

HIGHLIGHTING RESEARCH
AND OUTREACH EFFORTS AT
THE UNIVERSITY OF KENTUCKY

MAY 2020
ISSUE #0002

EQUINE SCIENCE REVIEW

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College of Agriculture,
Food and Environment

EDITOR AND LAYOUT

Holly Wiemers, MA, APR communications and managing director; UK Ag Equine Programs | holly.wiemers@uky.edu

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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 Jimmy Henning, PhD, extension professor, Plant and Soil Sciences

UK EQUESTRIAN ATHLETE INITIATIVE LAUNCHES RESEARCH PROJECT IN RESPONSE TO RECENT FINDINGS ABOUT VETERINARIAN MENTAL HEALTH

The University of Kentucky Equestrian Athlete (EqA) Initiative, formerly known as the Jockey & Equestrian Initiative, launched an equine care service providers' (ECSP) research project as a comprehensive survey in April to address equestrian health and wellness. Part of the Sports Medicine Research Institute within UK's College of Health Sciences, EqA is focused on the health of the equestrian athlete.

The team had been putting the project into place prior to the pandemic in response to recent findings related to the mental health of veterinarians.

In 2019, when Merck Animal Health released survey results looking at all veterinarians' mental health, the findings have changed discussions around veterinary medical providers as a key population needing attention. The Merck study reported that younger veterinarians demonstrated increased psychological distress, higher suicidal thoughts and attempts, compared to the general U.S. population.

Additionally, 41% of the veterinarians who responded stated they would not recommend going into veterinary sciences as a profession, with the three main reasons being compensation, debt and costs and personal toll of the profession. This survey was a follow-up to a survey from Auburn University and the Centers for Disease Control and Prevention, which found female veterinarian suicides are 2.4 times higher than the general population. This is similar to female veterinary technicians, who are 1.6-2.3 times more likely to commit suicide than the general population. Does animal care type impact these findings? The EqA team is

seeking answers through the ECSP project.

The ECSP research project is close to Michaela Keener's heart, as her eldest sister and professional mentor is a DVM. Keener, MS, is the research administrative coordinator for the Equestrian Athlete Initiative.

Running her own practice in their home state of Minnesota, Keener's sister (Laurelyn Keener) has shared numerous stories of the stresses and variables influencing vets' mental, physical

THE MERCK STUDY REPORTED THAT YOUNGER VETERINARIANS DEMONSTRATED INCREASED PSYCHOLOGICAL DISTRESS, HIGHER SUICIDAL THOUGHTS AND ATTEMPTS, COMPARED TO THE GENERAL U.S. POPULATION.

and financial well-being. Wanting to serve this valuable community, Tumlin and Keener designed a qualitative study to address these social, behavioral and economic factors.

The primary goal of this study is to develop a profile and encompassing view of work-life and personal life characteristics and practices. Included in the survey are the topics of stress, fatigue, mental health, vacation engagement, medical and adjunctive care, economic impacts of schooling and social media impacts on wellness perceptions. There are four populations included in the survey, veterinarians, veterinary technicians, farriers and specialists with at least 50% equine clientele. Some of the demographic questions include type of travel,



MARTY WHITEHOUSE, DVM AND UK ALUM, EXAMINES A PATIENT. PHOTO BY KIMBERLY TUMLIN

frequency of non-standard hours, location of services regionally and type of education that service providers have achieved.

"It's important to look at ways to improve the resources available to this population of workers, but we need to understand what differences and similarities each specific subgroup is facing on a regional basis," Keener said.

The information collected will allow researchers to advise professional organizations in order to address some of the issues seen among the different subgroups. Additionally, it will give researchers a base to work off of to continue conducting research needed to help change education, resources and other guidelines to increase health and wellness of equine care service providers.

Given the national impact of COVID-19, the team created an optional section to evaluate effects of the pandemic on these populations. The research team hopes to use this information to better characterize the group's

unique needs, looking at trends regionally and by state if sufficient data are available.

“Identifying differences of COVID-19 responses by region can inform best practices for these populations to establish responsive strategies to promote health and well-being,” Kimberly Tumlin, PhD, MS, MPH, EqA director and assistant professor in UK’s College of Public Health, said. “We anecdotally know there are vast differences in the number of practices, types of practices and geographical differences in type of work, but having evidence of work practices and how they relate to health perceptions are important to designing education and potential interventions.”

Growing up in northern Minnesota and then living in Wyoming for three years prior to moving to Kentucky in May 2019, Keener has personally observed the diversity of equine care service providers who are working in and across the country.

“I know there are vast differences between practice characteristics and injury history of veterinarians running a single-hand practice in rural Wyoming compared to those working in a surgical unit in a large veterinarian hospital; however, they might still be facing the same stresses of paying off debt, working long hours and how they balance their non-work life,” she said.

These factors are important in determining what types of education and interventions are needed to facilitate work and personal success. This novel research approach sheds light on a community vastly important to equine health and welfare. With the advent of social distancing, equine care service providers have reported to the EqA that they are experiencing more negative social media encounters and have the added impacts of COVID-19 concerns to consider.

“Collectively, we want to capture what our community has brought to our attention—that these critical workers have



MARTY WHITEHOUSE, DVM AND UK ALUM, CONDUCTS AN EQUINE DENTISTRY EXAM. PHOTO BY KIMBERLY TUMLIN

the need for learning resiliency strategies in addressing their physical, mental and emotional health,” Tumlin said.

The EqA team has worked hard to make sure the sections included in the survey are appropriate for the population. Small groups of equine care service providers were consulted with about each section to ensure that terminology was correct and to validate questions.

“We included sections on social media and substance use because our focus groups suggested they were key factors in both why and how work-life challenges were addressed,” Keener said.

Keener’s veterinarian sister, Laurelyn, has been one of the consultants who provided feedback on the language and topics of the survey.

