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Photo courtesy Dr. Jimmy Henning.

DEALING WITH TALL FESCUE NOW AND FOREVER

For many, toxic tall fescue is a nagging concern this time of year, but with little idea about how to manage it, we often ignore it and simply hope for the best. But we can do better. There are several steps we can take to protect mares this year and to prevent this issue from challenging us again.

THE BASICS

First, let's start with a quick review of tall fescue toxicity. Tall fescue is a cool season (growing in spring and fall), perennial grass that is naturalized throughout the southeastern U.S. Most tall fescue is infected with an endophyte or fungus that lives in between the cell walls of the plant. The plant and the endophyte have a mutualistic relationship. The plant provides the endophyte with a place to live, nutrients to feed on and a method to reproduce via its seed. In exchange, the endophyte produces a series of compounds, some that give the plant increased drought tolerance, pest deterrence and overall resiliency. However, some other compounds, such as ergot alkaloids, are also produced and are toxic to livestock, including horses.

We know that ergot alkaloids, most notably ergovaline, have acute adverse effects on late-term pregnant mares. Mares grazing toxic tall fescue will often experience prolonged gestation (14-28 days longer), thickened, retained placenta (sometimes presents as a redbag delivery) and agalactia, or reduced milk production, that often requires medical or supplemental intervention. Mares can also suffer from late-term abortions in severe cases. In early pregnancy, mares are less sensitive to tall fescue and ergovaline, but can experience prolonged estrus cycles, reduced pregnancy rates and early term losses as well.

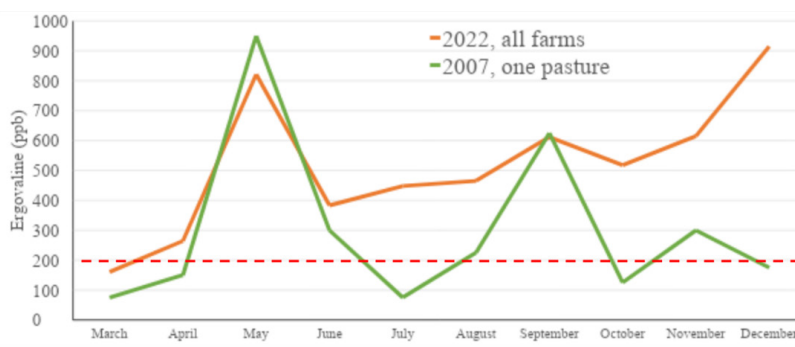


FIG. 1: ERGOVALINE (VERTICAL AXIS) CONCENTRATION CHANGES THROUGHOUT THE YEAR AND TYPICALLY HAS TWO MAIN PEAKS IN SPRING AND FALL. HISTORICALLY, LEVELS HAVE BEEN LOW IN SUMMER AND WINTER, AS SHOWN IN 2007 (GREEN), BUT MORE RECENTLY, MILD WINTERS HAVE DELAYED THE FALL DECREASES AND RESULTED IN PROLONG ELEVATED LEVELS OF ERGOVALINE INTO THE WINTER MONTHS, AS SEEN IN 2022 (ORANGE).

However, non-pregnant horses, including growing, working and breeding stallions, seem to adapt to grazing tall fescue well with minimal impact on health, so the remainder of our discussion will focus on reducing tall fescue toxicity in broodmares.

TIME OF YEAR

Ergovaline production, and therefore the risk of grazing tall fescue, are not consistent throughout the year. Typical years will see two peaks in production – in the spring when seedheads are forming around late May and again in the fall once the summer heat breaks, around September. Because mares are most sensitive in the last 30 days of pregnancy, we can reduce some of the risk by considering our foaling dates. For example, a mare due to foal in early March will be in her last 30 days of pregnancy in February, when ergovaline levels are typically quite low. On the flip side, a mare due to foal in July will be in her last 30 days in June, when ergovaline levels are the highest of the year. This mare would require additional steps to protect.

Recently, mild winters have made managing mares on tall fescue more complicated because we often don't see the reduced ergovaline levels

until much later in winter. Historically, January foaling mares were quite safe, but in the last two years, the UK Veterinary Diagnostic Lab has observed toxic levels of ergovaline well into January, putting those early-term mares at risk.

PASTURE HEIGHT

The endophyte lives in the base of the plant but must infect the seeds during plant reproduction to ensure the next generation of endophytes survives. In these areas of importance for the endophyte, we will also see concentrations of ergovaline found in the stem and seedhead and in the bottom 2-3 inches of the plant base. Dealing with the top is quite easy; just mow them. By keeping seedheads mowed down, we greatly reduce ergovaline in the horse's diet and improve the overall forage quality of the pasture.

The bottom is a bit harder to manage. Horses are spot grazers and prefer to graze the same areas again and again rather than grazing consistently across the pasture. Those frequently grazed areas will often contain more ergovaline, making rotational grazing important for tall fescue

management. Small paddocks where overgrazing is almost guaranteed is where the highest ergovaline concentrations are often found and therefore should be avoided for late-term mares as much as possible.

GOOD HAY

Another common option for tall fescue mitigation is to provide good quality hay and grain to dilute the tall fescue portion of the diet. But horses much prefer green grass over hay, so this is only effective if the hay is of high enough quality that horses choose to eat plenty of it.

