

HIGHLIGHTING RESEARCH
AND OUTREACH EFFORTS AT
THE UNIVERSITY OF KENTUCKY

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**RACECOURSE MANAGER CERTIFICATION
PROGRAM LAUNCHES, 3**
NTRA, UK and RSTL launch joint
initiative

**GOEHRING JOINS UK GLUCK EQUINE
RESEARCH CENTER, 5**
Named Wright Markey Endowed
Chair in Equine Infectious Diseases

**PCR ASSAY DEVELOPED BY UK FOR
ROTAVIRUS B, 7**
Researchers preliminarily identified
novel Rotavirus Group B

**PANEL DRAFTS RECOMMENDATIONS
FOR FEMALE EQUESTRIAN HEALTH AND
WELLNESS, 12**
Community of practice formed



College of Agriculture,
Food and Environment

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



Photo courtesy Dr. Jimmy Henning.

NTRA, UK AND RSTL SET JUNE LAUNCH FOR RACECOURSE MANAGER CERTIFICATION PROGRAM

The NTRA Safety & Integrity Alliance, the University of Kentucky College of Agriculture Food and Environment and the Racing Surfaces Testing Laboratory announced the dates for the launch of a joint initiative offering a Racecourse Manager Certification from the University of Kentucky.

The initial three-course program, entitled “Turfgrass as an Equine Sports Surface,” is designed for those already engaged in careers with turf surface maintenance. Free online classes will begin June 7 and will be archived on a YouTube channel. Individuals who complete the video courses and pass a test that requires a \$50 fee will receive a certificate of completion from the University of Kentucky. Participating Thoroughbred racetracks who enroll their personnel will receive credit toward future accreditation by the NTRA Safety & Integrity Alliance.

The “Turfgrass as an Equine Sports Surface” courses are:

- **June 7: Selection of Turf for Climate Zones**
- **June 14: Cultivation of Turf for Compaction and Wear**
- **June 21: Measurement of Turf Condition**

The curriculum for the turf management course was developed by Michael “Mick” Peterson, PhD, director of the Racetrack Safety Program and executive director of the Racing Surfaces and Testing Laboratory (RSTL). Other participants in the online courses include the following turf experts:

- Mike Boekholder, Boekholder & Associates
- Logan Freeman, Mountain Branch Golf Club, Joppa Maryland
- Michael Goatley, Jr., PhD,



IMAGE BY KULESI, PIXABAY.

professor and extension turfgrass specialist, Virginia Polytechnic Institute and State University

- Beth Guertal, PhD, professor of crop, soil and environmental sciences, Auburn University;
- Gregg Munshaw, PhD, director of agronomy, Mountain View Seeds
- Geoffrey Rinehart, MS, turfgrass management lecturer, University of Maryland

Participating experts in equine biomechanics include:

- Sarah Jane Hobbs, PhD, University of Central Lancashire
- Alison Northrop, Nottingham Trent University
- Lars Roepstorff, professor, Swedish University of Agriculture

Racing industry leaders participating include:

- Brian Jabelman, senior director of track operations, New York Racing Association
- Jim Pendergest, director of racing surfaces, Keeneland

Racetrack

- Jamie Richardson, racetrack superintendent, Churchill Downs
- Sean Gault, equine racing specialist, DCS & Associates

Individuals interested in more information can visit [here](#).

“This is exactly the type of collaboration we envisioned when the Racing Surfaces and Testing Laboratory (RSTL) joined forces with the University of Kentucky Ag Equine Programs. The benefits of this interaction are undeniable as we seek to further protect the welfare of the horse and develop the industry’s future workforce,” said NTRA President and Chief Executive Officer Alex Waldrop.

“We have assembled a powerhouse line-up of instructors to cover multiple equine disciplines ranging from turf racing to polo to eventing,” Peterson said. “This will be a science-based curriculum for individuals who are serious about their profession and desire to be leaders in their chosen fields. We are starting with a turf curriculum, but future modules will

focus on all types of surfaces and will include hands-on training with track maintenance equipment.”

“We are thrilled to see this program get off the ground and appreciate the support of NTRA. Our college has a strong commitment to getting our best information out to those in the real world who can use it,” said Nancy Cox, UK vice president for land grant engagement and College of Agriculture, Food and Environment dean.

“The science driving progress on racing safety includes not only the horses and riders themselves, but also clearly the racing surfaces on which they compete. It is exciting to see the optimization and application of knowledge from turfgrass science applied to the management challenges of turf racing,” said James MacLeod, director of UK Ag Equine Programs and Elizabeth A. Knight chair and professor of veterinary science at the Gluck Equine Research Center.

ABOUT THE RACING SURFACES TESTING LABORATORY

The Racing Surfaces Testing Laboratory is a non-profit (501c3) organization that carries out on-site and laboratory testing and data services for surfaces used for horse racing and equine sports. Founded in 2009, the lab is able to compare data from a wide range of surfaces used in the horse racing industry including dirt, turf and synthetic track surfaces. In 2020 the mission of the laboratory was expanded through a major gift which will allow improved on-site testing capabilities and expanded database services. In addition to

racetrack testing and the development of tools to improve the consistency of the surfaces, the laboratory works with the University of Kentucky on the study of alternative racetrack surfaces and equipment, and the development and the development and promotion of standards for racetrack surfaces. All of these efforts are focused on increased consistency of racing surfaces as a part of broader efforts for the protection of horses and riders.

ABOUT THE UNIVERSITY OF KENTUCKY AG EQUINE PROGRAMS

UK Ag Equine Programs serves as the front door to equine work being done at the University of Kentucky, representing the breadth and depth of all things equine in the College of Agriculture, Food and Environment. It exemplifies the college’s long-term commitment to serving the equine industry and horse enthusiasts regionally, nationally and internationally.

ABOUT THE EQUINE SPORTS TURFGRASS ALLIANCE

The Equine Sports Turfgrass Alliance, (ESTA) is a recently formed group of university and industry turfgrass experts in partnership with Dr. Mick Peterson. ESTA as an organization is dedicated to conducting research and providing education about turfgrass surfaces for racetrack, eventing, polo and other-use equine surfaces. This education event is their first offering. However, future research and educational opportunities for horse owners, trainers and equine facility managers are currently being developed. It is the goal of ESTA to bring science-backed maintenance practices to the forefront of equine turfgrass

systems.

ABOUT THE NTRA SAFETY & INTEGRITY ALLIANCE

The NTRA Safety & Integrity Alliance is a standing organization formed in 2008 with the goal of establishing national uniform standards in the areas of safety and integrity. Alliance accreditation standards cover six broad areas: (1) injury reporting and prevention; (2) creating a safer racing environment; (3) aftercare and transition of retired racehorses; (4) uniform medication, testing and penalties; (5) safety research; and (6) wagering security. The standards are revised annually to adopt new and progressively more stringent requirements.

