designed for Kentucky, Weather Alert can be used nationwide.

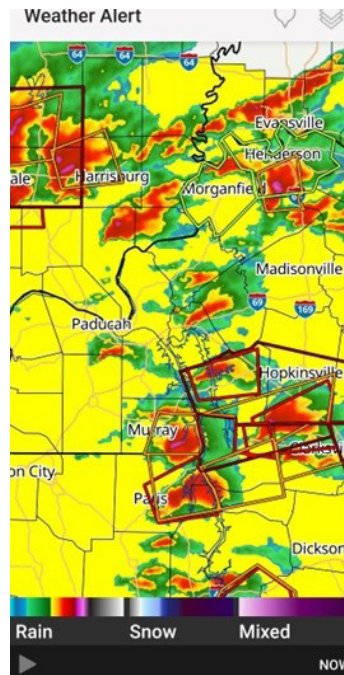
The app creators encourage feedback and invite users to send their suggestions and comments to [weather.alert@uky.edu](mailto:weather.alert@uky.edu) as they continue to develop and refine it.

Weather Alert is available for download on iOS and Android, with plans to expand to other platforms.

To download via iOS, visit <https://bit.ly/3wPqDBm>.

To download via Android, visit <https://bit.ly/4dUyxdq>.

The development of Weather Alert was made possible through Smith-Lever/Land Grant Engagement funding, support from SCAHIP and the UK Department of Biosystems & Ag Engineering.





# UK APPOINTS NEW VETERINARY SCIENCE CHAIR AND GLUCK EQUINE RESEARCH CENTER DIRECTOR

The University of Kentucky Martin-Gatton College of Agriculture, Food and Environment (CAFE) announces the appointment of Brett Sponseller as the new chair of the Department of Veterinary Science and director of the Maxwell H. Gluck Equine Research Center. Sponseller starts Aug. 1.

"I am excited to join the UK Veterinary Science Department. They are the 'best of the best,' which makes leading this outstanding team such an honor," Sponseller said. "I look forward to collaborating with the world-class faculty, staff and students and to serving the equine community."

Sponseller will be joined at UK by his wife, Beatrice, also an equine veterinarian. Beatrice Sponseller will be joining the faculty to support the Equine Science and Management undergraduate degree program. She will also oversee the clinical care and welfare of UK's equine research and teaching herds.

The Sponsellers have been deeply rooted in the equine industry spanning several decades. The duo have been equine clinicians and researchers for nearly 30 years and Thoroughbred breeders for more than 20 years.

"We are thrilled to have the Sponsellers at UK. They appreciate the unique opportunities available in the horse capital of the world and we anticipate they will make many lasting contributions," said Nancy Cox, UK vice president for land-grant engagement and Martin-Gatton CAFE dean.



THE UK MARTIN-GATTON COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT APPOINTS BRETT SPONSELLER (LEFT, PHOTO CREDIT ISU) TO LEAD THE VETERINARY SCIENCE DEPARTMENT AND GLUCK EQUINE RESEARCH CENTER. HIS WIFE, BEATRICE (RIGHT), JOINS THE TEAM AS A CLINICAL PROFESSOR IN THE DEPARTMENT.

Sponseller earned his Doctor of Veterinary Medicine from Cornell University, completed an internship in private practice with Equine Medical Associates in Edmond, Oklahoma, and completed a residency in large animal internal medicine with an equine emphasis from the University of California, Davis. He earned his doctorate in molecular, cellular and developmental biology from Iowa State University. Sponseller was an inaugural founder of the Equine Internal Medicine Service at ISU in 2003. Since, he has also maintained an extramurally funded research focus in equine infectious diseases, including those caused by *Rhodococcus equi*, equine infectious anemia virus, equine herpesvirus-1 and *Clostridioides difficile*.

His teaching portfolio includes didactic equine internal medicine, veterinary virology with graduate and professional students and equine internal medicine as a clinical rotation. Sponseller has mentored several residents that presently specialize in equine medicine in the Central Kentucky area.

"On behalf of our Gluck Equine Research Foundation, it is a great pleasure to welcome Dr. Brett

Sponseller as the next Director of the Gluck Center. With his distinguished background in both clinical and research endeavors dedicated to equine veterinary medicine, he offers a unique perspective for leadership of this world class research facility and its faculty that will undoubtedly resonate with stakeholders from the equine industry whom we seek to serve," said Stuart Brown, Gluck Equine Research Foundation Board chair, vice president of equine safety with Keeneland and longtime Central Kentucky veterinarian. "We look forward to his leadership and guidance of this program and future collaborations in service of our mission to advance the health and wellbeing of the horse."

Sponseller plans to extend the legacy of excellence in equine research at the Gluck Center by interfacing directly with industry stakeholders including breeders, trainers, veterinarians and owners. Strong partnerships will help address the pressing health and welfare issues facing horses and the equine industry. By collaborating closely with these key groups, Sponseller wants the research conducted at the Gluck Center to be di-



rectly relevant and beneficial to the equine community.

Sponseller plans to leverage the state-of-the-art facilities and resources available at UK, including a world-class veterinary diagnostic laboratory and a team of renowned faculty specializing in critical research areas. He envisions a proactive approach to research that advances scientific knowledge, translates into practical solutions and improves care approaches for horses.

He is committed to enhancing educational programs and expanding outreach initiatives to disseminate and communicate new findings and best practices. Sponseller's goal is to equip veterinarians, breeders and trainers with the latest knowledge and techniques in equine health and management.

Sponseller also plans to advocate for increased funding and support for equine research, recognizing the importance of sustained investment in advancing the field. Attracting new talent to UK's Veterinary Science Department and fostering a vibrant academic environment where innovation and excellence can thrive will be top priorities for him.

"I anticipate a fruitful and exciting future characterized by groundbreaking research, strengthened industry ties at home and abroad. I look forward to continuing our shared commitment to improving the health and welfare of horses," Sponseller said.

Beatrice Sponseller earned her Doctor of Veterinary Medicine from Freie Universität Berlin, Germany. Her pursuit of knowledge then led her to the Gluck Equine Research Center, where she conducted research for her German doctoral degree in the laboratory of John Timoney, emeritus professor world renowned for his equine infectious disease research.

Following this foundational research, Beatrice Sponseller expanded her expertise through a

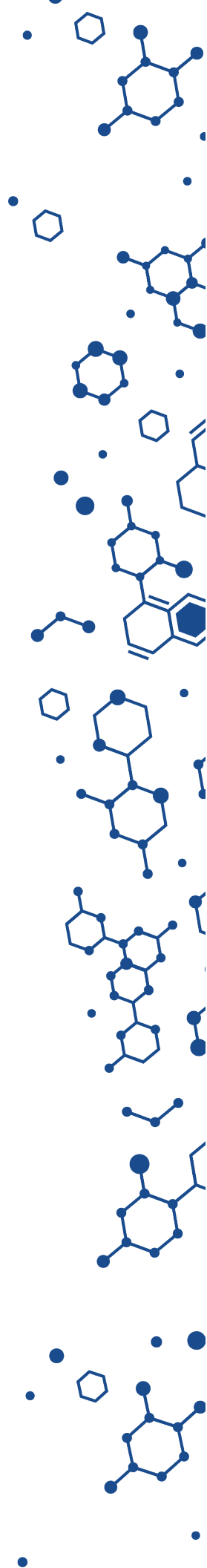
post-doctoral research fellowship at UC Davis, focusing on large animal infectious diseases. She complemented her research with practical clinical training in equine and large animal medicine at UC Davis, broadening her understanding of veterinary practice.

In 2001, she achieved certification from the American Board of Veterinary Practitioners, specializing in equine veterinary medicine, after completing a rigorous residency program at ISU. Her residency provided her with advanced skills and knowledge in equine internal medicine and emergency care, setting a solid foundation for her career.

With more than 25 years of experience in equine internal and emergency medicine at the ISU Lloyd Veterinary Medical Center, Beatrice Sponseller has made significant contributions to the field, including collaborative clinical research and discovery. For the past decade, she also engaged in routine equine ambulatory work at the ISU College of Veterinary Medicine.