“A great effort has been made to address the challenges met by professionals in various fields. Hopefully, information gathered as

a result of this attention to detail will enlighten many, and foster further discussion and research that benefits the mental health and work-life balance of equine healthcare providers in the future,” Laurelyn said. “The number of suicides within the veterinary profession is alarming, as is the rate at which [especially equine] veterinarians are experiencing burn-out, needs to be addressed, and the EqA Initiative is taking action to make positive changes across the industry.”

This comprehensive survey is available at <https://redcap.uky.edu/redcap/surveys/?s=EFF7XENDKA>.

Kimberly I. Tumlin, PhD, MS, MPH, director of the Equestrian Athlete Initiative and assistant professor within the UK College of Public Health, in conjunction with Michaela Keener, MS, research coordinator within the UK SMRI,

HOW ONE RESEARCHER IS USING HER BACKGROUND IN REPRODUCTIVE IMMUNOLOGY TO BETTER UNDERSTAND THE LEADING CAUSE OF EQUINE ABORTION

The phenomenon of pregnancy has fascinated researchers for centuries. How does the developing fetus, a foreign body that expresses antigens from the father, survive undetected by the mother's immune system? Initially, pregnancy was believed to survive due to a suppressed maternal immune system; and yet pregnant women can battle infection and mount responses to vaccines and any number of pathogens, leading to the realization that the female immune system wasn't suppressed, but rather altered.

But, what about the horse?

This topic has been the primary focus of recent research by Carleigh Fedorka, PhD, postdoctoral scholar in the Gluck Equine Research Center laboratory of Barry Ball, DVM, PhD, Dipl. ACT, Albert G Clay Endowed

Fedorka's research has focused on an understanding of the normal immune response to pregnancy in the horse, in addition to evaluating alteration within this response following pregnancy-related complications.

Chair in Equine Reproduction. While much can be inferred from the human, the pregnant mare differs physiologically from the

pregnant woman in a variety of ways. Human gestation relies solely on the endocrine support of progesterone, while equine gestation is supported by metabolites of this hormone during much of gestation. The human fetus is surrounded by a single fetal fluid compartment (the amnion), while the equine fetus resides within two (the amnion and allantois). And while human placentation is a single layered hemochorial type ('invasive'), equine placentation is a multi-layered epitheliochorial placenta ('non-invasive'). Taken together, inferences made between the two may not be relevant. Therefore, Fedorka's research has focused on an understanding of the normal immune response to pregnancy in the horse, in addition to evaluating alteration within this response following pregnancy-related complications, such as in the case of placentitis.

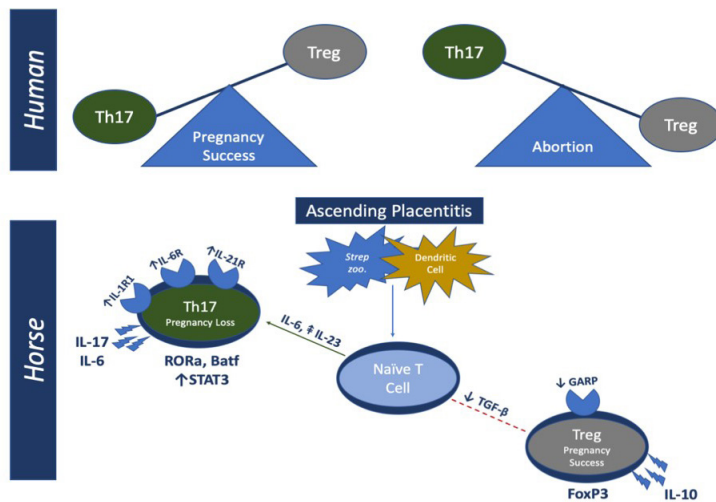
To begin, the adaptive immune response to pregnancy was evaluated, the findings of which were recently published in the article, "Alterations in T cell-related transcripts at the feto-maternal interface throughout equine gestation," in the journal *Placenta*. This branch of the immune system dictates both response to pathogens (pro-inflammatory Th1 cells / anti-inflammatory Th2 cells) in addition to tolerance of the semi-allogeneic fetus (meaning its genetic make-up is not identical



PHOTO BY UK AGRICULTURAL COMMUNICATIONS

to the dam) by the regulatory T cells (Tregs). In the normal equine pregnancy, numerous aspects of the adaptive immune response were found to mimic what has been noted in the human, the most important of which was that the induction of tolerance towards the fetus was associated with a heightened Treg response. Additionally, it was noted that no alterations were seen in the pro-inflammatory Th1 transcripts within the semi-allogeneic placenta, indicating an evolved mechanism to remain undetected and not attacked by the maternal immune system.

Understanding the normal immune response to equine gestation is an imperative so that alterations within this normal response could be assessed for potential biomarkers, therapeutics and predictors of equine



FOLLOWING INDUCTION OF PLACENTITIS, TH17-RELATED TRANSCRIPTS INCREASED IN THE PLACENTA, WHILE TREG-RELATED TRANSCRIPTS DECREASED. IN HUMANS, THIS PRECEDES PRETERM LABOR AND ABORTION

pregnancy-related complications, of which placentitis remains the largest. In women, pregnancy loss coincides with an increase in Th17 cells alongside a dysregulation of the Treg response, and this can be improved through use of therapeutics that stimulate this arm of immunity, including Neupogen (recombinant GM-CSF) or intravenous immunoglobulins (IVIG; plasma). Data from the laboratory suggests that ascending placentitis leads to an increase in Th17-related transcripts in the placenta, and this coincides with a decrease in Treg-related transcripts in both the endometrium and chorioallantois. It is unknown if a treatment such as IVIG can increase the number of Treg cells in circulation in the horse, but the group recently performed a preliminary study to assess this and hope to have results soon.

As the adaptive immune system and the innate immune system are tightly linked, the group has also investigated the cytokines that couple them. Fedorka and team recently published the article, “The feto-maternal immune response to equine placentitis,” in the American Journal of Reproductive Immunology to describe this. In this study, they found that the maternal

response to ascending placentitis differs from that of the fetus, as the mare responded to the disease with a primarily pro-inflammatory response, while the fetus appeared to play a regulatory role within this disease and expressed many anti- and immuno-modulating cytokines. Additionally, an increase in many of these cytokines (IL-1, IL-6, IL-10) could be noted in the fetal fluids, suggesting that ultrasound-guided fetal fluid sampling may be considered in detecting placentitis.