ABOUT THE NTRA

The NTRA, based in Lexington, Kentucky, is a broad-based coalition of more than 100 horse racing interests and thousands of individual stakeholders consisting of horseplayers, racetrack operators, owners, breeders, trainers and affiliated horse racing associations, charged with increasing the popularity, welfare and integrity of Thoroughbred racing through consensus-based leadership, legislative advocacy, safety and integrity initiatives, fan engagement and corporate partner development. The NTRA owns and manages the NTRA Safety & Integrity Alliance; NTRA.com; the Eclipse Awards; the National Horseplayers Championship (NHC); NTRA Advantage, a corporate partner sales and sponsorship program; and Horse PAC®, a federal political action committee. NTRA press releases appear on NTRA.com and social media.

| Source: Edited May 6 NTRA news release.



EQUINE INNOVATORS PODCAST FEATURES UK'S DR. SCOTT STANLEY ON DRUG TESTING IN RACING AND COMPETITION

Scott Stanley, PhD, professor of analytical chemistry at the University of Kentucky Gluck Equine Research Center, describes the challenges conventional drug testing presents and a potential biomarker-based solution. [This podcast](#) is the seventh episode in our “Equine Innovators” podcast series, brought to you by Zoetis. You can find “Equine Innovators” on TheHorse.com, Apple Podcasts, Spotify, Stitcher, and Google Podcast.

GOEHRING JOINS UK GLUCK EQUINE RESEARCH CENTER INFECTIOUS DISEASE RESEARCH GROUP



PHOTO COURTESY DR. LUTZ GOEHRING.

Lutz Goehring has been named the Warren Wright, Sr. – Lucille Wright Markey Endowed Chair in Equine Infectious Diseases at the University of Kentucky’s Gluck Equine Research Center. He begins June 1.

Goehring has an extensive background in research, scholarly journals, refereed book chapters, advising, mentoring and service. His research expertise has been on equine herpesvirus type 1 (EHV1). He is a specialist in equine internal medicine and a member of the European College of Equine Internal medicine.

“We are very excited to have Dr. Goehring join our program,” said David Horohov, PhD, chair of the Department of Veterinary Science and director of the Gluck Equine Research Center. “He will provide much needed research and clinical expertise in the area of equine herpesviruses.”

Prior to joining UK, Goehring was chair and professor of equine medicine and reproduction at the Center of Clinical Veterinary Medicine, Ludwig-Maximilians University in Munich, Germany. Before his time in Germany, he was a faculty

member in equine medicine in the Department of Clinical Sciences, College of Veterinary Medicine and Biomedical Sciences at Colorado State University for eight years. He also served as a clinical instructor in the Department of Equine Sciences at Utrecht University in Utrecht, The Netherlands.

He earned his earned his 1st Candidatuur in veterinary medicine from the University of Antwerp, Belgium, followed by a doctorate in veterinary medicine from Utrecht University. He completed a Master of Science in immunology from Virginia Tech University and completed his residency in equine internal medicine at Marion DuPont Scott Equine Medical Center in Leesburg, Virginia. He earned his Doctor of Philosophy from Utrecht University.

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

GLUCK CENTER’S PAGE, HOROHOV CO-AUTHOR LOWER AIRWAY INFLAMMATION PAPER

University of Kentucky Gluck Equine Research Center researchers Allen Page, DVM, PhD, scientist and veterinarian, and David Horohov PhD, chair of the Department of Veterinary Science and director of the Gluck Center, co-authored a recently published

paper from Purdue University looking at lower airway inflammation in racing Thoroughbreds, where they provided their expertise with inflammatory gene



expression analysis to examine this common issue in racehorses. For a limited time, the full paper is available online [here](#).

GETTING THE TARGET RIGHT – GERM THEORY

In the [March edition of ESR](#), we discussed vaccines and where our world would be without them. Identifying vaccine targets relies upon the ability to find the causative agent of the disease against which protection is being sought. This may seem pretty straightforward, but let us think for a moment about how disease-causing agents are actually identified.

In the mid-1800s, diseases such as cholera and bubonic plague were thought to be caused by ‘miasma,’ literally meaning ‘bad air.’ The miasma theory of disease holding sway at the time suggested that exposure to ‘bad air’ led to the development of disease. At that time, these deadly diseases, just two among many, were not attributed to a specific agent. We now know these diseases to be caused by bacteria, *Vibrio cholerae* and *Yersinia pestis*, respectively. Yet, how do scientists figure this out and demonstrate causative infectious agents definitively?

The period from the mid-1800s to the start of World War I in 1914 may be described as the ‘Golden Age of Microbiology.’ It was an eminent British scientist, John Snow, a skeptic of the miasma theory who, between 1849 and 1855, presented information describing cholera to be associated with a fecal-oral route of transmission. He suggested that disease was associated with ingesting ‘dirty’ water, that the water became contaminated with feces, and he identified the structure of cholera as being a ‘cell.’ These descriptions were among the first published during a time when modern science was still struggling with myth.

The seeds of Germ Theory had been around for a long time

with ancient Islamic scholars such as Ibn Sina (c. 1025), Ibn Khatima and Ibn al-Khatib (c. 1340) hypothesizing that ‘minute bodies’ were able to cause disease and that they could be transmitted by clothing and objects. Over the next few centuries, Germ Theory struggled against notions from religious doctrine, ‘spontaneous generation’ and the miasma theory.

Modern Germ Theory is attributed to the great French scientist Louis Pasteur. His many contributions to our knowledge of disease and hygiene go beyond science and can really be considered as quantum leaps for human and animal welfare. His initial foray with Germ Theory was through his investigations of ‘childbed or puerperal fever’ – an often-fatal infection in women shortly after they give birth. Childbirth throughout the ages has always represented grave risks to mothers. From the 17th to the 19th centuries, women gave birth in rudimentary hospitals rather than their own homes. Death rates were consistently reported as 20% - 25%, with occasional spikes of episodes with 100% fatality rates in childbirth wards. Shocking as that is, in those days, sanitation,



LMU VETERINARY STUDENT ERICA YOPP, PICTURED PLATING OUT BACTERICA. PHOTO BY DR. EMMA ADAM.

antisepsis, hand washing and the concept of taking disease from one patient to another on dirty hands, clothing or bedding was not recognized.

The Hungarian physician Semmelweis, known as the ‘savior of mothers,’ published a major breakthrough in 1847 where he demonstrated a 90% reduction in childbed fever deaths simply by having doctors wash their hands in a very dilute bleach solution between patients. Soon after this, Pasteur described seeing what we now know to be bacteria in the blood and discharge of such cases. However, it was not until Pasteur’s experiments with fermentation and spoilage that Germ Theory was thoroughly validated and ‘spontaneous generation’ finally quashed.

