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AND OUTREACH EFFORTS AT  
THE UNIVERSITY OF KENTUCKY

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# EQUINE SCIENCE REVIEW

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**JUSTIFYING KENTUCKY 31 TALL FESCUE NO  
MORE, 3**

Alternatives to Kentucky 31 have  
been on the market for decades.

**SCIENCE SLEUTHS, 5**

Zoonotic? It might not mean what  
you think it means.

**EQUESTRIAN ATHLETE SURVEY SEEKS TO  
LEARN MORE ABOUT ACTIVITY LEVELS, 7**

Open to individuals participating in  
any form of equestrian activity.

**EQUINE RESEARCH SHOWCASE RECAPS 8**

Immunology, mortality causes,  
protein synthesis, mineral needs,  
paristology and quality pastures.



College of Agriculture,  
Food and Environment

## WRITER, EDITOR AND LAYOUT

**Holly Wiemers, MA, APR** communications and managing director; UK Ag Equine Programs | [holly.wiemers@uky.edu](mailto: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 Dr. Jimmy Henning.*



# JUSTIFYING KENTUCKY 31 TALL FESCUE NO MORE

While central Kentucky is known as the Bluegrass Region, there is no denying that Kentucky 31 tall fescue is a big part of our pastures. Its presence, rightly so, affects how we manage those pastures. Alternatives to Kentucky 31 have been on the market for decades, but many of us have continued to resist switching to another grass. It's time for that to change.

## Types of Tall Fescue

Before we look at why horse farm managers and owners should be moving away from Kentucky 31, we need to clear up some confusion about the different types of tall fescue. For this discussion, we will lump all tall fescue into three types: Kentucky 31, endophyte-free and novel endophyte.

Kentucky 31 is a specific variety that originated in Menifee County, Kentucky. It was released in 1943 and is now grown on 35 million acres in the U.S. Kentucky 31 has a colorful past, and its proliferation is largely due to the efforts of one entrepreneurial farmer and an eager plant breeder (read the full, fascinating history of KY31 in [The Wonder Grass](#)). The original Kentucky 31 variety was highly infected with the toxic endophyte that causes so much difficulty in pregnant mares. It is a safe assumption that most naturally occurring tall fescue in pastures today is Kentucky 31, or very close to it. This tall fescue may also be called wild-type or toxic-type tall fescue. The combination of the plant and the specific endophyte is what makes it durable, long-lasting and toxic.

There are many varieties of endophyte-free tall fescues on the market today. Some have been bred to have softer leaves or greater palatability, but all of them have



PHOTO COURTESY KRISTA LEA, UK COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT.

one thing in common: no endophyte. From a horse perspective, this is a good thing. But remember that the endophyte is what gives the plant the added durability and tolerance to disease, insects, drought, heat and heavy grazing by horses. Without the endophyte, tall fescue is unlikely to survive much longer than orchardgrass, which is about five years or less. For years, these were the best alternatives to Kentucky 31, but still left so much to be desired.

Novel endophytes first showed up in the commercial market in 2000 and have continued to evolve and improve. These varieties result from taking an endophyte-free plant and inserting a naturally occurring, non-toxic endophyte into the seed at germination. The inserted endophyte is not genetically modified but has been collected from tall fescue plants from North Africa and Europe. Once these insertions are made, plants with the new endophyte are evaluated for durability as well as livestock safety. Those that perform well become commercial varieties of novel, or sometimes called friendly or beneficial, tall fescue. All of these have longevity

similar to Kentucky 31, but the safety of endophyte-free makes them the best choice for horse pastures as well as pastures for other livestock species (one novel variety, BarOptima+E34 has been known to produce some low levels of ergovaline, and therefore would not be considered safe for pregnant mares, though is acceptable for other livestock).

## Today's Tall Fescues

Despite the fact that novel endophyte tall fescues now provide us with the best of both worlds and are a very viable alternative to Kentucky 31, horse farm managers and horse owners are still tempted to purchase Kentucky 31. Years ago, there were some justifiable reasons, but those days are fast coming to an end for one simple reason: the Kentucky 31 of the 1940s isn't the Kentucky 31 of today.

Part of the success and proliferation of Kentucky 31 was the commercial production and fast replanting of newly harvested seed. In the 1940s, when the University of Kentucky was actively commercializing Kentucky 31, it

was believed to be a magic bullet, capable of solving many of our grazing problems. Farmers could readily see its superior agronomic characteristics and quickly planted Kentucky 31 as soon as seed was available. Seed quality was closely monitored, and due to demand, seed was planted the same year as it was harvested. The endophyte will survive about a year in the seed bag, so these new seedlings were also toxic (and therefore durable) since they arose from infected seed. The quick acceptance and superior durability and yield helped this variety to become as prevalent as it is today.

Now, demand is lower and the bag of Kentucky 31 you purchase this year may have been harvested last year. The degree of endophyte loss is dependent on how the bag was stored and shipped, and how long since it was harvested. These are all details that the end user doesn't know. And there is no regulatory body that is testing for

UK has purchased several lots of Kentucky 31 tall fescue, only to find such a low infection rate that it could not be used in research as planned.

As highlighted earlier, endophyte free fescues persist about the same as orchardgrass. So if you want to avoid tall fescue endophytes completely, it is best to go with orchardgrass, and plan to mow high and replant every three to four years. Even if you do plan to transition an old tall fescue field to a novel endophyte type, rotating through a few years of orchardgrass can help assure you that all of the original toxic tall fescue has been killed.

**NOVEL TALL FESCUE VARIETIES HAVE A LOT OF THINGS GOING FOR THEM. THEY HAVE BEEN RIGOROUSLY TESTED FOR SAFETY, INCLUDING FOR PASTURING PREGNANT MARES IN STUDIES CONDUCTED AT UK. NOVEL TALL FESCUES ARE CAREFULLY TESTED FOR GERMINATION, PURITY AND ESPECIALLY ENDOPHYTE VIABILITY.**

This information will be printed on the seed tag of each bag of seed. Additionally, many seed companies have joined to form the Alliance for Grassland Renewal, a nonprofit group which voluntarily imposes an additional level of testing and scrutiny. Varieties from these companies will have an Alliance for Grassland Renewal logo on the bag.

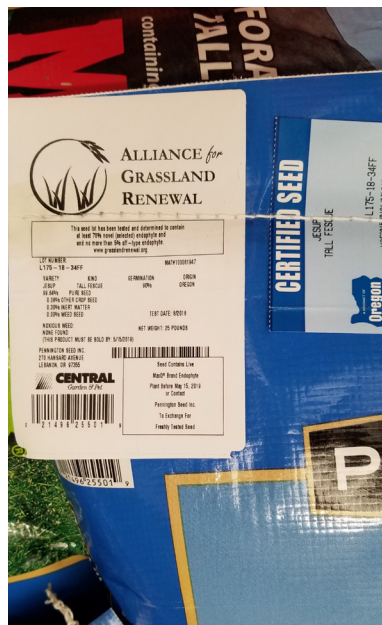
Price has been another major argument against novel tall fescue varieties, but that gap is closing. One farm recently priced out a pasture mixture with Kentucky 31 with a novel variety and found the price for the novel was only \$0.45 a pound higher. The safety of novel varieties makes them attractive to broodmare managers, but the durability and longevity should make them attractive to all horse owners. While non-breeding farms may not need to remove their old Kentucky 31 stands, they should certainly not plant the variety anymore.

Before you do plant any

pasture grass, be sure to consider the full process and timing. Fall is the best time to seed cool season grasses, but spring seeding can be successful if done early and the summer is mild. Completely killing out an existing field and reseeding will take a year or more before the field is ready to be used for pasture. Be sure to select improved varieties. Kentucky has an extensive forage variety testing program you can access [here](#). It is always a good idea to save back a few handfuls of seed in case there is ever a seed quality question. Double bagged in the freezer, seed will keep for years. Seeding pastures is often the most expensive and risk prone pasture improvement step we can make. Therefore, take every precaution to ensure success. Regardless of what type of horses you own or manage, Kentucky 31 tall fescue is not the best grass available and shouldn't be included in your seed mixtures.

The Alliance for Grassland Renewal is hosting three novel tall fescue renovation workshops this spring. These workshops focus on understanding the science behind toxic tall fescue, and the steps to successfully convert to and maintain novel tall fescue varieties. The first workshop is virtual, Feb. 23, 24 and 25 starting at 6 p.m. and costs \$30 to attend. In-person workshops are scheduled for March 23 in Mt. Vernon, Missouri, and March 25 in Lexington, Kentucky. Cost is \$65 to attend and includes lunch. All three are expected to be approved for veterinarian and vet tech continuing education credits via RACE, as well as Certified Crop Advisor and American Registry of Professional Animal Scientists. Visit [forages.ca.uky.edu/events](https://forages.ca.uky.edu/events) for more information and a link to register.

| *Krista Lea, MS, coordinator of the UK Horse Pasture Evaluation Program, and Jimmy Henning, PhD, extension professor, both in the UK Department of Plant and Soil Sciences, provided this information.*



SEED TAG WITH ALLIANCE FOR GRASSLANDS RENEWAL LOG. PHOTO COURTESY KRISTA LEA.

the presence of the endophyte. You could be getting a very highly infected bag of seed, no infection at all or something in between. Even



## SCIENCE SLEUTHS: THE SCIENCE THAT SHAPES DIAGNOSTIC TESTS

# ZOONOTIC? IT MIGHT NOT MEAN WHAT YOU THINK IT MEANS.

Zoonotic. I bet you have heard this term many times, and you probably think it means that you got sick from your pet (or other animal) or you maybe got your pet sick, right? Let's clear this up.

A zoonotic disease (also known as zoonoses), is caused by germs that can spread between animals and people. So, bacteria, viruses, parasites and fungi carried by animals can be spread to humans in some cases. This is what a zoonotic disease actually is. Of the more than 1,400 diseases found in humans, about 60% of those are zoonotic. Fun fact: the Centers for Disease Control and Prevention (CDC) estimates that six out of every 10 known diseases are spread from animals, and three out of every four new or emerging infectious diseases in people come from animals. Diseases can range from mild to severe and may even be fatal in some cases.

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

Veterinarians work directly with animals, so exposure to zoonotic disease is higher in this group of professionals. Direct contact with infected animals' saliva, blood, urine and feces is a valid concern. Indirect contact with areas where animals live or walk about freely as well as surfaces animals touch may be contaminated by germs also. Fleas, mosquitoes and ticks are able to pass disease to animals that can pass to humans as well (vector-borne). Waterborne disease can be caused in humans that drink or come into contact with water that has been contaminated by the feces or urine from infected

animals. Last, but certainly not the least of worries, foodborne illness. Every year people get sick from contaminated food such as unpasteurized (raw) milk, undercooked meat or eggs or raw fruit or vegetables that are contaminated and have not been washed properly.

### Who is the most at risk?

While anyone can get sick from a zoonotic disease, some people are more at risk than others. These include young children (those under 5 years old), people older than 65, anyone with a weakened immune system and pregnant women.

