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## Insect-Borne Equine Diseases:



ALEXANDRA BECKSTETT/THE HORSE

A Coggins test screens the horse's blood for antibodies against EIA's causative virus.

During the 2019 University of Kentucky (UK) Equine Showcase, held Jan. 26 in Lexington, Rebecca Ruby BVSc, Dipl. ACVP, of the UK Veterinary Diagnostic Laboratory, educated horse owners about important equine diseases carried or caused by insects.

### Q. What is equine infectious anemia (EIA), and how does a horse get it?

A. EIA is caused by a virus that integrates into the horse's DNA and results in lifelong infection. There is no vaccine and no cure for the disease.

The disease presents in three phases:

- Acute, characterized by high fever and low blood platelet count;
- Chronic recurrent infection, which results in frequent fevers and illness; and
- Inapparent carrier, in which the horse appears healthy outwardly but is infected and can still transmit disease.

The most common natural way EIA spreads is via blood-feeding insects, such as deerflies and horseflies, which take

blood from infected horses and pass it to uninfected ones.

Additionally, an increasing number of EIA cases have been linked to sharing needles and blood doping.

### Q. What can I do to prevent EIA?

A. Many horse owners who travel and compete are familiar with the Coggins test, a blood test that detects antibodies against the EIA virus.

"Only approximately 22% of the U.S. horse population is tested annually," Ruby said.

To prevent EIA spread, Ruby suggested that all horses be tested at least annually, especially new herd additions and those

used as blood or plasma donors. She also stressed that needles and syringes should never be reused or used to inject more than one horse at a time.

Finally, property owners should use environmental and on-animal control, such as topical application of fly sprays to deter flies and help prevent EIA spread.

### Q. What happens if my horse tests positive for EIA?

A. If your horse tests positive, he or she will be quarantined and retested for confirmation. State regulatory officials are always involved in positive cases and will determine the exact steps taken in each case.

Typically, horses within 200 yards of the infected horse are considered exposed and are also quarantined. All exposed horses are tested at 30- to 60-day intervals, and the quarantine ends when horses are negative for at least 60 days.

Because there's no cure for EIA, positive horses must be permanently quarantined at least 200 yards from all other equids and undergo periodic regulatory testing, moved under permit to a federally approved facility, or euthanized.

### Q. What is Potomac horse fever (PHF) and how does a horse get it?

A. Potomac horse fever is caused by the bacteria *Neorickettsia risticii* and can be mild to life-threatening. Within 24 to 48 hours of infection, approximately 60% of infected horses have moderate to severe diarrhea, often accompanied by colic,

## In This Issue

Preventing Water Pollution on Horse Farms	3
Tall Fescue Varieties	5
Inaugural Horse Industry Safety Summit	9
Undergrad Research	10

**INSECT-BORNE EQUINE DISEASES: Q&A**

and some horses develop severe toxemia or dehydration. Laminitis can occur in as many as 40% of affected horses. A horse can present with any combination of the aforementioned clinical signs.

Pregnant mares that develop PHF can abort their foals or fetuses several months following infection.

Case fatality rates vary from 5% to 30% and depend mostly on the strain involved.

The source of the infection includes aquatic insects, such as caddisflies and mayflies. Horses that graze near water bodies can inadvertently ingest the adult insects. Horses can also consume insects attracted by stable lights that subsequently accumulate in feed or water.

**Q. What can I do to prevent PHF?**

**A.** There is a vaccine available to boost a horse's immunity to *N. risticii*. While this vaccine might not prevent illness in some cases, many researchers believe it can reduce the severity of clinical signs if a horse is exposed to the organism, Ruby said. Work with your veterinarian to assess your horse's risk level, determine if he'd benefit from a vaccine, and develop the best course of action to prevent disease.

**Q. How can different parasites affect my horses?**

**A.** *Onchocerca* is a parasite carried by culicoides (midges or no-see-ums) that can

cause dermatitis (itchy skin inflammation) in horses. Midges prefer to bite certain areas on the horse, including the tail, mane, and belly. Once *Onchocerca* enter the horse's system via a midge bite, adults live in the nuchal ligament (on the neck crest) and can produce microfilaria, or larvae, for five years. Ruby said the best treatment is ivermectin, which kills the microfilaria but not the adult.

*Habronema* is a nematode, or worm, that lives in a horse's stomach and can cause summer sores. These sores typically develop on the legs, inner corners of the eyes, and moist areas where the skin's surface is easily broken from irritation.

Ruby also described a common parasite horse owners should protect against—the tapeworm—which is hosted by the oribatid mite. The mites feed off the organic material present in the feces and ingest the tapeworm egg. Eggs develop within the mite and, when the horse later consumes the mite, the parasites travel to the junction of the ileum and cecum. Tapeworms have been associated with colic and intussusceptions, where one section of the intestine telescopes into another.

