

HIGHLIGHTING RESEARCH  
AND OUTREACH EFFORTS AT  
THE UNIVERSITY OF KENTUCKY

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# EQUINE SCIENCE REVIEW

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College of Agriculture,  
Food and Environment

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



*Photo courtesy Jimmy Henning, PhD, extension professor, Plant and Soil Sciences*

# ONE YEAR IN, MARS EQUESTRIAN™ FELLOW AT UK'S GLUCK CENTER CONTINUES TO HELP OLDER HORSES

Horses aged 15 and over make up between 20% to 30% of the U.S. equine population. An important milestone will be reached this year in the quest to learn more about this population. October marks the one-year anniversary of Amanda Adams, PhD, associate professor at the University of Kentucky Gluck Equine Research Center specializing in aged horse research, becoming the first MARS Equestrian™ Fellow. This fellowship supports her work to improve not only how the industry cares for senior horses but also how veterinarians can better diagnose the conditions and diseases that affect them.

According to Linda Mars, gaining a better understanding of how nutritional and management requirements change with age and activity will help the industry provide the best possible care to horses and ponies throughout their lives.

As horses age, they face an increased risk for some common conditions and diseases. One of those, pituitary pars intermedia dysfunction, develops in approximately 20% of senior horses. Another condition, equine metabolic syndrome, is associated with insulin dysregulation and often obesity. This can occur in all aged animals but may have additional adverse consequences in the older horse. Both are associated with the development of laminitis, a very painful and debilitating condition of the hoof that is often life ending.

These are just two of the key



THE ADAMS LAB GROUP, DEPARTMENT OF VET SCIENCE, AT THE HORSE FACILITIES ON THE C. ORAN LITTLE RESEARCH CENTER, PART OF THE COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT AT THE UNIVERSITY OF KENTUCKY. (LEFT TO RIGHT): SUZANNE SCHINDLER, ALEX BERTKE, ASHTON MILLER, JOHN ALLEN, STEPHANIE REEDY, MELISSA SIARD, MASON MULHOLLAND, AMANDA ADAMS, CHIP STAMPER, SARAH ELZINGA, ALESSANDRA CAMPANA, SARAH SIVINSKI. PHOTO BY STEPHEN PATTON, UK COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT.

problems that Adams' team has been able to work on with MARS Equestrian support. Her team has established and maintains a unique herd of nearly 80 aged, obese and metabolic syndrome horses. The herd is the only one of its kind in the U.S., and it provides unique opportunities to study geriatric and endocrine diseases in horses.

According to Adams, most of what her team knows and what they are learning about aging and endocrine diseases in this population of special needs horses wouldn't be possible without access to this research herd.

"In a short period of time, we have made major breakthroughs in gaining a better understanding of how to nutritionally manage horses suffering from insulin dysregulation, specifically in equine metabolic syndrome horses. We are also learning that

the season has a profound influence on the metabolic responses of these diseased horses, which will help shed light on why these horses may develop laminitis at certain times of the year," said Adams, a faculty member of the UK College of Agriculture, Food and Environment. "Over the last year, we have also been working to define sarcopenia (an age-related loss of skeletal muscle mass and strength) in aged horses and how specific diet and exercise routines may reverse or improve that muscle loss. Furthermore, we are studying what effect exercise has on the inflammation-aging response in aged horses."

While the progress is promising, Adams said that more work is needed. In addition to learning how to better manage

these horses, there is a need at the basic scientific level to understand how the aging process affects the horse's immunity, metabolic status and nutritional needs.

"The many problems we face with the aging horse are important given the growing senior horse population," said Pat Harris, PhD, DipECVCN, VetMB, MRCVS, RCVS specialist in veterinary clinical nutrition (equine) and director of science, MARS Horsecare.

"It is critical that we continue these efforts to advance the field and improve our knowledge in senior horse care, ultimately creating a better world for horses," said Bridgett McIntosh, director of MARS Equestrian™.

#### ABOUT THE GLUCK CENTER

The mission of the Gluck Center is scientific discovery, education and dissemination of knowledge for the benefit of the health and well-being of horses. Gluck Center faculty conduct

equine research in seven targeted areas: genetics and genomics, immunology, infectious diseases, musculoskeletal science, parasitology, pharmacology, therapeutics and toxicology and reproductive health. The Gluck Equine Research Center, a UK Ag Equine Program, is part of the Department of Veterinary Science in the College of Agriculture, Food and Environment at the University of Kentucky.

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MARS Equestrian™ Sponsorship by Mars, Incorporated is the link between our iconic brands and the equestrian community. For generations, Mars has celebrated a rich equestrian heritage, and through purposeful partnerships, MARS Equestrian™ is committed to the sport and building an enduring legacy. From world-class competitions across all equestrian disciplines, to stewarding the power of horses on society and sustainability, MARS Equestrian™ is dedicated to our purpose to improve the lives of horses, pets, and the people who love them. For more information please visit our website at [www.marsequestrian.com](http://www.marsequestrian.com) and social media @marsequestrian.

#### ABOUT WALTHAM PETCARE SCIENCE INSTITUTE

The WALTHAM Petcare Science Institute is Mars Petcare's pet research center. Our work focuses on the nutritional and behavioral needs of pets, as well as preventive health. We use this knowledge to support development of innovative products and services, advancing science to deliver our Purpose: A BETTER WORLD FOR PETS™. The WALTHAM™ Equine Studies Group, which is headed by Professor Pat Harris, MA, PhD, VetMB, DipECVCN, MRCVS, is dedicated to advancing the science of horse nutrition and provides the scientific support for MARS Horsecare globally including the BUCKEYE™ Nutrition, SPILLERS™, and WINERGY™ brands. By collaborating with key research institutes and universities around the world its work remains at the forefront of equine nutritional science.

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

## RESEARCH SHOWS THAT PPID HORSES EXPERIENCE ALTERED IMMUNE FUNCTION

Ashton Miller, PhD, recently finished her doctorate and a postdoctoral appointment at the University of Kentucky Gluck Equine Research Center. Her work focused on understanding how equine endocrine and immune function are impacted by pituitary pars intermedia dysfunction (PPID), also known as Equine Cushing's Disease, which is common in older horses.