In the mid-1860s, Pasteur demonstrated that freshly boiled

broth did not spoil if exposure to the atmosphere was by a long, finely filtered opening. He theorized that dust or particles carried the ‘germs’ of spoilage with them and refuted that the appearance of spoilage particles in fetid broth was a ‘spontaneous generation’ event. This led to incredible advances in human health through hygiene, sanitation and techniques we now take for granted, such as the pasteurization of liquids like milk and fruit juice to reduce spoilage.

The Golden Age of Microbiology was also dominated by the great Robert Koch. Koch, who developed the first Anthrax vaccine, developed and tested fundamental criteria by which a microorganism can be established as the causative agent of disease. Koch’s postulates, as they continue to be known and described, are as follows:

- The microorganism must be found in diseased animals [or humans] but not in healthy

animals [or humans].

- The microorganism can be isolated from a diseased animal [or human].
- The isolated microorganism will cause disease if introduced into a healthy animal [or human].
- The microorganism must be able to be reisolated from the inoculated, diseased animal [or human] and identical to the original specific causative microorganism.

The term microorganism is now more widely interpreted as bacteria, viruses, fungi, parasites, prions, etc. However, these guiding criteria enable scientists to be discerning and rigorous. With the burgeoning plethora of molecular biology technologies, from PCR to genomic sequencing, now available to us, it has never been more important to be discerning and rigorous.

While we can identify microorganisms in all manner of bodily

sites and samples, it is even more critical to question what is normal and what is abnormal.

In the next part of the series (July 2021), we will further explore how Koch’s postulates remain guiding lights for scientific integrity. However, we will also consider how advancing research forces us to never blindly accept them – a notion we think the great scientific intellects of Snow, Semmelweis, Pasteur and Koch would appreciate.

| *Emma Adam, DVM, PhD, DACVIM, DACVS, is based at the University of Kentucky Gluck Equine Research Center and Veterinary Diagnostic Lab and is responsible for research and liaison. Jackie Smith, PhD, MSc, MACE, Dipl AVES, is an epidemiologist based at the University of Kentucky Veterinary Diagnostic Lab.*

UK DEVELOPS REAL-TIME PCR ASSAY FOR EQUINE ROTAVIRUS B ASSOCIATED WITH FOAL DIARRHEA



PHOTO BY MATT BARTON, UK COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT.

Researchers at the University of Kentucky’s Gluck Equine Research Center and the Veterinary

Diagnostic Laboratory (UKVDL) have preliminarily identified a novel Equine Rotavirus Group B associated with diarrhea in very young foals.

See past updates [here](#).

This virus could not be detected using current diagnostic tests for Equine Rotavirus A and appears to be different than the virus strain used in the currently available commercial vaccine.

UK has now developed a real-time PCR assay to detect this new Equine Rotavirus B in fecal

specimens. The test is offered by the UKVDL as an individual test as well as part of equine diarrhea panels as described below:

Equine Rotavirus B, Real-time PCR fee is \$45 (in-state).

Equine Diarrhea (Multiplex Viral PCR, Panel 4) fee is \$80.

This is a multiplex real-time PCR assay which is intended to be used as an aid in the diagnosis of

- Equine rotavirus A
- Equine rotavirus B
- Equine coronavirus
- Combined Bacterial & Viral

Multiplex PCR, Panel 5 fee is \$140. This is a multiplex real-time PCR assay intended to be used as an aid in the diagnosis of

- Equine rotavirus A
- Equine rotavirus B
- Equine coronavirus
- Clostridium perfringens,
- Clostridium difficile,
- Salmonella spp
- Lawsonia intracellularis,
- Neorickettsia risticii (agent of Potomac Horse Fever)

Rotavirus is a serious disease, especially in young foals where fluid and electrolyte losses through watery

diarrhea can be life threatening. Timely supportive veterinary medical care is indicated. We recommend strict biosecurity protocols as the best protection strategy at this time. Biosecurity protocols need to be developed for each farm in collaboration with your veterinarian.

Please contact Erdal Erol, DVM, MSc, PhD, head of diagnostic microbiology and associate professor at the UKVDL (Erdal.erol@uky.edu) or Deborah Maples, DVM, diagnostic services coordinator at the UKVDL (deborah.maples@uky.edu or 859-257-

8283) for more information about this test.

| *Craig Carter, DVM, PhD, Dipl. ACVPM, director of the University of Kentucky Veterinary Diagnostic Laboratory provided this information in a UKVDL bulletin.*

SHORT- AND LONG-TERM EFFECTS OF COVID-19 RESTRICTIONS ON EQUINE MARKETS



PHOTO BY BERMIX-STUDIO-SNCOPWNPMSA-UNSPLASH.

COVID-19 pandemic-related restrictions produced a recession, which economists typically define as two consecutive quarters of decline in GDP (gross domestic product) growth. Like every other business sector across the globe, the equine industry has been affected by COVID-19 related restrictions. We are now only starting to be able to assess short-

term impacts, and it will be some time before the long-term impacts are fully understood. While we can look to recoveries from past recessions for insight, the contraction initiated by COVID-19 shutdowns is far different from earlier recessions, rendering historical information less predictive of the recovery path.

Across the globe, restrictions

faced by equine industry participants have varied. Some governments mandated the closure of equine facilities to reduce the spread of the virus and minimize risks of injury, while others delegated responsibility to equine enterprise owners and managers. The complete closure of equine facilities has been especially damaging, as these operations bear significant ongoing expenses with no source of revenue.

Staggering early unemployment rates precipitated concerns of an impending equine welfare crisis. However, while some horse owners have certainly struggled to make ends meet due to unexpected job loss, much of this unemployment was temporary, and a large-scale crisis appears to have been avoided. Moreover, some organizations specializing in re-homing horses actually reported an increase in adoptions during the initial shutdown.

A handful of preliminary studies are underway across the U.S.

to assess short-term COVID-19 related impacts. One such study is focused on breeding, boarding/training/lesson and competition enterprises in Kentucky across all breeds and disciplines.

Preliminary results suggest that while not escaping the effects entirely, it appears that breeding and boarding/training/lesson operations were minimally impacted. However, enterprises related to competition, both racing and non-racing, appear to have sustained much greater financial hardship. In addition to direct job loss, the widespread cancellation of local, national and international competitions has had a ripple effect on regional economies. Events able to operate shouldered increased costs associated with following health

guidelines and were required to function with limited or no spectators, which are often a source of revenue.

Some consider commercial sales and breeding activity a bellwether for the health of the industry. In North American Thoroughbred auction markets in 2020, average prices for weanlings were down 6.2%, yearlings were down 20.3%, 2-year-olds in training were down 26.7% and broodmares were down 1.7%. Stud fees for North American sires standing for \$2,500 or more were down 3.7% overall. While contractions are never welcome, the decline was less drastic than some were anticipating.