### The take home message.

Protect yourself from zoonotic diseases. Wash your hands with soap and water right after coming in contact with animals, even if you didn't touch them. If soap and water are not available, use a hand sanitizer that is alcohol-based (at least 60%). Use something to prevent bites from mosquitoes, ticks and fleas. Avoid scratches and bites from animals, and make sure your pets and livestock are vaccinated. Handle and prepare food safely.

| 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 veterinary industry liaison.

## EQUINE INNOVATORS PODCAST FEATURES UK'S DR. MORGAN HAYES ON BARN AND INDOOR ARENA VENTILATION PROBLEMS AND HOW TO FIX THEM



Good barn and indoor arena ventilation are crucial for both horse and human health. Dr. Morgan Hayes of the University of Kentucky, in Lexington, describes what can go wrong with ventilation in each of those spaces, and how farm owners and managers can combat those issues. She also lets us in on results of her study on stall fans. Hint: They might not be accomplishing what you think.

This podcast is the seventh episode in our "Equine Innovators" podcast series, brought to you by Zoetis.

You can find "Equine Innovators" on TheHorse.com, Apple Podcasts, Spotify, Stitcher, and Google Podcast.

# INFOGRAPHIC

## EXPRESSION OF SELECT MRNA IN THOROUGHBREDS WITH CATASTROPHIC RACING INJURIES

A study published Jan. 12 in Equine Veterinary Journal shows strong potential for the development of a blood test that could indicate whether a racehorse is at risk for a catastrophic breakdown.

From an initial pool of 21 genes identified by previous research in horses and humans for their roles in encoding proteins associated with inflammation, bone repair and remodeling, tissue repair, and general response to injury, researchers at the University of Kentucky's

Gluck Equine Research Center were able to zero in on three genes that showed significantly different activity between injured and non-injured horses.

The journal article can be found in the [Equine Veterinary Journal](#).

Featured in equine publications, including:

[BloodHorse](#)  
[TheHorse](#)  
[Horses and People](#)

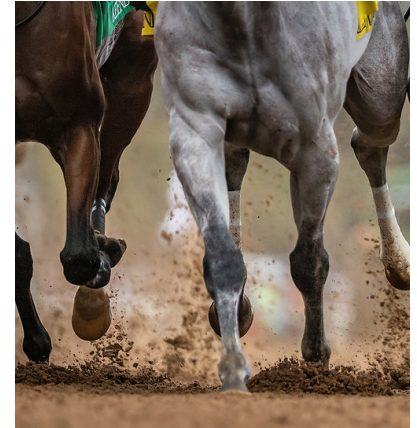
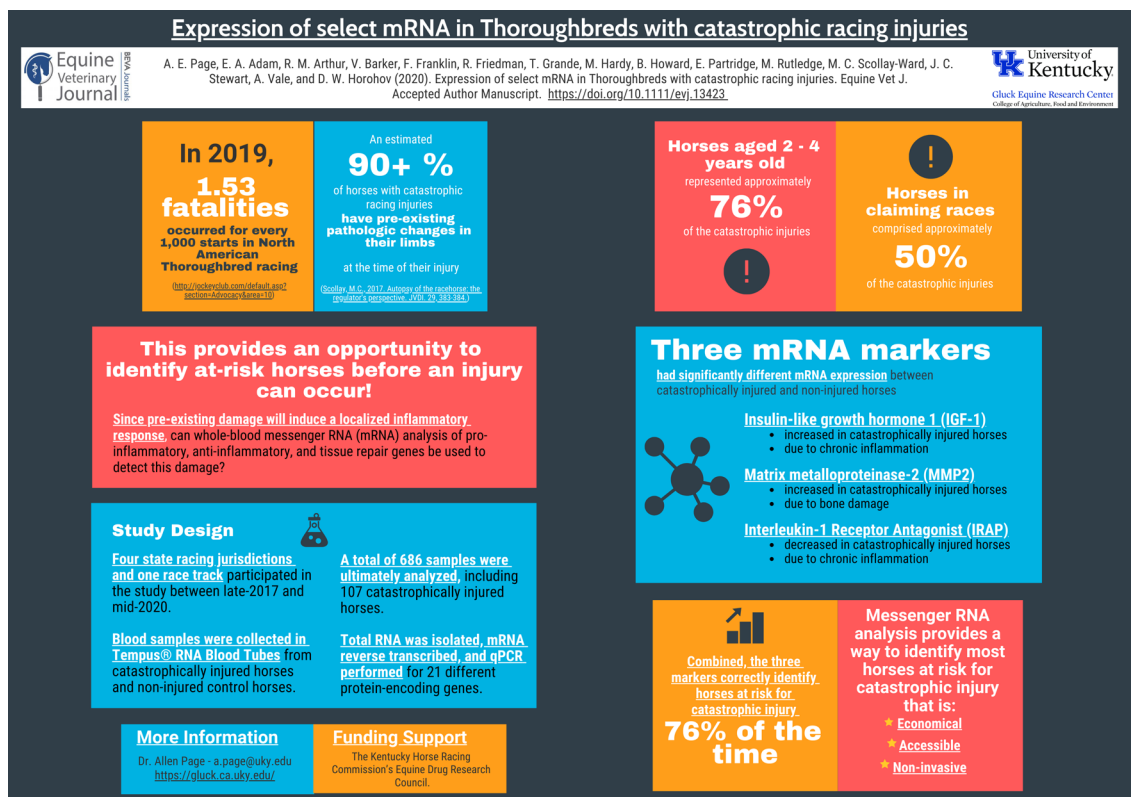


PHOTO COURTESY MARK PEARSON PHOTOGRAPHY.



INFOGRAPHIC DEVELOPED BY DR. ALLEN PAGE.

# EQUESTRIAN ATHLETE SURVEY SEEKS TO LEARN MORE ABOUT EQUESTRIANS' ACTIVITY LEVELS

Research emphasizing human performance in equestrian sport is outnumbered by that conducted on the horse. The Equestrian Athlete Initiative (EqA), based out of the University of Kentucky's Sports Medicine Research Institute (SMRI), has a mission to optimize health, wellness and performance for the equestrian athlete through research.

The main EqA team comprises the EqA research director Kimberly Tumlin, PhD, MS, MPH and EqA Research Coordinator, Michaela Keener, MS. Together, this team values embracing and validating the unique diversity of equestrian athletes, as equestrian sports range greatly in discipline, age and performance requirements.

Despite the expansive history of the equestrian athlete, we still do not know key descriptors such as activity levels with and without horses, perceptions of equestrian participation, injury mechanisms, basic demographics or how COVID-19 restrictions may have altered activity engagement. To help answer some of these questions, the EqA team built a nationwide survey to address these gaps in the field.

Equestrian sports allow for life-long participation and are one of the only sports where females and males compete concurrently. With numerous disciplines, equestrian sports allow individuals to participate both recreationally and competitively. This diverse competitive field in discipline, rider background and age at which individuals participate in these activities pose various challenges. Not only is there a need for research that investigates ways to prevent injury among these athletes, but there is also a need to find ways to ensure healthy participation throughout the life course of these athletes.

Physical activity is a strong



PHOTO COURTESY MICHAELA KEENER. DRIVER IS RAYMOND HELMUTH COMPETING AT THE INDIANA CLASSIC EVENT IN THE MARATHON PHASE.

modifiable factor in prevention of non-communicable diseases, a leading cause of mortality and morbidity in the United States. The current CDC recommendation for adult activity is at least 150 minutes of moderate-intensity aerobic activity and at least two days of muscle strengthening activity. However, data is limited on how equestrian activities count towards these CDC recommendations.

The purpose of the Equestrian Athlete Survey is to address important factors of equestrian participants. This survey is open to individuals currently participating in any form of equestrian activity, competitively, recreationally, therapeutically, occupationally, etc., anywhere in the United States who are 12 years old or older. Data collection includes basic demographics to look at discipline and regional differences across the country. The research team is interested in equestrians' weekly activity levels across disciplines, age, region and level of engagement to see if equestrians meet

CDC guidelines. The team is interested in looking at equestrians' perceptions of their participation as physical activity and a sport, which the team expects to vary with age, region, discipline and level of engagement. Finally, the research team hopes to gauge how equestrian engagement has shifted with COVID-19 restrictions, between shutdowns, stay at home orders and cancellations of competitions, camps and clinics.

Participate in the survey [here](#).



| *Michaela Keener, MS, is the research coordinator for the Equestrian Athlete Initiative within University of Kentucky's Sports Medicine Research Institute.*



# VACCINATION, IMMUNITY AND IMMUNE RESPONSES IN WEANLINGS

David Horohov, PhD, chair of the University of Kentucky Department of Veterinary Science, director of the Gluck Equine Research Center and Jes E. and Clementine M. Schlaikjer Chair, gave a talk on vaccination, immunity and immune responses in weanlings at the third session of UK's annual Equine Research Showcase Feb. 2. Presenting sponsors for the event included BET, Kentucky Performance Products, McCauley's, Merck, Rood & Riddle Equine Hospital and Tribute Equine Nutrition.

In his talk, Horohov discussed immune responses and their components (antibodies and cellular immunity), types of vaccines administered to horses such as killed, live or vectored/plasmid types and overall factors affecting vaccine responses in these animals.

He first provided background on the immune system, explaining that when we discuss immunity, we generally are discussing responses that are by the immune system.

"One that we're all familiar with is the production of antibodies by a particular subset of white blood cells and lymphocytes called B cells. These B cells secrete the antibodies that play a major role in protection against a number of infectious and even non-infectious agents, parasitic agents as well. These antibodies can bind to, neutralize, capture and facilitate the removal of various pathogenic organisms from circulation, and so in general they are considered to be the front-line defense of the immune system," Horohov said.

According to Horohov, this also includes the role of cell mediated immunity, often referred to killer T cells or cytotoxic T cells, another subset of white blood cells. These cells have the capacity to kill virus-infected cells or cells that may be harboring an intercellular bacterium (such as *Lawsonia* or *Rhodococcus equi*). They can also kill tumor cells.

He said the other, less talked about portion of the immune response is the helper T cell, the cells that produce various cellular proteins called cytokines and these various cytokines help B cells grow up to become antibodies producing plasma cells. They also help killer T cells develop their cytotoxic activity.

"The cell mediated immunity aspect of the response to an infectious agent or vaccine has to include all three of these components in order for it to be effective. But getting to these steps is actually a fairly difficult process and involves a number of steps," Horohov said.

Horohov broke down the three stages of the immune response. First is the initial recognition, second the immune expansion and third the effector function, which is where antibodies and cell-mediated immunity come into action.

According to Horohov, there is



GRAPHIC COURTESY DR. DAVID HOROHOV.

initially a recognition component that has to occur. This is where an infectious agent or pathogen comes into contact with the body and antigen presenting cells send signals to the rest of the body's cells that there is something in the body. This is done by passing small parts of the virus across the surface so the other cells will be able to recognize the virus when it makes contact.

"As a result of that recognition, the cells that identify that particular antigen, as we call it at that point, will actually undergo a proliferation or a division so that you'll start out with initially only a few cells that recognize that specific agent but after many rounds of replication, you could end up with hundreds or thousands of cells that recognize it. Not surprisingly, that replication of those cells is driven by a cytokine that's produced by T helper cells, called interleukin 2," Horohov said.