Recently, a major paper from her dissertation work was published in *Domestic Animal Endocrinology*. The study examined various aspects of endocrine and immune function in aged horses with and without PPID. One of the main findings was that horses with PPID do have altered immune function.

One of the key conclusions noted in the study is that resting ACTH, or adrenocorticotropic hormone, is likely the best choice for



PHOTO BY JENNY EVANS, UK GLUCK EQUINE RESEARCH CENTER.

determining successful responses to treatment with pergolide. Neither PPID nor pergolide appeared to influence insulin, total cortisol and free cortisol. As measured, systemic immune function was altered in PPID horses, and it is likely that these horses are at increased risk of opportunistic infection. Despite reducing ACTH,

pergolide treatment did not appear to influence immune function.

A key takeaway from the work done by Miller and the research team is that veterinarians and owners of PPID horses may benefit from increased biosecurity precautions when caring for PPID horses, particularly in higher risk situations, such as transport, large gatherings or competitions. In addition, it is important for veterinarians and horse owners to recognize that PPID horses are likely at higher risk of opportunistic infection and to encourage regular testing for PPID in horses over the age of 15 years old to identify subclinical cases.

The entire study can be found online [here](#).

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

# UK RESEARCHER WORKING TO MAKE HORSERACING SAFER THROUGH MEASUREMENTS ON TRACK SURFACE CONSISTENCY



TIM FAHRENDORF, KEENELAND ASSISTANT TRACK SUPERINTENDENT, TAKING TRACK MOISTURE DATA USING TIME DOMAIN REFLECTOMETRY DURING THE 2015 BREEDER'S CUP RACES. PHOTO COURTESY DR. MICK PETERSON.

Thanks to the recent investment from The Jockey Club, the Lexington-based Racing Surfaces Testing Laboratory is becoming more efficient at the inspection of racing surfaces prior to the start of every race meet. The gold standard for safety is consistency and these inspections are a critical step toward improved consistency.

The intent of the pre-race meet inspection is to ensure that with the track properly prepared, the surface is consistent between years and, when possible, also between different tracks. This consistency reduces variation, both around the track and between tracks, and ensures that annual maintenance has been performed.

However, keeping a consistent surface requires daily maintenance as well as watering of turf and dirt,

aeration of turf surfaces, grading of the dirt surface, harrowing and, in some cases, tilling of synthetic surfaces. This daily maintenance is critical to keeping the surface in the same condition at the finish of the race meet as at the start.

The inspection is undertaken prior to the start of the race meet, with the surface prepared for racing like it would be done on a normal race day. As a critical part of what's called the Maintenance Quality System program, race meet inspection involves the use of the Biomechanical Surface Tester consistent with the ASTM standard for testing of surfaces as well as ground penetrating radar and material testing.

Because of the many variables involved in maintaining the track – most importantly water for dirt

or turf tracks or temperature and age for synthetic tracks – daily measurements are required to ensure that the surface is consistent for horses and riders, thereby also providing the safest possible surface to compete upon.

Currently, commercial instruments are used for the measurements, including the Going Stick, a tool developed by TurfTrax in England for measuring the turf, and a time domain reflectometry moisture probe for measuring moisture on the dirt or turf.

Perhaps the most time consuming of the critical daily measurements is the depth of the dirt track cushion, which still relies on a ruler placed into the track and careful visual measurements.

Presently no tool has been developed which is well-suited for testing of synthetic tracks on a daily basis.

Current tools that are used require a very large investment of time, with as much as three hours of labor required to take and upload the data and to document the maintenance of the surface every day. Furthermore, none of the commonly used tools, including the moisture probe and the Going Stick, acquire GPS coordinates. This means the person taking the measurement has to be meticulous about taking data in the same location every day and if there is an area of concern, like a dry area of the turf track, it may not be included in the data set.

One of the most recent areas of



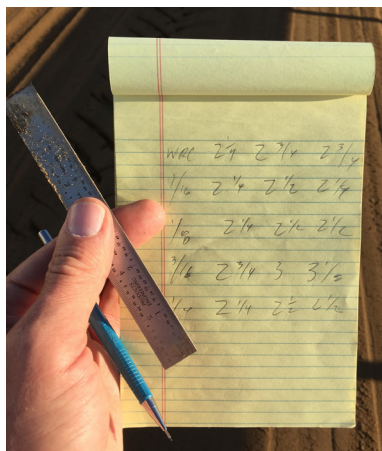
METEOROLOGICAL GRADE WEATHER STATION USED TO MONITOR THE RACETRACK CONDITIONS. PHOTO COURTESY DR. MICK PETERSON.



TIM FAHRENDORF, KEENELAND ASSISTANT TRACK SUPERINTENDENT, TAKING TRACK MOISTURE DATA USING TIME DOMAIN REFLECTOMETRY DURING THE 2015 BREEDER'S CUP RACES. PHOTO COURTESY DR. MICK PETERSON.



THE ORONO BIOMECHANICAL SURFACE TESTER (OBST) IS USED PRIOR TO EACH RACE MEET TO DUPLICATE THE LOADS AND SPEEDS OF THE FORELIMB AT A GALLOP. PHOTO COURTESY DR. MICK PETERSON.



THE CURRENT METHOD OF MEASURING CUSHION DEPTH RELIES ON PAPER AND PENCIL, THE NEW INTEGRATED TRACK TESTER WILL AUTOMATE THIS PROCESS.. PHOTO COURTESY DR. MICK PETERSON.

concern is the impact of salinity from irrigation water on the accuracy of moisture meters. Without proper correction of the moisture meter to account for soil salinity, widely different values of salinity can be measured using many of the tools, which can lead to misleading data.

To address this gap in technology, Racing Surfaces Testing Laboratory is working with UK research efforts to develop a new tool, called the Lexington Penetrometer.