Unfortunately, due to the risk of abortion caused by medical examination or treatment), few practitioners will utilize fetal fluid sampling as a diagnostic for disease, and the team’s interests shifted towards less invasive sampling procedures for biomarker detection. Fedorka and her colleagues assessed the effect of ascending placentitis on specific cytokines in blood circulation and found interleukin-6 (IL-6) to be elevated. A signaling molecule that can act as both pro- and anti-inflammatory, we also found that in the disease of placentitis, IL-6 activated a specific receptor and signaling pathway to stimulate anti-inflammatory, anti-apoptotic and pro-survival outcomes. IL-6

demonstrated both high sensitivity and specificity for detection of placentitis in the experimental model, and future research is needed to see if it is useful in the field. These results will be presented at the American Association of Equine Practitioners annual convention in December 2020.

Reproduction is a discipline that involves biomedical issues in several areas, including endocrinology, immunology and infectious disease. It is only with a grasp of the various topics within that researchers can make appropriate inferences into the diseases, disorders and problems that affect the cornerstone of our industry: the broodmare. It is through this conjunction of reproduction and immunology that Fedorka hopes to benefit the industry by improving the understanding of both normal and abnormal. While the normal is fascinating on a scientific level, it is with this information that future research can assess the abnormal, eventually utilizing this information to develop biomarkers for disease prediction, alter management for disease prevention and assess therapeutics for improvement of outcomes.

The topic of reproductive immunology paves a path in each of these directions, all of which target the main goal of UK’s reproduction laboratory: overall health of the horse.

| *Carleigh Fedorka, PhD, postdoctoral scholar in the Gluck Equine Research Center laboratory of Barry Ball, DVM, PhD, Dipl. ACT, Albert G Clay Endowed Chair in Equine Reproduction, provided this information.*

UK EQUINE UNDERGRADS TAKING RESEARCH REINS

University of Kentucky Equine Science and Management undergraduates are able to choose from a variety of internships to complete course credits, including positions in UK equine research. Two of the program's undergraduates recently highlighted their internship experiences during the major's Spring 2020 Internship Showcase event.

Jenna Bryant, a junior in the program, and Dagan Montgomery, who just graduated with his degree, chose to do their internships in equine-related research.

Bryant worked under Jill Stowe, PhD, associate professor in UK's Department of Agricultural Economics, analyzing Thoroughbred yearling sales in United States markets.

"I ENJOY THESE OPPORTUNITIES BECAUSE I THINK THEY HELP STUDENTS APPRECIATE THE SCIENTIFIC PROCESS AND TO CONTINUE DEVELOPING THEIR ABILITY TO THINK MORE CRITICALLY ABOUT PROBLEMS AND SOLUTIONS."

JILL STOWE

Montgomery worked under Ashley Fowler, PhD, and Mieke Holder, PhD, both researchers in the Department of Animal and Food Sciences, seeking to measure how different supplements in horse feed affected forage plant growth.

Both sought to improve an industry they are passionate about.

Bryant's responsibilities were to uncover as much data as she could find in the realm of yearling sales and economic indicators, going as far back as 1936. She then compiled that data into a usable format for analyzing.

Bryant recalled spending a lot of time in the Keeneland Library.

Through this research, she was published in an academic journal with Stowe on their findings, a study that analyzed profitability of yearling sales based on seven stud fee categories. Her passion from this project came from her experience in the breeding, buying and selling aspects of the industry.

"I know all too well how hit or miss this market is, which is why I jumped at the chance to understand the economics of it," Bryant said.

Her advice to other undergraduate students seeking a career in research? "Ask your favorite professors if they have anything going on, or if they've heard of any professors in the department looking for help," she said. "It's a great way to get some credit hours out of the way, while also giving you a chance to present what you've accomplished."

"One of the most rewarding parts of my job is having the opportunity to advise and mentor undergraduate students who are passionate about pursuing research. Initially, I teach them a few tools they might learn as a grad student and then let them get their hands dirty," Stowe said. "What I typically find is that this introduction sparks a new level of intellectual curiosity, and they start thinking about new research questions and how these tools might be used to answer them. This is very exciting to me! I also enjoy these opportunities because I think they help students appreciate the scientific process and to continue developing their ability to think more critically about problems and solutions."

As she begins her senior year this fall, Bryant plans to continue with Stowe and tackle other interesting projects that have been on the back burner.

Montgomery's research was

Timely Tips:

Pasture management

- Graze cover crops using temporary fencing.
- As pasture growth begins, rotate through pastures quickly to keep up with the fast growth of spring.
- As pasture growth exceeds the needs of the livestock, remove some fields from the rotation and allow growth to accumulate for hay.
- Determine need for supplemental warm season forages.
- Flash graze pastures newly seeded with clovers to manage competition.

Detailed Ag Weather Forecast

We all know not to cut hay if it's going to rain tomorrow, but have you ever wondered about the drying conditions: humidity + cloud cover + wind speed + temperature?

The University of Kentucky Ag Weather Service provides this kind of detailed forecasts in three-hour time intervals. Visit http://weather.uky.edu/ky/forecast.php#Point_Ag_Forecast

Source: University of Kentucky Forage News, April 30, 2020

UK RESEARCHERS ADDRESS EQUESTRIAN ATHLETE HEALTH AND WELLNESS AMID COVID19 REENTRY

JOCKEY & EQUESTRIAN INITIATIVE EXPANDS TO EQUESTRIAN ATHLETE (EqA) INITIATIVE

The Sports Medicine Research Institute (SMRI) housed in the University of Kentucky College of Health Sciences has one of its four main initiatives focusing on the health and wellness of equestrian athletes. Core to the SMRI's mission is a multidisciplinary approach to research, strong community collaborations and providing direct service to the Commonwealth.