High-quality alfalfa, alfalfa/mixed hay or even early maturity grass hay can be used and doesn't have to be of Western U.S. origin. Kentucky hay producers can put up very high-quality hay, though you may have to search for it a bit more. Forage testing can speak to the quality of the hay, but ultimately it all depends on if they eat it or not.

RESTRICTING PASTURE ACCESS

Particularly in late spring, no quality of hay will entice a horse as much as green grass, and therefore we must restrict pasture access to protect these mares. This could include keeping mares up in stalls for part of the day, establishing a dry lot where hay is fed or turning mares out with grazing muzzles to restrict intake during the day and continue feeding hay at night in the stall. Be careful to consider the source of hay or grass bedding, as ergovaline does occasionally persist in these as well, though this is not common.

MEDICAL INTERVENTION

When all else fails, the use of domperidone has been shown to eliminate many of the effects of toxic tall fescue but has its own financial and physiological impacts that should be discussed



FEEDING HIGH QUALITY HAY WILL ENCOURAGE HORSES TO CONSUME MORE HAY AND LESS TOXIC TALL FESCUE. PHOTO COURTESY KRISTA LEA.

with a veterinarian before use.

ELIMINATING TALL FESCUE

With several variables contributing to tall fescue toxicity in broodmares, and their very low tolerance to ergovaline, the only way to truly ensure safety for mares is to eliminate toxic tall fescue from the diet. Removing it isn't all that difficult, and several options do exist, but what to replace it with is the challenge. Endophyte-infected tall fescue is the strongest, toughest, most durable plant found in most horse pastures. Removing it leaves pastures open to many problematic plants, including nimblewill, foxtail and just about any broadleaf weed. Orchardgrass and bluegrass are not likely to take over or even maintain cover alone.

Novel endophyte tall fescue varieties are likely the best replacement for toxic tall fescue and are both safe and productive for horses. Novel endophyte tall fescue varieties are commercially available tall fescues that contain a different endophyte – one that still provides the plant with durability and toughness, but doesn't produce toxic compounds. These grasses survive well under

heavy grazing by horses, tolerate drought, heat and pests and can compete with weeds and undesirable grasses. These grasses are best established in a completely killed pasture rather than overseeded. Details on the renovation process and on different novel endophyte varieties can be found in [this](#) UK publication.

During this and all foaling seasons, managers should track pregnancies for symptoms of tall fescue toxicity, regularly walk pastures to evaluate tall fescue presence and test pastures when needed. While complete re-establishment of pastures sounds scary, this is actually the best way to not only remove toxic tall fescue from pasture, but also greatly improve the overall quality of pastures and eliminate other challenges. More information regarding tall fescue toxicity, ergovaline testing and pasture renovation can be found on the UK Forages [website](#).

| *Krista Lea, MS, is the coordinator of the University of Kentucky's Horse Pasture Evaluation Program.*

MAKING HORSE RACING SAFER IN KENTUCKY AND BEYOND: HOW NEW TOOLS COULD REVOLUTIONIZE THE GAME

In horse racing, a track's turf surface is more than just grass. It sets a stage where safety and fairness are vital. With the racing community always looking for ways to make the sport safer, a new study has shed light on tools that make assessing the condition of race-tracks much easier and more accurate.

Titled "A Comparison of Devices for Race Day Characterization of North American Turfgrass Thoroughbred Racing Surfaces," this study, published in MDPI Animals was a joint effort by the University of Kentucky Martin-Gatton College of Agriculture, Food and Environment (CAFE) and Michigan State University (MSU). It is now helping lead the way to a safer sport.

The researchers set out to find an easier way to check the consistency and safety of racetrack surfaces, which has become even more important since the introduction of the Horseracing Integrity and Safety Act (HISA).

"While there's been extensive research on dirt surfaces, turf racing has gained popularity and presents unique maintenance challenges," said study author Peter Schmitt, a Ph.D. student in biosystems and agricultural engineering. "Our study focuses on turf, aiming to identify surfaces that can remain free-draining and hold races under varying weather conditions."

The traditional testing method involves the Orono Biomechanical Surface Tester (OBST), designed by Michael Peterson, study co-author, UK Department of Biosystems and Agricultural Engineering professor and director of the Race-track Safety Program. Developed nearly two decades ago, the OBST



PHOTO COURTESY MARC PEARSON PHOTOGRAPHY.

mimics the forelimb impact of a Thoroughbred at a gallop. Recognized as the industry's gold standard test equipment for this use, it plays a crucial role in pre-meet inspections of racing surfaces. However, there is one drawback—its complexity for everyday use.

"The OBST, while invaluable for pre-meet inspections, isn't suited for daily assessments due to its size and the training required to operate," Schmitt said. "We're exploring tools to make these essential surface checks more accessible to racetrack personnel."

The research team tested five portable tools at MSU's Hancock Turfgrass Research Center in East Lansing, Michigan that could offer a quicker, easier way to get valuable information about the track's condition.

"Our goal was to evaluate

whether simpler, more accessible tools could approximate the OBST's measurements," Peterson said. "If simpler tools can approximate the OBST's detailed measurements, it could revolutionize how racetracks are maintained—making it easier to keep conditions consistent and safe without extensive equipment or specialized training."