The new integrated racing surface tester is designed to be more effective for the measurement of the daily condition of the racing surface. This instrument employs the same principle of surface measurement as the Longchamp penetrometer, a standard tool developed in France to use on racetracks. In addition to using an electronic version of the Longchamp penetrometer, there is a sophisticated commercial moisture and salinity measurement sensor that is integrated with a GPS sensor, allowing the location of each measurement to be logged. Data is sent in real time to a relational database for storage and display.

The current prototype inspection tool will be used in research led by UK and the National Thoroughbred Racing Association Surfaces and Safety Laboratory associated with UK Ag Equine Programs.

While the first use of the new device will be to measure moisture, the penetration resistance of the turf adaptation to other surfaces is also ongoing. In particular, the device has already been modified to allow the same mechanical system to be used to measure cushion depth and moisture on a dirt racing surface. A flexible low power network will then allow this data to complete with location and time data to be displayed on a smart phone for real time data for the support of maintenance decision making.

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

# UK GLUCK CENTER LAUNCHES NATIONAL SURVEY ON HORSES AGED 15 YEARS AND OLDER

While horses aged 15 years and over make up a significant portion of the U.S. equine population, surprisingly little is currently known about their management and health status. In response, the University of Kentucky Gluck Equine Research Center is launching a survey to better understand the special needs of this age group. Eligible survey participants should own one or more horses that currently reside(s) in the U.S. While the survey focuses on horses, including ponies, aged 15 years and older, owners of younger horses are also invited to participate in the survey. The survey takes between three and 25 minutes to complete. The survey can be accessed [here](#). The survey will be available through Nov. 20. Participants will also have the option to enter a raffle to win two bags of BUCKEYETM Nutrition feed (1st prize), or four pounds of Reasons® Joint Support Treats (2nd and 3rd prizes).

The survey project is coordinated by Alisa Herbst, a doctoral candidate at the Gluck Center in the College of Agriculture, Food and Environment, who is concentrating on the aging process of horses. She is being supervised by assistant professor Amanda Adams, PhD, MARS Equestrian Fellow and a specialist working with geriatric horses.

“The main goal of this survey is to create a management and health profile of U.S. horses aged 15-plus years,” she said. “By applying the insights that we gather from the survey, and other work in my PhD, I hope that we can provide improved support for those managing horses of this age group.”



UK RESEARCHER AMANDA ADAMS' GERIATRIC HORSE HERD GRAZES IN A PASTURE AT THE UNIVERSITY OF KENTUCKY. PHOTO BY ALISA HERBST, UK DOCTORAL STUDENT.

Herbst is collaborating on this project with an international and national research team that includes Adams; Patricia Harris, PhD, DipECVCN, VetMB, MRCVS, RCVS specialist in veterinary clinical nutrition (equine) and director of science, MARS Horsecare; Michelle Coleman, DVM, PhD, veterinarian and assistant professor at Texas A & M University College of Veterinary Medicine and Biomedical Sciences; and Erica Macon, doctoral candidate at UK's Gluck Center. MARS EquestrianTM is providing sponsorship for this study.

“We're very excited about the information that this survey will provide. While much beloved by their owners, we still know very little about the specific needs of this population. I look forward to hearing more about the results from this survey, and I greatly appreciate the sponsorships provided by MARS Equestrian for this effort,” said David Horohov, PhD, chair of the Department of Veterinary Science at UK, direc-

tor and Jes E. and Clementine M. Schlaikjer Endowed Chair at the Gluck Equine Research Center.

The contribution of every horse owner, and especially those with any horse or pony over 15 years of age, will be vital for the success of this project and the continued improvement in the health of horses.

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and WINERGY™ brands. By collaborating with key research institutes and universities around the world its work remains at the forefront of equine nutritional science.

| *Alisa Herbst, a doctoral candidate at the Gluck Center in the College of Agriculture, Food and Environment, who is concentrating on the aging process of horses, provided this information.*

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NOV 3	Equine Asthma	<i>"From Broken Wind to Equine Asthma - History, Causes and Effects"</i> <b>Jean-Pierre Lavoie, DMV, DACVIM</b>
NOV 10	Equine Asthma Diagnosis	<i>"Diagnostics and Interpretations - Getting the Best Answers"</i> <b>Bonnie Barr, VMD, DACVIM</b>
NOV 17	Equine Asthma Therapy	<i>"Medical Therapy - What are the options; effectiveness and safety"</i> <b>Jean-Pierre Lavoie, DMV, DACVIM &amp; Sarah Reuss, VMD, DACVIM</b>
DEC 1	Equine Asthma Therapy	<i>"Environment and Feeding Management - The big dust up"</i> <b>Morgan Hayes, PhD, PE</b>



## GRADUATE STUDENT SPOTLIGHT: MARIA ALEJANDRA BLANCO



PHOTO BY JUAN CRESPI, COURTESY MARIA ALEJANDRA BLANCO.

María Alejandra Blanco is not your usual PhD candidate, but that seems to be the norm rather than the exception when doing research in animal biomechanics and engineering. Blanco is a professor of forage Science at the Universidad Católica Argentina and, along with her husband, owns Grass and Horses, a construction company and consulting firm that installs and maintains equine arenas throughout Latin America. In addition to all of those commitments, she is a current PhD candi-

date at University of Buenos Aires, co-advised and with a dissertation directed by Mick Peterson, PhD, professor in the University of Kentucky Department of Biosystems and Agricultural Engineering.

Blanco first met Peterson at an Arbeitsgruppe Pferd surfaces training program organized by Arno Lindner, PhD, from Bonn, Germany. Peterson provided two lectures on the relationship of sand physics to equine biomechanics. Working with Peterson had immediate appeal to Blanco because it allowed

her to make use of her scientific training and the topics she was currently teaching to some of her students in her business. The business made use of her husband's construction expertise and her own personal passion for horses.

Blanco's dissertation considers the effects of different base materials and surface treatments on the performance of the arenas she is building. In order to be realistic, the larger scale and more expensive equipment has been benchmarked during visits to the Lexington-based Racing Surfaces Testing Laboratory.