The long-term impacts of COVID-19 restrictions will ultimately

depend on the shape of the general market's recovery. While GDP growth responded quickly when the economy reopened, the recovery has not been uniform across sectors. Some parts of the economy, most notably service and tourism-related industries, continue to struggle. Any business cycle that affects disposable income will ultimately affect the equine industry as well, since it is centered on what economists consider a "luxury" good.

| *Jill Stowe, PhD, associate professor in University of Kentucky's Department of Agricultural Economics provided this information in the April 2021 issue of the Equine Disease Quarterly.*

PANEL DRAFTS CONSENSUS RECOMMENDATIONS FOR FEMALE EQUESTRIAN HEALTH & WELLNESS

In 2018, Karin Pekarchik, MS, senior extension associate for distance learning, and Kimberly Tumlin, PhD, MS, MPH, assistant professor in the Department of Epidemiology, College of Public Health and the Equestrian Athlete Initiative director for research for the Sports Medicine Research Institute, cofounded the University of Kentucky Female Health and Wellness Community of Practice (CoP) to focus on equestrian health, inviting international researchers, instructors and practitioners in fields related to equestrianism to become members.

The purpose of the community of practice is to bring together equestrian researchers and industry practitioners to discuss the current status and future challenges of equestrian health and wellness and to serve as a centralized resource for communities, researchers and citizen scientists.

Collectively, that CoP drafted

a consensus statement that also included proposals and recommendations. This international community of practice was an initiative of the University of Kentucky Female Equestrian Health and Wellness CoP.

THE CoP'S CONSENSUS STATEMENT ON FEMALE EQUESTRIAN HEALTH AND WELLNESS OUTCOMES PROVIDES SIX PROPOSALS AND CORRESPONDING RECOMMENDATIONS TO GUIDE RESEARCHERS, ORGANIZATIONS AND EQUESTRIANS.

Proposal 1

The multi-faceted and multi-disciplinary equine industry involves complex interactions between horse and rider, has highly varied levels of participation and contributes to considerable economic impact. Opportunities for research abound. More scholarly research is imperative to improv-



ing health and wellness outcomes of riders and to the economic prosperity of equestrian sport.

Recommendations

Broad research should be conducted covering categories such as attraction to the equine industry; access; leisure, amateur and professional participation; biomechanics of horse and rider; environmental exposures; psychological aspects of equestrian sport; equipment and apparel; and local, regional, national and global economic viability and vitality.



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Rationale

Beyond the agricultural work and transit that the horse afforded humans for centuries, human intrigue with this majestic creature remains strong, and the equine industry ever expands to include recreational, amateur and professional handling/riding, competitive racing, dressage, three-day events, hunters and endurance disciplines as well as breed-specific showing. Equine-assisted activities including physical, occupational, and psychological treatments prove beneficial. Youth clubs, collegiate activities, discipline-specific associations and federations celebrate and regulate riding. Although engagement within the industry differs according to interest, access and abilities, all levels of equine enthusiasts have a critically important need for reliable information, systematic instruction and proper equipment to avoid harm and to foster fulfillment in human aims involving interactions with horses.

Proposal 2

Equestrian athletes should receive or have access to sport-specific guidelines and training to address the physical and psychological skills required within each discipline of riding in order to promote health and wellness, improve safety and prevent injury and encourage full participation throughout recreational and professional athletic pursuits and careers.

Recommendations

Individuals, equestrian federations and other equestrian organizations should seek and benefit from resources and/or partnerships provided by credentialed professionals and scholars. Equestrian federations and organizations should model other sports' governing bodies that have rolled out specific and comprehensive guidance specific guidance related to preparation for, participation in and excelling within each discipline.

Rationale

Participating in equestrian activities requires various degrees of athleticism, ranging from novice to elite, particular to the selected discipline of riding. All disciplines of riding demand physical and psychological balance, strength, agility and stamina. Equestrians participating in each discipline of riding should have access to discipline-specific information regarding best practices of biomechanics, considering components of movement particular to the discipline and unmounted and mounted exercises designed to prepare the athlete for sport. Psychological preparation for sport must also be addressed for optimal participation and performance.

Proposal 3

Female equestrian health and wellness issues differ from male issues due to biological (sex) and gender (social and cultural) distinctions.

3A:

Female equestrians should have and will benefit from access to female-sport-specific guidelines and training designed to address female sex and gender needs and expectations.

3B:

With these sex and gender distinctions in mind, research on topics specific to female health promotion and injury prevention and educational programs designed for female well-being within equestrian sports should enable female riders to avoid unnecessary pain and to participate fully in recreational and professional pursuits.

Recommendations

An increase in grants for, commitment to and engagement in scholarly studies should advance understanding of issues encountered by female equestrians. An increase in grants for, commitment to, engagement in educational programs and training, including sport-specific guidelines, should serve to prevent harm to and enhance overall health

and wellness of females, who constitute the majority of riders.

Rationale (3A and 3B)

Differences related to biological sex concern physical and physiological differences, including primary sex characteristics of the male and female reproductive systems and secondary sex characteristics such as musculoskeletal distinctions.

Reproductive system differences include hormonal influences.

Musculoskeletal differences include the shape of the pelvis as well as height and muscular strength differences.

Gender refers to social and cultural distinctions between male and female. While many similarities exist between males and females and while males and females compete with equality within equestrian sports, females and males may approach the activities with different biological, physiological and social concerns, expectations and needs. The UK Female Equestrian Health and Wellness CoP centers on female health and wellness. The CoP recognizes that diversity broadens and enriches all; and notes that the interests of men as well as all races and genders, including non-white races and LGBTQ equestrians, must also be considered.

Many under-researched subjects concerning female equestrian health beg for attention and already-studied topics have not yet been applied to female wellness within equestrian sport. Inherent dangers in equestrian and other sports have spurred ample beneficial research on impact injuries such as concussions and fractures. In contrast, chronic pain related to riding has been relatively unnoticed.

Chronic pain of the spine, hip, knee, ankle, breast or uterus may inhibit participation and prevent or limit enjoyment. The effect of chronic pain on mental health of female athletes has not been sufficiently addressed. The well-documented female athlete triad looms

as a concern, especially for young women riders, but equestrian literature rarely mentions this interrelated issue. Disordered eating, amenorrhea (absence of menstruation) and osteoporosis comprise this female athlete triad, and an athlete with any of the three can be at risk. Other under-researched or well-researched but under-applied topics include osteoporosis, menstrual pain, bladder and continence issues, nutrition and the influences of apparel and equipment, such as bra fit on breast pain and saddle fit on hip and pelvic pain. On a positive note, much empirical work can be done about studying the physical and mental health benefits of participating in equestrian activities and careers throughout multiple life stages.