These five tools—a moisture probe, a Clegg Impact Hammer, a Longchamp Penetrometer, a Turf Shear Tester and a Going-Stick®—were used on various types of grass and soil mixtures designed to replicate the diverse conditions of North American racetracks. The goal was to see if these tools could accurately measure what's happening on and under the surface that's directly relevant to a racing horse's speed and safety.

According to Peterson, one of the study's most interesting findings was how well the moisture probe worked. Measuring soil water content can give a good picture of a track's overall condition. The study showed the Longchamp Penetrometer, which determines how easily the soil can be penetrated, and the Clegg Impact Hammer, which assesses the surface's hardness, also showed promise by giving a clearer view of what's underfoot.

These tools could allow race-tracks to quickly gather important data about their turf surfaces, making it easier to keep the track in top condition for race day. This approach would improve the daily track maintenance and lead to a better understanding of how different surface conditions affect horse and rider performance—

and, crucially, their risk of injury.

The potential research benefits extend well beyond the immediate safety improvements. By standardizing tracks' assessment, the industry can ensure that races are as fair as possible, with all horses running on surfaces that meet the same high standards. Moreover, combining surface condition data with race times and injury reports could provide new insights into preventing accidents and improving horse welfare.

"This isn't just about finding new tools; it's about improving our understanding of what makes a racing surface safe and fair," Peterson said. "By integrating these assessments with other data, we can start to draw more nuanced conclusions about the factors contributing to safety and performance."

View the study [here](#).

This project was supported by the National Institute of Occupational Safety and Health (NIOSH), Centers for Disease Control and Prevention of the U.S. Department of Health and Human Services (HHS) as part of an award totaling \$1.5 million with 0% financed with non-governmental sources. The contents are those of the author(s) and do not necessarily represent the official views of, nor an endorsement, by NIOSH, CDC, HHS, or the U.S. Government. For more information, please visit www.cdc.gov/niosh.

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

UK HORSE PASTURE EVALUATION ENROLLMENT IS NOW OPEN FOR 2024

Enrollment is now open for the 2024 UK Horse Pasture Evaluation Program. If you are interested in having your farm evaluated for species composition and tall fescue toxicity, please click the enrollment link [here](#) and submit your information. Evaluations include:

- Species composition is determined by objectively identifying the percentage of grasses, legumes, forbs and other pasture constituents.
- Endophyte analysis is a measure of the number of tall fescue plants infected with the toxic endophyte and gives a measure of toxic potential to broodmares.
- Ergovaline concentration is snapshot of the current toxicity profile within the pasture and compared to other pastures on the farm and allows for triage of pastures for mitigation.
- Management recommendations including herbicide applications, overseeding and complete re-establishment are based on all data collected on the farm and conversations with farm management.
- For repeat evaluations, pasture changes over time are charted to observe the impacts of management, grazing and weather patterns.
- Soil type maps are created and can impact land use and overall carrying capacity. Please note we do not collect soil samples, and instead encourage farms to use their county extension agent or commercial agronomic services for soil sampling.
- Personal consultation to go over the full report and discuss options for improved manage-



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

ment going forward. Any horse farm within the Commonwealth of Kentucky is eligible for this program, regardless of size, breed or discipline. Farms are serviced on a first-come, first-served basis. Costs vary by size of farm and types of analysis. A quote for all services will be provided before the evaluation begins.

Additional questions can be directed to program coordinator Krista Lea at Krista.Lea1@uky.edu.

EASTERN TENT CATERpillARS MAKE THEIR 2024 KENTUCKY DEBUT

The first Eastern Tent Caterpillars (ETC) of the season are now emerging. Initial sightings have been reported in Western Kentucky counties after having spent the last nine months as masses of eggs on twigs of wild cherry and related trees. The normal time for the egg to hatch is when the forsythia bloom starts.

The insect is infamous for its connection with the Mare Reproductive Loss Syndrome (MRLS) in the early 2000s when an estimated 3,500 foals were either aborted, stillborn or died shortly after birth. During 2001, Central Kentucky lost an estimated 30% of the 2001-2002 Thoroughbred foal crop. Overall, the state suffered an economic cost of approximately \$336 million from losses suffered in all breeds of horses.

Jonathan Larson, PhD, an assistant extension entomology professor at the University of Kentucky Martin-Gatton College of Agriculture, Food and Environment, noted that these caterpillars start to hatch when 90 - 100 growing-degree days have accumulated. Growing-degree days are a measurement of development for insects that reflects the high and low temperature of any given day.

“Last year, we observed this threshold at the end of February. This season, however, the progression is slightly delayed,” Larson said. “Egg hatch occurs over several weeks in early spring, raising the likelihood of surviving late freezes. When the temperature rises above 37 degrees Fahrenheit, the caterpillars begin to grow and develop.”

ETC’s preferred food plants are wild cherry, apple and crabapple, but may also appear on hawthorn,



THE EASTERN TENT CATERPILLAR IS INFAMOUS FOR ITS CONNECTION WITH THE MARE REPRODUCTIVE LOSS SYNDROME IN THE EARLY 2000S WHEN THEY CAUSED KENTUCKY \$336 MILLION IN DAMAGE. PHOTO BY STEVE PATTON.

maple, cherry, peach, pear and plum trees. As the caterpillars mature to 2 - 2.5 inches and become hairy, they may leave their host trees searching for places to spin their cocoons or additional food sources if their original tree is depleted. This often leads them along fences and into pastures.