However, by working with companies in both Germany and England, she has been able to use state-of-the-art materials for her construction and testing work. Two years of test plots in Argentina are now being analyzed and she is working on a timeline for completing work which will inform equestrian surface design in her truly international thesis work.

| *UK Ag Equine Programs' staff provided this information.*

## Grad Student Peter Schmitt featured on episode of "From the Field" about Turf Research

University of Kentucky PhD graduate research assistant Peter Schmitt is a guest in this audio episode of "From the Field," part of Michigan State University's Virtual Field Days. During the segment, Schmitt discusses recent advances in turf racetrack surfaces and how existing knowledge on the safety of turf in other sports is being applied to horse racing. Schmitt works in the newly established Equine Surfaces and Safety Research Laboratory, supported by a gift from National Thoroughbred Racing Association, in the University of Kentucky Department of Biosystems and Agricultural Engineering. [Read more](#) about how Schmitt is using his industry experience as an engineer to analyze surfaces with the goal of increasing safety in horse racing. Listen to the audio [here](#).



PHOTO: UK COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT.

# IVERMECTIN AND MOXIDECTIN RESISTANCE DISCOVERED IN NORTH AMERICA

There are three dewormer drug classes available for horses, and on the majority of farms across the world, cyathostomin (small strongyle) parasites have developed resistance to two of these. That has left us with one drug class, the macrocyclic lactones (moxidectin and ivermectin). Despite heavy use for the past several decades, these drugs have maintained good efficacy against cyathostomins, and very few reports have documented signs of resistance to this class. However, we consistently find that strongyle egg counts come back quicker following deworming with moxidectin and ivermectin and have been recommending horse farms routinely monitor dewormer efficacy.

In a recent study, we report routine parasite and treatment efficacy surveillance data from a Thoroughbred farm in Central Kentucky. This farm has diligently followed current guidelines for equine parasite control and has implemented systematic surveillance of parasite fecal egg counts from all horses present. Here are the main findings:

- The study population consisted of more than 50 yearlings born on the farm in Kentucky, and another approximately 50 yearlings born in Ireland and imported in October 2019.
- It was found that efficacy of ivermectin and moxidectin was markedly reduced in the Irish imports, whereas the U.S.-born yearlings demonstrated 100% strongyle egg count reduction.
- These findings were confirmed through re-treating and re-testing over an eight-month period. In this case, resistance



SMALL STRONGYLE PARASITES. PHOTO COURTESY DR. MARTIN NIELSEN.

to ivermectin and moxidectin was imported with the Irish imports.

- The resistance was only discovered due to the meticulous testing protocol in place on this farm, and it allowed the farm manager and staff to take appropriate steps to contain and manage the situation.
- Ivermectin and moxidectin resistant cyathostomin parasites are likely present in multiple places around the world, and proper treatment efficacy testing is strongly encouraged.

You can watch a summary in the video [here](#) or get open access

to the full article [here](#).

| *Martin Nielsen, DVM, PhD, Dipl. ACVM, Schlaikjer professor of Equine Infectious Disease, associate professor in the University of Kentucky Department of Veterinary Science at the Gluck Equine Research Center, provided this information.*

## SCIENCE SLEUTHS: THE SCIENCE THAT SHAPES DIAGNOSTIC TESTS

### WHAT DOES $R_0$ MEAN?

$R_0$ , pronounced “R naught,” is a mathematically derived term used to indicate how contagious an infectious disease is. It is commonly referred to as the reproduction number of a disease. As a disease is transmitted to new people, it reproduces itself. Considering the current pandemic, this is an important topic to consider.

#### What does this mean for the veterinary community?

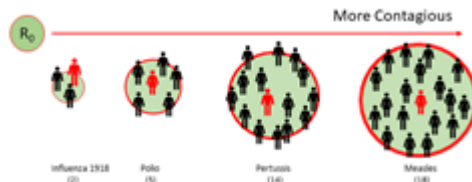
While the current pandemic and the use of  $R_0$  is geared specifically towards humans, it still works the same way with animal health. Veterinary epidemiologists, veterinarians and researchers utilize this method as well when studying disease outbreaks in animal populations.

#### How does it work and what does the number mean?

$R_0$  tells you the average number of people (animals) that will contract a specific contagious disease from one person (animal) infected with that particular disease.  $R_0$  specifically applies to a population of people (animals) that were previously free of infection, haven't been vac-

nated (if available) and are at risk of contracting that disease.

The  $R_0$  value is only applicable when everyone in a population is vulnerable to a disease, such as the novel coronavirus COVID-19 that we are currently experiencing. When the  $R_0$  value is less than 1, each existing case will cause less than one infection in another person (animal) and at this point the disease will actually decline and eventually die out. If the  $R_0$  is equal to 1, the disease is will stay viable and stable without causing an increase in cases. If  $R_0$  is greater than 1, each case will cause more than one new infection. This



will cause an increase of disease.

For example, say a disease has an  $R_0$  of 15, a person (or animal) that has the disease will, on average, transmit the disease to another 15 people (or animals). The disease will continue to propagate and spread this way if there is no

protective immunity from either vaccination or previous exposure. According to the journal *Emerging Infectious Diseases*, the  $R_0$  for COVID-19 is approximately 5.7 as of [July 2020](#). With an  $R_0$  of 5.7, we would need 82% of the population to be immune to COVID-19 to end the spread of new infections through vaccine and herd immunity.

The take home message: Once testing, modeling and analysis are complete, an  $R_0$  that is less than 1 means we are on the way to seeing a disease die out, while a number greater than 1 has potentially serious implications. We will be discussing these issues and concerns in future columns in the *Equine Science Review*. That means keep an eye out for our future articles.