Proposal 4

Athletic equipment and apparel serve to protect, preserve health and promote optimal performance. Both equipment and apparel designers and manufacturers should consider female anatomy and physiology so that their products can maximize female equestrian function and wellness.

Recommendations

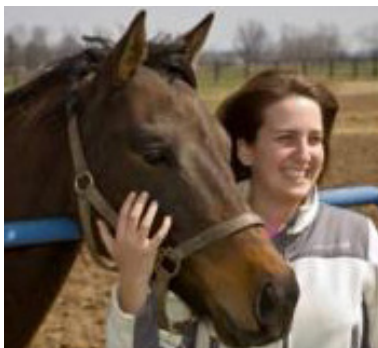
Equipment and apparel design and development, principally saddle and undergarment evolution, influence female equestrian health, wellness and performance. More research into ideal tack and technical clothing for female equestrians should lead to greater understanding of how to improve biomechanics and the invention of products to prevent pain due to joint inflammation, skin irritation or soft tissue damage and to maximize female riders' experience.

Rationale

Most sports have embraced the positive impact of well-designed and well-crafted equipment, such as approved helmets, that reduce the likelihood of concussions, pads that cushion bones and joints and vests to protect vital



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NATALIE STONES.

organs. Investigation into the effects of ill-fitting tack on equine athletes has revealed much room to improve, and reputable companies strive to continuously offer greater comfort and ease of movement, especially at the intersection of horse and rider in the budding science of saddlery. Prior to the second World War, saddles were made with male military officers or men rounding up cattle in mind. Until recent years saddle fitting did not reflect the societal changes in the latter 20th Century that allowed greater participation of women in riding. While balance remains paramount, saddle makers must account for differences in male and female pelvis orientation and hip configuration so that female riders can comfortably accommodate the movement of their horses. Master saddler Jochen Schleese and Sabine Schleese have spurred the movement, challenging saddle makers and fitters to consider female biological and physiological distinctions from prior male-oriented saddlery. (Note: Sabine Schleese is a member of this community of practice.) Adaptations including narrower twists, extended stirrup bars, curved flaps, wider seats and Schleese's patented crotch cutouts with padding for the symphysis pubis attend to and accommodate the female pelvis and hip and address the length ratio of the femur to the tibia.

Undergarments are another key area of interest for female equestrians. Recent studies on bra fit suggest that female equestrians often suffer from breast pain possibly related to significant vertical displacement of the breasts while riding and from improperly designed and/or poorly fitting bras. This breast pain may be short-term due to issues such as underwire pressure, tight shoulder straps, rubbing and chafing or suffering may become chronic due to irreversible damage to fatty tissue. Female riders often require padded underwear to prevent friction between the saddle and skin causing saddle sores.

Proposal 5

Clearly defined career development tracks within equestrian disciplines and trades should become a priority for the industry.

Recommendations

All employees, especially entry level employees, should be respected and mentored. The industry and all employers should ensure efficacy of their workforce, focus on the benefits of work within nature and the value of engaging with animals and people, model successful certification practices, emphasize apprenticeships and increase grant scholarships to enhance the equine industry.

Rationale

Although equestrian ventures can contribute in a significant way economically, high turnover of entry-level employees within organizations occurs due to dissatisfaction with pay, insufficient instruction, safety concerns, unavailability of role models and demanding physical work. Supportive personnel within the equine industry may feel unappreciated and be undertrained. Employee education, skills training, recognition, rewards, clearly defined pathways of ascent and apprenticeships may help retain the workers who buttress the equestrian industry. Imbuing prestige into the work of handling and grooming may encourage these dedicated individuals.

Proposal 6

Many equestrian sports are sex-integrated, with males and females competing directly against one another. However, equestrian pursuits are not fully equitable, and all organizations within the equestrian industry should ensure parity of the sexes in opportunities, roles, responsibilities and compensation.

Recommendations

Females and males should have equal representation in paid and unpaid positions, including as volunteers, employees, on boards, etc. Pathways should be developed

so that women achieve parity with male counterparts. Dedicated support, development and mentoring networks could encourage girls and women onward through transitions in levels of competition and in business. Organizations should seek justice and act impartially. Education about bias and discrimination may address unacknowledged assumptions and unfortunate practices. Where women lack equal representation, organizations may consider quotas. Workplaces must be fair and safe, free of physical or mental dangers, such as sexual harassment.

Rationale

Studies demonstrate that girls and women participate in equestrian activities over their lifespan more than boys and men. Since the majority of equine enthusiasts are females, many women have much to offer others from their decades

of experience. Yet a greater percentage of men occupy leadership and ownership positions. This difference between the sexes may be multifactorial, and women, for various reasons, related to differing roles and responsibilities over the female lifespan, may choose to decline higher offices for which they are capable. However, the contrast between the greater number of women involved in equestrian activities and the smaller number of women in key management, leadership and ownership titles calls for thoughtful contemplation and fair action.

| *The University of Kentucky Female Health and Wellness Community of Practice (CoP) provided this information.*

Bibliography and complete list of members can be found online [here](#).



COMMUNITY OF PRACTICE MEMBERS (TOP TO BOTTOM, LEFT TO RIGHT), ALICIA BENBEN, DR. JENNY BURBAGE, DR. HANNAH HOCH, LAURA LONG, DR. KATE SNYDER, KATE DASHPER, SARAH JANE CULLEN, MARY MIDKIFF, LORNA CAMERON, LUCY DUMBELL, GLENYE OAKFORD, VICKI LEWIS, ANDREA WHITTLE AND DR. SUSAN POLLACK.

EQUESTRIAN HEALTH AND WELLNESS LINKS

Universities/Education

[Leeds Beckett University](#)

[North American Racing Academy](#)

[University Centre Hartpury, Equine](#)

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[University of Kentucky Active Women's Health Initiative](#)

[University of Kentucky Equestrian Athlete Initiative](#)

[University of Kentucky Female Equestrian Health and Wellness Community of Practice](#)

[University of Kentucky Indoor Arena Survey Results](#)

[University of Kentucky Horse Industry Safety Summit](#)

[University of Melbourne](#)

[University of Portsmouth Research Group in Breast Health](#)

[Waterford Institute of Technology](#)

Businesses

[Schleese, Saddleft 4 Life](#)

Books

[Glenye Cain, The Home Run Horse](#)

[Joy Hicklin, Sleepy Ponies](#)

[Mary Midkiff, Fitness, Performance, and the Female Equestrian](#)

PROMISING DEVELOPMENTS IN QUEST TO PREVENT CATASTROPHIC RACEHORSE INJURIES

UNIVERSITY OF KENTUCKY STUDY SHOWS ASSOCIATION BETWEEN mRNA BIOMARKERS AND CATASTROPHIC INJURIES IN THOROUGHBRED RACEHORSES, A POSITIVE STEP FORWARD IN THE DEVELOPMENT OF A PRE-RACE SCREENING TOOL

Catastrophic injuries in Thoroughbred racehorses is a top-of-mind concern for the global racing industry and its fans. That sentiment is shared by researchers at the University of Kentucky and their collaborators, who are working to learn more about changes happening at a cellular level that might indicate an injury is lurking before it becomes career or life ending.