It takes about a week or two for the whole response to occur. Yet with a re-exposure, the memory T

cells are able to have a response within a few short days. The key point is that there are several steps along the way to generate the two processes in the immune system, the antibody immunity and cellular immunity. Depending on what is being produced, it is possible to have more of an antibody response versus a cell mediated immunity response. Horohov explained that this is particularly important when you vaccinate an animal.

“The general rule of thumb is that vaccines should stimulate protective immune responses, both antibody and cellular, in the absence of disease. And indeed for the horse, we have a large number of vaccines that are currently available, and many of them are good at inducing protective immunity in the absence of any subsequent disease,” Horohov said.

The conventional vaccines that we are most familiar with often fall into the broad categories of being an inactivated vaccine or modified live vaccine. Inactive vaccines, one in which the agent itself, whether that be a virus or bacteria, has been killed or inactivated in some manner so that it is incapable of causing infection, but still can cause the induction of an immune response. By contrast, the modified live vaccine is a vaccine that has a live or infectious component to it. The agent has been selected in such a way though that it does not cause disease but is still capable of stimulating an immune response.

Horohov then referenced an article by J.M. Minke, relaying that in 2004-2005 they discussed a second generation of vaccines different from others, referred to as plasmid or vector mediated vaccines. This means that instead of the whole virus being present, it has selected genes or particular pieces of DNA from that agent to stimulate an immune response. This was done with the West Nile Virus (WNV) vaccine.

**“I like to tell people that while we are all excited that we have a COVID vaccine that uses messenger RNA and its one of the first of the nucleic acid base vaccines to be used in humans, horses actually beat them by about 10 years in terms of an effective vaccine using a nucleic acid,” Horohov said.**

Each one of these vaccine types has its advantages and disadvantages, Horohov said. Inactivated vaccines, which tend to be the most common, while good at stimulating immune responses, those responses are primarily an antibody response. They are less effective in general when it comes to stimulating cell mediated immunity. Advances in technology have increased the ability to do this, but compared to modified live vaccines and vector vaccines, they are overall less effective when looking for that cell mediated response. The protection with these also tends to be short term, and because of the fact this is a killed agent, they also tend to be strain specific. If that strain changes, it means the vaccine must be reformulated.

“Modified live vaccines are at a greater advantage because they effectively induce antibody and cell mediated immunity, and because they mimic the natural process, they enable a response more consistent with the natural process. These vaccines tend to have longer term protection and are also cross reactive, so slight variations that may occur as a result of virus mutations can actually be covered by the broader cross reactivity. The concern with these vaccines is always that because they are live and susceptible to mutations, they could revert to virulence,” Horohov said.

Vector vaccines, Horohov said, are kind of the best of both worlds. They’re capable of inducing both

potent antibody as well as cell mediated immune responses. It’s thought that they offer longer term protection, more akin to what you see with the live vaccine. Though there isn’t enough data to fully confirm that, research is appearing to show that to be true. They also tend to be very specific since they are evolved from exact antigens related to the pathogen that is being protected against. That is both good and bad. It reduces some of the cross reactivities that may not be wanted, but if the virus mutates, it is also possible to lose effectiveness.

“Most important of all is that they are very difficult to generate. Indeed, part of the excitement now about the COVID vaccine is that it was done so quickly; it was quite the accomplishment actually,” Horohov said.

There are several factors that come into play on how the vaccine actually affects the horse. The vaccine may work well for one, but not well for another, and that can be due to a wide variety of things.

“One we always talk about is genetics. Indeed there are genes that regulate the immune response itself, they regulate the production of the various factors that are needed, regulate the behavior of the cells themselves, so certainly there could be genetic differences,” Horohov said.

Genetics play an evident role in vaccine effectiveness because they are seen easily in responsiveness to vaccinations between species. This likely results from the differences (polymorphisms) in immune-related genes. The question that arises is which genes in particular?

“Well right now we are only just beginning to get a grasp on which particular genes are involved and some of the DNA technology that has been developed over the past 10 years or so that has been used to identify which particular genes play a role in regulating specific immune

responses,” Horohov said.

While it may be possible to identify these genes, Horohov poses the question of “What could you do with this information?” Topics discussed in the past have been more frequent vaccinations, improving vaccines as a whole or different vaccine, and some go as far as creating personalized vaccines.

“These things sounded fairly farfetched a couple years ago are now a real possibility due to advances we are seeing,” Horohov said.

Other, factors can also come into play when discussing vaccine responses.

“We also know that there are other external factors such as stress that play a role. Particularly, when we talk about weanlings and when we start vaccinating them, this is an important factor to consider,” Horohov said.

Stress doesn’t have to be dramatic to an extent, Horohov explained. Types of stress that occur can be physical, social and nutritional.

“Well, if you think about all three of these things, that’s exactly what happens when you wean these little guys. You’re subjecting them to a physical trauma, subjecting them to a social stress because they are being moved away from their moms into crowds of other youth and individuals they may not recognize, and of course there’s a nutritional change that’s occurring at the same time. It’s no surprise we’re probably seeing stress in our animals,” Horohov said.

**THE CONSEQUENCE OF THOSE STRESSORS IS THE REDUCTION IN IMMUNE FUNCTION. IT CAN ALSO INCREASE THE SUSCEPTIBILITY OF INFECTION. IMPORTANTLY, IT DECREASES RESPONSIVENESS TO VACCINES.**

A study done a couple of years ago by Amanda Adams, PhD, MARSTM Equestrian Fellow and associate professor at the Gluck Equine Research Center, then in Horohov’s laboratory, investigated weaning effects on the CMI (cell mediated immunity) response in foals. Her research found that weaning did reduce the CMI response, and the immunomodulating treatment used showed no effect in the horses studied.

The third and final factor affecting immune responses in these horses is age. Age is known to be a factor because of the varying responses received from weanlings and adult horses, and the time-frames to vaccinate both of them. A study undertaken on giving vaccines to foals versus weanlings showed that regardless the type of vaccination, there was no effect on the foals. Horohov said he thinks this has to do with the fact the fact that the foal’s initial antibody is provided by the mare.

Because of the nature of the equine placenta, no maternal antibody is transferred to the foal in utero. But after birth, colostrum in the milk provides the foal with maternal antibodies that confer production against various infectious agents. These maternal antibodies decay within four months, leaving the foals susceptible to infection. If the foals are vaccinated during this period of time, a situation known as maternal interference can occur.

“Maternal interference is defined as the suppressive effect of passively transferred maternal antibodies on the production of pro-



PHOTO COURTESY UK COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT.

ductive antibodies by the neonate in response to vaccination. This is the reason why when you look at the AAEP recommendations for foal vaccination, you see quite specifically that there are two sets of recommendations they give you. One, if the foals are from mares that are vaccinated, there is a timing recommendation that says the foal’s first dose should be at around 5-6 months of age. However, if the foal is from an unvaccinated mare, they recommend giving the first dose as soon as possible and then a booster,” Horohov said.

His take home message?

“Vaccination remains a cost-effective method to prevent infectious diseases. Multiple vaccines are available which each have advantages and limitations and host factors can affect vaccine performance and adverse reactions as well, reasons for that are due to genetics, stress and age,” Horohov said.

| *Sabrina Jacobs, a senior majoring in equine science and management and minoring in wildlife biology and management, is a communications and student relations intern with UK Ag Equine Programs.*



# PRIMARY CAUSES OF MORTALITY IN WEANLINGS AND YEARLINGS

Laura Kennedy, DVM, Dipl ACVP and associate professor at the University of Kentucky Veterinary Diagnostic Laboratory, spoke at the third session of the virtual 10th annual UK Equine Research Showcase, an event focused on weanling and yearling horses. Presenting sponsors included BET, Kentucky Performance Products, McCauley's, Merck, Rood & Riddle Equine Hospital and Tribute Equine Nutrition.

Reviewing three years of cases submitted to the UKVDL, Kennedy shared that 141 weanlings submitted between Sept. 1, 2018 and Dec. 31, 2020 and 182 yearlings submitted between Jan. 1 and Dec. 31, 2020, were evaluated. Submissions were 95% Thoroughbreds, with the vast majority from within 25 miles of the central Kentucky laboratory.

"We have a group of horses that is often very intensely managed, intensively housed - for better or for worse - and the owners have access to a lot of specialized medicine and surgery. So, our horse population is a little bit different than most," Kennedy said.

### A look at weanlings

Beginning with weanlings, Kennedy shared the most common causes of death based on category. Of the weanlings submitted, 43% were euthanized and sent to UKVDL due to gastrointestinal disorders and 31% for musculoskeletal disorders. The remaining 26% were categorized in other, smaller groupings.

For the weanling mortalities due to gastrointestinal issues, Kennedy shared the main causes of death within that category.

"This is where we see quite a bit of differentiation from our

other age groups," she said. "In this gastrointestinal group, 24% of submissions are due to what we would consider colic for lack of a better term. Colic cases are going to be intestinal strangulations,



PHOTO COURTESY ERIN DESNOYERS.

small or large intestine volvulus, any of those other things we would generally think about as colic surgery types."

According to Kennedy, the remaining mortalities in this category come from a variety of gastrointestinal problems, from miscellaneous bacterial diseases, congenital malformations or sequelae to infections or diseases.

"In weanlings we also look at two infectious diseases; 25% due to disease from a bacterium called *Lawsonia intracellularis* and 15% from *Rhodococcus equi*," she said.

*Lawsonia intracellularis* is an intracellular bacterium that resides in the rapidly dividing cells of the intestinal crypts, causing a disease called Equine Proliferative Enteropathy (EPE). It was first

and most commonly recognized in swine but was identified within horses in 2000. Since then, there has been an increase in identification of this disease, yet the question remains if that's due to simply being aware of the disease or if there really is an increase in cases, she said.

A disease of weanling foals, it typically occurs within 3-8 months of age, according to Kennedy, who said one hypothesis of why this disease occurs in this age group is that the stress of weaning predisposes them to EPE. *Lawsonia* does sporadically affect and cause disease in yearlings and adults as well.

"The typical clinical presentation for a foal with *Lawsonia* is very characteristic. These are going to be foals that have ill thrift, be poor doers. They're going to be thin without a lot of muscle, be hairy and have a potbelly. They're just not going to look like they are doing well," she said.

Kennedy also said that these foals tend to be depressed and she hears from owners that the clinical history often includes a rapid weight decline. They can also suffer from dependent edema, which means an accumulation of excess fluid along their ventrum (belly line) and the lower parts of their limbs.

"They may or may not have diarrhea, they generally don't have a fever, they have an increased white blood cell count and high fibrinogen. This just signals that there is inflammation. The primary feature of the *Lawsonia* foals is that they have a very low (serum) protein level," Kennedy said.

According to Kennedy, the bacteria is interesting because it infects the cells down in the crypts

of the lining of the small intestine. Crypt epithelial cells are rapidly dividing cells and the precursor of mature enterocytes, which are the functional cells. Infection with the bacteria stimulates crypt epithelial division and inhibits maturation, and without these mature enterocytes, the nutrients are lost.