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

## UK IN THE NEWS: A QUICK GUIDE TO MICRONUTRIENTS FOR HORSES

*Though they make up only a tiny part of horses' diets, micronutrients play big roles in major physiological functions, ranging from bone and muscle performance to digestion to hormone signaling.*

Source: *The Horse*, Sept. 28, by Kristen Janicki

Micro: a prefix originating from the Greek letter “μ,” meaning small. Though they make up only a tiny part of horses' diets, micronutrients play big roles in major physiological functions, ranging from bone and muscle performance to digestion to hormone signaling. Let's dive into the world of micronutrients to learn more.

Mieke Holder, MS, PhD, assistant professor of nutrition and environmental impact in the University of Kentucky's Department of Animal and Food Sciences, in Lexington, is quoted in the story. Read more [here](#).

# COLLABORATIVE STUDY FINDS CLIMATE CHANGE WILL ACCELERATE DRUG RESISTANCE DEVELOPMENT AND AFFECT PARASITE BURDENS IN HORSES

Martin Nielsen, DVM, PhD, Dipl. ACVM, Schlaikjer professor of Equine Infectious Disease, associate professor in the University of Kentucky Department of Veterinary Science at the Gluck Equine Research Center, in collaboration with some of the leading parasitology researchers in New Zealand, recently published a study in the *International Journal for Parasitology: Drugs and Drug Resistance*. In the study, he and AgResearch, New Zealand, scientists Christian Saueremann, Dave Leathwick and Mark Lieffering combined several computer simulations to study how climate change could affect horse parasites and drug resistance. During the study, the team combined their cyathostomin (small strongyle) simulation model with six different climate change prediction models.

Some of the key findings from the study:

- Shifting of seasonality will have a marked impact on parasite transmission patterns.
- This in turn can lead to larger parasite burdens in areas changing from temperate to warmer climates.
- The warmer climate and longer parasite transmission season can also affect development of dewormer resistance.
- Non-drug related strategies will become increasingly important for parasite control.

An excerpt from the study's abstract:

Climate change is likely to influence livestock production by increasing



PHOTO BY SHAILA SIGSGAARD, COURTESY DR. MARTIN NIELSEN.

the prevalence of diseases, including parasites. The traditional practice of controlling nematodes in livestock by the application of anthelmintics is, however, increasingly compromised by the development of resistance to these drugs in parasite populations.

This study used a previously developed simulation model of the entire equine cyathostomin lifecycle to investigate the effect a changing climate would have on the development of anthelmintic resistance. Climate data from six General Circulation Models based on four different Representative Concentration Pathways was available for three New Zealand locations. These projections were used to estimate the time resistance will take to develop in the middle (2040–49) and by the end (2090–99) of the century in relation to current (2006–15) conditions under two treatment scenarios of either two or six yearly whole-herd anthelmintic treatments.

The development of resistance varied between locations, time periods

and anthelmintic treatment strategies. In general, the simulations indicated a more rapid development of resistance under future climates coinciding with an increase in the numbers of infective larvae on pasture and encysted parasitic stages. This was especially obvious when climate changes resulted in a longer period suitable for development of free-living parasite stages.

A longer period suitable for larval development resulted in an increase in the average size of the parasite population with a larger contribution from eggs passed by resistant worms surviving the anthelmintic treatments.

It is projected that climate change will decrease the ability to control livestock parasites by means of anthelmintic treatments and non-drug related strategies will become increasingly important for sustainable parasite control.

Their paper is available via open access [here](#).

# ROTATIONAL GRAZING ON HORSE FARMS

For decades, rotational grazing was a term you heard on cattle farms, not horse farms. But this is changing, and for good reason. By grazing pastures in rotation, we are able to maintain better pastures and utilize them more efficiently. Many horse owners who have implemented rotational grazing have found it has greatly benefited their operations, but it can feel tough to get started. Thankfully, it doesn't have to be! This is a short guide to help horse owners and farm managers kick-start a rotational grazing program on their horse farm.

## Components of Rotational Grazing

There are two key components to rotational grazing that benefit a pasture: grazing and rest. Successful grazing simply means that the majority of the growth above about 3 inches has been removed. Horses are not great at this because they are spot grazers, but mowing is an easy way to compensate. When rotationally grazing pastures, mow the pasture around 3-4 inches to even out the growth after horses are removed.

Rest is the other half of the equation and the part we often shortcut. The rest period between grazings allows plants to regrow, building new leaves and replen-

ishing their root reserves. Repeatedly shortening or skipping this period all together (continuous grazing) will deplete plants of root reserves, slow the growth of new leaves and eventually thin the pasture and invite weeds. The amount of rest needed varies by many factors, including time of year, grass species and previous grazing pressure, but two weeks is a good starting point.

prolonging stand life and reducing the encroachment of weeds.

## Implementation

For horse farms, our research has found two different practices that tend to work well, and can be used independently or together. The first is what is called "paired pastures" and simply means pairing two existing pastures and rotating between them. Ideally, these would

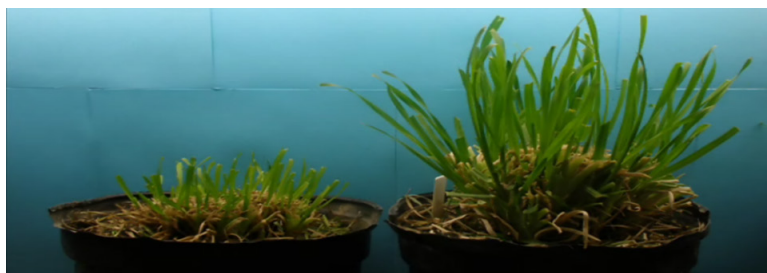


FOR THIS FARM IN MERCER COUNTY, KENTUCKY, A PAIRED Paddock SYSTEM WORKED BEST. PAIRINGS WERE BASED ON SIZE AND LOCATION. BY GROUPING PaddockS 1, 2 AND 3 TOGETHER, THESE ARE ALLOWED GREATER REST AND INCREASED UTILIZATION. COURTESY KRISTA LEA.