Accidental ETC consumption by pregnant mares was linked to the MRLS epidemic from 1999 to 2001. MRLS can result in the loss of foals both early and late in pregnancy or in the birth of weakened foals. The caterpillars’ hairs, especially their hair cuticles, can embed in the lining of the mare’s gut. This leads to bacterial infections that can adversely affect the fetus and placenta by breaching the gut’s protective barrier.

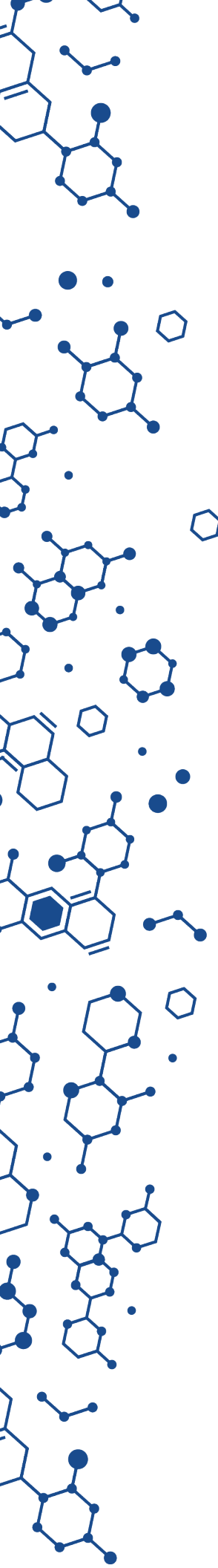
“If farm managers notice high numbers of nests, they should relocate pregnant mares from areas near wild cherry trees to reduce the risk of exposure,” Larson said. “The greatest risk occurs when these mature caterpillars leave the trees to pupate and transform into moths.”

ETCs are named for the compact silk-tent shelters they con-

struct in the crooks and crotches of branches to defend against predators and parasitoids. This species is known for its tidy, nest-building compared to the fall webworm, which creates large, messy webs at branch tips. The ETC population varies annually due to climate, predators and diseases.

Despite not reaching the extreme levels seen during the MRLS outbreak, the presence of these caterpillars still raises concerns. Larson emphasizes the importance of notifying horse owners about the onset of caterpillar activity each year, allowing them to monitor and manage the risk of MRLS by checking their property for caterpillar webs.

As part of caterpillar management practices, pregnant mares should be kept away from infested trees, and preferred host trees should either be removed or not planted close to horse farm paddocks. In certain situations, using insecticides, such as the organic pesticide *Bacillus Thuringiensis* (Bt), to control the caterpillars in addition



to those preventive measures may be necessary. Treating tall trees that are challenging to spray may also be necessary.

For the latter scenario, professional arborists will treat via trunk injection. Products labeled for ETC control include Tree-äge (emamectin benzoate), Inject-A-Cide B (Bidrin), Abacide 2 (abamectin) and Lepitect (acephate). Applicators should read and follow all label instructions. All four injectable products are labeled for use on horse farms.

“ETC activity can vary annually due to climatic conditions, predators and disease,” Larson said. “However, understanding their life cycle and habitat preferences allows us to address potential risks preemptively. Awareness is our best defense. By tracking the hatching and development of these caterpillars, we can implement targeted interventions to protect our trees and, crucially, our horses.”

For more information about assessing trees for egg masses, the UK Entomology publication *Checking Eastern Tent Caterpillar Egg Masses* is available at <https://entomology.ca.uky.edu/ef449>.

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

GRADUATE STUDENT SPOTLIGHT

Meredith Talley

Progression in degree:

I am a first-year graduate student within the Animal and Food Sciences Department, working with Kyle McLeod, PhD, associate professor.

Background and interests:

I studied biology and Spanish at Transylvania University, where my interest in animal nutrition began. I grew up in Paducah, Kentucky, and have lived in Lexington since I was 14. I grew up training and competing in dressage. I now own three horses.

Research focus:

Investigation of the microbiome of the horse. The main goal of the research is to see if fatty acid amides are produced by the horse microbiome. If this can be demonstrated in vitro, we may see how nutritional conditions impact their production.



PHOTOS COURTESY OF MEREDITH TALLEY.

UNIVERSITY OF KENTUCKY'S PRE-VET EXPERIENCE DAY CHARTS A COURSE FOR FUTURE VETERINARIANS

The University of Kentucky Martin-Gatton College of Agriculture, Food and Environment recently welcomed aspiring veterinarians from across the country to its inaugural Pre-Veterinary Experience Day.

The event was designed to guide, inform and inspire the next generation of veterinarians by providing a real-world, hands-on showcase of this dynamic profession. This educational landmark event brought together students from diverse backgrounds, each with a shared passion for animal healthcare, to explore the multifaceted world of veterinary medicine.

"This is the first time we've had a pre-veterinary experience day," said Colette Tebeau, UK Department of Animal and Food Sciences (AFS) pre-vet academic coordinator. "Our students were requesting more education about what it means to be a pre-vet student. It's important for them to know what is required for veterinary school and to be well educated in many different aspects of the veterinary industry."