Could it be possible to identify an early marker or signal in horses at risk of catastrophic injury, allowing for intervention before those injuries happen? And, if yes, might this type of detection system be one that could be implemented cost effectively on a large scale?

According to Allen Page, DVM, PhD, staff scientist and veterinarian at UK's Gluck Equine Research Center, the short answer to both questions is that it looks promising.

To date, attempts to identify useful biomarkers for early injury detection have been largely unsuccessful. However, the use of a different biomarker technology, which quantifies messenger RNA (mRNA), was able to identify 76% of those horses at risk for a catastrophic injury.



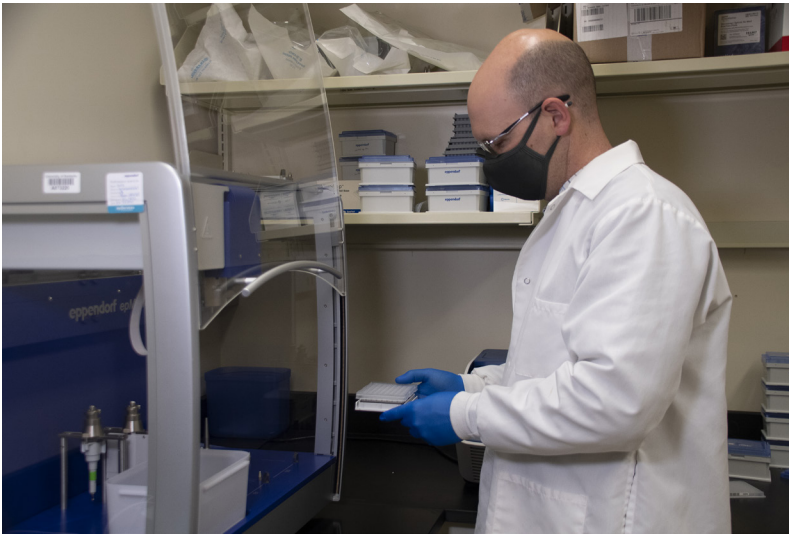
PHOTO BY DR. ALLEN PAGE.

An abstract of this research was recently presented at the American Association of Equine Practitioners' annual meeting in December 2020 and the full study [published Jan. 12 in the Equine Veterinary Journal](#). In this initial research, which looked at 21 different mRNA markers selected for their roles in encoding proteins associated with inflammation, bone repair and remodeling, tissue repair and general response to injury, three markers showed a large difference in mRNA levels between injured and non-injured horses.

For almost four years, Page

and his University of Kentucky colleagues have been analyzing blood samples from almost 700 Thoroughbred racehorses. The samples, collected by participating racing jurisdictions from across the United States, have come from both catastrophically injured and non-injured horses in a quest to better understand changes that might be happening at the mRNA level and if there are any red flags which consistently differentiate horses that suffer a catastrophic injury.

According to Page, the ultimate hope is to develop a screening



DR. ALLEN PAGE IN HIS LAB. PHOTO BY SABRINA JACOBS.

tool that can be used pre-race to identify horses at increased risk for injury. The results of this study, which was entirely funded by the Kentucky Horse Racing Commission's Equine Drug Research Council, suggest that analysis of messenger RNA expression could be an economical, effective and non-invasive way to identify individual racehorses at risk for catastrophic injury.

Joining Page in the research from UK's Gluck Center are Emma Adam, BVetMed, PhD, DACVIM, DACVS, assistant professor, research and industry liaison, and David Horohov, PhD, chair of the Department of Veterinary Science, director of the Gluck Center and Jes E. and Clementine M. Schlaikjer Endowed Chair.

Previous research has shown that many catastrophic injuries occur in limbs with underlying and pre-existing damage, leading to the theory that these injuries occur when damage accumulation exceeds the healing capacity of the affected bones over time. Since many of these injuries have underlying damage, it is likely that there are molecular markers of this that can be detected prior to an injury.

The identification of protein biomarkers for these types of injuries has been explored in pre-

vious research, albeit with limited success. The focus of this project, measuring messenger RNA, had not yet been explored, however. The overall objective was to determine if horses that had experienced a catastrophic injury during racing would show increased inflammatory mRNA expression at the time of their injury when compared to similar horses who were not injured.

THE GENETIC ACRONYMS: A PRIMER ON DNA, RNA, MRNA AND PCR

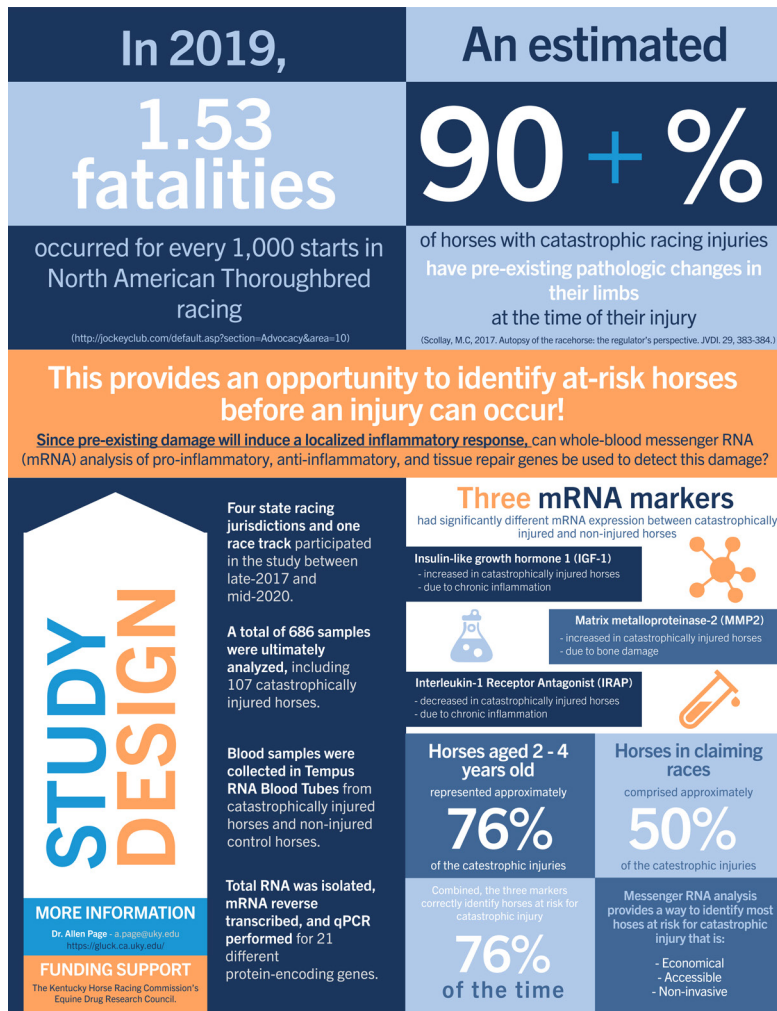
This research leverages advances made in genetics during the last several decades, both in a greater understanding of the field as well as in applying that knowledge to specific issues facing the equine industry, including catastrophic breakdown in racehorses.