That's it. No complicated formulas or daily schedules. Starting with two weeks on, two weeks off will start to benefit the pasture by

be of similar size and location, making the switch every two weeks simple and straightforward. Instead of turning out one horse in each of the two paddocks every day, turn both horses out in one paddock for two weeks, then rotate to the other. This will increase the grazing pressure (stocking density) on the pasture being grazed but will allow a crucial rest period for the second pasture. The stocking rate is the same as when one horse was in each pasture, but the rest and rotation will be better for maintaining a vigorous grass stand.

The second method is simply dividing a pasture in half and rotating between the two sides.



REST IS A KEY COMPONENT OF ANY ROTATIONAL GRAZING SYSTEM. THE PLANT ON THE RIGHT WAS CLIPPED TO 3.5 INCHES ONCE A MONTH (ROTATIONAL GRAZING) WHILE THE PLANT ON THE LEFT WAS CLIPPED WEEKLY TO 1 INCH (CONTINUOUS GRAZING). BOTH WERE THEN ALLOWED TO REGROW FOR FIVE DAYS. WHICH PLANT WOULD YOU PREFER IN YOUR PASTURE? COURTESY KRISTA LEA.

This can easily be accomplished by using temporary electric fence, or even more permanent fencing. It may also be possible to put a water source in the fence line separating the two sides, so that one water facility feeds both sides and reduces the labor needed to make the switch. If using temporary fencing, this method allows you to test out where and how you divide and appreciate the benefits before committing to the expense of permanent fencing.

After starting with two paddocks for two weeks, you may find certain times of year that a slower rotation, say three or four weeks, is more beneficial. You may find having several paddocks and doing one week on and three to four weeks off works better for you. Expert level grazers will move based on amount of forage available in the current and the next paddock. Regardless of whether this is your first attempt at rotations, or you are an expert, keep these simple

increase benefits.

- Safe electric fences are pulled tight, highly visible and highly charged for more bite. Also be sure to have a permanent fence perimeter.
- Be willing to try new things, and experiment with new ways of doing the same things.

#### Resources for Rotational Grazing

The University of Kentucky Forage Extension [website](#) has several great publications including [Rotational Grazing](#) and [Temporary Fences for Horses](#). Keep in mind that while cattle and horses are different and must be managed as such, many of the same concepts in cattle grazing can apply to horses as well. Many horse farm owners have found great benefit in attending primarily cattle educational seminars such as the Kentucky Grazing School. Additionally, many Cooperative Extension Agents and Natural Resource Conservationists have experience in setting up rotational grazing systems. Regardless of how you set it up, any level of rotation will be an improvement over continuous grazing and will benefit you, your pastures and your horses.

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



THIS FARM IN FRANKLIN COUNTY, KENTUCKY, IS A HUNTER JUMPER OPERATION THAT ORIGINALLY HAD JUST TWO PASTURES. BY SUBDIVIDING INTO TWO OR THREE PADDOCKS, THE FARM WAS ABLE TO IMPLEMENT A ROTATIONAL GRAZING SYSTEM, MINIMIZING THEIR INVESTMENT TO JUST TEMPORARY ELECTRIC FENCE. IF ALL GOES WELL, THEY MAY MAKE THE FENCING PERMANENT IN THE FUTURE. WATER FACILITIES IN THE FENCE LINES PROVIDE WATER TO ALL PADDOCKS AND A DRY LOT (HUA) WITH JUST THREE WATERERS. COURTESY KRISTA LEA.

#### Next Steps

Rotational grazing plans are what you make of them. They can be quite simple, as outlined above, or as complex as moving animals twice a day, common in grazing dairies. Simply put, as the number of paddocks increases, so does the percent utilization because there is less waste. Increasing paddock number while keeping the number of horses the same means that stock is concentrated on small areas and horses don't have as much chance to be selective.

concepts in mind:

- The rest periods are crucial; be sure to give each paddock at least two weeks off between grazing.
- Don't graze pastures below about 3 inches.
- Mow paddocks when horses are removed to even out growth or to remove weeds and seedheads; otherwise, let it grow.
- Simple is great to start, but adding paddocks gives you greater control and will likely

# FOLLOW-UP UK MRNA BIOMARKER STUDY WILL BUILD ON PROMISING RESEARCH INTO PREVENTING CATASTROPHIC RACEHORSE INJURIES

Catastrophic injuries in Thoroughbred racehorses is a top concern for the industry and for its fans. That sentiment is shared by researchers at the University of Kentucky's College of Agriculture, Food and Environment, who are working to learn more about changes happening at the cellular level that might indicate an injury is present before it becomes career- or life-ending.

According to Allen Page, DVM, PhD, staff scientist and veterinarian at UK's Gluck Equine Research Center, a recently completed study submitted for review shows it is possible to identify several early markers for horses at risk of catastrophic injury, possibly allowing for intervention before those injuries happen.

In this initial study, Page and his colleagues analyzed blood samples from more than 1,000 Thoroughbred racehorses. The samples, collected by participating racing jurisdictions from across the country, have come from both catastrophically injured and non-injured horses in a quest to better understand if there are any red flags in horses that suffer a catastrophic injury.

Previous research showed that many catastrophic injuries occur in limbs with underlying and pre-existing damage, leading to the theory that these injuries occur when damage accumulation exceeds the healing capacity of the affected bones over time. As a result, researchers think it is likely there may be markers of this damage that can be detected prior to an injury.

The identification of protein biomarkers for these types of injuries has been explored in previous research with limited success. As a result, the group opted to focus on quantifying messenger RNA gene transcripts or markers, knowing that the results would likely be much more sensitive than measur-



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

ing proteins.

"We are definitely encouraged by our findings in the initial study. Out of the 21 markers we measured, three of them show real promise as being able to predict injury," Page said. "Since the ultimate hope is to develop a screening tool that can be used pre-race to identify horses at increased risk for injury, we anticipate adding multiple other markers with our new study that is just getting started."

As part of their new study, Page and his colleagues plan to utilize RNA-sequencing, a relatively new technology, to expand their search to the approximately 22,000 protein-coding genes horses have. This will dramatically increase the likelihood that they will be able to identify additional markers for horses at risk of injury. They plan to do this by using the large number of samples that have already been collected, further leveraging their initial study and decreasing the amount of time it will take to complete their new study.