In response to a community engaged research process, the initiative formerly known as the Jockey & Equestrian Initiative, has recently expanded to the Equestrian Athlete (EqA) Initiative. Under this expansion, jockey health remains a priority, but defining "equestrian athlete" is more encompassing than some might first think.

What is an equestrian athlete?

Many individuals work broadly in the equine industry as riders, workers and/or recreational enthusiasts. Equestrian athletes are individuals who interact with horses as their teammate, as their friend or as their client. This means the initiative is not only interested in those riding or driving horses at any level and in any discipline, but is also focusing on those taking care of both the horses and the riders. Horses are often partners in ensuring human health, such as in equine-assisted learning, therapeutic riding and occupational therapy activities.

"With this expansion, we can serve the equestrian community



"CHARLIE HORSE," WITH A JOCKEY ABOARD SIMULATES RACING. PHOTO COURTESY UK PR.

in Kentucky and throughout the country," said Kimberly Tumlin, PhD, MS, MPH, EqA director and assistant professor in UK's College of Public Health.

The mission of the EqA is to optimize the health, wellness and performance for the equestrian athlete through research. This research will support evidence-based outreach that is specific to equestrian populations.

It is still not clear what physical, social or psychological factors may impact health and wellness of equestrians, particularly at the community level. We consider equestrians in professional and recreational groups, and need to better define the risks and benefits of engaging with horses on human wellness.

Consider that professional equestrians represent a large population of workers with non-standard work arrangements. These individuals are occupationally

classified as non-standard workers with contingent, independent contractor, and/or workers assigned to non-traditional 8 a.m. - 5 p.m. workdays. For example, professional jockeys, competitive eventing riders or horse trainers have unique work demands based within equestrian athletics. With unpredictable work schedules, occupational equestrian athletes' work is often temporary, with instability due to factors beyond the workers' control, and often these riders have a lack of legal protections and worker benefits. These riding athletes travel on a regular basis and have additional stress of being under high pressure of competition, which defines ability to secure future work. Lifestyle characteristics could be detrimental to worker health for various demographic groups. Non-riders also have non-standard work arrangements, particularly in the breeding industry that is

so important to the Kentucky economy.

In defining these different roles that equestrians play in the industry, Tumlin and research coordinator Michaela Keener, MS, research administrative coordinator, Equestrian Athlete Initiative, picked up the reins to define EqA's direction under the support of the SMRI.

"We are truly excited to be able to bring this level of research to the equestrian community with the vision to improve the health and safety of equestrian athletes," said Nick Heebner, PhD, ATC, director of research, SMRI.

Laboratory focusing on health and wellness of jockeys

With the expansion of the initiative to encompass all equestrian athletes, the lab is still working with Keeneland, the Jockey's Guild and the local Thoroughbred community to continue to focus on the health and wellness of jockeys, exercise riders and novice riders who aspire to be jockeys or exercise riders.

A main feature in the laboratory is the MK Racewood Race Horse Simulator; nicknamed Charlie Horse. Charlie Horse has a remote control mode, as well as a reactive, rider-controlled mode. This allows race riders and other galloping disciplines to ride a horse



"CHARLIE HORSE." PHOTO COURTESY MICHAELA KEENER.

anywhere from speeds simulated to be 25-40 mph.

"This specific racing simulator is the first in the country to our knowledge, and allows us to capture differences in positions between speeds," Keener said. "Using our motion capture system, we can determine if a rider is favoring certain joints they may have previously injured while riding and haven't fully recovered from."

Elite jockey Sophie Doyle, who participated in performance testing at the lab, believes Charlie Horse and the lab have something new to offer to the community.

"Whether it is establishing a baseline of performance to understand where you are today, or if you are recovering from an injury and want to be able to test how you are recovering, the data they collect will provide insight which we have never had riding in America," Doyle said.

Like much of the country, human subjects' research in the SMRI is delayed while we practice social distancing. With both Keeneland's Spring Meet and the Land Rover Three Day Event among some of the top spring highlights in the Lexington community canceled, and countless shows, clinics and camps canceled or postponed, the EqA team has turned to community members to discuss COVID-19's impact on the equestrian community. The community feedback was most concerned with social, behavioral and economic impacts of COVID19 on their equestrian participation.

| *Kimberly I. Tumlin, PhD, MS, MPH, director of the Equestrian Athlete Initiative and assistant professor within the UK College of Public Health, in conjunction with Michaela Keener, MS, research coordinator within the UK SMRI, College of Health Sciences, provided this information.*

EQUINE INNOVATORS: COVID-19 AND THE EQUINE ECONOMY WITH DR. JILL STOWE

University of Kentucky researcher and equine industry economist Jill Stowe, PhD, associate professor in the UK College of Agriculture, Food and Environment Department of Agricultural Economics, gives a glimpse of how COVID-19 is impacting the horse world and looks at the financial challenges that lie ahead.

This podcast is the second episode in our new "Equine Innovators" podcast series, a collaboration between UK Ag Equine Programs and TheHorse.com, brought to you by Zoetis. You can find the Equine Innovators" podcast on TheHorse.com, Apple Podcasts, Spotify, Stitcher, and Google Podcast. Download the podcast at https://thehorse.com/wp-content/uploads/2020/04/EquineInnovators_Episode2.mp3.



TAKING IT ONLINE... PARASITOLOGY GRAD STUDENT SUCCESSFULLY DEFENDS HER PHD VIRTUALLY TO A WORLDWIDE AUDIENCE

Years of hard work culminating in a successful PhD defense is a rite of passage for graduate students across the country. Conducting your defense live online to a worldwide audience is a novel approach, and one necessitated by the COVID-19 pandemic.

Ashley Steuer, DVM, Zoetis Resident in Veterinary Parasitology and now newly minted PhD from the University of Kentucky Gluck Equine Research Center, found herself in this unique position as she defended her doctorate April 14 to a worldwide audience simultaneously via the Zoom and Facebook Live platforms.