The genetic code of life is made up of genes and regulatory elements encoded by DNA, or deoxyribonucleic acid, which is found in the nucleus of cells in all living organisms. It is arranged in a double helix structure, similar to a twisted ladder. The rungs of that ladder are nucleotide base pairs and the ordering of those base pairs results in the specific genetic code called a gene. The genetic code in the genes and the DNA tell the body how to make proteins.

RNA, ribonucleic acid, is created by RNA polymerases, which read a section of DNA and converts it into a single strand of RNA in a process called transcription. While all types of RNA are involved in building proteins, mRNA is the one that actually acts as the messenger because it is the one with the instructions for the protein, which is created via a process called translation. In translation, mRNA bonds with a ribosome, which will read the mRNA's sequence. The ribosome then uses the mRNA sequence as a blueprint in determining which amino acids are needed and in what order. Amino acids function as the building blocks of protein (initially referred to as a polypeptide). Messenger RNA sequences are read as a triplet code where three nucleotides dictate a specific amino acid. After the entire polypeptide chain has been created and released by the ribosome, it will undergo folding based on interactions between the amino acids and become a fully functioning protein.

While work looking at inflammation often involves measuring proteins, Page and his collaborators opted to focus on mRNA due to the limited availability of reagents available to measure horse proteins and concerns about how limited the scope of that research focus would be. Focusing on mRNA expression, however, is not without issues.

According to Page, mRNA can be extremely difficult to work with. "A normal blood sample from a horse requires a collection tube that every veterinarian has with them. Unfortunately, we cannot use those tubes because mRNA is rapidly broken down once cells in tubes begin to die. Luckily, there are commercially-available blood tubes that are designed solely for the collection of mRNA," he said.



“One of the early concerns people had about this project when we talked with them was whether we were going to try to link catastrophic injuries to the presence or absence of certain genes and familial lines. Not only was that not a goal of the study, the samples we obtain make that impossible,” Page said. “Likewise for testing study samples for performance enhancing drugs. The tubes do an excellent job of stabilizing mRNA at the expense of everything else in the blood sample.”

In order to examine mRNA levels, the project relied heavily on the ability to amplify protein-encoding genes using a technique called the Polymerase Chain Reaction (PCR). By using a variety of techniques, sam-

ples from the project were first converted back to DNA, which is significantly more stable than mRNA, and then quantified using a specialized machine that is able to determine the relative amount of mRNA that was initially present in the individual samples. While it is easy to take for granted the abilities of PCR, this Nobel Prize winning discovery has forever changed the face of science and has enabled countless advances in diagnostic testing, including those used in this study.

RESEARCH INTO MRNA BIOMARKERS

Catastrophic racing and training injuries have long been a target for researchers due to the high societal and welfare impacts on

the racing industry. With the nearly universal requirement for necropsies on horses that succumb to these injuries, work by researchers has demonstrated that most horses with catastrophic injuries have pre-existing damage in their legs. This pre-existing damage presents an opportunity to detect injuries before they occur, whether that be with advanced imaging or less invasive techniques, such as screening of blood for injury biomarkers.

Horses eligible for inclusion in the study were Thoroughbreds entered into any race in one of five participating jurisdictions from September 2017 to June 2020. To look at the mRNA, these jurisdictions collected specific blood samples either pre-race or post-race from a selection of non-injured horses or immediately from a horse after a catastrophic injury. Once collected, samples were sent to the Gluck Center where they were analyzed using PCR. The names of horses and sample types (injured, pre-race or post-race) were kept from the researchers until the samples had been fully analyzed.

Once the names and dates of samples were revealed, public records were then used to learn more about each horse. Information examined included the horse’s sex, age, race type and whether non-injured horses raced again within three months of the sampled race. For horses who had been catastrophically injured, necropsy results were used to categorize the type of musculoskeletal injury that occurred.

“Out of the 21 markers (genes) that were measured, three of them immediately stood out as being able to predict injury. The three individual markers of interest were Insulin-like Growth Factor 1 (IGF-1), Matrix Metalloproteinase-2 (MMP2) and IL-1 Receptor Antagonist (IL1RN). Taken together, the changes seen in all three of

these markers suggest that there is increased inflammation in the injured horses and that the inflammation arises from bone, just as was suspected,” Page said.

“Based only on these three markers, we were able to correctly identify horses at risk for injury 76% of the time and exclude horses for being at risk 88% of the time,” Page said. “Obviously, we want to maximize those numbers as much as possible, so while there’s room for improvement, this is significantly better than any other option currently available.”

One of the limitations of the study was that horses were only sampled once, so there was no ability to identify changes in individual horses over a period of time. Once horses start being sampled repeatedly on a regular basis with this testing, Page said he believes the ability to identify at-risk horses will improve dramatically.

WHAT DOES THE FUTURE HOLD?

“Since the ultimate hope is to develop a commercially-viable screening tool that can be used pre-race to identify horses at increased risk for injury, we anticipate adding multiple other markers with a new study that is just getting started,” Page said.

As part of the new study, also funded by the Kentucky Horse Racing Commission, Page and two Gluck Center colleagues, James MacLeod, VMD, PhD, John S. and Elizabeth A. Knight chair and director of UK Ag Equine Programs, and Ted Kalbfleisch, PhD, associate professor, plan to utilize RNA-sequencing, a relatively new technology, to expand their search to all of the approximately 22,000 protein-coding genes horses have. This will dramatically increase the likelihood that they will be able to identify additional markers for horses at risk of injury. They plan

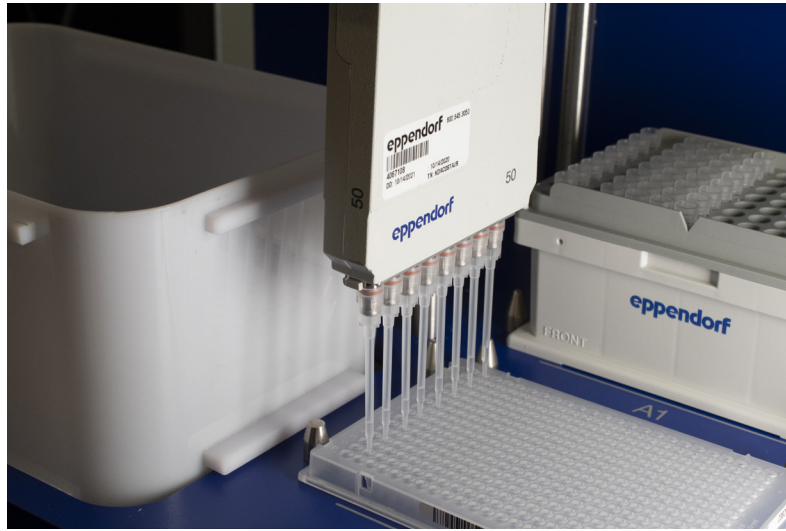


PHOTO BY SABRINA JACOBS.

to do this by using the large number of samples that have already been collected, further leveraging their initial research and decreasing the amount of time it will take to complete their new study.