The new study has been funded by the Kentucky Horse Racing Commission's Equine Drug Research Council, which also funded the three-year initial study.

"A lot of the credit for these

projects goes to the KHRC and the Equine Drug Research Council. Their willingness to fund our projects is really a testament to their interest in supporting innovative and novel ideas geared towards improving the safety and well-being of horses and riders," Page said.

"I am pleased that the EDRC is able to continue to provide support for this important study and that Dr. Page is able to continue his work on finding ways to protect our equine athletes," said David Horohov, PhD, chair of the Department of Veterinary Science at UK, director and Jes E. and Clementine M. Schlaikjer Endowed Chair at the Gluck Equine Research Center.

Joining Page in the research from UK's Gluck Center are Horohov; Emma Adam, DVM, PhD, DACVIM, DACVS, assistant professor, research and industry liaison; James MacLeod, VMD, PhD, John S. and Elizabeth A. Knight chair and professor; and Ted Kalbfleisch, PhD, associate professor.

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

# 2020 SUSTAINABILITY CHALLENGE GRANT PROGRAM: AERATED MANURE COMPOST FACILITY FOR THE SMALLER HORSE FARM OPERATION

A single, average sized horse produces an estimated 9,400 kg or 20,800 lb. of feces and stall bedding waste material (manure) per year<sup>1</sup>. This amount of manure adds up quickly as the number of horses housed on a farm increase.

In certain regards, larger farms have more options to deal with manure. These farms tend to have more space available for responsible land application of manure or they generate the quantities of manure that is of interest to commercial composting companies, who are willing to collect these quantities of manure at minimal cost.

In contrast, smaller farms, housing six or fewer horses, typically do not have the associated acreage to support responsible, repeated land application of raw manure, yet the amount of manure generated may still not be sufficient to make it financially feasible for composting companies to collect at low cost. This leaves the smaller horse farm owner with the choice to either pay to have the manure hauled away or to compost the manure on farm. However, composting on farm can be both daunting and labor intensive, while manure removal services can be costly, especially if the horses are kept for recreational purposes only. In some cases, this leads to the over-application of manure on land as a way to reduce the frequency of manure removal services. Over-application of manure, however, becomes an environmental threat to our surface and ground water quality in Kentucky and beyond.

Through funding made available by the 2020 Sustainability Grant Challenge, a project being conducted by researchers in the University of Kentucky College



PHOTO COURTESY DR. MIEKE HOLDER.

of Agriculture, Food and Environment aims to design and install a cost-efficient aerated composting facility at the UK Maine Chance Horse Unit (North Farm), designed to handle manure from four to six horses. By installing an aerated compost bin, as opposed to a traditional, non-aerated bin, researchers aim to reduce the labor involved in turning the piles, making it a more attractive option for smaller horse farm owners.

Why would a farm owner be interested in composting, especially if there are additional costs to install a compost bin? Composting reduces the total manure mass and volume<sup>2</sup>, which can lower costs associated with transport off the farm. Successful composting also neutralizes seeds from weeds and pathogens and parasites that may be present in raw manure, creating a stable product to apply to pastures<sup>3</sup>. In addition, compost has been shown to result in less nutrient leaching compared to raw manure, reducing the overall environmental impact of compost<sup>4</sup>.

An additional benefit of composting is that the compost generated on farm can potentially be sold as a value-added product, as opposed to having to pay someone to take it before it was composted.

The project is a collaborative effort by UK College of Agriculture, Food and Environment researchers Mieke Holder, PhD, assistant professor; Bob Coleman, PhD, PAS, Dip. ACAN, associate professor and equine extension specialist; Laurie Lawrence, PhD, professor; and Ashley Fowler, PhD, all from the Department of Animal and Food Sciences; as well as Morgan Hayes, PhD, PE, assistant extension professor in the Department of Biosystems and Agricultural Engineering; and Jamie Dockery, Fayette County Extension agent for horticulture education. These team members contribute different expertise to the project from multiple departments.

Its focus is on creating a facility that will be of use for hands-on teaching experiences, environmental impact-oriented research proj-





PHOTO COURTESY DR. MIEKE HOLDER.

ects and extension events where farm owners can have a full-scale facility to look at and compare to what they may want to install at home. Finally, the compost generated from the facility will be made available to the community for use in community gardens, showing how UK-owned Maine Chance horses can contribute to a more sustainable local community.

Funding for this project is provided by the Sustainability Challenge Grant, a collaborative effort between the UK Office of Sustainability, the President's Sustainability Advisory Committee and the Tracy Farmer Institute for Sustainability and the Environment. For more information, please see home page for the grant website.

| *Mieke Holder, PhD, assistant professor in the Department of Animal and Food Sciences at the University of Kentucky, provided this information.*

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1. Komar et al., 2012
2. Komar et al., 2012
3. Bernal et al., 2009
4. Fowler et al., 2020

## UK IN THE NEWS: THOROUGHBRED AFTERCARE SUMMIT: A GOOD PASTURE IS KEY TO TRIMMING HORSEKEEPING COSTS

Source: *The Paulick Report*, Oct. 6, by Natalie Voss

As many people continue to struggle with economic uncertain or job instability due to COVID-19, university experts say one of the best ways to cut costs of horsekeeping is probably right outside your window.

In the first session of this year's virtual Thoroughbred Aftercare Summit presented by the Retired Racehorse Project, Krista Lea, MS, research analyst at the University of Kentucky Department of Plant and Soil Sciences, said good pasture management is key to trimming budgets. Pasture is a cheaper feed source than growing or purchasing hay when it's maintained properly. On one acre of pasture, every inch of grass growth is equivalent to roughly 200 pounds of dry matter, or four 50-pound bales of hay.

"That may not seem like a big deal, but if you look at it across the entire pasture and how many inches there are, it adds up pretty quickly," said Lea, pointing out that 6 inches of growth adds up to 24 bales per acre of pasture.