Teaching has been a cornerstone of her professional journey, with a strong emphasis on clinical teaching and the development of clinical courses for veterinary students in their senior year. This dedication to education has been pivotal in shaping future generations of veterinarians. She looks forward to applying her expertise in clinical practice and teaching at UK.

| *Holly Wiemers, MA, APR, is communications and managing director of UK Ag Equine Programs.*



# UK BREAKS GROUND ON MARTIN-GATTON AGRICULTURAL SCIENCES BUILDING

The University of Kentucky Martin-Gatton College of Agriculture, Food and Environment, alongside The Bill Gatton Foundation, celebrated the groundbreaking of the \$60 million Martin-Gatton Agricultural Sciences Building. The project is the first new teaching facility in nearly 35 years for the college and is financed with the university's modernization fund pool, which prioritizes restoring and renewing the historic footprint of campus.

Generous support from The Bill Gatton Foundation will also facilitate numerous enhancements to the building that will provide students with an exceptional educational experience and support a new Companion Animal Program.

Named in honor of the late UK alum and former trustee Carol Martin "Bill" Gatton's parents, Edith Martin and Harry W. Gatton Sr., this building will be situated along Cooper Drive adjacent to the Charles E. Barnhart Building and completed by March 2026.

The new building will serve faculty, staff and students across several academic departments and provide a new home for the investments made in the college's initiatives and people by The Bill Gatton Foundation. Last year, the foundation made a historic, \$100 million investment in the college's faculty, students and programs that will come alive in this state-of-the-art facility.

"This groundbreaking marks a transformative step in empowering students to become agents of positive change for the Commonwealth," said UK President Eli Capilouto. "This is a moment to celebrate how The Bill Gatton Foundation is supporting our people and programs working to advance Kentucky."

Spanning 66,000 square feet,

the building, designed by BHDP, is slated to become the college's primary teaching facility and student center. It will feature spacious, open classrooms on the ground floor, complemented by a café where students can relax, build relationships and collaborate.

This space will also house the planned Companion Animal Program, a priority for Mr. Gatton, who valued the power of the human-animal bond. Numerous studies have shown how animals can have a positive impact on human mental and physical well-being. Many UK subject matter experts are eager to address this need across a range of disciplines, and creative programs are in development through support of The Bill Gatton Foundation gift.

"This new building will showcase the investments planned for the next 20 years by The Bill Gatton Foundation," said Nancy Cox, vice president for Land-grant Engagement and dean of the college. "This building stands as a testament to Mr. Gatton's mission to shape a brighter future for Kentucky."

Additionally, the build-



MARTIN-GATTON AGRICULTURAL SCIENCES BUILDING RENDERING. THE NEW FACILITY, SLATED FOR 2026, WILL SPAN 66,000 SQUARE FEET AND BECOME THE PRIMARY TEACHING FACILITY AND STUDENT CENTER FOR MARTIN-GATTON CAFE.

ing's unique design will integrate outdoor spaces connected to the renovated Cooper House and the newly established James B. Beam Institute for Kentucky Spirits, creating an immersive learning environment.

"Large and flexible classroom spaces will accommodate the college's expanding enrollment. Collaborative areas and purposeful outdoor spaces will help us cultivate the next generation of agricultural leaders," said Carmen Agouridis, senior associate dean for the college.

In addition to 15 state-of-the-art classrooms, the building will house various academic programs, including UK Ag Equine Programs, Natural Resources and Environmental Science, Agricultural and Medical Biotechnology and Pre-Veterinary Advising. Visit Gatton's Legacy Like No Other tribute page at <https://www.ca.uky.edu/gatton-foundation>.

*Derrick Meads is the Director of Marketing and Strategic Communications for the UK Martin-Gatton College of Agriculture, Food and Environment.*

# THE ESSENTIAL ECOSYSTEM WITHIN: UNRAVELING COPROPHAGY AND THE GUT MICROBIOME OF FOALS

A horse's gut is a complex ecosystem, hosting a wide variety of microorganisms that play a crucial role in digesting the fibrous diet horses consume. Key among these microorganisms are fibrolytic bacteria, essential for breaking down cellulose and hemicellulose in plant cell walls into nutrients the horse can absorb. These bacteria are necessary for horses to extract energy from their primary food sources like hay and grass.

However, foals are not born with these essential bacteria in their gastrointestinal tract (GIT). These microorganisms colonize the gut, a critical process that begins early in a foal's life. As highlighted by a University of Kentucky Martin-Gatton College of Agriculture, Food and Environment study published in MDPI animals, one of the natural behaviors facilitating this process is coprophagy, where foals consume the feces of their mothers.

"Identifying the relationship between coprophagy and the establishment of fiber-digesting bacteria in the foal is an exciting step, adding another piece of the puzzle in understanding the foal's microbiota and some influential factors," said first author Morgan Pyles, equine science lecturer at the University of Minnesota Crookston and former graduate student within UK's Department of Animal and Food Sciences. "Some of our other research aimed to investigate mare milk composition and yield. Understanding more about these factors, like coprophagy and milk composition, are important for developing management strategies for broodmares and also for rearing orphan foals."

Coprophagy might initially sound unsettling, but it's a behavior seen in many animals and serves an important purpose. For foals, eating their mother's feces is a way to ingest beneficial microbes



that they need to kickstart their gut ecosystem. The study specifically focused on how this behavior helps establish fibrolytic bacteria in the foal's GIT.

The researchers used an innovative approach to confirm that foals engaged in coprophagy. They fed mares chromic oxide, which doesn't get digested or absorbed into the body and thus passes straight through the GIT. The presence of this marker in the foals' feces directly confirmed the occurrence of coprophagy.

The study found a strong correlation between coprophagy and the establishment of fibrolytic bacteria in the foals' GIT. This bacterial colonization is crucial for the foals as they transition to a diet that includes solid food alongside their mother's milk. This process signifies a crucial milestone in enhancing their digestive abilities, allowing them to extract nutrients from fibrous plant material effectively.

These findings have practical implications for the care of foals. They underscore the importance of natural behaviors like coprophagy in the healthy development of the horse's GIT. This could influence how breeders and

caregivers manage young horses, ensuring they can engage in these behaviors, which, in turn, supports their health and growth.

"We also know from research in other species that the gastrointestinal microbiome plays a role in protecting the host from pathogens," said co-author and Department of Animal and Food Sciences professor Laurie Lawrence. "We hope that by improving our understanding of the normal colonization process in neonatal foals we will also learn about best management practices for preventing neonatal gastrointestinal diseases such as diarrhea."

Understanding the natural processes that contribute to the development of the gut microbiome in foals informs horse care practices and enriches the broader knowledge of microbial colonization in mammals. This emphasizes the complex connections between hosts and microbes, revealing the advanced strategies animals have developed to create and sustain a healthy gut microbiome.

| *Jordan Strickler is an agriculture communication specialist within UK's Martin-Gatton College of Agriculture, Food and Environment.*



# UK BREAKS GROUND ON AGRICULTURAL RESEARCH BUILDING, ADVANCING THE STATE'S AG INDUSTRIES

The University of Kentucky Martin-Gatton College of Agriculture, Food and Environment (CAFE), joined by members of the Kentucky General Assembly, UK Board of Trustees and university administration, celebrates the groundbreaking of the \$285 million Agricultural Research Building.

Set to be completed in November 2026, the 263,000-square-foot building will be the college's central research hub, aligned with its teaching and extension missions, which serve the entire Commonwealth.

Located on the south side of UK's main campus, the building will create a dynamic agricultural community. Picture rendering provided by BHPD Architecture and Flad Architecture.

The project represents a significant investment in the college's research enterprise, and a partnership between the state and its flagship land-grant university. A significant outcome from the 2024 legislative session, the project is funded with \$200 million in state bonds and restricted funds from the university.

"This groundbreaking marks a transformative step in supporting the discovery that will help protect and grow the Commonwealth's multi-billion-dollar agriculture industry, present in communities throughout Kentucky's 120 counties," said UK President Eli Capilouto. "We are deeply grateful to the Kentucky General Assembly for investing in the work we do to benefit Kentucky agriculture and ensuring a safe, resilient and abundant food supply."

Designed by BHPD Architecture and FLAD Archi-



THE NEW AGRICULTURAL RESEARCH BUILDING WILL SERVE AS THE CENTRAL RESEARCH HUB AT THE MARTIN-GATTON COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT, ALIGNING CLOSELY WITH ITS TEACHING AND EXTENSION MISSIONS. PICTURED (L-R), SUZANNE MILES, NANCY COX, ELI CAPILOUTO, ROCKY ADKINS, REBECCA MCCULLEY AND AMANDA MAYS BLEDSOE. PICTURE BY MATT BARTON.

tects, the building will house state-of-the-art wet and dry research and teaching laboratories, and a complex of greenhouses on its roof to facilitate research in animal science, entomology, horticulture, plant sciences, plant pathology and soil science.