Her dissertation, titled, "Host-Parasite Interaction in Horses - Mucosal Responses to Naturally Acquired Cyathostomin Infections and Anthelmintic Treatment," was viewed live by 150 people who were fairly evenly split between the two platforms and hailed from countries including Germany, Switzerland, Italy, the United Kingdom, Denmark, Finland, Sweden, Netherlands, New Zealand, Australia, Abu Dhabi, South Africa, Colombia, Argentina, Brazil and Canada. The audience included several leading parasitologists from around the world. The recorded dissertation, which is available on the Gluck Center's Facebook Page page (https://www.facebook.com/watch/live/?v=566563937578152&ref=watch_permalink), has since been viewed more than 1,400 times.

"It was a great experience! It uniquely allowed colleagues, friends and others from around the world to tune into the event that they would not have been able to attend in person. This level of support is a very humbling and heartening experience to witness," Steuer said. "I hope that others

also enjoyed the event and were able to learn from it. That is why we are here, to promote and spread quality research concerning the horse. Of course, it is a little nerve-racking to undergo any defense event, but it wasn't so intimidating, as, at times, it felt like I was speaking to myself."

"I particularly enjoyed Ashley's interaction with her audience", said her research mentor, Martin Nielsen, DVM, PhD, Dipl. ACVM, Schlaikjer professor of Equine Infectious Disease, associate professor at the Gluck Center. "Several questions were asked during the event. On Zoom, participants used the chat function for asking questions, and Ashley responded to those within the session. Several additional questions were asked on Facebook, where about 50 comments were made, and Ashley responded to all questions posted there after her defense.

"IT WAS A GREAT EXPERIENCE! IT UNIQUELY ALLOWED COLLEAGUES, FRIENDS AND OTHERS FROM AROUND THE WORLD TO TUNE INTO THE EVENT THAT THEY WOULD NOT HAVE BEEN ABLE TO ATTEND IN PERSON. THIS LEVEL OF SUPPORT IS A VERY HUMBLING AND HEARTENING EXPERIENCE TO WITNESS."

ASHLEY STEUER



"I like how our graduating students can get an opportunity like this to demonstrate their acquired skills as science communicators, and I would like to see us using Facebook live for PhD defense seminars again in the future," he said.

About Steuer

Steuer earned her Bachelor of Science from Michigan State University in 2012 and her Doctor of Veterinary Medicine from the University of Tennessee in 2016. While in veterinary school, she discovered that her passion was veterinary parasitology.

According to her bio, Steuer followed this passion by pursuing a dual PhD/residency program through the National Center for Veterinary Parasitology, where she became the Zoetis Resident for Veterinary Parasitology at the Gluck Center. Over the last four years, she has participated in many research projects, including the evaluation of the immunologic



and inflammatory reactions to anthelmintic treatment in horses; identification of a novel species of parasites in wildlife; testing novel anthelmintic treatments in horses; validation of an automated fecal egg counting method prototypes; a combination deworming study; a parasite prevalence and management practice assessment of rural Kentucky farms; evaluation of common diagnostic techniques; and the development of an in vitro protocol and for maintaining and transcriptome analysis of adult *Parascaris* spp.

Steuer has published two first author manuscripts and served as co-author on seven published manuscripts. She has also participated in numerous extension events, such as speaking about parasite control to local equine clubs and assisting with developing parasite control

programs for local farms.

She has been actively involved in teaching through Lincoln Memorial University College of Veterinary Medicine and the University of Tennessee College of Veterinary Medicine. She also pursued her passion of diagnostic parasitology through the UK Veterinary Diagnostic Laboratory and the UTCVM Veterinary Parasitology Diagnostic Laboratory.

About her dissertation research

According to Steuer's published abstract, *Cyathostomins* are ubiquitous parasites in horses. In rare cases, cyathostomins lead to a generalized typhlocolitis (inflammation of the caecum and colon) and death. In healthy horses, local reactions are noted to the mucosal larvae; however, the mechanisms and

importance of these reactions has not been explained. It has been hypothesized that anthelmintics can alter these reactions.

Two studies were conducted to clarify the local and systemic immune response following larvicidal treatment. In the first study, ponies with naturally acquired cyathostomin infections were allocated into three groups: fenbendazole-treated (FBZ), moxidectin-treated (MOX) and untreated control.

The second study aimed at evaluating a larvicidal treatment and a non-larvicidal treatment belonging to the same anthelmintic class to classify the local and systemic immune response following larvicidal treatment. Horses with naturally acquired cyathostomin infections were allocated into three groups: Ivermectin (IVM)/praziquantel-treated, MOX/praziquantel-treated and untreated control.

Overall, these studies demonstrated that treatment with an anthelmintic, both larvicidal and non-larvicidal, in healthy horses does not significantly change the proinflammatory or anti-inflammatory response. In fact, it may decrease the local mucosal response in horses, due to the decrease in worm burdens. *Cyathostomins* induce a proinflammatory response within the host tissue, while the encysted larvae may also induce an anti-inflammatory response as well.

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



UK LAUNCHES NEW PARASITOLOGY VIDEO SERIES AND TAKES A JOURNEY THROUGH A HORSE'S LIFE

Martin Nielsen, DVM, PhD, Dipl. ACVM, Schlaikjer professor of Equine Infectious Disease at the University of Kentucky Gluck Equine Research Center, has launched a new lesson-style video series on equine parasitology.