With regard to *Rhodococcus equi*, Kennedy said this disease is a primary cause of pneumonia in young foals (those between 1 and 4 months old). In contrast, with weanlings, you are more likely to see an abdominal manifestation of *Rhodococcus*.

“This can cause inflammation of the colon, plus or minus the caecum, and sometimes the distal end of the small intestine, which is the ileum and also affects lymph nodes. These horses present for signs of abdominal disease, which is fever, depression, anorexia, weight loss, colic and diarrhea,” Kennedy said.

According to research, the most common clinical signs of *Rhodococcus equi* are massively enlarged lymph nodes with extensive adhesions between the nodes, mesentery and intestines. Once these foals develop abdominal abscesses, they become difficult to manage and treat.

“*Rhodococcus* is soil-borne, nearly ubiquitous and a normal component of feces. It favors very dry, dusty conditions. It’s gram-positive, and a facultative-intracellular, which means it does best while it’s inside a cell, but that’s not required,” Kennedy said.

For musculoskeletal causes of death in weanlings, Kennedy also broke down the epidemiological data into percentages. Trauma made up 65% of deaths in weanlings, followed by 19% from inflammatory responses, 12% from degenerative affects and, finally, congenital defects/gunshot wounds each made up 2% of the total number.

“These guys get turned out in the fall, the wind picks up, they’re out for the first time with all of their buddies, and they tend to either run into each other or a solid object,” Kennedy said.

Inflammatory responses included another problem linked *Rhodococcus equi*, sites of infection within a bone, Kennedy said. This may occur in conjunction with, following or independent of disease in other systems.

“Some of our equine cases can present in a very traumatic fashion with a vertebral abscess due to *Rhodococcus equi* and acute fractures,” Kennedy said.

Neurologic disease in weanlings makes up only 5-6% of the overall population. Yet of the weanlings that are presented with neurologic disease, 86% of them are due to Wobbler syndrome and the remaining 14% are due to EPM.

### A look at yearlings

Causes of mortality look a little different for yearlings compared to weanlings. Yearlings are approaching maturity and causes of death start to become more similar to adult horses.

“When we look at diagnosis for yearlings, we have 34% musculoskeletal, 22% gastrointestinal and 27% present with neurologic disease, followed by a scattering of other things,” Kennedy said.

Musculoskeletal issues in yearlings present almost exactly like the weanlings. In this age group, 66% of deaths were related to trauma, 20% due to conditions that cause a major proinflammatory problem, 11% due to degenerative health effects and 3% due to congenital defects.

“The preponderance of our yearlings that are euthanized for neurologic disease have Wobbler syndrome - 82% of them. Then just a handful, 10% of them, had EPM,” said Kennedy.

Wobbler syndrome, (Cervical Stenotic Myelopathy) is a neurological disease that results from spinal cord compression due to vertebral malformation. Even though Wobblers presents with neurologic signs, it is actually a skeletal disease process. It is not a primary disease process of the nervous system. Males are more commonly affected, and it is a multi-

factorial disease, which makes it difficult to treat. It primarily occurs in young growing horses. Advanced imaging is helping to better characterize the disease.

Looking at yearlings and gastrointestinal disease, this is where they are more like adult horses, said Kennedy. Gastrointestinal disease in yearlings is due to inflammatory causes 68% of the time while colic causes 32%.

“With these horses, their gastrointestinal system is going to be mature. Everything is functioning the same as it would within an adult horse. They’re eating the same way an adult horse would, and their management is also often similar, so you have horses/yearlings that are kept with extensive access to pasture with limited concentrates. This tends to happen from winter through late spring/early summer for these horses. Horses that are going to a yearling sale are going to be brought in at that point and have limited access to pasture but increased concentrates, and they are going to start becoming athletic,” Kennedy said.

### Takeaway message

“Young horses are silly and tend to run into one another and solid objects. It’s one of the most common things we see. Young Thoroughbreds are predisposed to the development of Wobbler syndrome, and because of the breeds highly represented in central Kentucky, we see a lot of them. In general, specific disease profiles decrease with age. Neonatal foals have a very specific set of diseases, weanlings have a specific set of diseases, more or less, but then as they mature further to become yearlings, they can have Wobblers, but that tracks out for a couple more years. As horses get older than a year or two, the specificity of disease decreases,” Kennedy said.

| *Sabrina Jacobs, a senior majoring in equine science and management and minoring in wildlife biology and management, is a communications and student relations intern with UK Ag Equine Programs.*

# IMPORTANCE OF PROTEIN SYNTHESIS IN THE GROWING HORSE

On Jan. 19, the University of Kentucky hosted the second session of its 10th Annual UK Equine Research Showcase. More than 100 equine professionals and students tuned in to the virtual webinar to hear about nutrition and pastures for the growing horse. Presenting sponsors for the event included BET, Kentucky Performance Products, McCauley's, Merck, Rood & Riddle Equine Hospital and Tribute Equine Nutrition.

Kristine Urschel, PhD, associate professor in the Department of Animal and Food Sciences, was the second in the lineup to discuss the importance of amino acids and protein synthesis in maturing, young horses. Urschel reviewed why protein is important for the body, delving into how protein is synthesized and highlighting noteworthy research in horses 6 months to 2 years old.

Proteins can have many different roles in the body. Some types of proteins may be responsible for a horse's structural makeup, such as their muscles and collagen. Other proteins help with metabolic processes, for example, transportation of important substances from the bloodstream across cell membranes where those substances can then be used.

There are 21 different amino acids that link together to form proteins. These amino acids are joined together in various combinations by peptide bonds to form long chains. Each individual amino acid chain has a unique side chain which will ultimately determine the three-dimensional shape of the protein and the role of that protein within the horse's body. As noted, amino acids play a major role in protein synthesis; however, amino acids are also key for other



PHOTO COURTESY UK COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT.

functions in the horse, including the synthesis of additional metabolically important molecules. One of these molecules, creatine, resides in the muscle to assist with energy metabolism in the growing horse.

Why do we care about protein in the growing horse?

According to Urschel, when horses are growing, they are putting down a lot of muscle.

"At birth, a horse will be composed of about 35% muscle and by one year, muscle development has increased to 45%. A mature horse can reach up to 55% in muscle mass," she said. "Muscle mass is defined by the balance between the rate protein is being synthesized compared to the rate protein is breaking down. In a growing horse, we need protein synthesis to exceed protein breakdown to allow a net gain of protein mass."

In order for protein to be synthesized in a cell, first, DNA will need to be transcribed into mRNA to serve as the blueprint for the protein composition. The mechanistic target of rapamycin (mTOR) signaling pathway will then send

a message to the ribosome in the cell to begin assembling the amino acids necessary to build the protein. These processes within the cell cannot occur unless the cell is equipped with energy reserves that it can make from dietary sources, mainly glucose and fatty acids.

With the understanding of proteins and how they are synthesized, Urschel then discussed her research, honing in on the mTOR signaling pathway and dietary amino acid adequacy as two key components for protein synthesis.

The mTOR signaling pathway, within the cytoplasm of the cell, is comprised of multiple different proteins which interact with each other and either activate or inhibit the mTOR signaling pathway for protein synthesis. Urschel and researchers in her lab have studied the mTOR signaling pathway by collecting muscle biopsy samples. The Western blot analysis method is used to study the activation of the proteins and their response to different stimuli.

"If it is found that when the proteins that we study within the mTOR signaling pathway are



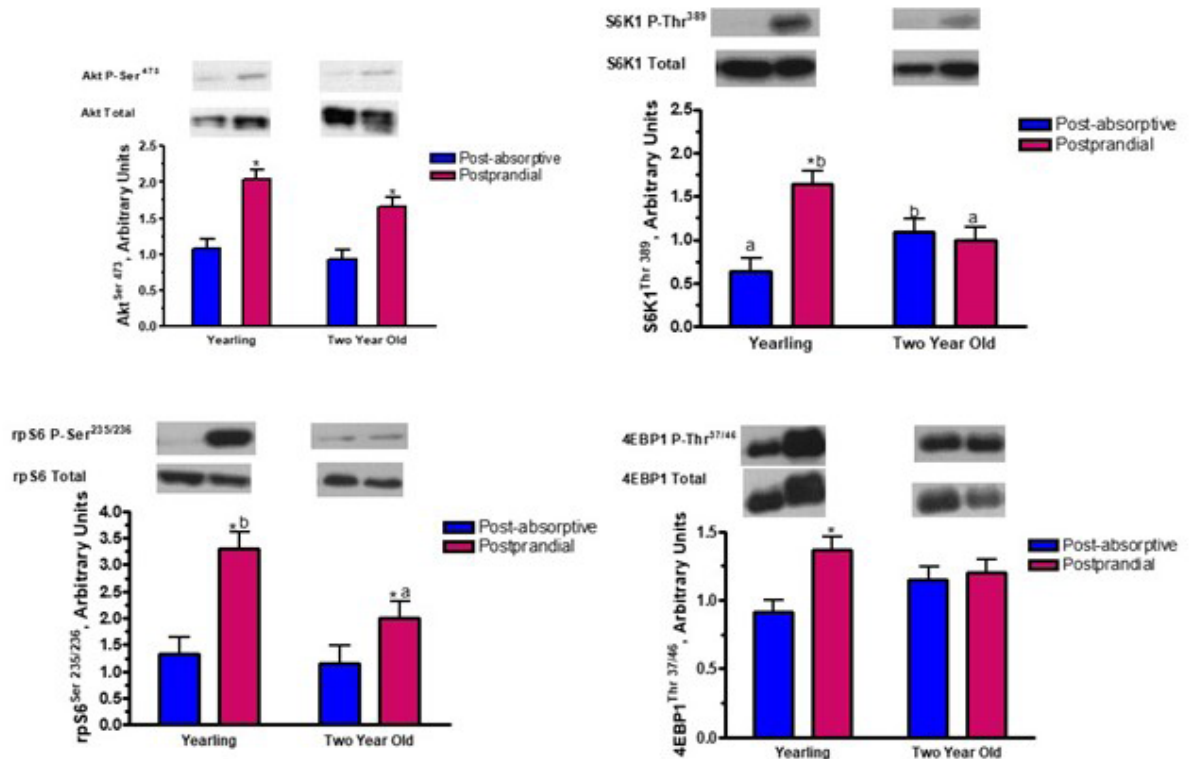


FIGURE 1, GRAPHIC COURTESY DR. KRISTINE URSCHEL.

phosphorylated, the environment is conducive to protein synthesis”, Urschel said.

Data was reviewed from a study conducted by Urschel looking specifically at yearling and 2-year-old Thoroughbred horses (Figure 1). They analyzed the mTOR signaling pathway activation in a fasting state and 90 minutes following a high protein feeding. They found mTOR activation from a fasted state to a post high protein meal state resulted in an increase in phosphorylation, which suggested an increase in activation of protein syntheses.

“What was interesting was that it seemed the activation in protein synthesis was greater in the yearling horses than the 2-year-old horses,” Urschel said.

This begs the question, how much protein is needed to maximize mTOR activation for protein syntheses? In a recent study completed by Urschel’s post-doctoral scholar, Caroline Loos, PhD, activation was analyzed in mature horses. The data showed the level of activation is maximized at 0.25 grams of protein intake per

kilogram of body weight, which equates to approximately 125 grams of protein for one meal.