"This college carries a great responsibility," said Nancy Cox, vice president of Land-grant Engagement and dean of Martin-Gatton CAFE. "With new high-tech research labs, we are able to conduct relevant research and educate graduate students who are the future scientific workforce that will serve Kentucky and beyond."

The building will also host a dynamic 250-seat auditorium, accommodating larger classes such as Introduction to the Horse and the Horse Industry, Domestic Animal Biology, and Bees and People. This scalable space will be used for educational lectures, community outreach and large events.

The building will house the following academic departments:

- Department of Animal and Food Sciences
- Department of Entomology

- Department of Horticulture
- Department of Plant and Soil Sciences

The Kentucky Office of the State Entomologist and Plant Disease Diagnostic Laboratory will also be housed in the building, providing key services to Kentucky's diverse communities.

"The impact of these new facilities on our research is multi-fold," said James Matthews, associate dean for research in Martin-Gatton CAFE. "They enable our current faculty to continue excelling in their research endeavors, aid in the recruitment of top-tier research leaders for the future and accelerate our capacity to share the results of this work with the people we serve across the state."

The new building will feature state-of-the-art laboratories, enabling researchers in the Department of Animal and Food Sciences to perform a wide range of analyses, from nutrient assessments of feeds and foods to gene and protein expression studies. Additionally, advanced teaching laboratories will offer students enhanced hands-on learning opportunities, significantly enriching their experiential



LOCATED ON THE SOUTH SIDE OF UK'S MAIN CAMPUS, THE BUILDING WILL CREATE A DYNAMIC AGRICULTURAL COMMUNITY. PICTURE RENDERING PROVIDED BY BHDP ARCHITECTURE AND FLAD ARCHITECTURE.



INSIDE AND OUTSIDE OF THE AGRICULTURAL RESEARCH BUILDING, NEW LABORATORIES AND GREENHOUSES WILL PROVIDE ADDITIONAL TEACHING SPACE FOR LEARNING. PICTURE RENDERING PROVIDED BY BHDP ARCHITECTURE AND FLAD ARCHITECTURE.

learning experiences

Inside and outside of the Agricultural Research Building, new laboratories and greenhouses will provide additional teaching space for learning. Picture rendering provided by BHDP Architecture and Flad Architecture.

“Having new facilities will greatly enhance our equine, companion and food animal research programs that strive to optimize animal production, health and management, reduce environmental impacts, and enhance the quality of food products and their safety,” said Scott Radcliffe, chair of the Department of Animal and Food Sciences.

Additionally, a separate teaching greenhouse will provide interior and exterior teaching spaces. This greenhouse will accommodate courses like Introduction to Floral Design, Introduction to Plant Identification and Plant Propagation. The UK Horticulture Club will also use this greenhouse for community engagement through plant sales.

The building will be located on the south side of UK's main campus, near the planned Martin-Gatton Agricultural Sciences Building, the Barnhart Building and the Plant Science Building, creating a dynamic agricultural campus.

The college recently held a groundbreaking for the Martin-Gatton Agricultural Sciences building, which will become the primary teaching facility, center for student success and home to new programs made possible by the generosity of The Bill Gatton Foundation. Together, these two facilities are part of the more than \$500 million transformation of the college's infrastructure.

Learn more about these projects at [future.ca.uky.edu](http://future.ca.uky.edu).

| *Source: Edited news release, June 14, 2024. Derrick Meads is the Director of Marketing and Strategic Communications for the UK Martin-Gatton College of Agriculture, Food and Environment.*



# THE 2022 KENTUCKY EQUINE SURVEY: MEASURING A DECADE OF CHANGE

In any business or industry, good records help decision makers make good decisions. However, in general, the equine industry is one where market data is scarce. Industry-specific studies are not inexpensive, but they are worth the investment. A decade ago, the University of Kentucky and the Kentucky Horse Council joined forces to conduct the 2012 Kentucky Equine Survey, a comprehensive, statewide survey of horses, ponies, donkeys and mules. Fast-forward 10 years: UK and KHC teamed up again to produce the 2022 Kentucky Equine Survey (KyES), allowing us to learn how the industry was impacted by events of the past decade, including emerging from the most significant contraction since the Great Depression and World War II, economic uncertainty following the COVID-19 pandemic and the highest inflation levels seen since 1980. The information generated by these studies is intended to be a resource for a broad set of decision makers, including policymakers, elected officials, entrepreneurs and business owners, researchers, educators, and veterinarians.

Statewide and national equine-specific studies are essential because, due to the diverse nature of equine enterprises, traditional agricultural surveys miss significant parts of the industry. The United States Department of Agriculture (USDA) Census of Agriculture, conducted every five years, measures equine production on “farms,” defined as any establishment that has at least \$1,000 in cash receipts on the sale of agricultural products annually or at least five equids. This defi-



IMAGE COURTESY HANNAH WAROWAY.

inition largely excludes places that do not engage in the production of horses, ponies, mules or donkeys (breeding and/or selling). As a result, we believe that Census of Agriculture estimates undercount equids in Kentucky by more than 50%.

The purpose of the 2022 KyES was to determine inventory estimates of Kentucky's equine operations and equids, and to measure economic activity on equine operations. Data collection was conducted by the Kentucky Field Office of the National Agricultural Statistics Service, an agency of the USDA. The unit of observation was an “equine operation” (as opposed to a “farm”), which was defined as an address at which at least one equid (horse, pony, mule or donkey) resided. This definition encompasses places including commercial breeding and training facilities, competition facilities, lesson barns and boarding facilities, nonprofit operations and personal residences. Surveys were distributed by mail to 15,000 equine operations in Ken-

tucky. Of those, 8,337 were returned with usable data (56% response rate). Results from the survey indicate that there were approximately 31,000 equine operations in Kentucky. Farms or ranches comprise the largest type of equine operation (18,000), followed by personal residences (10,000); boarding, training or riding facilities (1,000); and breeding operations (600). Another 1,400 operations indicated other primary functions.

There were an estimated 209,500 horses, ponies, mules and donkeys in the state on July 1, 2022, which is down more than 13% from 2012. Thoroughbreds (48,500) were the most prevalent breed, followed by Quarter Horses (35,000), Walking Horses (28,500), Donkeys and Mules (13,500) and Saddlebreds (12,000). Most equids in Kentucky are used for trail and pleasure riding (62,500), followed by breeding (33,500 broodmares; 22,000 “growing” horses; and 4,000 breeding stallions) and 32,500 equids are idle, retired or otherwise not working. More than



45% of Kentucky's equids are between 5 and 15 years old, with nearly one-quarter (24.8%) over 15 years old; about 20% 1 to 4 years old; and about 10% foals and weanlings.

The value of all equids in Kentucky was \$6.5 billion. The total value of all assets, including equine and equine-related assets (such as land and buildings, vehicles and equipment and so on), was estimated at \$27.7 billion.

In 2021, income from sales of equids was nearly \$1.1 billion, while income from equine-related services was \$990 million (\$450 million from breeding services and \$540 million from non-breeding services). Accordingly, total equine-related income from sales and services was almost \$2.1 billion 2021. In the same time frame, total equine-related expenditures amounted to \$1.6 billion (\$535 million in capital expenditures and \$1.03 billion in operating expenditures, excluding labor). Of these operating expenses, 82% were spent in Kentucky.

Kentucky's equine operations employed 12,500 workers (6,300 full-time and 6,200 part-time employees), with total payroll expenses of \$322 million and non-wage benefits of \$30 million. Labor expenses were highest for breeding-related activities (35%), followed by racing (13%), recreation (11%) and competition (9%). Equine owners were asked to identify which equine health issues are most important. The top three equine health concerns were caring for senior equine (27.1%), musculoskeletal issues (22.4%) and digestive problems (17.4%).

Comparing the results from the last two surveys suggests some strengths: an increase in the value of equids sold; equine operation income increased more than expenses; and a smaller supply of equids, coupled with a decline in non-paid transfers, suggests that the risk of horses becoming unwanted has lessened.

The decline in the number



**Number of Equine**  
There are **209,500** equines in Kentucky. The most prevalent breeds are Thoroughbreds, Quarter Horses and Tennessee Walking Horses.