The day was structured into two tracks catering to students at different stages of their education. The first track aimed at undergraduates early in their pathway, focusing on the prerequisites for veterinary school and the skills needed to become a veterinarian. The second track was designed for students nearing the application process, offering insights into preparing a competitive veterinary school application and exploring various post-graduation career op-



PHOTO COURTESY OF SABRINA HOUNSHELL

portunities.

Students participated in panel discussions with veterinarians who shared their experiences and challenges in the field. This included working in a small animal clinic, equine practice, clinical practice with other large animal species, and government/regulatory/academic career paths. These interactive sessions, led by UK faculty and collaborators, aimed to give students a glimpse into the day-to-day life of veterinarians and the myriad career options available.

"It's important to bring professionals from around the nation to talk to the students because they have those real-life experiences," said UK agriculture and medical biotechnology junior Anna Turlington. "They can bring that knowledge and experience to students who might not know that beforehand. Students can learn that they can do it too, it's not impossible and that the industry needs people of all different backgrounds."

Samantha Gentile, an animal

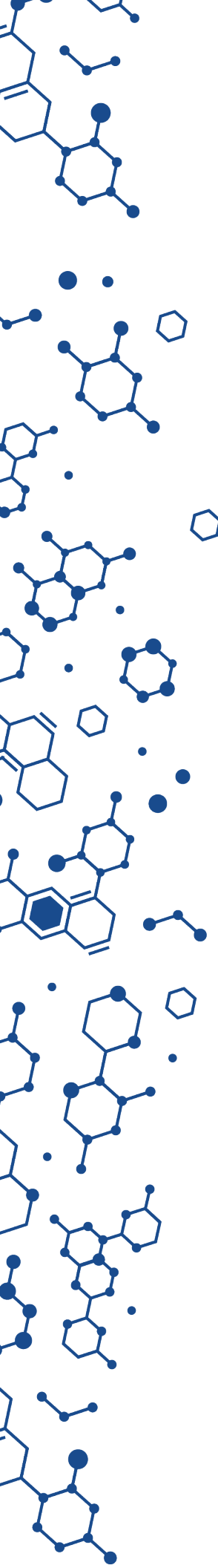
science major from the University of California, Davis, traveled over 2,300 miles to attend.

"I've been a pre-vet student pretty much all my life," Gentile said. "My boss at work informed me of the opportunity. She told me it would be an incredible experience. It's also nice to get different vet perspectives from other schools."

Gentile said she was particularly impressed with the insights into the veterinary school interview process and the preparation for presenting oneself effectively.

"I learned a lot about the interview process and how to properly present myself. I knew a lot about the animal side of things and how to write an application. Here, I learned how to express myself better through the different questions that were asked today and the different presenters."

After morning presentations, students had their choice of hands-on locations: the Bluegrass Stockyard, Spy Coast Farm, Nicholasville Road Animal Hospital and the UK



Veterinary Diagnostic Laboratory.

“These industry tours were designed to give students firsthand insight into how a facility works,” said Amber McNamara, AFS associate professor and Pre-Veterinary Advising Program director. “For example, at a practice facility, they saw how a patient moves through the clinic and learn from the experts who are doing this great work every day.”

UK’s Pre-Veterinary Advising program consists of an advisory team, led by McNamara and Tebeau, serving all university students in meeting their requirements for veterinary schools across the U.S., including contracts with Auburn University and Tuskegee University.

The Pre-Veterinary Experience Day also served as a networking hub, connecting students with professionals and peers sharing similar interests.

“I love networking and meeting new people, whether it’s from different schools or professionals in the industry,” said Ava Vransy, a UK equine science and management major. “There’s always somebody new in the profession I can learn from and help me determine what I want to do in the future.”

Tebeau said the event was a much-needed platform for addressing the growing concerns over the nationwide shortage of veterinarians, particularly in large animal and equine rural practices.

“A lot of it comes back to the industry’s lack of veterinarians,” she said. “Large animal and equine but even small animal regulatory areas are struggling to find veterinarians. In veterinary medicine, we’re facing significant shortages that impact not just our rural communities but our urban centers as well.”

By providing an interactive space for education, discussion and networking, the event has laid the groundwork for future veterinarians to enter the field and an informed vision for their careers.

As the veterinary profession continues to evolve, the need for

well-educated, passionate individuals entering the field has never been greater.

“I hope that they leave with enthusiasm for the field,” McNamara said. “There are so many paths that they could take within veterinary medicine. There are so many veterinarians who love to get up every morning and do their job. This is a rewarding career because we get to make a difference in the lives of animals. Whether you’re in front of the classroom teaching the next generation of veterinarians, or you are hands-on with that animal and their owner, the field is always an exciting one.”

The platinum sponsor for the event was Park Equine Hospital and gold sponsor was the Kentucky Soybean Board.

Silver sponsors included Bohringer Ingelheim, Chevy Chase Animal Clinic, Hagyard Equine Medical Institute, Kentucky Association of Equine Practitioners, Kentucky Department of Agriculture, Kentucky Livestock Coalition, Lexington Equine Medical, and Rood & Riddle Equine Hospital.

Bronze sponsors included the Kentucky Cattlemen’s Association and Kentucky Veterinary Medical Association.