According to Urschel, while there has not been any research conducted on the level of protein needed for the maximum activation of mTOR signaling in younger horses, this recent study does provide some insight into the maximum activation levels in horses overall.

“Just because this signaling pathway is maximally activated, this does not mean we are at the maximum rate of protein synthesis,” Urschel said. “The mTOR pathway measurements taken mostly look at getting the process started or the equipment assembled and doesn’t actually tell us how much protein is being made.”

How much protein is being synthesized is going to depend on additional external factors such as energy levels within the cell, as well as having sufficient amino acids, she said.

“There has not been much mTOR signaling work done in growing horses, but there are lots of exciting opportunities for the

future,” Urschel said.

According to Urschel, based on the research that has been conducted, one can conclude muscle seems to be most sensitive to feeding stimuli early in life. But there are still more questions. If there is a prolonged disruption in the feeding cycle during a young horse’s life, could this have a negative impact on muscle development? Furthermore, does exercise play a synergistic role with feeding in growing horses to aid in muscle development, something which has been shown in other species? These are all important questions for possible future research studies.

Urschel then transitioned from discussing the mTOR signaling pathway to the use of dietary amino acids in growing horses. The National Research Council (NRC) has published nutrient requirements for horses which include the amino acid lysine. Currently, lysine is the only amino acid with enough data to be listed as a requirement.

Urschel explained, “Protein syntheses needs specific amino

acids in specific ratios.”

When a specific amino acid is unavailable, protein synthesis is halted until the amino acid is available for use. Urschel displayed a barrel illustration in her presentation (figure 2, next page) displaying various levels of amino acids. Protein synthesis is restricted by the most limited amino acid in the diet. In a well formulated diet, there should not be any limiting amino acids; however, it has been found in growing horses that lysine, threonine and methionine are potentially limiting amino acids.

In Urschel’s lab, amino acid metabolism is studied through a stable isotope method to determine how well an amino acid can be used for protein synthesis. If an amino acid is not used, it is then degraded in the body and converted into CO<sub>2</sub> that is exhaled by the horse. For example, phenylalanine oxidation is inversely related to whole-body protein synthesis. If a limiting amino acid exists in a diet, less phenylalanine can be incorporated into the protein and more phenylalanine will be oxidized into CO<sub>2</sub> which is then exhaled by the horse.

In another study, six Thoroughbred weanlings were fed high and low protein diets consisting of two different concentrates in conjunction with alfalfa hay cubes. The high protein diet was well over the NRC protein requirement for this age group and the low protein diet was within the NRC require-

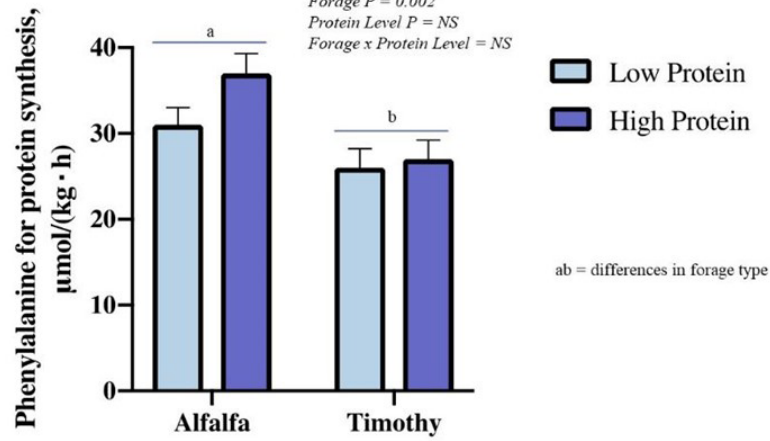


FIGURE 3: DATA ANALYZING PROTEIN SYNTHESIS IN YEARLINGS FED ALFALFA OR TIMOTHY HAY PAIRED WITH A HIGH OR LOW PROTEIN CONCENTRATE, GRAPHIC COURTESY DR. KRISTINE URSCHEL.

ment for this age group. The isotopic method was then used to determine if a limiting amino acid existed. The data showed a lower protein synthesis rate in the low protein diet versus the higher protein diet indicating a limiting amino acid. It was thought the limiting amino acid may be threonine based on previous research showing this specific amino acid as limited in Thoroughbred weanlings.

This led to another study investigating threonine supplementation in weanling Thoroughbreds. Six weanling Thoroughbreds were fed timothy hay cubes and a commercial growing horse concentrate top-dressed with either a threonine or glutamate (non-essential amino acid) supplement. With this combination of feed, there was no evidence to support threonine as a limiting amino acid.

In a recent study by a UK graduate student that has not yet been published, the effects of forage type and ration balancer protein content on whole-body protein synthesis in yearling Thoroughbreds was studied. This study looked at data from eight different Thoroughbred yearlings fed combinations of either timothy or alfalfa hay with either a high or low protein ration balancer. The results

of this study (Figure 3) showed that alfalfa forage overall resulted in higher rates of protein synthesis than the timothy hay. Interestingly, the data did not show higher rates of protein synthesis between a high or low protein concentrate when fed with either of the two forages. Therefore, the data did not indicate that there was a limiting amino acid present when either the timothy or the alfalfa forage was paired with a low protein ration balancer. The observed benefit of the alfalfa over the timothy forage may have been due to a greater energy intake to support protein synthesis with the alfalfa forage. Additionally, it was found that the added protein and amino acids in the higher protein treatments were ultimately excreted by the horse. This caused an excess of nitrogen to be excreted in the urine and ultimately resulted in an increased amount of nitrogen released into the environment.

In conclusion, Urschel reiterated protein is an essential nutrient for the growing horse and the valuable role protein plays for muscle development. After reviewing the mTOR signaling pathway and dietary amino acids, the research speaks for itself. Forage based diets coupled with an appropriate ration balancer can provide adequate amino acids for the growing horse.

| Erin DesNoyers is operations coordinator for UK Ag Equine Programs.

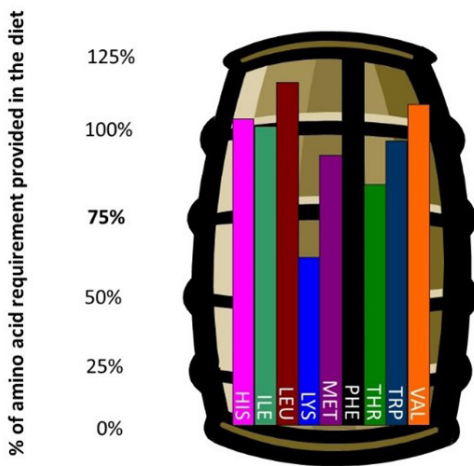


FIGURE 2, GRAPHIC COURTESY DR. KRISTINE URSCHEL.

# DIETARY MINERALS IN THE GROWING HORSE

Mieke Holder, PhD, assistant professor in the University of Kentucky Department of Animal and Food Sciences gave a talk on dietary minerals in the growing horse during the second session of UK's 10th annual Equine Research Showcase Jan. 19. The session highlighted nutrition and pasture topics appropriate for weanling to yearling horses. Presenting sponsors for the event included BET, Kentucky Performance Products, McCauley's, Merck, Rood & Riddle Equine Hospital and Tribute Equine Nutrition.

Holder shared the importance of looking at dietary minerals in the growing horse for the benefit to both horse owner and environmental health. She also described the complications of researching this age group because of how fast their mineral uptake can change. Participants were given information to advocate for better mineral research in establishing biomarkers for future studies, resulting in horse owners not having to overpay for minerals they don't need as well as to help protect the groundwater from eutrophication (process by which a body of water becomes enriched in dissolved nutrients).

Holder began by establishing the definition of growth in horses, which she said is the increase of both the body size and body weight as the young horse matures. Growth rate, however, is another way to define growth, according to Holder, and that is the amount of growth that occurs over a specified period of time.

Holder then displayed actual data of some of the foals being



WEANLINGS ON UK'S MAINE CHANCE FARM. PHOTO COURTESY DR. MIEKE HOLDER.

housed at the UK Maine Chance Equine unit. Their growth rates gradually got lower the older the foal became.

"As expected, growth rates of the very young foals that are just a week old are quite high, and as these horses mature and have an increase in their body size, the average daily gain slowly decreases," Holder said, "There are many factors that can affect growth rates, some of which have to do with genetics - breed - or even the environment -nutrition, management, season."

Comparing the requirements of a young, growing horse to a mature horse hanging out in the pasture, it is evident that the younger of the two has higher nutritional requirements per kilogram of body weight. Holder explained that when thinking about mineral requirements specifically, we have a general understanding that as the skeleton changes, there is going to be a

higher requirement for minerals such as calcium and phosphorus.

"But in truth, it's not just calcium and phosphorus. It is all the other minerals that also play a role in how these foals grow and develop," Holder said.

To further explain why dietary minerals are so important, Holder gave attendees an example.

"So, if we have a 12-month-old yearling, and this guy has a predicted adult weight of 1,100 pounds (or 500 kilograms), he is going to be consuming approximately 17 pounds (or 7.8 kilograms) of dry matter per day. And that amount of dry matter is going to come from the concentrate portion as well as the forage portion of what that yearling is being fed," she said. "If we envision that as a pile of food in front of the horse, it's quite impressive that at the end of the day, if we take this concentrate/forage and break it down into all of these nutrients, only about



five ounces (or 150 grams) of that pile is actually going to represent the minerals in that diet.”

Breaking down the minerals and their responsibilities, Holder first differentiated macro minerals versus micro minerals. Macro minerals tend to be needed in grams per day, and they’re primarily responsible for bone and teeth strength/integrity, muscle contraction, nutrient transfer and intra/extra cellular fluid distribution. Micro or trace minerals are needed in milligrams per day and are part of or co-factors to enzymes through which they affect: metabolism, hormones, connective tissue, antioxidant status and the nervous system.

### **HOLDER EXPLAINED THAT HOWEVER IMPORTANT MINERALS ARE, MORE IS NOT ALWAYS BETTER.**

“Some minerals are actually toxic at relatively low levels, whereas other minerals can become toxic if you feed too much of them,” Holder said. “From an environmental point of view, because horses are not capable of storing large quantities of minerals, those excess minerals that you provide to the horse become part of the fecal matter and urine and end up eventually contaminating our waterways.”

Knowing how much to feed a horse is incredibly important. For many years, scientists have been trying to determine what the actual mineral requirements of horses are, she said. There are a couple of different ways this can be determined, but one of the traditional ways is to do a balance study.

“Basically, you feed the horse a certain amount of mineral, and you collect all the feces and urine from that horse and calculate what disappeared. In theory this sounds pretty simple, but in the real world this is a very difficult study to do. You normally have to start out with



ALGAE IN A POND, ONE EXAMPLE OF GROUNDWATER EUTROPHICATION. PHOTO COURTESY DR. MIEKE HOLDER.

an adaptation period of 14 days to stabilize the intake of that specific mineral. You then have a five to seven-day period of collection of urine and feces. And then if you want to determine endogenous (or internal) losses, you typically need to include multiple levels of that mineral,” Holder said.