**Equine Operation Income**  
The total income from equine-related sales and services in Kentucky is **\$2.1 billion**.



**Total Value**  
The total value of equine and equine-related assets in the state of Kentucky is **\$27.7 billion**.



**Careers**  
Equine operations provide **12,500** full- and part-time jobs in Kentucky.



**Operating Expenses**  
**82%** of operating expenses for Kentucky's equine operations stay within the state.

Find complete results from the 2022 Kentucky Equine Survey, including county-by-county data, by scanning this QR code!



of equids and equine operations in Kentucky is being experienced by all facets of animal agriculture across the nation, providing research opportunities to explore the driving factors of these declines within the entire agricultural industry.

Understanding the number and location of equids is critical to ensuring the health of these animals and the future sustainability of the industry. This information drives provision of veterinary and other business services, research programs and educational outreach. For Kentucky, the 2022 KyES reinforces the economic significance of equine agriculture, which remains vibrant and strong as a signature

industry in Kentucky, generating investment, tourism, recreation and positive symbolism for the state.

The full report and supplementary materials (detailed methodology, county fact sheets and additional detailed state- and county-level analyses) are available online at <https://equine.ca.uky.edu/kyequinesurvey>.

| *C. Jill Stowe is a professor within UK's Department of Agricultural Economics.*

# INSULIN DYSREGULATION (ID) AND THE LINK TO LAMINITIS: WHY DIAGNOSTIC TESTING IS IMPORTANT

Over the past two decades, research has improved our understanding of the most common equine endocrine diseases: pituitary pars intermedia dysfunction (PPID, formerly referred to as Equine Cushing's disease), and equine metabolic syndrome (EMS). One of the most critical new findings is that insulin dysregulation (ID) is the key driver of horses developing endocrinopathic laminitis, now called hyperinsulinemia-associated laminitis (HAL), formerly referred to as founder. As we learn new information about these disorders, we continue to change the guidelines and recommendations for diagnostic testing. If a horse is suspected to have one of these endocrine disorders, timely and accurate diagnostic testing is key for developing a management and dietary plan to lower the risk of these horses developing laminitis. Diagnostic testing and outcomes are not a "one-size-fits-all" model, as there are different metabolic types. Thus, evaluating the complete picture, including both clinical signs of disease and diagnostic testing, is critical.

## BRIEF REVIEW OF PPID, EMS AND THE INVOLVEMENT OF ID

ID is the key feature and top concern for equids with EMS, and ID can coexist in equids with PPID. PPID is a progressive and debilitating disease affecting older horses of all breeds with a reported prevalence of more than 20% in horses older than 15 years and more than 25% in horses older than 20 years. PPID is characterized by abnormal growth and function of the pituitary gland in



AGED HORSE RESEARCH CENTER, WOODFORD FARM, SUMMER HORSES GRAZED IN A FIELD OUTSIDE THE UK AGED HORSE RESEARCH CENTER. PHOTO BY UK AG COMMUNICATIONS.

the pars intermedia region, causing abnormal secretion of various hormones. This then contributes to the clinical signs seen with PPID, which can be varied and include hypertrichosis/hirsutism (overabundant hair growth and failure to shed hair), weight loss, abnormal fat redistribution, muscle wastage/atrophy, lethargy and depression, polyuria/polydipsia (increased drinking and urination) and increased susceptibility to infections such as sinusitis and hoof abscesses being most common. Whilst most PPID cases can occur without EMS/ID being present, PPID can co-exist in a subset of horses with both EMS/ID. Horses with PPID and ID will be at a higher risk for laminitis, but at this time the specific link between PPID and ID has not been fully clarified.

EMS is extremely common, with a recent study of ponies and cobs in the UK reporting a prevalence of 23%. The breeds most at risk of developing EMS include the pony breeds, Spanish breeds, gaited breeds, Morgans,

miniature horses and warmbloods. These breeds have a high-genetic risk of developing EMS with only mild environmental influences, although other horses with lower genetic risk can still develop EMS if pushed by environmental factors including diet and lack of exercise. Ultimately, EMS is not a single disease but a collection of risk factors for endocrinopathic laminitis - the leading cause of laminitis. At the core of this group of risk factors is ID and generalized or regional adiposity (cresty neck and subcutaneous deposits of adipose tissue behind the shoulders and at the tail head). That being said, we now know that not all obese animals are ID. Indeed, some animals may have a lean phenotype and are considered the non-obese manifestation of EMS, while these are often horses with PPID and EMS.

ID is characterized by an abnormal, postprandial (after feeding) metabolic response, especially with diets containing increased levels of carbohydrates. It is this abnormal insulin response that in-

creases the risk of horses developing HAL, a painful hoof condition which often results in the need for euthanasia. While increased insulin is concerning when sustained hyperinsulinemia over ~100 uIU/mL is observed, precise cut-offs are unknown at this time. Regardless, the key to preventing laminitis is the appropriate diagnosis of ID and subsequent management changes to maintain healthy postprandial responses to diets by lowering circulating insulin responses.

#### HOW TO DIAGNOSE ID?

One should incorporate diagnostic testing for ID if an equid has history or clinical signs of EMS, or if one suspects an equid to be PPID and ID. ID diagnostic testing should be considered during a wellness or pre-purchase exam, when considering corticosteroid use, or as a tool to help guide decisions with nutritional management and monitoring of an equid that has been diagnosed with ID.

ID is defined as any combination of the following: basal (resting) hyperinsulinemia, postprandial hyperinsulinemia (response to the oral sugar test or consumed feeds) or tissue insulin resistance (IR). The most accepted and practical in-field diagnostic tests for ID are measuring resting (basal) insulin and/or performing dynamic testing using the oral sugar test (OST). Measuring resting or basal insulin requires collecting a single blood sample from an equid in the fed state (hay or pasture, but not grain, which is explained further below); either plasma or serum insulin concentrations are then used to detect resting hyperinsulinemia (HI). This approach is really used for convenience sampling or monitoring, as it has a low sensitivity/high specificity, meaning it can detect more severely affected equids but does a poor job identifying mildly affected equids. Unfortunately, resting insulin levels can be normal in some ID animals, which

emphasizes the importance of dynamic testing using the OST. Resting insulin is also useful when assessing postprandial responses to a horse's current diet regimen or monitoring responses to management changes.

The two currently recommended dynamic tests for diagnosing ID are the OST and the insulin tolerance test (ITT). The OST is preferred because the insulin response reflects the natural sequence of events that mimic the response to a meal, including digestion, absorption, hormone responses, secretion of insulin from the pancreas and risk of HAL, versus the ITT which measures hepatic and/or tissue insulin sensitivity. To conduct the OST, it is currently recommended that the equid undergo a three to six-hour fast, followed by administering either a low dose (0.15 mL/kg) or high dose (0.45 mL/kg) of lite corn syrup. Recent research characterizing the OST test has indicated a few important considerations when testing, including the fed vs fasted state of the animal prior to the OST; low vs high dose of corn syrup; season; and stress. For more information about these studies, contact Amanda Adams, PhD, associate professor at the Gluck Equine Research Center (Amanda.adams@uky.edu). Research has shown that winter and spring can exacerbate ID, thus one may avoid this time of year for testing or at least keep this in mind when testing during these times. Currently there are no seasonal reference ranges for diagnosing ID.

In cases where ID is thought to co-exist with PPID, diagnostic testing for PPID is important. Today, the most recommended and frequently used diagnostic tests for PPID are 1) measuring baseline plasma ACTH concentrations and/or 2) measuring ACTH concentrations following the thyrotropin-releas-

ing hormone (TRH) stimulation test, which is believed to be the most discriminating method. Determining which test is most appropriate for an individual case should be guided by clinical signs or stage of disease. If early stage is suspected, the TRH stimulation test is preferred. If moderate or advanced PPID is suspected, assessing baseline ACTH concentration may be sufficient. Retesting is recommended if results are not consistent with clinical signs. If results fall within equivocal range, the TRH stim is recommended. Given that season has an impact on ACTH levels, if possible, it's best to avoid fall testing.

For all diagnostic testing purposes (PPID and/or ID), it is critical to send samples to a reputable lab that has established reference ranges for each of the tests. Since not all labs and assays are the same, the same facility for sample testing should be used, especially if comparing results. Additionally, consider reviewing the Equine Endocrinology Group's published guidelines for up-to-date diagnostic testing protocols, and recommendations for reference ranges and interpretation of testing results (<https://equineendocrinologygroup.org/>). Additional information regarding the Adams' Lab research going on at the University of Kentucky's Aged Horse Research Center can be found at [www.seniorhorsehealth.com](http://www.seniorhorsehealth.com).

| *Amanda Adams, PhD, is an Associate Professor at the University of Kentucky's Gluck Equine Research Center. Source: April Equine Disease Quarterly.*



# GROWING EQUINE ‘MINI-GUTS’ TO INVESTIGATE INFECTIOUS CAUSES OF INTESTINAL ILLNESS IN THE HORSE



PHOTO BY UK MARTIN-GATTON COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT.