“We are really excited about this new project and the promise that it holds,” Page said. “In our first study, we drove the data because we had to select which mRNA markers we wanted to examine. In our new study, the RNA-sequencing data is really what will be driving us.”

While that project is ongoing, Page and his colleagues continue to refine and improve upon the various laboratory steps required to isolate and analyze mRNA. Guided by the hope of providing the racing industry with a high-throughput screening tool, the group has employed multiple robotic platforms that can already handle 100 samples per day and be easily scaled up to handle more.

“As a researcher, I see it as being my job to provide practical and reliable solutions to the horse racing industry,” Page said. “I know that change can be scary, but we can all agree that something needs to change to help better protect racehorses and the jockeys

who ride them. Ultimately, the racing industry will decide when it wants to give this screening tool a chance. I’m confident that, when the industry is ready, we will be too.”

The full study published in the Equine Veterinary Journal can be found [here](#).

| *Source: story first appeared in Trainer Magazine: https://issuu.com/anderson-co/docs/nat-60_issuu_v1*

| *Holly Wiemers, MA, APR, is the communications and managing director for UK Ag Equine Programs. Additional information provided by Allen Page, DVM, PhD, staff scientist and veterinarian at UK’s Gluck Equine Research Center and Emma Adam, DVM, PhD, DACVIM, DACVS, who is based at the University of Kentucky Gluck Equine Research Center and Veterinary Diagnostic Lab and is responsible for research and serves as a veterinary industry liaison.*

EQUINE SAFETY AND YELLOW BUTTERCUPS

University of Kentucky forage specialists have fielded several calls on the safety of yellow buttercups in Kentucky pastures and asked Megan Romano, DVM, DABVT, toxicologist, UK Veterinary Diagnostic Laboratory, to comment on the potential risks to horses.

According to the current USDA PLANTS database, nearly 30 different species of *Ranunculus*, or buttercups, are found in Kentucky. Leaves, flowers and stems of buttercup have a sharp, pungent taste and the plants are generally avoided by grazing livestock.

Some *Ranunculus* species contain ranunculin, a compound hydrolyzed to protoanemonin when the plants are damaged – for example, when they are chewed. Protoanemonin is a vesicant, meaning it causes blistering of the skin, mouth and digestive system.

Ranunculus species with the highest ranunculin concentrations are the most toxic. Damage to plant cells also occurs when buttercups are cut and dried in hay. Hydrolysis of ranunculin to protoanemonin likely occurs as the plants dry. Protoanemonin then forms anemonin, which is not a vesicant. Dried *Ranunculus* plants are therefore expected to lose toxic potential fairly rapidly, although specific research has not been published to confirm this. The risk posed by *Ranunculus* species in Kentucky is minimal if there are plenty of other forages present – animals avoid grazing the unpalatable fresh plants, and the dried plants appear to be much less toxic.

Buttercups can cause mouth pain and blisters, drooling, oral and gastric ulcers, colic and diarrhea. Horses are probably



PHOTO BY DR. JIMMY HENNING.

the most sensitive species to the gastrointestinal effects of *Ranunculus* species. These effects can be severe if buttercups are ingested in large quantities, but their acrid taste usually deters further grazing. Clinical signs are typically seen only in animals forced to consume buttercups when they have nothing else to eat.

A few anecdotal reports have suggested an association between the presence of *Ranunculus* species in the pastures and abortions in cattle and horses; these reports are unconfirmed, and attempts to reproduce the disease have been unsuccessful. Bur buttercup (*Ceratocephalus testiculatus*) can cause significant illness, but this plant occurs primarily in the Western U.S. and is not a true buttercup, as it belongs to a different genus.

A review of UKVDL records over the last 13 years found no cases of livestock deaths attributable to *Ranunculus*. It is possible,

however, that cases of colic or diarrhea have unknowingly been caused by ingestion of *Ranunculus* species and were never attributed to the plant. Buttercup toxicosis poses the greatest risk to starving animals with nothing else to eat; it can be easily prevented by providing animals with adequate forage. Because animals avoid grazing *Ranunculus*, it proliferates in overgrazed pastures. Overgrazing can be prevented by maintaining appropriate stocking rates.

According to the UK publication, "[Broadleaf Weeds of KY Pastures, AGR-207](#)," Late February or March is the time of the year to spray for buttercup control. Maintaining good grass cover prevents many weeds, including buttercup, from germinating in fall or winter. Resting pastures and not overgrazing are key to improving pasture health. Thin stands with bare areas or that contain summer annual grasses like crabgrass can

be overseeded with a pasture mix in September. Be sure to soil test every two to three years and apply amendments based on soil test recommendations. In most horse pastures, nitrogen is most beneficial in the fall to improve root density and thicken stands.

For more information, check out our publications [Establishing Horse Pastures or Soil Sampling and Nutrient Management of Horse Pastures](#). Additional information on buttercup in pastures and control methods can be found [here](#).

| *Ray Smith, PhD, professor and extension forage specialist in the Department of Plant and Soil Sciences; Megan Romano, DVM, DABVT, toxicologist, University of Kentucky Veterinary Diagnostic Laboratory; and Krista Lea, MS, coordinator of the University of Kentucky's Horse Pasture Evaluation Program provided this information. Source: KY Forage News.*

UK's Emma Adam featured in Rood & Riddle Equine Hospital's StallSide podcast

Emma Adam, DVM, PhD, DACVIM, DACVS, assistant professor, research and industry liaison at the University of Kentucky Gluck Equine Research Center, was featured in the April StallSide podcast, which focused on the new strain of rotavirus that has been uncovered by UK. In the episode, she discussed the discovery, research and current treatments for this possible life-threatening type of foal diarrhea.



View the episode [here](#).

UK AG WEATHER CENTER PROVIDES WEATHER INFO FOR FARMERS

The University of Kentucky Weather Center launched a weekly newsletter that contains important forecast and weather information for farmers and producers.

To receive the newsletter, opt-in [here](#). If you missed the first issue, read it [here](#).