One of the reasons pasture is a better option than hay is that a considerable amount – up to 60 percent – of hay can be lost in the storage and feeding process, which leads to a lot of wasted money, particularly if hay prices are high in your local area. Proper pasture maintenance can not just improve the quality of the grass grown, but extend the growing season. Jill Stowe, PhD, associate professor with UK Ag Equine Programs, found that even assuming a cheap hay price of \$4 per 50-pound bale, extending the pasture grazing season by a week can save up to \$28 per day per horse.

Read the rest of the story [here](#).



KRISTA LEA, (TOP) AND DR. JILL STOWE (BOTTOM) WERE FEATURED PANELISTS.

# MORRIS ANIMAL FOUNDATION AWARDS NEARLY \$1 MILLION IN GRANTS FOR NEW STUDIES BENEFITING EQUINE HEALTH, INCLUDING EMS STUDY WITH UK'S AMANDA ADAMS

Morris Animal Foundation, a leader in advancing animal health, has awarded nearly \$1 million in large animal health research grants, supporting 14 projects, including one at the University of Kentucky Gluck Equine Research Center. The studies will help veterinary scientists improve the well-being of horses through improved prevention and treatment of numerous health challenges.

“We were very impressed with the quality of proposals received this year and we believe they have the potential to drive significant improvements in the well-being of our equine companions,” said Janet Patterson-Kane, BVSc, PhD, FRCVS, Morris Animal Foundation Chief Scientific Officer. “We are very proud to support these enterprising researchers in their endeavors.”

Through this year’s grants, the Foundation is supporting teams at 13 universities and institutions. The Foundation’s Large Animal Scientific Advisory Board reviewed all submitted grant applications and selected, based on scientific merit and impact, the studies with the greatest potential to save lives, preserve health and



advance veterinary care.

One study approved for this year is for work done by Amanda Adams, PhD, associate professor and MARS Equestrian Fellow at UK’s Gluck Equine Research Center.

The study, titled “Understanding How Diet Composition Influences Insulin Response in Horses with Equine Metabolic Syndrome,” is a one-year, \$47,570 study. Adams and her team will study how diet composition affects insulin levels in horses with equine metabolic syndrome as a step toward improving dietary recommendations to control this condition.

Equine metabolic syndrome

(EMS) is a growing problem in horses. The disease is a leading cause of laminitis, a painful and devastating inflammatory condition of the hoof. Insulin dysregulation (ID), a condition where insulin levels fluctuate abnormally in response to feeding, is a component of EMS. There is a lack of informative studies on the nutritional management of ID and EMS. Researchers plan to analyze data on EMS horses fed five different forage diets to better understand insulin response. This new information will be used to help improve dietary management of EMS-ID horses.

## About Morris Animal Foundation

Morris Animal Foundation’s mission is to bridge science and resources to advance the health of animals. Founded by a veterinarian in 1948, we fund and conduct critical health studies for the benefit of all animals. Learn more at [morrisanimalfoundation.org](http://morrisanimalfoundation.org).

| Source: Edited Sept. 17 news release from Morris Animal Foundation

## TIME LAPSE GROWTH VIDEOS

The University of Kentucky Department of Plant and Soil Sciences has posted nine short time-lapse videos illustrating a number of forage management practices, including the importance of seeding depth, impact of winter pasture management, rotational stocking and relative seedling vigor of different forage species. Laboratory technician Gabriel Roberts, a member of the department’s forage extension group, was responsible for capturing the time-lapse videos.

The Playlist for these videos can be found on the [KY Forages YouTube Channel](#).

Source: University of Kentucky Forage News, Oct. 1, 2020



# UK PART OF REGIONAL GROUP WORKING TO REDUCE FARMER STRESS

Unprecedented times have unleashed an enormous amount of new and unique stressors on American farm families. To help producers and their families better deal with stressful events, researchers in the University of Kentucky's College of Agriculture, Food and Environment and College of Nursing have joined other scientists from across the South to develop resources to help producers combat stress.

"With all of the changes going on in the world right now, we want to make sure farm families have the resources they need to successfully work through these stressful situations," said Tony Pescatore, PhD, extension professor in the UK College of Agriculture, Food and Environment. "Producers find themselves not only facing financially stressful situations with market fluctuations that have been enhanced by COVID-19, but they also face emotional stressors related to their ties to their animals, if they are forced to reduce their herd."

Pescatore and Jennifer Hunter, PhD, UK extension professor of family and consumer sciences, are co-investigators on a three-year, \$7.2 million grant the University of Tennessee received from the U.S. Department of Agriculture as part of their Farm and Ranch Stress Assistance Network. For their part of the grant, UK faculty and staff will conduct an analysis of current available mental health resources in Kentucky and determine what programming needs exist in the state in terms of farm stress and mental health. They will craft an action plan for Kentucky and help draft one for the entire



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

Southern region, which includes 13 states and two U.S. territories.

"Unfortunately, there is still a significant amount of stigma regarding mental health issues, and access to mental health service providers is extremely limited in rural Kentucky," Hunter said. "We hope to develop a multi-disciplinary approach to solve a complex problem."

In addition to Hunter and Pescatore, researchers in the UK College of Nursing, animal and food scientists and extension specialists in agriculture and natural resources and family and consumer sciences will work on the project.

"As a family nurse practitioner, I have seen firsthand how sustained stress and mental health issues can take a heavy toll on individuals, families and entire communities," said Julie Marfell, DNP, FNP-BC, FAANP, associate professor in the College of Nursing. "During this time of economic uncertainty, it is espe-

cially important that we engage with our farm families and rural communities to understand their needs and provide the services and resources necessary to improve their mental health and wellness. I look forward to working with UK's College of Agriculture, Food and Environment to help increase access to services and reduce the stigma surrounding mental health in rural Kentucky."

The grant also includes funding for the hiring of a UK extension specialist who is also a registered nurse specifically focused on the area of agriculture mental health.

*| Katie Pratt is an agricultural communication specialist within UK's College of Agriculture, Food and Environment.*