Gastrointestinal disorders represent a range of serious, potentially life-threatening conditions that continue to be a major challenge to horse owners and the equine industry, leading to significant financial costs associated with prevention and treatment as well as the loss of horses of all ages. A major roadblock in studying and understanding disease outcomes associated with infectious causes of colic is a lack of relevant laboratory model systems in which to model intestinal infections. To overcome this obstacle, the Shaffer Laboratory developed microscopic, organ-like systems (termed ‘organoids’) from a variety of horse tissues to study bacterial and viral equine infectious diseases. Importantly, due to their unlimited self-renewal and tissue expansion, organoids bridge the gap between the laboratory and disease models, providing an attractive alternative to animal experimentation. In addition, organoids have emerged as an invaluable tool for accurately predicting drug metabolism and

response, such that they represent an ideal platform for therapeutic discovery and pre-clinical development.

When generated from the intestines, mini-gut organoids (referred to as ‘enteroids’) reproduce the unique characteristics and microarchitecture of the equine gastrointestinal tract, providing a robust laboratory model to mimic the horse intestine. While enteroids grown in a three-dimensional (3D) configuration are beneficial for long-term culture and functional characterization, host-pathogen interactions are more challenging to model. For example, enteroids grow in a wide range of shapes and sizes, leading to inconsistent approximation of equine cell numbers and inaccurate or unpredictable bacteria-to-cell ratios. Moreover, pathogens invade tissues using receptors localized to the luminal host cell surface. Unfortunately, ensuring that bacteria or viruses gain access to the enteroid interior where luminal cell receptors are located is technically challenging, time-consuming and difficult to standardize. To address

this challenge, our lab developed methods to manipulate enteroids to allow bacteria or viruses access to critical cell receptors. Our first approach involves imbedding parts of enteroids onto a semipermeable membrane submerged into specialized media that encourages normal cell division and architecture. In this system, enteroids self-assemble such that the luminal cell surfaces (those that would normally be on the inside of the intestine) are exposed and accessible from the top of the culture dish. This technique provides a more convenient, consistent and precise way to control equine cell numbers and allows us to easily infect enteroid-derived tissues.

Our second method involves attaching enteroid tissue onto microfluidic chip devices capable of directional fluid flow and mechanical deformation that applies physical stretch across the chip. Critically, these normal, physiologic forces generate a tissue microenvironment that more accurately mimics the directional flow of digesta traveling through the gut via wavelike peristalsis. These chips developed in our lab consist of two parallel channels separated by a semipermeable membrane that enables “cross-talk” between the interfaced gut tissue and an artificial vasculature created by an equine endothelial cell barrier. Therefore, these gut-on-a-chip models recreate a multi-tissue system similar to blood vessel lined organs in a living horse. Notably, this system affords the opportunity to study the front-line defense to infectious agents; introduction of immune cells through the endothelial channel allows us to monitor pathogen-induced cellular migration from the artificial vasculature into the gut tissue. In

this configuration, immune cells exit the vasculature channel to neutralize invading pathogens in the gut tissue channel, thereby replicating host defenses elicited during infection in the horse.

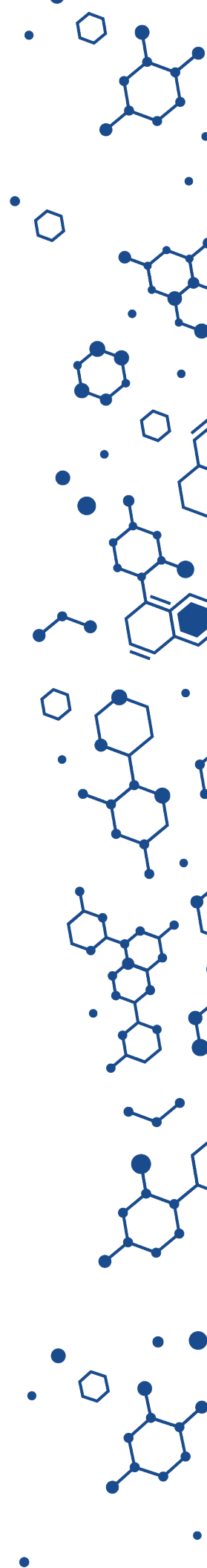
Using advanced laboratory techniques, we validated and demonstrated the functionality of our enteroids. For example, we determined that, similar to tissues within the horse gastrointestinal intestinal tract, equine enteroids exhibit barrier functions, relevant brush border enzyme activities and mucus production. Further, we compared cellular differentiation patterns within enteroid systems using immunohistochemistry and advanced RNA sequencing analyses. Across our various techniques, we determined that our polarized enteroid model exhibits increased cellular differentiation compared to 3D enteroids. However, the addition of biomechanical forces (stretch and flow) in the gut-on-a-chip system demonstrated the highest level of cell type variation, reinforcing our hypothesis that microfluidic devices generate the most life-like laboratory environment in which to study equine infectious disease outcomes.

Our aim is to develop versatile enteroid models for both bacterial and viral infections. Since *Salmonella* is one of the most common causes of bacterial enteritis in the horse, we first used our enteroid platform to evaluate the effects of bacterial infection on host inflammatory responses. In initial studies, we analyzed how *S. Typhimurium* uses bacterial nanomachines to inject virulence proteins into intestinal cells to manipulate host immunity and enable colonization. Building on our success, we are using our unique models to investigate additional aspects of microbial pathogenesis and to accelerate the development of novel vaccines to combat infectious disease threats to the equine industry. For example, equine rotavirus B has emerged as a significant health and economic concern and continues to cause foal diarrhea outbreaks in Kentucky and other states including New York and Pennsylvania. We are the first laboratory to demonstrate productive equine rotavirus

replication in our intestinal enteroid cultures – a critical experimental step that will enable future vaccine development.

Overall, our organoid technologies can be used to understand how pathogens interact with specific equine tissues, to explore new ways to prevent infection and to discover effective drugs to combat infectious disease. Furthermore, developing additional equine organoid models will provide the experimental foundation for numerous studies focused on tissue injury and regeneration, inflammation and infection control, pre-clinical analysis of new therapeutics, toxicology and drug metabolism studies and the identification of genetic factors that determine disease outcome in the horse. Our organoid-to-microfluidic chip pipeline is rapidly pioneering the way towards successful equine precision medicine that will allow us to develop effective medical intervention strategies in the lab. Ultimately, our platform will reduce animal experimentation and is accelerating progress in disease modeling, vaccine design and development, understanding infectious disease outcomes and investigating regenerative medicine in the context of the dynamic physiology of the horse.

| *Lynn Leedhanachoke, MS, DVM, is a graduate student in UK's Department of Veterinary Science, Gluck Equine Research Center. Carrie Shaffer, PhD, is an assistant professor, also within UK's Department of Veterinary Science, Gluck Equine Research Center. Source: April 2024 Equine Disease Quarterly.*





# UK IN THE NEWS

## Mick Peterson Q & A: Dirt, Synthetics And 'Extraordinary Leadership'

Source: TDN, June 27;

<https://www.thoroughbreddailynews.com/mick-peterson-q-a-dirt-synthetics-and-extraordinary-leadership/>

By Dan Ross

Tuesday's Jockey Club Welfare and Safety of the Racehorse Summit identified seven "opportunities" for the industry to make a wholesale leap forward in equine safety and welfare standards. One of the seven was improved surface maintenance protocols. The better these protocols, the safer the track.

Part of the universe of data disseminated throughout the summit was a breakdown of dirt surfaces into four climate groups. Researchers found the safest dirt tracks in hot dry climates (with an average 1.31 fatality rate per 1,000 starts). The dirt surfaces in climates with hot summers and cold, freezing winters had the worst equine fatality rates (1.53 fatalities per 1,000 starts).

One of Tuesday's speakers was Michael "Mick" Peterson, executive director of the Racing Surfaces Testing Laboratory (RSTL) and professor of Biosystems and Agricultural Engineering at the University of Kentucky.