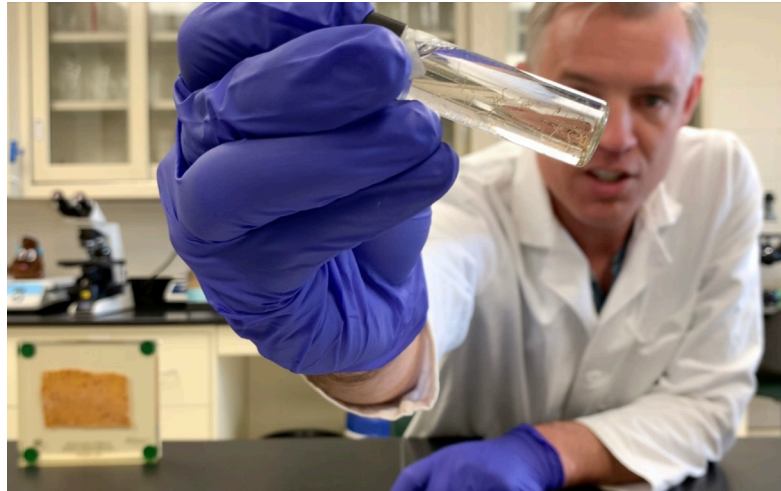
The series consist of approximately 15-30 minute videos dedicated to one equine parasite each. The series covers threadworms, ascarids, small strongyles, bloodworms, tapeworms, bots and pinworms.

"I found that during the lockdown, people all over the world were craving meaningful activities to spend their time on. Binge watching TV shows and movies on Netflix tends to get a little stale with time, and at some point, you start looking around for something different," he said. "I may be slightly biased, but I thought I had exactly what any horse owner, equine or veterinary student and veterinarian was looking for... worms!"

"I communicate about these all the time, but I wanted to try a different format. So with this video series, I take a journey through the horse's life and talk about the parasites it encounters in the order of appearance," Nielsen said. "I cover biology, life cycle, disease, treatment, resistance and so on. I show a few graphs and pictures as well as several specimens from our parasite collection, but at the same time, I try to keep it lighthearted and entertaining."

So far, three have aired, with four more to follow soon. The first three videos proved to be extremely popular, each garnering more than 10,000 views.

"I particularly enjoy seeing how these videos are being picked up by a large variety of groups, including



4H'ers, Pony Clubbers, extension agents, veterinarians and veterinary students from across the world," he said. "I mean, this is what and who we are here for. Meaningful science communication brought straight to the end-user."

[Episode 1: Strongyloides westeri \(https://www.youtube.com/watch?v=uRoBvmjwoYM\)](https://www.youtube.com/watch?v=uRoBvmjwoYM)

[Episode 2: Ascarids \(https://www.youtube.com/watch?v=-0kGoYWw4hs\)](https://www.youtube.com/watch?v=-0kGoYWw4hs)

[Episode 3: Small Strongyles](#)

[https://www.youtube.com/watch?v=IBITUYuOH2c\)](https://www.youtube.com/watch?v=IBITUYuOH2c)

[Episode 4: Bloodworms \(https://www.youtube.com/watch?v=Dff0FZfjd0\)](https://www.youtube.com/watch?v=Dff0FZfjd0)

Find future videos on the Gluck Center's Facebook page (<https://www.facebook.com/GluckEquineResearchCenter/>)

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

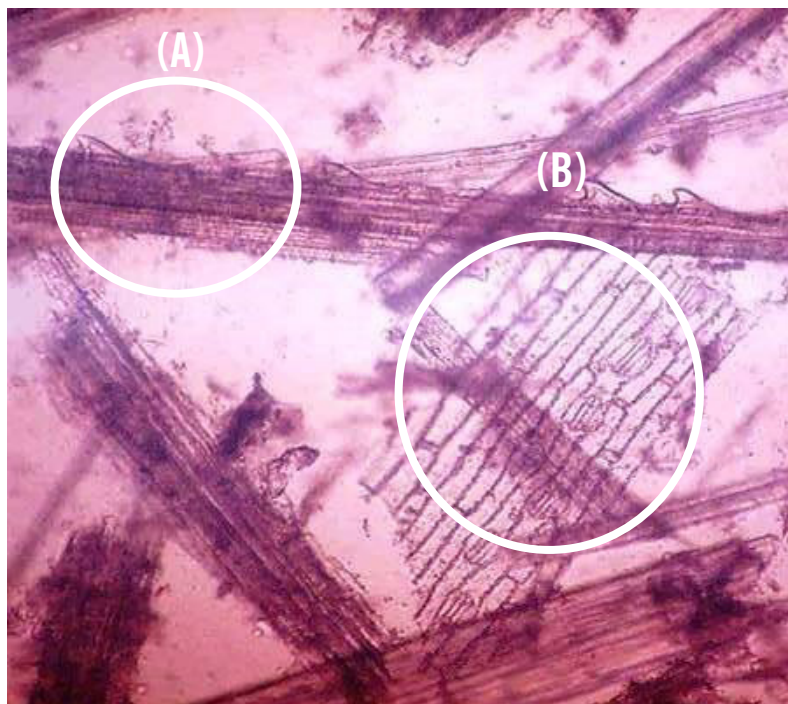
TALL FESCUE RISK MEASURED THROUGH FIELD AND MANURE MEASUREMENTS

Tall Fescue is a name that can evoke fear in many horse owners. Some of this fear is rightfully earned, some of it undue and some of it not sufficient. In Kentucky, late May through June is when we see tall fescue growing most rapidly, producing seed for next year and potentially causing the greatest negative impacts on our horses.

It's also the best time to look at pastures critically and evaluate the risk they pose to mares. Before we get to mitigation strategies, let's review some tall fescue basics and look at some common myths about tall fescue and horses.

Tall fescue basics

- Tall Fescue (*Schedonorus arundinaceus* (Schreb.) Dumort., nom. cons.) is a cool season, bunch-type grass native to Europe and naturalized in the Eastern U.S., particularly in the Transition Zone (area between the cold North and hot, humid South).
- It has good forage quality, yield and palatability, making it an excellent forage for horses.
- Tall fescue forms a symbiotic relationship with a fungal endophyte, which gives it added resilience to drought, pests and grazing. Without the endophyte, tall fescue would not persist like it does.
- The endophyte produces many ergot alkaloids, the primary one being ergovaline.
- Ergovaline (and other ergot alkaloids) can cause complications in late-term mares, such as prolonged gestation, thickened placental



AN EXAMPLE OF A FECAL SAMPLE CONTAINING TALL FESCUE EPIDERMIS (A) AND ORCHARDGRASS PRICKLE HAIRS (B) IN A VIEWING FRAME AT STANDARD MAGNIFICATION.

membranes, difficulty foaling (due to overgrown foals), increased foal and mare mortality and decreased milk production (agalactia).