Event collaborators included Bluegrass Equine Podiatry, Blue Grass Stockyards, Eastern Kentucky University, Morehead State University, Nicholasville Road Animal Hospital, Orrville Veterinary Clinic, Spy Coast Farm, VisitLex and Zoetis.

The event will be held annually on the Saturday before Presidents’ Day. More information about the event, speakers and topics can be found [here](#).

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



PHOTOS COURTESY OF SABRINA HOUNSHELL

AN IMPROVED UNDERSTANDING OF THE GENOME OF *SARCOCYSTIS NEURONA*, THE PRIMARY CAUSE OF EPM

Our lab is working to solve equine protozoal myeloencephalitis (EPM), one of the most commonly diagnosed neurologic diseases in horses in North and South America. Annual direct costs associated with the diagnosis and treatment of EPM represents a large economic burden to the equine industry and is estimated to be between \$55.4 million and \$110.8 million in the United States alone. This does not account for the additional economic impact due to lost production, decreased performance and the cost of care during recovery. Even after successful veterinary intervention, full recovery from the disease can be difficult due to lasting damage to tissues of the central nervous system.

EPM is caused primarily by *Sarcocystis neurona*, a single-celled parasite. Normally, *Sarcocystis* has a two-host life-cycle where it spends most of its time in small mammals such as skunks, racoons and nine-banded armadillos. After asexual replication, parasites will form dormant cysts (sarcocysts) in the muscle tissue of this animal, which are later ingested through scavenging by the opossum definitive host. In the opossum, the parasites excyst in the intestines, where they sexually replicate to produce environmentally-stable infective sporocysts that are passed along with feces into the environment. Interestingly, the natural lifecycle of *S. neurona* does not include the horse. Horses become accidental hosts when they ingest feed or water contaminated with opossum fe-




ces containing these sporocysts. In the horse, the parasites excyst in the gut and migrate to the brain and/or spinal cord where they cause local inflammation and tissue damage. Depending on the location of this inflammation, clinical signs can vary to include slight incoordination, asymmetric muscle atrophy, partial facial paralysis, difficulty swallowing, ataxia, recumbence, seizures and/or death.

Of 5,250 horses sampled in 2013 from 18 states across the United States, seroprevalence of antibodies against *S. neurona* was 78% indicating that horses are commonly infected by this parasite. A study by the National Animal Health Monitoring System in 2001 reported the annual occurrence of EPM to be approximately 0.14% in the US, with case fatality rate at 4.7%. The large discrepancy between the seroprevalence of antibodies to *S. neurona* and the low occurrence of EPM is puzzling and suggests that disease pathogenesis is complex.

Initially revolutionized by the sequencing of the human genome, contemporary research now permits efficient investigation of the proteome, transcriptome, microbiome, etc. of any organism for which there is a high-quality genome sequence and annotation

(identification of the structure and functional importance of individual genes). Using the horse as an example, the equine reference genome has allowed for identification of genetic variants associated with coat-color, dwarfism, cytokine expression and multiple other traits. Furthermore, the equine reference genome has made possible the Functional Annotation of Animal Genome (FAANG) project, a collaborative initiative promising to correlate and make available a tissue-specific transcriptome (identification of all the genes expressed in a specific cell type) and regulome (all of the regulatory components of a specific cell type) of the horse.

Like “omics” investigations in humans and horses, computational approaches represent a powerful toolset to improve our understanding of *S. neurona* and EPM. The current reference genome for *S. neurona* was produced more than a decade ago. Using state-of-the-art, next-generation sequencing technologies and improved computational methodologies, we have generated an updated reference genome for *S. neurona* that provides an improved assembly and more accurate genome annotation. Importantly, previous gene annotation for the *S. neurona* genome



relied heavily on evidence from the “close” relatives *Toxoplasma gondii* and *Neospora caninum*. In this new genome, the structure of each gene has been painstakingly curated using evidence derived specifically from *S. neurona*, which should ensure the peculiarities caused by 250 million years of *Sarcocystis* evolution remain evident.

This collaboration between the University of Kentucky’s Gluck Equine Research Center, Purdue

University and the University of Georgia will give us and other researchers a better understanding of the genetic “language” of *S. neurona*, which should lead to improved diagnostic methodologies, preventative measures and treatments for EPM.

| *Source: January 2024 Equine Disease Quarterly. Jamie Kaj Norris is a PhD Student in the Gluck Equine Research Center under researcher Dan Howe, PhD, professor.*

Issues of the EDQ can be found online at <https://gluck.ca.uky.edu/pubs>

2024 GLUCK SEMINAR SERIES UPCOMING SESSIONS

UK Maxwell H. Gluck Equine Research Center’s seminar series is free and can be attended both in person and remotely. Topics relate to research in equine health and well-being as well as research in related fields. The series features invited expert speakers as well as our own graduate students, postdocs and faculty.

Location: Gluck Equine Research Center, 1400 Nicholasville Road, Lexington, Kentucky. We provide coffee and cookies. Each seminar will have a Zoom registration link, which will be posted here on Gluck’s Facebook page as well as on the [website](#).