Since the Horseracing Integrity and Safety Act's (HISA) safety regulations went into effect in July of 2022, the RSTL has been responsible for overseeing pre-meet inspections, material testing and daily measurements at all racetracks under HISA's jurisdiction. Indeed, the organization was responsible for more than 70 pre-meet inspections at 53 racetracks last year. It also provides the centralized electronic database through which information is shared with HISA.

In the following edited Q & A with Peterson he expands upon his Tuesday presentation, discussing the evolution of the RSTL's work, key lessons learned, and the path forward for the industry.

TDN: WHAT HAS THE ADVENT OF HISA MEANT TO THE WORK YOU DO?

MP: Prior to the start of HISA—and I'm only being partially facetious here—it was the tracks that needed the least help that we worked with the most. HISA has given us an opportunity to work with everyone, removing the economic barrier for the smaller tracks to get the information they need to make decisions.

One important aspect of this is, we don't always tell them to spend more money. In fact, in a lot of cases, we can help them identify things that they might be putting money into that may not be benefiting from. For example, replacing extensive cushion every year.

You'll need to augment it often-times, but replacement is typically not necessary.

The other piece is that HISA has also helped us identify some best practices and some amazing performances from tracks that previously you would not even have considered. My example of that is John Banno [track superintendent] at Thistledown. He does an amazing job. He has some needs with equipment. He has some financial and support needs, some workforce issues. But given what he has, he has a fantastic track. And that's through hard work.

TDN: LET'S TALK ABOUT SOMETHING DISCUSSED DURING THE SUMMIT. JUST WHY ARE HOT DRY CLIMATES SO MUCH BETTER FOR DIRT TRACKS THAN CLIMATES WITH HOT SUMMERS AND COLD WINTERS?

MP: I'm not sure it's necessarily the temperature as it is the role of precipitation, both rain and snow, and in particular ice and freeze-thaw conditions. Those present particular challenges to maintaining a dirt track.

There are a number of tracks that have gotten quite good at it. But it requires a lot of care and a lot of experience to take care of that transition between a wet summer or a dry summer and a frozen and a thawing track.

The other particular challenge in some areas of the country, you'll have it freezing overnight and thawing during the day. If you want to talk about

a challenging situation for maintaining a track, that's probably the most difficult.

TDN: [GRADING IS ESSENTIALLY THE SLOPE OF THE TRACK FROM THE OUTSIDE INWARDS TOWARDS THE RAIL AND THE TRANSITIONS FROM THE STRAIGHTS INTO THE TURNS]. YOU SAID THAT THE QUESTION OF "VARIABILITY" IS SO CRITICAL TO CUSHION DEPTH AND GRADING. WHY?

MP: Most of the loading on the skeleton of the horse is due to the muscle action. The track is not that big a deal if you look at it overall. But what's fundamentally different about muscle action is the horse has trained on a particular surface. It lives with those muscles, has developed those muscles, and the skeletal system has developed to support that muscle loading. The track surface then turns that up to 11.

What happens is it's just that little bit that pushes you over the cliff. And the problem with track variability is that it can be just for a few strides. It could be day to day. It could be when the horse ships to a new track. But you've just added that variation on top. And that's what poses the risk to the horse, especially the fracture risk.

TDN: HOW DOES WHAT YOU'VE JUST EXPLAINED POSSIBLY CORRELATE TO THE SPATE OF FATALITIES AT CHURCHILL DOWNS AND SARATOGA LAST YEAR?

MP: Churchill Downs, Saratoga, Santa Anita—we see weather events associated with a lot of these challenging periods

in racetracks.

I guess it's probably less true of Churchill because the weather wasn't that unusual. But you still have these decisions to make when it's been wet and it's suddenly drying out. Or when it's been dry and you've got rain coming in. The timing of all those maintenance decisions relative to the moisture content is incredibly difficult and takes a lot of experience.

Some superintendents have gotten very good at it. But with climate change, we're seeing these variations in weather that are unprecedented for a lot of these tracks. It makes all that experience even more important.

TDN: WHEN YOU TALK ABOUT "VARIABILITY," YOU'RE ALSO TALKING ABOUT YOUR OTHER WORD DU JOUR, "CONSISTENCY," RIGHT?

MP: If you think about that adaptation to the surface, what you're really concerned about is the proverbial bad step. There's a risk of a bad step when you ship from one track to another or when the weather changes unexpectedly. Consistency spatially and temporally and from track to track is what keeps the loading on the bones consistent with the adaptation of the skeleton for its purpose.

TDN: IS IT FAIR TO SAY, THEN, THAT SEALED TRACKS THEMSELVES AREN'T NECESSARILY A BAD THING, IT'S HOW THEY'RE MANAGED WHEN THEY'RE

OPENED UP AND THEY'RE DRYING OUT THAT'S SO CRITICAL?

MP: I agree with you completely. Again, if our focus is on consistency and we can get a consistent track, even though it's sealed or floated, then the key is to make sure we understand what the hoof is doing on that surface and make sure that we can keep that going as the track gets sealed or as the track's opened up.

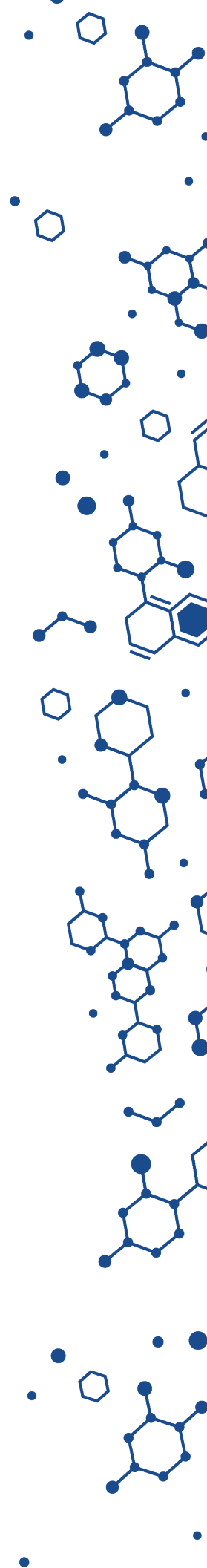
TDN: DO YOU THINK THE INDUSTRY WILL COME TO A POINT WHERE DIRT SURFACES MAINTAINED TO THE HIGHEST POSSIBLE STANDARDS IN THE RIGHT KINDS OF ENVIRONMENTS WILL BE JUST AS SAFE AS A SYNTHETIC SURFACE?

MP: We're already there. Santa Anita and Del Mar are two of the safest tracks in North America. Del Mar was the safest major track for like three out of seven years. Here's the challenge: it's not making the ones in the hot dry areas as safe as synthetics. The challenge we've got is to make all of the dirt tracks as safe as synthetics.

TDN: DO YOU THINK IT'S POSSIBLE THEN TO GET THOSE TRACKS THAT ARE IN THOSE HOT SUMMER, COLD, FREEZING WINTER CLIMATES AS SAFE AS SYNTHETICS?

MP: I have no doubt. I think some of them are going to be synthetics. But I think others can meet that standard.

TDN: YOU'VE BEEN DOING THIS FOR YEARS NOW. DURING THAT TIME, WHAT ADVANCES IN TRACK MAINTENANCE DO YOU THINK HAVE PROVEN THE MOST IM-







PORTANT?

MP: Probably the biggest gains we've seen in the last five, seven years has been on grading and maintaining consistent slopes. [Long-time So-Cal-based track superintendent] Dennis Moore has been telling me for years about how critical it is to properly grade a track.

TDN: YOU'VE TALKED BEFORE ABOUT THE "LASER LEVEL" BEING SO CRITICAL HERE. WHY SO?

MP: The three stages of work is for the track to tell the regulator what you are going to do. Second stage is to do the work. Third stage is to check the work.

The laser level is to check the work because you don't know you've done a good job until you've measured it at the end of the day. So, they go out, carefully grade it, then they have someone else typically check it with a laser level to make sure they properly graded it, got their transitions consistent.

The laser level is an inexpensive piece of equipment. We're talking \$1,500. We are not talking a \$50,000 piece of equipment. There's just no reason for every track not to be using it.

TDN: HOW MANY TRACKS AREN'T USING IT?

MP: I'm going to check my watch now because many are rapidly transitioning. And this has been one of the outcomes from HISA because the grades are measured every time we do our pre-meet inspections.

We talk to them, show them how variable they are compared to other tracks, and then say, 'have you thought about using a laser level'? Then they go buy a laser level, learn how to use it.