According to Holder, what seems like a simple experiment becomes very difficult, expensive and resource intensive. Evaluating trace minerals can be challenging. As they are already prescribed in small amounts, the accuracy in which they can be recovered in feces and urine becomes difficult.

“All of this is already very tricky, but now if you throw a growing horse into the mix, you are dealing with a dynamic model,” Holder said, “The rate at which a 6-month-old horse is growing at the beginning of your adaptation period is going to be different than the growth rate at the end of the collection period.”

Another way to determine requirements is through using biomarkers. The biomarker will tell you when you are feeding the optimal amount of the specific mineral in question. Holder used selenium as an example.

“We know selenium has this biomarker of glutathione peroxidase. In theory, as you feed more selenium, there is an increase in glutathione peroxidase activity. So if you were to set this up in a study, you would have several different levels of the mineral of interest that you feed, and then you could see some kind of pattern,” Holder said.

The biggest problem that we have is that selenium is one of the only minerals that has a good reliable biomarker available. Not just an issue for horse research, the lack of reliable biomarkers available affect human and other animal research. Holder said that there is a lot of research going on across different species to establish biomarkers that can be used.

Begging the question, “How do we know how much to feed our horses then?” Holder went into detail establishing the route that equine nutritionists take.

“As nutritionists, we like to refer to the recommendations made by the NRC. The NRC basically contains the nutrient requirements for horses and the most recent publication was put out in 2007. The NRC recommendations are based on available scientific literature, and wherever the literature is lacking, they will apply mathematical equations and use that to make recommendations. In some cases where data is completely lacking, they will look at other species’ available data to make recommendations,” Holder said.

An important thing to note about the NRC guidelines, Holder said, is that they are based on spec-

ified average growth rates. This means that if a horse is maturing at a different growth rate, you may need to make adjustments that will take into account the growth rate variance.

Holder explained that we don't really know if all mineral requirements decrease similarly or linearly with age and decreased growth rates. It is important to try to find

new ways to solve this puzzle.

She highlighted the need for future research on identifying biomarkers for minerals that can be used to monitor status and better characterize mineral requirements. Doing this work can benefit the financial bottom line for horse owners by helping them not pay for excess dietary minerals in addition to contributing to overall environ-

mental health. She also stressed the importance of involving the community in research efforts.

| *Sabrina Jacobs, a senior majoring in equine science and management and minoring in wildlife biology and management, is a communications and student relations intern with UK Ag Equine Programs.*

## UK EQUINE RESEARCH SHOWCASE RECAP

# PARASITOLOGY INFO FOR WEANLINGS & YEARLINGS

University of Kentucky held the third session of its UK Equine Research Showcase Feb. 2. The virtual research session included three expert talks with information about causes of mortality, vaccination immunology and parasitology in young horses. Presenting sponsors for the event included BET, Kentucky Performance Products, McCauley's, Merck, Rood & Riddle Equine Hospital and Tribute Equine Nutrition.

Martin Nielsen, DVM, PhD, Dipl. ACVM, Schlaikjer professor of Equine Infectious Disease and associate professor at the Gluck Equine Research Center, concluded the program with a presentation about parasitology relating to young horses, specifically weanlings and yearlings.

During the presentation, Nielsen discussed drug resistance in several species of parasites, including ascarids, small strongyles and large strongyles. Understanding the types of parasites present and what anthelmintic drugs are best for treating them is key to proper deworming. He also spoke about the types of parasites that are present in young horses at certain times of their life and times



CALLUM JONES, FARM MANAGER AT WESTBURY STUD IN NEW ZEALAND, RIGHT, AND DR. MARTIN NIELSEN. PHOTO COURTESY DR. MARTIN NIELSEN.

of the year.

Nielsen began by sharing information about a herd of horses on UK's farm, a herd that is part of the university's "historic herd," a group of horses established in 1979 by the late Harold Drudge, PhD, and the late Gene Lyons, PhD. This herd has not been dewormed since it was created. Studying the parasite loads in this group has led to significant research understanding and developments.

"We have foals hitting the ground every year, so we move through this cycle of parasites that a horse encounters on its path through life," Nielsen said regarding the

importance of the research herd.

During last year's UK Equine Research Showcase, researchers including Nielsen discussed their work as it related to foals

"We started with foals and talked about them. I of course talked about the kinds of parasites a foal will encounter, and I talked about how there's really a lot of transitions going on [in] early life. I will try to continue that journey tonight," Nielsen said.

"There are a lot of drug-resistant worms out there; and that should not be a surprise to you, you should all be aware of this," Nielsen said.



CALLUM JONES, FARM MANAGER AT WESTBURY STUD IN NEW ZEALAND, RIGHT, AND DR. MARTIN NIELSEN. PHOTO COURTESY DR. MARTIN NIELSEN.

Nielsen reviewed a few common parasites and the frequency of the resistance to common anthelmintic (antiparasitic) drugs.

**Ascarids (roundworms) are known to have a wide-spread resistance to both ivermectin and moxidectin, and small strongyles are starting to develop a resistance to these drugs. Ascarids have minimal to no resistance to benzimidazoles (fenbendazole and oxbendazole), and small strongyles are known to have a widespread resistance to this class of dewormer. Ascarids have minimal resistance to Pyrantel, while small strongyles have wide-spread resistance to this class. All dewormer classes are still effective for use against large strongyles (bloodworms).**

According to Nielsen, intensive treatment for large strongyles is what led to widespread resistance

to anthelmintic drugs amongst ascarids and small strongyles. Discussing a famous benzimidazole resistance study carried out by the legendary Dr. Gene Lyons, Nielsen shared that drug resistance remains even after several decades of withdrawal from the specific drug.

Nielsen also recapped the parasites present in foals and the typical timeline in which they are present. Threadworms (*S. westeri*) are highly present in the first months, followed by ascarids (*Parascaris* spp.), followed in the later months of the first year by small strongyles and tapeworms (*Anoplocephala* spp.).

“We can’t know by looking at a foal, what is going on inside that foal. It is really crucial that we have a good idea of what’s going on, and so testing is the way for it, there’s no other way to know this,” Nielsen said.

As foals move into their yearling stage, parasites are more often coordinated with the time of year. Eliminating and monitoring ascarids early on, typically January or February, prevents their frequency throughout the rest of the year. Strongyles will always be present, but this is less of a concern because they are only mild pathogens. Tapeworms are a seasonal parasite, where infections will occur typically early fall to late spring.

Nielsen recommends that deworming drugs being used should be tested for treatment efficacy. A simple fecal egg count reduction test can determine how effective the drug is. A fecal egg count reduction test should be performed on a minimum of six horses, at 14 days apart, to be completely accurate.

Fecal egg count amounts are relative to the type of parasite and the age of the horse. Where a strongyle egg count of 700 would be a moderate or normal amount for foals and yearlings, it would be considered a somewhat high

count for an adult. Therefore, the threshold for parasite egg counts in younger horses is much higher than it is in adult horses.

“A higher egg count does not mean more worms,” Nielsen said in reference to the misconception that there is a correlation between amounts of eggs being shed and number of worms. He said that the purpose of a fecal egg count is to figure out what an individual horse is contributing to contaminating the pastures. Counts also lead us to make more informed decisions on what drugs to use for parasite control.

Nielsen then discussed his New Zealand study on deworming protocols for foals. One group of foals was heavily treated with anthelmintics every month while the other group was only dewormed twice prior to weaning. Amongst the 93 foals, there were no discernable health observations in either group. Additionally, weight gains were identical in the two groups.

“There were no differences in any health parameter between these foals despite the vastly, vastly different number of treatments that were administered. In all, are we deworming too much? Yes, I think so,” Nielsen said.

*| Sydney Carter, a junior majoring in equine science and management and minoring in journalism, is a communications and student relations intern with UK Ag Equine Programs.*



# QUALITY PASTURE FOR QUALITY YEARLINGS

Ray Smith, PhD, professor and forage extension specialist in the University of Kentucky Department of Plant and Soil Sciences, gave a talk on pasture quality impacts on yearling horses during the second session of UK's 10th annual Equine Research Showcase Jan. 19. The session highlighted nutrition and pasture topics appropriate for weanling to yearling horses. Presenting sponsors for the event included BET, Kentucky Performance Products, McCauley's, Merck, Rood & Riddle Equine Hospital and Tribute Equine Nutrition.

With information given from research and observation on farms, Smith covered topics from establishing horse pastures, soil fertility and managing horse pastures. He maintains that that good management mixed with good pastures can lead to quality forage for growing horses, reduced hay and grain feeding and a lovely view.

Beginning with stages of pasture management, Smith introduced the concept of establishing horse pastures. Ideal horse pastures have at least 80% desirable forages and less than 20% undesirable forages.

"In the central Kentucky region, we would count desirable forages for weanlings as tall fescue, Kentucky bluegrass, orchardgrass, white clover and ryegrass," Smith said, "Less than 20% should include broadleaf weeds, weedy grasses like nimblewill, johnsongrass, foxtail and bare soil."

Smith explained that the average Kentucky horse pasture is 55% desirable forage, in comparison to the 80% rating that is



PHOTO COURTESY UK COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT.

recommended. To understand why that is, Smith discussed soil fertility and what that means for a pasture.

"The standard recommendation is to sample your soils every two to three years. Ideally, you'll use a probe you can purchase online or borrow from your county agent, because it takes a cylindrical core of the soil that provides the same amount of topsoil as it does the deeper soil. I recommend going 4 inches deep and 10-20 samples per pasture," Smith said.

Depending on the results, it is suggested that horse owners and horse farm managers apply the recommended amounts of phosphorus, potassium and lime. If assistance is needed to interpret the recommendations, Smith encouraged the people to contact their county agent or a consultant.

Nitrogen is another essential nutrient for pasture production. Specifically, for Kentucky's cool season perennial grass pastures,

Smith gave nitrogen recommendations of 60 to 80 pounds of urea per acre (30-40 pounds of actual nitrogen) in late September and in late October or double this amount with one application in mid-October. This increases the regrowth of the pasture but doesn't lead to excess production.

Smith said horse owners and horse farm managers should not try to balance diets by applying fertilizers to fields, for example adding a type of product to increase micronutrient levels in the grass. It's much easier and more dependable to provide micronutrients through mineral supplementation.

Smith said a question he often gets pertains to overseeding an existing pasture to thicken up the stand. Doing this is possible, but it is important to note that for this to work, there must be some bare soil. Mowing or grazing close before seeding is also important,

due to having less competition for the growing seedlings. Planting species that do well in shade, such as orchardgrass, also proves to be beneficial, because as the surrounding growth matures, it still allows the new seedlings to grow. If overseeding is the route that is being taken, Smith suggested to overseed in early September and to watch the depth closely. If planted deeper than ¼ to ½ inch, the seedlings may not emerge from the soil.

Smith encouraged horse farm managers to consider a complete renovation for problem fields. If the pasture has too many weedy species and has proven difficult to recover, it may be necessary to completely start over. Doing this requires removing all competition from existing plants. This can be accomplished with two killing sprays of glyphosate at a high rate in early July and in mid-August or repeated tillage. Then seed perennial mixture to establish the new stand in early September.