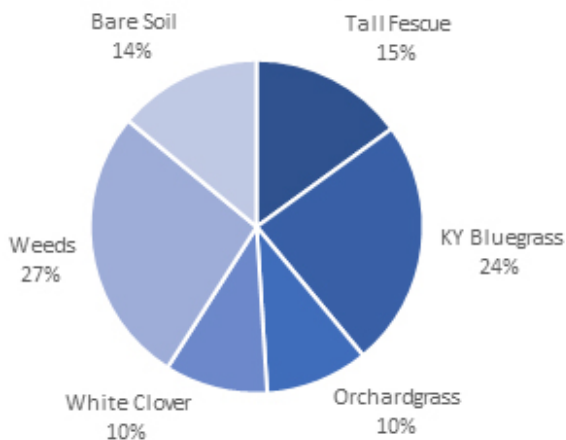
- Early-term mares can experience prolonged luteal function, decreased breeding efficiency and early-term pregnancy losses, when consuming high levels of ergovaline.
- All other classes of horses, including stallions, growing horses and performance horses will experience vasoconstriction, but this appears to have much less impact and is therefore of less concern with these classes of horses.

Myth: We don't have tall fescue
This belief is a common

misconception. It is easy to think that if you haven't had fescue issues in your mares before, you must not have tall fescue. This is rarely the case, though there are several reasons it might appear so.

The University of Kentucky Horse Pasture Evaluation Program began sampling pastures in 2005, looking at their botanical composition. In 15 years of sampling more than 250 farms, we've never found a farm that had no tall fescue and rarely found a pasture with less than 5%. On pastures with no recent renovation, we see tall fescue typically represents 15-20% of the total pasture. While this number isn't high, it jumps significantly once you factor out the 30-40% of a pasture that is typically covered by weeds or no cover at

Average Composition of Horse Pastures in Central Kentucky



all. Significant weeds or bare areas drastically increase the amount of tall fescue in the horse's diet. Additionally, 70% or more of tall fescue plants in most Kentucky pastures are endophyte infected, which means it is very likely the tall fescue in your pasture is also infected with the endophyte.

So why don't we see more cases of tall fescue toxicity? The answer lies in timing. The seasonal cycles of pastures and foaling mares don't usually line up. Ergovaline, and other ergot alkaloids produced by the endophyte infecting tall fescue are not active in cold months. In central Kentucky, we usually see spikes of ergovaline from late April to early June. Because the majority of mares foal by the end of April, few are exposed to toxic levels of ergovaline.

But this fortuitous timing doesn't always occur. Late foaling mares could be at higher risk simply because of their foaling date. And in mild winters, we sometimes don't see ergovaline drop sufficiently. In this same time period, other cool season grasses are dormant and of low forage quality, meaning there is little to dilute the fescue. This is further compounded if the farm is feeding fescue hay or using fescue bedding. Cases of toxicity have been observed in January and

February.

Myth: Horses don't like tall fescue

Given the coarse feel of tall fescue compared to the soft leaves of orchardgrass, it's understandable why it has been assumed that horses would avoid tall fescue. But this is another dangerous assumption that is largely untrue. UK Plant and Soil Science PhD candidate Jesse Morrison used microhistological analysis of equine feces to determine diet composition on pastures. In this study, tiny grass fragments in manure were observed under a microscope and counted. Counts were compared to pasture composition measurements to determine if horses consumed certain species more or less than how frequently they appeared to in the field.

In both the spring and fall, eight half-acre paddocks were each grazed by a single horse for three days. Manure and species composition data were collected from each and the microhistological analyses were compared to pasture data. A strong correlation was found between the amount of a species found in pasture and the amount of plant fragments in manure for both tall fescue ($r^2=0.81$) and orchardgrass ($r^2=0.57$). This suggests that

horses do not select for or against either species, but graze both species, as well as Kentucky bluegrass in a similar pattern as the availability of these grasses.

Horses are much more likely to decide where to graze based on other factors, such as buddies in a nearby pasture; proximity to the barn, water or shade; distribution of manure and urine; or simply where they've grazed before. It is likely that there is some variation in individual preference and tolerance to ergovaline as well.

Proven mitigation strategies

All hope isn't lost just because you have some tall fescue. As we've seen before, every farm in Kentucky (and much of the Southeastern U.S.) has tall fescue. But there are several steps you can take to reduce the risk of toxicity on your foaling mares. Here are a few:

- Good pasture management. Fertilizing, seeding, weed management and rotational grazing can help you to reduce weeds and bare soil and increase desirable forages to dilute the amount of tall fescue in the total diet.
- Clip pastures. Ergovaline accumulates in the stem and the seedhead, so clipping to remove these reduces the overall concentration in the plant. Take care not to graze or mow below 3 inches, as ergovaline also accumulates at the bottom 3 inches of the plant.
- Avoid small paddocks. Managers often want to place their most valuable mare in a small turnout paddock near the barn to keep a close eye on her. Unfortunately, these paddocks are often heavily overgrazed and neglected when it comes to pasture management. Because of this, other grasses are grazed out and tall fescue is grazed close,

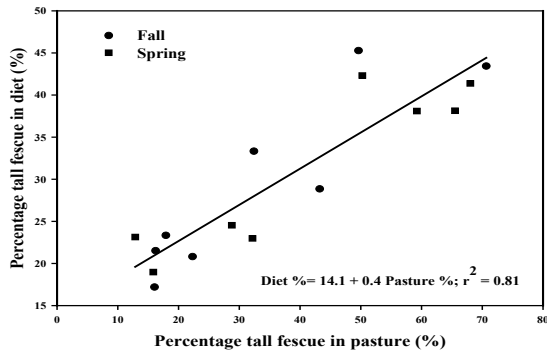


Figure 1 Regression plot of fecal tall fescue percentage and percent tall fescue available in paddocks from grazing experiment.