TDN: WHAT ARE THE KEY THINGS THAT SEPARATE THE GOOD SURFACE MAINTENANCE TRACKS FROM THE TRACKS THAT COULD PROBABLY DO BETTER?

MP: There will be people who will tell you that they've got to have the right equipment. They need a big budget. They need a lot of staffing. They need a stable workforce. Those are all helpful. But I believe they can overcome almost all of those with just extraordinary leadership.

Thistledown is a great example of that. That is a fantastic surface. And Dan, I don't know how to say it, the equipment is inadequate. But John Banno, he just works so hard to make it work. I'm not sure anybody else could take over there and make it work like he does.

By the same token, Southern California has shown that the best outcome is when there is investment in tracks and equipment combined with leadership and veterinary oversight.

TDN: HOW DOES THE INDUSTRY FOSTER THIS KIND OF LEADERSHIP MORE STRATEGICALLY?

MP: Have you seen our announcement for our superintendents meeting? These superintendents, a lot of them aren't very young. There are a few good young ones. Chris Bosley, who is now at Ellis Park, is one. But this is a big workforce-related risk. If we don't address that,

nothing else matters.

Part of that is the industry needs to adapt to new things. The new generation of superintendents is going to make use of technology in a very different way because they're going to be on their phone checking things. They're going to be making use of electronics. They're happy with the joystick to control the grader. They don't have to have big levers. Those sorts of changes are a big deal.

Now, there's a certain 72-year-old guy who loves technology—Dennis Moore—I love to use his as an example of someone older who adopts any technology you give him. What needs to happen is for these superintendents to work together to develop the skills between them, and then to bring in some new people.

TDN: YOU MENTIONED DURING THE SUMMIT HOW YOU SEE PLENTY OF ROOM FOR IMPROVEMENT IN THE COLLECTION OF REAL-TIME DAILY MEASUREMENTS. IN AN IDEAL WORLD, WHAT REAL TIME DAILY MEASUREMENTS WOULD YOU LIKE TO SEE AT EVERY TRACK AND WHY?

MP: There is one real-time measurement that I really, really want to see. For turf, its daily measurements are fine. But on dirt, you really need moisture measurements done every race, and they need to be over the entire surface. That's additional information for the superintendents to make during the course of a race card.

TDN: THAT'S GOING TO REQUIRE THE BUILDING OF NEW TECHNOLOGIES.

MP: We've had several good ideas that have failed mis-

erably. So yes, I think that's exactly right. I can tell you a couple of things not to do. How's that?

TDN: IN BROACHING THESE NEEDED ADVANCES, ON TUESDAY YOU DISCUSSED THE NEED TO MAKE THE INFORMATION PUBLICLY AVAILABLE. NON-PATENTED, IN OTHER WORDS. WHY IS THIS YOUR APPROACH?

MP: To the extent that the methods and the equipment are standard, it allows us to build a larger data set and to have more people contributing to the design and interpretation of the data.

The best example of this is with our biomechanical surface tester. It was adopted through the [American Society for Testing and Materials] ASTM and as a standard measure for the [Federation Equestre Internationale] FEI. It's been used at every Olympics since London. It's used at four or five-star events. Out of the adoption of that research and the data that has been fed back into racing, it's allowed us to continue to develop what we're doing.

TDN: It's just the right thing to do, in other words.

MP: Yes, it is the right thing to do. And I would love to see the same process move forward with some of the wearables because the interpretation of that data is so complex. And by providing the data in a much more open forum, it'll make it much easier to validate the results as they come into more common use.

## Sudden Deaths: A Puzzle That Still Must Be Solved

Source: *BloodHorse*, June 25

By Sean Collins

One of the largest puzzles still to be solved by the equine medical community is the occurrence of "sudden death," which involves an abrupt fatality in an apparently healthy horse during or immediately after exercise that is not associated with a musculoskeletal injury.

Exact causes for these sudden deaths have proven hard to decipher. With high-profile cases occurring in recent years, such as the training deaths of 2021 Kentucky Derby (G1) first-place finisher Medina Spirit and 2023 Santa Anita Derby (G1) winner Practical Move, the solving of such a phenomenon has become increasingly important to the racing community.

Stuart Brown, Keeneland's vice president of equine safety, moderated a panel June 25 at the Welfare and Safety of the Racehorse Summit in Lexington to discuss the state of the equine medical field in solving the sudden death puzzle.

"We're talking about something that happens in less than one out of 10,000 starts," Brown said. "It certainly comes—through the nature of that rate of occurrence—with very tough phenomena with which to study."

Sudden death in Thoroughbreds is often compared to a human having a heart attack, though heart issues alone do not cause all sudden deaths in horses. Although cardiovascular failure is believed to be a cause in many cases, sudden death has

also been known to occur due to trauma to the spine or hemorrhages associated with a fracture, colic, or infectious disease.

"We know that about half of the exercise-associated sudden deaths are due to cardiac issues," said Lynn Hovda, chief commission veterinarian of the Minnesota Racing Commission. "What we don't know is what is strictly normal in a horse. ... We have a large knowledge gap that we need to fill."

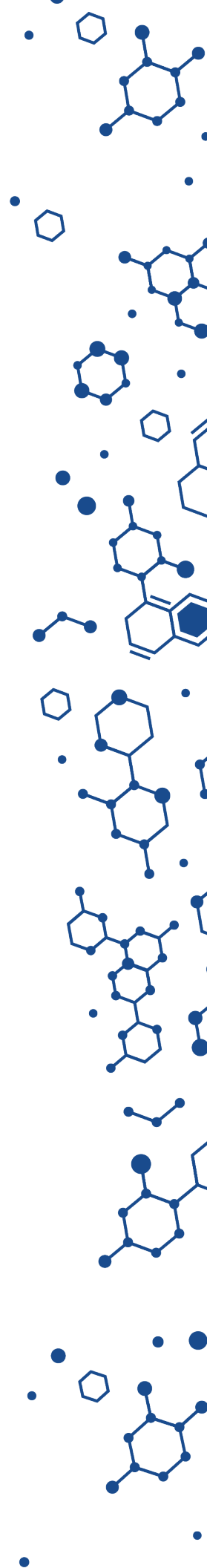
Many potential risk factors, such as cardiac arrhythmias, a condition in which the heart's electrical signals don't work properly, can be present in healthy equine athletes.

"When you look at healthy exercising Thoroughbred racehorses, about 82% of them have at least one premature depolarization during exercise," said University of Minnesota professor and researcher Sian Durward-Akhurst. "(Many) have multiple premature depolarizations and about 20% of them have some kind of complex arrhythmia. ... Trying to say which horses are safe and which horses are not is really quite difficult."

University of Kentucky veterinarian pathologist Laura Kennedy said she is able to diagnose only about half of sudden death cases.

"There can be significant overlap between a catastrophic injury and sudden death in the amount of pulmonary hemorrhage," Kennedy said. "A catastrophic injury, that's a very dramatic event. I could see that it could cause some hemorrhage in the lungs."

"The heart is an electrical instrument. It's going to be







looking at those tiny conduction differences. That's where we have to focus."

The panelists agreed that the best path forward to solving sudden deaths is communication. Discussing changes in the horse's behavior, medical history, and other factors with the trainer can help paint a bigger picture of what external factors could have led to the sudden death.

<https://www.bloodhorse.com/horse-racing/articles/277821/sudden-deaths-a-puzzle-that-still-must-be-solved>

## **Welfare and Safety seminar data aids catastrophic horse injuries**

*Source: Lex18 News June 25*

The days of allowing a horse to race with an injury are essentially over, and it's a big reason why the sport has seen a reduction in catastrophic injuries.

"Since 2009 when we instituted the equine injury database, we know we've reduced fatalities by 34 percent in the last year," said Grayson Jockey Club President Jamie Haydon.

Haydon was speaking moments after his presentation at the club's 11th annual summit on The Welfare and Safety of the Racehorse.

During this seminar, ideas and revelations from data and research are shared to determine better ways of keeping the horses safe before, during, and after training and racing. For example, Haydon pointed out that in America, a horse

isn't allowed to race unless he/she has been examined by an independent veterinarian. This practice has helped to eliminate many in-race injuries, according to Haydon.

"The one bad step theory is just that, it's a theory. There's no such thing. Injuries build up over time, (now) we can see micro-fractures in bones. That adds a level of care," he said of the race-day exams.

Haydon said if a potential problem is uncovered, the horse is scratched and they move on.