3/14	Dr. Qingsheng Li, University of Nebraska-Lincoln <i>Inter- and Intra-species Transmission of Lentiviruses and HIV-1 Vaccine Development</i>
3/21	Edward Olajide, MS student, Department of Veterinary Science, UK <i>Prevalence of presumed latent Equid alphaherpesvirus 1 in a random population in Kentucky</i> Lynn Leedhanachoke, PhD student, Department of Veterinary Science, UK <i>Applications of Equine Organoids to Dissect Host-Pathogen Interactions</i>
3/28	Dr. Anastasia Vlasova, The Ohio State University <i>The canine coronavirus affair: One health perspective</i>
4/4	Bibek Lamichhane, MS student, Department of Veterinary Science, UK <i>Next generation probiotics for the control of Salmonella associated diarrhea in horses</i> Lauren Johnson, PhD student, Department of Veterinary Science, UK <i>Functional Impacts of Introgression within the Horse’s Genome</i>
4/11	Dr. Wes Van Voorhis, University of Washington <i>Structure-based Drug Development to Discover Therapeutics for Sarcocystis, Toxoplasmosis, and Cryptosporidiosis</i>
4/18	Dr. Amanda Bradbery, Montana State University <i>The critical stages of growth and development of the performance horse athlete: Evidence to optimize nutrition and management strategies</i>
4/25	Mackenzie Smith, PhD student, Department of Veterinary Science, UK <i>What Does it “Mean”: Exploring New Statistical Approaches to Parasite Data</i> Nichol Ripley, PhD student, Department of Veterinary Science, UK <i>Bloodworm Biology: Using Genomics to Redefine a Reemerging Parasite</i>
5/9	Dr. Lutz Goehring, Department of Veterinary Science, University of Kentucky <i>Equid alphaherpesvirus 1 (EHV-1) – what have we learned?</i>

TIME TO BEGIN CONTROL EFFORTS FOR BUTTERCUP

Buttercups mostly grow as winter annuals, although some species are classified as short-lived perennials. In Kentucky there are different species of buttercups that are known to impact pasture fields, such as hispid buttercup (*Ranunculus hispidus*), tall buttercup (*Ranunculus acris*), creeping buttercup (*Ranunculus repens*), bulbous buttercup (*Ranunculus bulbosus*) and small flower buttercup (*Ranunculus abortivus*). These plants typically produce five shiny, yellow petals beginning in the early spring.

Although different species may have somewhat similar flower heads (Figure 1), each of these buttercup species differs somewhat in their vegetative leaf characteristics. During the time petals are showy new seed has already begun to develop. Waiting until after flowers appear can be too late to implement control tactics. This is one reason buttercups survive year to year and new plants emerge each year.

Some buttercup plants may emerge in the fall but most plants emerge from seed during the late winter months when temperatures begin to warm. Buttercup is a cool season weed and often flourishes in over-grazed pasture fields with poor stands of desirable forages (Figure 1). Therefore, pasture management practices that improve and promote growth of desirable plants during these months are among the best methods to help compete against the emergence and growth of this plant.

Conversely, livestock allowed to overgraze fields during the fall and winter months is one of the main factors that contributes to buttercup problems. Mowing fields or clipping plants close to the ground in the early spring before buttercup plants can produce flowers may help reduce the amount of new seed produced, but mowing alone

will not totally eliminate seed production.

For chemical control, herbicides registered for use on grazed grass pastures that contain 2,4-D alone will effectively control buttercup. Depending on other weeds present, herbicide products that contain dicamba+2,4-D (eg. Weedmaster, Brash, Rifle-D, etc.), aminopyralid (eg. GrazonNext, Duracor) or triclopyr (eg. Crossbow) can also be used. However, legumes such as clovers interseeded with grass pastures will be severely injured or killed by these other herbicide products. For optimum results, apply a herbicide in the early spring (March or early April) before flowers are observed, when buttercup plants are still small and actively growing in a vegetative growth stage. For best herbicide activity, wait until daytime air temperatures are greater than 60 F for two to three consecutive days. Consult the herbicide label for further information on grazing restrictions, precautions or other possible limitations.

For fields heavily infested with buttercup, a variety of control tactics may be needed. Apply an herbi-



FIGURE 1: HISPID BUTTERCUP WITH MATURE FLOWERS AND NEW SEED FORMING.. PHOTO COURTESY MARTIN-GATTON COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT.

cide to help reduce the population of buttercup plants in the spring and use good pasture management techniques throughout the year to help improve and thicken the stand of desirable forages.

| *J. D. Green, PhD, is an extension weed scientist within UK's Department of Plant and Soil Sciences in the Martin-Gatton College of Agriculture, Food and Environment.*



PASTURE FIELD IN LATE APRIL WITH FLOWERING BUTTERCUP. PHOTO COURTESY MARTIN-GATTON COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT.

UK UNDERGRAD RESEARCH STUDENTS DOCUMENT RELIABLE METHOD FOR EQUINE TAPEWORM TESTING

You can't detect tapeworm eggs in fecal samples. Everyone knows that, right? Well, this is not entirely true.

Two UK Martin-Gatton College of Agriculture, Food and Environment undergraduate students recently published a study demonstrating that one technique was capable of reliably detecting and enumerating equine tapeworm eggs in fecal samples from infected horses.