When establishing a new pasture, it is important to note that high-quality, improved seed should be used as well as planting enough of it at the right time. Using the best seeding method available and controlling the competition are other ways to promote new growth. Following this, rest is needed for a few months, as it takes six to 12 months for a newly seeded stand to develop a good sod.

Showing diagrams of seedling root growth between types of grass, Smith weighed the options of annual rye, perennial rye, tall fescue and orchardgrass.

“My point here is if you want a quick pasture, annual rye would be the best of these four. But it’s only going to live until the following summer, so it is very short term. Perennial rye grass in our area is another quick establishing pasture but has about a two-year window,” Smith said.

Therefore, he said, for long term perennial pasture, use orchardgrass and Kentucky bluegrass and consider including one of the new novel tall fescue varieties for added durability.

When discussing management of horse pastures, Smith said the goal is to match grazing to seasonal growth.

“Cool season grasses grow best in the spring and the fall, and stocking rates should be reduced during the summer months. There’s a slump in the growth there, sometimes referred to as the summer slump period. For intense summer-only grazing, establish a grass like bermudagrass or even crabgrass. The limitation with crabgrass is that it is an annual grass, so it would have to be seeded every year. We typically don’t recommend either of these in Kentucky because they have a fairly short summer growing season. So, we like to focus on good management of cool season, perennial grasses,” Smith said.

In managing pastures, one of the strongest recommendations from Smith was to look for ways to employ rotational grazing. A video example was provided that showed two orchardgrass plants, one employing rotational grazing and one continuous. The rotational grazed orchardgrass showed significantly more growth after one month, than the plant simulating continuous grazing.

Smith also talked about stocking density, or the average animals per acre for a growing season, and stocking rate, or animals per acre at any one time. For Kentucky, he suggested 2 acres per 1,200 pounds or about 1 acre per yearling (rotationally grazed).

“It’s better to have higher stocking rates and rotational graze than low stocking rates and continuously graze,” Smith said, “Some rest is much better than no rest, particularly with the grazing patterns of horses.”

On mowing management of pastures, Smith suggested mowing when grass seed heads emerge, when weeds are shading out grasses or producing seed, when horses are removed from a pasture or when seeding a pasture.

“When you mow very close, less than 3 inches, it is detrimental to the pasture with the exception of something like bermudagrass, a summer perennial grass. When you start getting higher than 8-10 inches, the quality and palatability is dropping,” Smith said.

Smith also touched on Kentucky 31 tall fescue in the growing horse and its controversial background. He shared that no conclusive data has been found in regard to the negative impacts on growing horses, but with all classes of horses KY-31 tall fescue causes vasoconstriction.

“The take home that I want to make is while it is not a major concern, it could be a concern. The simple solution, if you like the positive attributes of fescue with how strong of a grass it is and how good of a sod it forms, you should consider planting a novel endophyte tall fescue if you do a complete re-establishment,” Smith said.

The novel endophyte types have a beneficial endophyte that helps the grass but doesn’t produce ergovaline. Kentucky 31 does have a toxic endophyte, and that’s where you have the problems with the late term pregnant mares, he said.

UK is hosting a Novel Tall Fescue Renovation Workshop virtually Feb. 23-25, from 6-8:30 p.m. EST. Cost to attend is \$30. An in-person workshop, scheduled for March 25 at the Lexington Bluegrass Stockyards will be \$65, COVID-19 restrictions in place. Learn more or register for that event at [www.grasslandrenewal.org/workshops](http://www.grasslandrenewal.org/workshops).

| *Sabrina Jacobs, a senior majoring in equine science and management and minoring in wildlife biology and management, is a communications and student relations intern with UK Ag Equine Programs.*

## UK PASTURES PLEASE!! RECAP

# MANAGING CARBOHYDRATES IN HORSE DIETS

Central Kentucky Agricultural Extension agents and University of Kentucky Ag Equine Programs hosted the 11th annual Pastures Please!! pasture management workshop virtually on Jan. 26. The workshop included three expert talks covering the topics of managing carbohydrates in the equine diet, current herbicide effectiveness on weed control and investments for pasture management.

Laurie Lawrence, PhD, professor and equine nutrition researcher in UK's Department of Animal and Food Sciences shared information about managing carbohydrates in horse diets.

**“YES, HORSES ARE HERBIVORES BECAUSE THEY EAT PLANTS. BUT I THINK OF THEM AS ‘CARBOVORES’ BECAUSE CARBOHYDRATES ARE THE PRIMARY COMPONENT OF A HORSE’S DIET,” SHE SAID.**

Horses consume mainly carbohydrates and not all carbohydrates are equal. There are different digestion processes for different types of carbohydrates. Horses have individualized needs; some need a more highly digestible, high-calorie diet, while others may be better off with a low digestible, lower-calorie diet. How best to meet individual dietary needs can be helped by an understanding of the composition of forage.

According to Lawrence, the main method of carbohydrate consumption for horses is by eating plants. Plants use photosynthesis to create carbohydrates out of water and carbon dioxide. Along with the synthesis of glucose during



PHOTO COURTESY UK COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT.

this process, plants also release oxygen. Understanding complex carbohydrates allows horse owners to be aware of how their horse uses carbohydrates for energy.

The digestion of carbohydrates occurs in multiple parts of the digestive tract. Starches and sugars are absorbed as glucose in the small intestine, whereas other complex carbohydrates pass through the small intestine to be broken down more effectively in the large intestine.

Cellulose, hemicellulose, pectin and fructan have chemical bond structures that can only be broken down in the large intestine. The microbes in the cecum and colon break down and ferment the compounds, which creates volatile fatty acids that the horse absorbs to use as caloric energy.

As an example, Lawrence gave the nutritional breakdown of a common hay, mature orchardgrass. On an as-fed basis, its carbohydrate content is approximately 64%. Of the specific carbohydrate components in orchardgrass hay, low percentage digestible compounds like

lignin and cellulose are of minimal use to the horse in terms of nutrients. High percentage digestible compounds like fructan and starch are of high use to horses.

Hay and pasture grazing are also different.

“Typically, we make hay when the plant is somewhat more mature. It has accumulated some mass and we would see the seed heads and more well-defined stems,” Lawrence said. “On the other hand, when our horses are grazing, they are grazing material that is much more vegetative. It’s in an earlier stage of growth, so the plant leaves are much finer and much softer without the seed heads.”

According to Lawrence, while both hay and pasture are grasses, forage that is mature, such as hay, is much lower in calories because there are fewer digestible nutrients. Forage that is immature and vegetative is much higher in calories because it has more digestible nutrients.

The need for digestible, high nutrient forages is influenced by



each particular horse's needs. For example, a lactating mare, weanling or performance horse needs a high nutrient diet. Conversely, a sedentary "pasture ornament" would be better off maintaining a diet consisting of fewer digestible nutrients.

High sugar forages are sometimes preferable because they cause weight gain and encourage lactation, but they can also raise the blood glucose and insulin levels in horses, which may be a

concern for horses with metabolic disorders. Too much fructan in the diet can also cause a cascade of internal issues that lead from disturbed microbial community to diarrhea, colic or laminitis.

With that in mind, some horse owners may decide to feed high digestible nutrient-rich forage but limit the intake. It's a strategy Lawrence cautioned might lead to other problems such as chewing wood on fences, run-in sheds or barns.

"Horses are driven to chew on things, and in normal environments

they would probably be spending 60 to 70% of their time grazing and chewing. When we restrict forage intake, then we can have some side effects from that we may not want," she said.

The talk can be found on the [KY Forages YouTube channel](#).

| *Sydney Carter, a junior majoring in equine science and management and minoring in journalism, is a communications and student relations intern with UK Ag Equine Programs.*

## UK PASTURES PLEASE!! RECAP

# WISE INVESTMENTS FOR PASTURE MANAGEMENT

Central Kentucky Agricultural Extension agents and University of Kentucky Ag Equine Programs hosted the 11th annual Pastures Please!! pasture management workshop virtually on Jan. 26. The workshop included three expert talks about managing carbohydrates in the equine diet, current herbicide effectiveness on weed control and investments for pasture management.

Ray Smith, PhD, professor and forage extension specialist and Krista Lea, MS, plant and soil research analyst and coordinator of the UK Horse Pasture, both from UK's Department of Plant and Soil Sciences, concluded the program with a presentation about wise investments for pasture management.

The discussion highlighted the steps to take in order to evaluate pastures and get the best use out of them. Smith detailed how management practices such as weed control, use of fertilizers, nitrogen, overseeding and pasture resting can improve a pasture.

Smith began with weed control. He shared an image of a pasture full of flowering buttercup



PHOTO COURTESY UK COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT.

and pointed out that by the time weeds get to that point, it is too late to use herbicides or to manage them effectively.

"Weed control is often misused. You want to make sure you know what weeds are there, and spray for the ones that are there. Some herbicides have good residual control, meaning they control weeds even after spraying. Others don't last very long. But the unintended consequence of killing weeds is you have bare soil, and then you need to do something to cover that bare

soil... So, you've got to be very careful with what herbicide you use because they have different wait periods before reseeding." Smith said.

An average range for the cost of herbicides is \$12-\$25 per acre. Smith indicated that if weeds are rampant in a pasture, this is a small price to pay to help lessen the burden. When weeds are minimal, then the best recommendation is patience and good grazing management

While weed control and management is a useful tactic, it is not the answer to all pasture problems.



PHOTO COURTESY UK COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT.

Other issues, such as low nutrient density, should be managed in other ways.

One of the ways that Smith encouraged nutrient management is through the use of fertilizer.

“Fertilizer is often misunderstood, in how to apply the fertilizer and when you need to apply the fertilizer. When I’m talking about fertilizer in this context, I’m going to talk about particularly in Kentucky, applying lime to change the pH, applying phosphorus and applying potassium. So, the real value of applying those nutrients is maximizing the production and also the stand life. It is safe to apply fertilizers and these particular products when the horses are on the field.” Smith said.

Using the fertilizers Smith mentioned can cost up to \$65 per acre.

For the best results, Smith recommended a soil test be conducted to indicate what is needed so as to not overdo the concentration of a particular nutrient. Pastures should be soil tested every two to three years in order to accurately treat the pasture. Fertilizers may be applied any time of the year, except when the land is wet.

“You can’t fertilize your way out of poor management,” Smith said, meaning overgrazing and poor upkeep of pastures cannot be fixed with fertilizer.

Nitrogen, while it is a fertiliz-

er, is its own entity for the purpose of pasture management. The use of it increases yield. Fall application of nitrogen is recommended and encourages leafy growth, strong roots and early spring growth. Early spring application boosts newly planting seedlings and helps develop overgrazed pastures, but can result in excess pasture growth and more mowing. Remember that nitrogen is beneficial to all plant species, including weeds, so be judicious in the amount of nitrogen applied. The average cost of nitrogen is \$23 per acre.

Smith addressed overseeding as an effective pasture management tool, but one that is often poorly executed. Overseeding allows for growth to occur in bare areas which, in turn, prevents weed growth. Timing and resting the growth is critical to development of the plants. In Kentucky, the ideal time for overseeding is in September.