Other advancements on the medical side have helped too. Once upon a time, almost every catastrophic injury resulted in euthanasia. That's no longer the case.

"We have improved surgical and anesthesia techniques," said Emma Adam from the University of Kentucky's Gluck Equine Research Center. "And we obviously know more about rehab now," she added, while discussing that every serious equine injury no longer has to be a death sentence for the injured horse.

See the story in its entirety here: <https://www.lex18.com/news/covering-kentucky/welfare-and-safety-seminar-data-aids-catastrophic-horse-injuries>

## **Feeding Frequency in Horses: How Many Meals is Enough?**

*Source: TheHorse.com, May 20, 2024, by Stacey Oke, DVM, MSc*

Horses evolved to eat frequent, small roughage meals throughout the day, so why do we only feed them twice?

Take a minute and picture horses in the not too distant past or in the wild today. They have no access to grain (concentrate) meals, and they graze for a substantial portion of the day. For managed horses, however, it is common to feed them two meals per day made up of a portion of concentrates and a serving of hay. Some of the more intensively managed horses have limited access to daily turnout and pasture, which means they might spend the bulk of their days in a stall without food between their meals.

"What we've done, without bad intention, is taken a continuous-feeding animal and turned them into meal-feeding animals," explains Anthony Blikslager, DVM, PhD, Dipl. ACVS, professor of equine surgery and gastroenterology at North Carolina State University's College of Veterinary Medicine, in Raleigh.

Even if those quality meals provide all the calories and nutrients a horse needs, they are not the healthiest option based on the horse's gastrointestinal (GI) structure and function.

"How and when a horse is fed is just as important as what a horse is fed," says Laurie Lawrence, PhD, professor in the department of animal and food sciences at the University of Kentucky, in Lexington.

In this article we'll review some of the basic features of the equine GI tract, describe why less frequent meal feeding can be detrimental to your horse's health, and discuss alternative feeding management strategies.

Read the story in its entirety here: <https://thehorse.com>

[com/1127828/feeding-frequency-in-horses-how-many-meals-is-enough/](https://www.aahp.org/1127828/feeding-frequency-in-horses-how-many-meals-is-enough/)

## AAEP Publishes Updated Internal Parasite Control Guidelines

*Source: June 6 edited news release*

The American Association of Equine Practitioners (AAEP) has issued revised Internal Parasite Control Guidelines to help minimize the risk of parasitic disease and maintain the effectiveness of current drugs for as long as possible by delaying further development of anthelmintic resistance.

The guidelines, originally created in 2013 and last revised in 2019, account for recent advances in knowledge concerning increased anthelmintic resistance and optimization of parasite control management practices. The guidelines also address common misconceptions and offer parasite control program recommendations for senior horses (over 15 years old), mature horses (between 5 and 15 years old) and young horses (under 5 years old).

“We have seen dramatic development in the field of equine parasite control over the past 10 years, since we first launched these guidelines, and we work hard to keep our recommendations up to date,” said Martin Nielsen, DVM, PhD, DVSc, DAVCM, DEVPC, Schlaikjer Professor of Equine Infectious Diseases at the University of Kentucky’s Gluck Equine Research Center.

Important conclusions to be drawn from the revised guide-

lines are to:

- Perform fecal egg count reduction tests annually to ensure that you are using effective dewormers in every herd or barn.
- Recognize that no anthelmintic will eliminate all parasitic stages from a horse.
- Continue using fecal egg counts once or twice per year to stratify horses into low, medium and high shedders to reduce pasture contamination.
- Deworm all horses at a baseline rate and target selected horses more often based on fecal egg counts.
- Not use fecal egg counts to diagnose disease in horses as there is no correlation between fecal egg counts and disease-causing parasite life stages.
- Discontinue deworming all horses with fixed intervals year-round and stop blindly rotating anthelmintic classes.

The guidelines were reviewed and updated by the AAEP Internal Parasite Control Guidelines Task Force, chaired by Nielsen and comprised of 10 AAEP members predominantly board certified in veterinary internal medicine, veterinary parasitology, and/or veterinary microbiology. The updated guidelines were reviewed and approved by the AAEP Infectious Disease Committee and board of directors.

View the guidelines or save them to your mobile device at <https://aaep.org/resource/internal-parasite-control-guidelines>. AAEP

members may also access the guidelines through the AAEP On-the-Go app; search “AAEP On-the-Go” at your app store to download.

In addition to the Internal Parasite Control Guidelines, AAEP guidelines for more than 30 equine infectious diseases and foreign animal diseases are accessible through the app and the AAEP Guidelines Library at <https://aaep.org/guidelines-resources/resource-library/guidelines-library>.

About AAEP

The American Association of Equine Practitioners, headquartered in Lexington, Kentucky, was founded in 1954 as a non-profit organization dedicated to the health and welfare of the horse. Currently, AAEP reaches more than five million horse owners through its more than 9,000 members worldwide and is actively involved in ethics issues, practice management, research, and continuing education in the equine veterinary profession and horse industry.



# ACCOLADES

## Carter named recipient of 2024 AVMA Meritorious Service Award

Source: Edited news release

The American Veterinary Medical Association (AVMA) named Craig N. Carter, professor of epidemiology at the University of Kentucky, as the winner of the 2024 AVMA Meritorious Service Award for his decades of distinguished service to the veterinary profession.

Established in 2001, the award recognizes a veterinarian who has brought honor and distinction to the profession through personal, professional or community service activities that are conducted outside the scope of organized veterinary medicine or research. The AVMA Board of Directors selects the recipient.

“As a clinician, researcher, academician, and active and reserve military officer, Dr. Carter exemplifies the very best of our profession,” said Rena Carlson, president of the AVMA. “One of his nominators described him as a ‘Renaissance man’ and I could not agree more. Our entire profession and our nation have benefited from his tireless and distinguished scholarship and service, including his strong support of One Health.”

“It is humbling beyond belief to receive this honor as a member of our diverse profession which makes so many contribu-

tions to advance animal health and human health, in the spirit of One Health, every day,” said Carter. “I proudly accept this on behalf of the outstanding AVMA leadership and my many remarkable mentors, co-workers and brilliant students who will help build a promising future for all natural life.”

Carter holds four degrees from Texas A&M University: BS in Biomedical/Computer Sciences, DVM, MS in Epidemiology, and PhD in Veterinary Public Health, and is a Diplomate in the American College of Veterinary Preventative Medicine (1985-present).

A small sampling of Carter’s career milestones: After receiving his DVM, he opened a solo ambulatory all-species practice to serve the Brazos Valley region of Texas while also volunteering with the Brazos Animal Shelter and serving on its Board of Directors.

Following completion of his MS in 1985, he was appointed the first head of the new Epidemiology & Informatics section for Texas Veterinary Medical Diagnostic Laboratory.

From 2007-2022, he served as director of the UK Veterinary Diagnostic Laboratory, where he oversaw laboratory operations providing diagnostic services for more than 3,000 hospitals and clinics and state and federal agencies in Kentucky and across the United States.

Carter has been the president of several organizations, including the American Association of Veterinary Laboratory Diagnosticians, the American Veterinary Epidemiology Society (now known as the American Veterinary One

Health Society), the American Veterinary Computer Society (now the International Association for Veterinary Informatics) and the American Academy of Disaster Veterinary Medicine. He was executive

director of the World Association of Veterinary Laboratory Diagnosticians from 2001-2017. Carter’s many honors include the 2020 American Veterinary One Health Society Award for Service.

Carter also served for more than 40 years in the U.S. Air Force and U.S. Army in both active and reserve duty, including four wartime deployments in Vietnam, Operation Desert Shield, Afghanistan and Iraq. After the 9/11 attacks, he commanded the first U.S. Army Reserve Veterinary Corps unit into Afghanistan. Upon returning home, he served as Chair of the Brazos Valley Veterans Memorial project, which was dedicated by President George H. W. Bush on Nov. 10, 2002. He retired in 2009 from the U.S. Army Reserves as a full Colonel.

As a scholar and researcher, he has authored approximately 150 publications, earned more than \$12 million in grant funding, and has been invited to present at scores of national and international gatherings. He is especially proud to have written the biography of veterinarian James H. Steele (assisted by Cynthia Hoobler, DVM), who established the first public health section within the AVMA in 1946 and stood-up the Veterinary Division of the CDC in 1947.

To learn more about the AVMA Meritorious Service Award and past recipients, visit [www.avma.org/awards](http://www.avma.org/awards).