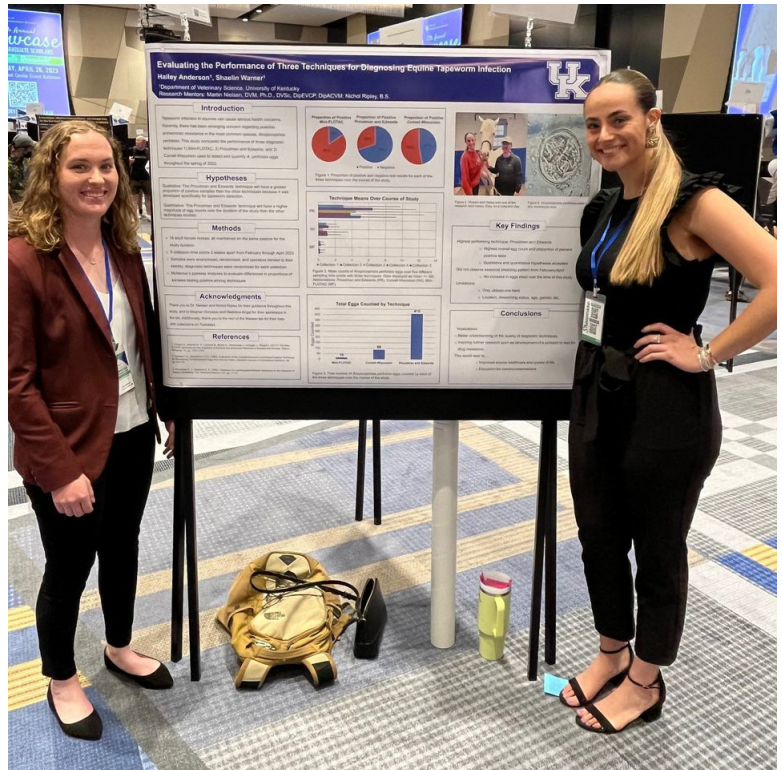
Recent data has suggested multi-drug resistance in equine tapeworms, which has created a need for better and more systematic monitoring of these parasites. Hailey Anderson (Equine Science and Management) and Shaelin Warner (Agricultural and Medical Biotechnology) meticulously compared three different techniques over the course of several months.

One of the three techniques, referred to as the Proudman technique, found significantly more positive samples and recovered more eggs within the samples than the other two techniques. Overall, this technique diagnosed correctly in about 75% of the samples, whereas the other two performed at much lower levels.

It has become urgently important to screen for drug resistance in equine tapeworms, and current work in the Nielsen Laboratory aims at further refining this technique to make it suitable for use in the field.

The paper is fully published in the highly ranked journal *Veterinary Parasitology* with Anderson and Warner as joint first authors in recognition of their excellent hard work:

Hailey C. Anderson, Shaelin F. Warner, Nichol E. Ripley, Martin K. Nielsen, 2024. Performance of three techniques for diagnosing equine tapeworm infection, Veterinary Parasitology 327, 110152.



HAILEY ANDERSON (LEFT) AND SHAELIN WARNER (RIGHT).
IMAGE COURTESY DR. MARTIN NIELSEN.

Full access to the paper can be found [here](#).

| *Martin Nielsen, DVM, PhD, Dipl. ACVM, is the Schlaikjer professor of Equine Infectious Disease, director of graduate students and associate professor in the University of Kentucky Department of Veterinary Science at the Gluck Equine Research Center*



EQUINE TAPEWORM. IMAGE COURTESY DR. MARTIN NIELSEN.

ACCOLADES

Izabela de Assis Rocha, PhD-student (pictured below) in Daniel Howe's laboratory, has been awarded a research grant from Morris Animal Foundation.

The project is titled "Investigation of the Immunopathogenesis of Equine Protozoal Myeloencephalitis."

Rocha and collaborators will study why a small percentage of horses infected with the causative parasite *Sarcocystis neurona* are afflicted with a severe neurological disease called equine protozoal myeloencephalitis while other infected horses are unaffected.



Shavahn Loux, PhD, scientist (pictured right, top), and **Bruno Menarim, PhD, assistant professor** (pictured right, bottom), both at the University of Kentucky Gluck Equine Research Center, have been awarded grants from Grayson-Jockey Club Research Foundation.

Loux's research aims to develop a novel for diagnosis of nocardioform placentitis, a common cause of late-term abortion in mares.

Menarim's project aims to investigate the benefits of a new treatment, polyacrylamide, for treatment of joint disease in horses.

You can read more about their projects as well as the other awarded research projects [here](#).



Yosra Helmy, PhD, assistant professor (pictured right) in the University of Kentucky Gluck Equine Research Center was recently awarded the prestigious Peggy Cotter Award from the American Society of Microbiology (ASM). This award is given to early career scientists within the discipline of microbiology and will cover accommodation and travel costs associated with attending the annual ASM conference.



Allen Page, DVM, PhD (pictured right), is an assistant professor at the University of Kentucky Gluck Equine Research Center working with inflammation and health. He was recently awarded research funding from The Foundation For The Horse, which is incorporated by the American Association for Equine Practitioners (AAEP).

Through serial evaluation of mRNA in horses diagnosed with and receiving professional rehabilitation for suspensory ligament, tendon or stifle injuries, Page's research seeks to define patterns that may ultimately improve understanding and maximize healing responses following injury. This would modernize current return to activity guidelines for common orthopedic and soft tissue injuries in horses.