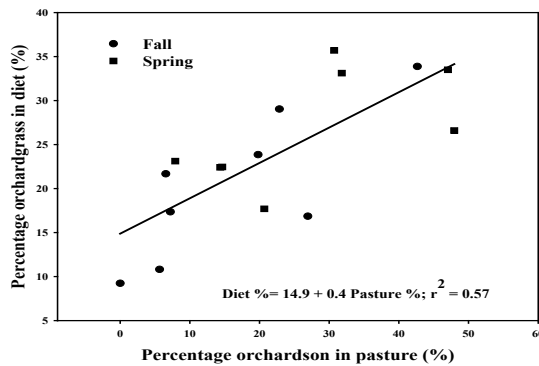


Figure 2 Regression plot of fecal orchardgrass percentage and percent orchardgrass available in paddocks from grazing experiment.

resulting in high levels of ergovaline. On average, larger pastures tend to be better managed and therefore safer for mares compared to smaller paddocks.

- Test your local hay. While Western-grown hay has very little chance of containing much tall fescue, hay harvested from local grass fields certainly can. Fortunately, ergovaline is degraded during the drying process; therefore hay only contains about half the levels of pasture. But there can be potential for toxic levels in hay, especially when cut at the seedhead stage. Once the hay is baled and stored, ergovaline will stay in that hay for a year or more. A simple ergovaline test from UK's Veterinary Diagnostic Laboratory can rule this out.

- Consider a targeted herbicide to remove tall fescue. Herbicides with the active ingredient imazapic (Plateau is a popular brand) can effectively kill tall fescue in pastures while only temporarily stunting bluegrass and orchardgrass. This is a great option if you have a good stand of desirable grasses, are on steeply sloped ground or need to quickly remove tall fescue from pastures before foaling season. Read and follow all label recommendations for any herbicide and consider how you will fill in areas left bare.
- Start over. This sounds like a daunting task, but complete re-establishment has significant benefits. If a pasture is more than 50% undesirable, including toxic tall fescue, weeds, bare soil and annual grasses (crabgrass and foxtail), it is likely a good candidate for complete reestablishment. In one year's time, a pasture can be turned from problematic to lush and productive. Be sure to start planning this step far in advance.
- Talk to your veterinarian about medical intervention. In some cases, daily doses of domperidone are the

best option for alleviating the symptoms of toxic tall fescue and increasing the likelihood of delivering a live foal without complications and having enough milk to nurse.

- Remove mares from pastures. If time or other constraints prevent you from pasture interventions, keeping mares in the last 60 days of foaling in stalls or dry lots might be the best bet to prevent toxicity issues.

Conclusion

Tall fescue is found in pastures throughout Kentucky and much of the Southeastern U.S. and horses are unlikely to avoid it enough to prevent toxicity. To be the best managers of our broodmares, we must take additional steps of reducing or even eliminating toxic tall fescue in our broodmare pastures. Contact your local county extension agent for assistance in identifying and testing tall fescue and coming up with a mitigation strategy. Several good publications including how to sample tall fescue and how to establish new horse pastures can be found at forages.ca.uky.edu/equine. Special thanks to Jesse Morrison, PhD, assistant research professor in Mississippi State University's Department of Plant and Soil Sciences, for the microhistological data.

A fact sheet about fescue can be found here: <http://www2.ca.uky.edu/agcomm/pubs/id/id144/id144.pdf>.

Video resources can be found here: <https://gluck.ca.uky.edu/ce>.

| Krista Lea, MS, coordinator of the University of Kentucky's Horse Pasture Evaluation Program, and Ray Smith, PhD, extension professor in UK's Department of Plant and Soil Sciences, provided this information.

PLAN AHEAD FOR EQUINE FEED NEEDS, BUT NOT TOO FAR AHEAD



PHOTO CREDIT: UK COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT

United The COVID-19 pandemic has caused a lot of overbuying of food, and this is not only at the grocery stores. Horse owners may have an urge to buy more feed than usual.

Bob Coleman, PhD, extension equine specialist for the University of Kentucky College of Agriculture, Food and Environment, urged horse owners to take a step back and think before making extra feed purchases.

“I can certainly understand that horse owners may be a bit worried about the feed supply,” he said. “I think it’s always smart, not just during a pandemic, to think ahead and try to anticipate your normal feed needs. Maybe plan to buy a little bit more than usual, but don’t go overboard.”

Thinking about feed needs in terms of a week or two at a time will help horse owners feel confident they have enough to cover those needs.

“If the truck delivers feed on say Tuesday, think about what you

need for a week to 10 days and add a little buffer for unknowns like weather, plant delays, things like that,” Coleman said. “Also, you need to think about where you’re going to store any excess feed.”

Bagged feed needs to be off the ground and dry to keep it from any critters and from becoming moldy. Also, make sure horses don’t have easy access to feed storage areas.

“You want to make sure you store the oldest bag on top, so that you use it first,” he said. “Or if you use bulk feeders, make sure the oldest feed is on the bottom, so you use it first. This is just a best management practice, so you can make sure you maintain freshness.”

Buying a month’s worth of feed is probably too much. With all the COVID-19-related closures, horses are not as active as usual and that reduces their energy expenditures and ultimately the amount of feed they require.

“Work with your feed supplier or contact your local extension

agent if you need help determining your horse’s nutritional needs,” Coleman said. “They may need more hay and less grain right now. It’s also good to ask the feed supplier what their COVID-19 procedures are right now. They may not be able to load the feed for you, if you pick it up yourself.”

Coleman emphasized that planning for horse’s feed needs is not something unique to pandemic times.

“You always need to be thinking ahead about what you need, where you’re going to get it and how you’re going to store it,” he said. “No one wants to run out, but you also don’t want to get into a situation where you have to throw out feed.”

| Aimee Nielson is an agricultural communications specialist in UK’s College of Agriculture, Food and Environment.