The ideal planting depth when overseeding is between  $\frac{1}{4}$  and  $\frac{1}{2}$  inches below the soil. Bluegrass does best when planted in the fall but takes a while to gain a decent amount of growth. Orchardgrass is the most shade tolerant grass, and therefore can compete well with existing grasses in a pasture. Perennial and annual ryegrass come up quickly, but since they are short-lived, they should only be used as a temporary fix for muddy or overgrazed areas in a pasture.

Smith closed out the session with

information about resting pastures.

“Resting allows grasses to rebuild leaves and roots after grazing, increases stand life, increases forage quality, favors grasses over weeds, reduces soil erosion and nutrient leaching and the pasture looks better. And the cost of rest is free.” Smith said.

Pastures need to be rested in order to allow existing grasses to regrow leaves and restore carbohydrate reserves in long-term survival, according to Smith. Seedlings in particular are vulnerable to close grazing consistent hoof traffic. Allowing pasture an opportunity to rest also encourages improved forage production, which permits the feeding of less hay and grain.

Smith used images of experiments to further convey his point. The comparisons between rested pasture and continuously grazed pasture growth show that resting is beneficial for plant growth.

To properly rest a pasture, it should be grazed down to 3-4 inches, and then mowed if the pasture is uneven. Horses should be relocated off of the pasture for two to four weeks in order to regrow about 8-10 inches of forage. After this, the horses may be returned to grazing in the pasture. Rotational grazing is a great method to allow pasture resting time.

**FOR ALL OF THE PASTURE MANAGEMENT PRACTICES THAT SMITH DISCUSSED, THE TOTAL COST WOULD BE ABOUT \$153 PER ACRE, DONE EVERY THREE YEARS. BY DOING THIS, THE AMOUNT OF USABLE FORAGE IN A PASTURE MAY BE DOUBLED.**

Smith shared resources for additional information, including the forage extension webpage, The Equine Science Review, county extension agents and the UK Horse Pasture Evaluation Program. A recording of the talk can be found on the [KY Forages YouTube channel](#).

| *Sydney Carter, a junior majoring in equine science and management and minoring in journalism, is a communications and student relations intern with UK Ag Equine Programs.*



# CONTROLLING TROUBLESOME WEEDS IN HORSE PASTURES

Central Kentucky Agricultural Extension agents and University of Kentucky Ag Equine Programs hosted the 11th annual Pastures Please!! pasture management workshop virtually on Jan. 26. The workshop included three expert talks about managing carbohydrates in the equine diet, current herbicide effectiveness on weed control and investments for pasture management.

Bill Witt, PhD, professor emeritus in the Department of Plant and Soil Sciences, led the second discussion of the evening about new herbicides and how they protect against troublesome weeds in horse pastures.

This discussion emphasized that pasture management is a timely matter. Weeds and unwanted grasses are much easier to deal with in the early stages of development rather than the late stages. While there is no “cure-all” herbicide on the market, effective management and strategic use of herbicides can eradicate unwanted plants.

Witt began with the information that in central Kentucky, there are many weed species in pastures due to the region being geographically in the transition zone. He said that there are more than 25 species that can be easily found in a given pasture, but there is not one single herbicide or management practice that by itself controls them all.

With cool season grasses (orchardgrass, bluegrass and fescue), there are several common troublesome weeds: buttercups, thistles, ragweed, dandelions,



PHOTO COURTESY DR. JIMMY HENNING.

poison hemlock, wild violets, yellow foxtail, nimblewill, plantains (buckhorn and broadleaf), purple deadnettle and chickweed.

Nimblewill is a warm-season grass that grows among the cool-season grasses. Due to it being unpalatable to horses, it is considered a weed. There is minimal selective control over this weed and its presence can be the cause for needing complete renovation of a pasture. The other weeds discussed are manageable over several courses of different treatments.

According to Witt, the reason that specialists do not have a “cure-all” weed control tool is due to the difference in time of emergence and growth of the different species.

The new herbicide, DuraCor has the active ingredient of Aminopyralid similar to other herbicides like GrazonNext HL and Milestone. The

ingredient that sets DuraCor apart, however, is floryauxifen-benzyl.

These Aminopyralid-based herbicides kill all broadleaf plants. Witt does not recommend the use of these products if a person intends on keeping clover in their pasture. Proper management of the manure and forage is a necessity when using these products because Aminopyralid remains in manure for months after use.

“Historically we have used Plateau to control tall fescue in horse pastures,” Witt said about the older pre-emergence herbicide. There has been research on its use to minimize yellow foxtail growth, but for this to be effective, the treatment needs to be done in May to early June, pasture grass must be 3-4 inches tall and foxtails should be 4 inches or less in height.

“The other herbicide that is used



occasionally in horse pastures is called Sharpen. It is for pure stands of cool-season grasses and kills clover that's out there, or anything else if it's small. This particular product was being used in the grain crops for a while and is foliar applied," Witt said about the herbicide.

Sharpen should be applied at 1-2 ounces per acre with methylated seed oils at 1% with water or liquid nitrogen. It is functional for small weeds only.

Witt also spoke about spray

drift management. Reading labels carefully and heeding the restrictions are important measures to take. Understanding that the surrounding plants and crops could be impacted by the choice to use herbicides is key to doing so successfully. The active ingredients in an herbicide don't play a role in the physical drift, but they do play a major role in the adverse effects.

Pasture herbicides cause distinct, obvious symptoms. Plants such as grapes, flowers and tomatoes are the most susceptible to injury from

herbicides. Because of this, Witt encouraged getting help using herbicides if a person is uncomfortable spreading the products themselves.

The talk can be seen on the [KY Forages YouTube channel](#).

| *Sydney Carter, a junior majoring in equine science and management and minoring in journalism, is a communications and student relations intern with UK Ag Equine Programs.*

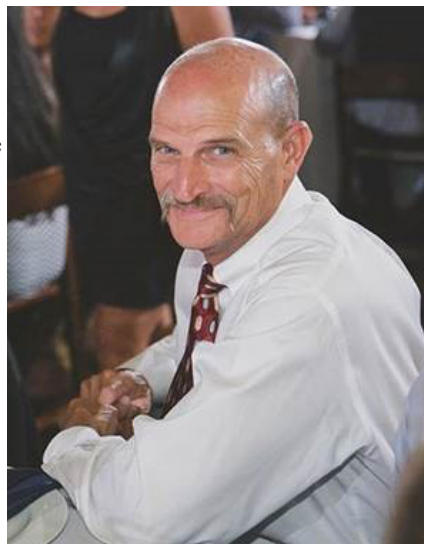
## WOOD NAMED LEADER OF UK AGRICULTURE AND NATURAL RESOURCES EXTENSION

A faculty member with a long history of leadership in the University of Kentucky College of Agriculture, Food and Environment was recently named the assistant director of UK Agriculture and Natural Resources Extension.

Craig Wood, PhD, assumed the leadership position in the UK Cooperative Extension Service Feb. 1. He has served as interim assistant director of the program since 2018.

"Dr. Wood will continue to use his outstanding skills, expertise and visionary leadership to meet challenges and leverage opportunities to move our Agriculture and Natural Resources Extension program forward," said Laura Stephenson, PhD, director of the UK Cooperative Extension Service.

Wood is known across the college for his technology leadership. Prior to becoming interim assistant director, Wood was associate director of the eXtension Initiative. Housed at UK, the initiative provided a one-stop, virtual connection to Cooper-



AS ASSISTANT DIRECTOR, WOOD WILL PROVIDE VISION AND OVERSIGHT FOR AGRICULTURE AND NATURAL RESOURCES AND HORTICULTURE EXTENSION AND WORK WITH EXTENSION SPECIALISTS AND ASSOCIATES TO CONDUCT STATE-LEVEL PROGRAMS. PHOTO PROVIDED.

ative Extension Service specialists across the nation. He also served as director of the Creative Applications for Learning Environments Lab and associate director of UK Agricultural Communications Services.

Wood has been a faculty member in the Department of Animal and Food Sciences since 1985. As

an extension professor, he focused on horse production, management, nutrition and muscle physiology. In this position, he also supervised the Kentucky 4-H Horse Program.

As assistant director, Wood will provide vision and oversight for agriculture and natural resources and horticulture extension and work with extension specialists and associates to conduct state-level programs.

Wood received his bachelor's degree in animal science from Texas Tech University. He earned his master's degree and doctorate, both in animal science, at New Mexico State University.

| *Source: January 29 Edited news release from the UK College of Agriculture, Food and Environment by Katie Pratt, agricultural communications specialist.*

## EDUCATIONAL OPPORTUNITIES

# KY ALFALFA CONFERENCE GOES VIRTUAL IN 2021

Like many events, the Kentucky Alfalfa Conference has moved to an online only format for 2021. Although online, the program will be high quality as always and will provide ample time for discussion and questions. Presentations will be spread over the evenings of March 2,3 and 4. Topics and speakers include:

- Measuring forage quality: Sampling and Interpretation, Chris Teutsch, PhD, extension forage specialist, University of Kentucky Grain and Forage Center of Excellence
- Using forage quality to market hay, Tom Keene, hay specialist, UK Department of Plant and Soil Sciences
- What does past research tell us about drying rate in alfalfa? Jordyn Bush, graduate research assistant, UK Integrated Plant and Soil Sciences Program
- Adjusting hay equipment to minimize field losses, representative from New Holland
- New data on maturity differences in Orchardgrass and Alfalfa – Implications on forage quality, Ray Smith, PhD, professor and extension forage specialist, UK Department of Plant and Soil Sciences
- When weather doesn't cooperate: Which fields do I cut first? Farmer Panel: Dennis Wright-Logan County, Brad Hines-Hart County and Clayton Gerald-Hart County
- Option for managing thinning alfalfa stands, Jimmy Henning, PhD, extension professor, UK Department of Plant and Soil Sciences

There is no cost for attending, and proceedings will be available online soon after the event. Register [here](#).

| *Source: KY Forage News, Jan. 31*

# NOVEL TALL FESCUE RENOVATION WORKSHOP

The University of Kentucky and the Alliance for Grassland Renewal is hosting an in-person workshop in Lexington, Kentucky, March 25, in addition to a three-night virtual workshop Feb. 23-25.

Both workshops will include discussions on tall fescue toxicosis causes, symptoms and management, as well as establishment and first year management of novel endophyte tall fescue varieties and variety selection and quality control. Other topics include on farm economics, producer highlights, product updates from seed companies and cost share programs available to producers.

[Virtual Workshop](#)

[In Person Workshop](#)

Cost for attending the virtual workshop is \$30 and includes a PDF of educational materials and access to the recorded presentations after the live event. The in-person workshop is \$65 and includes lunch and printed materials. COVID restrictions will be in place and masks and social distancing will be required. Continuing education credits for the Certified Crop Advisor (CCA) program and Veterinary CE (AAVSB RACE) have been applied for. An additional, in-person workshop will be held in Mt. Vernon, Missouri, March 23. To learn more, visit [The Alliance for Grassland Renewal](#).

| *Source: KY Forage News, Jan. 31*