**Q. What is insect bite hypersensitivity (IBH)?**

**A.** Sometimes called "sweet itch," IBH is the most common allergic skin disease in horses. Ruby said IBH has both genetic and environmental components and can be identified by its clinical signs: hives, itching, hair loss, and inflammation.

**Q. What should I do when my horse shows signs of IBH?**

**A.** If your horse shows IBH signs, first consult your veterinarian. He or she might conduct an intradermal allergy test, which can help determine what is bothering your horse. For severely affected horses, veterinarians frequently use corticosteroids to treat acute signs. After diagnosis, your veterinarian might recommend histamine blockers and allergy shots to help control the disease, along with fly sheets, boots, masks, and insect repellants.

**Q. What common tick-borne diseases affect horses?**

**A.** Technically, ticks are arachnids, not insects. But, they can still transmit bacteria and diseases to horses.

The bacterium *Anaplasma phagocytophilum* lives in a horse's white blood cells, mainly neutrophils, and is transmitted by several tick species. They can transmit the virus horses within two hours of feeding,

**Masthead**

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**The Horse: Your Guide To Equine Health Care**

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Insects carrying PHF's causative agent are drawn to lights and can fall into your horse's feed and water, where he might ingest them inadvertently.

**INSECT-BORNE EQUINE DISEASES: Q&A**

but it can take up to 36 hours for infection to develop. Veterinarians can diagnose this condition by visualizing the bacteria in the neutrophils or via blood testing. Affected horses generally have a high fever during the first day or two of infection; other clinical signs can include depression, anorexia, limb edema (fluid swelling), and reluctance to move. Horses typically recover in about two weeks, but relapses have been reported.

Additionally, Lyme disease, an infection

caused by *Borrelia burgdorferi*, is transmitted via infected ticks and can cause a variety of clinical signs. Owners and veterinarians anecdotally report signs including stiffness and lameness in more than one limb, muscle tenderness, hyperesthesia (hypersensitivity to touch and sound), lethargy, behavioral changes, and muscle wasting and pain over the thoracolumbar area (the horse's lower back). However, only three clinical signs have been experimentally produced with infection, Ruby said: uveitis (a type of eye inflammation), dermatitis and neurologic disease.

Horses that test positive for exposure

range from 14.8% to 94% in different parts of the United States. All current tests detect antibodies against the causative agent (so, exposure rather than infection). Researchers are still working to determine Lyme disease's true role in horses. The first step to diagnosing Lyme disease is to rule out the presence of other diseases. **UK**

>Samantha Geller, a senior double-majoring in equine science and management and environmental and sustainability studies, is a communications intern with UK Ag Equine Programs and the Gluck Equine Research Center.

## Preventing Water Pollution on Your Horse Farm

Tammy Brewster-Barnes, MS, extension associate at UK, spoke to students, veterinarians, farm owners, and horse enthusiasts about horses and the Kentucky Ag Water Quality Act at the 2019 UK Equine Showcase.

She covered water quality issues relating to horse farms, as well as best management practices (BMPs) for preventing water pollution on or near farms, creating a water and soil conservation and nutrient (manure) management plan, and accessing resources available to help landowners comply with the Kentucky Agricultural Water Quality Act (AWQA).

The Kentucky General Assembly passed the Kentucky AWQA in 1994 to protect surface and groundwater resources from pollution resulting from agriculture and forestry activities. The act promotes practical natural resource management systems that protect waterways. It mandates that landowners of 10 or more acres who apply plant-available nutrients or who export manure must develop and implement a nutrient management plan as part of their agriculture water quality plan.

Brewster-Barnes said the agriculture industry is a significant source of nonpoint water pollution—runoff from eroded pastures, manure piles, fertilizer application, and concentrated animal waste. These pollutants frequently enter the watershed through agriculture-related activities and can have devastating impacts on both the environment and horse health.

In terms of water quality, “farmers have the biggest opportunity to make the biggest changes,” she said.

The Kentucky AWQA emphasizes the importance of using effective and economic BMPs to create a water quality plan to reduce and prevent water pollution. It states that BMPs establish the minimum acceptable quality levels for planning, siting, designing, installing, operating, and maintaining agriculture and silviculture

(tree) facilities and operations. Brewster-Barnes said BMPs depend on the property's agricultural activities (i.e., farming the land or raising cattle) as well as water bodies on or near the farm, the land slope, and erosion potential, which all vary from site to site.

### Horses and Water Quality

She said horse owners' biggest concern relating to water quality should be the introduction of excess phosphorus and sediment into Kentucky's creeks, streams, and rivers. Phosphorus is commonly added to horses' diets via concentrates and supplements. When owners feed excess phosphorus, the horse excretes it via waste, after which it can end up as nutrient runoff. This can upset the balance of the aquatic ecosystems downstream.

Phosphorus in manure and commercial fertilizers can be utilized by plants, bind to the soil, or become water-soluble when soil concentrations are too high. Meanwhile, sedimentation in Kentucky's waterways from erosion due to lack of land cover carries soil-bound phosphorus into the water. Then, aquatic plants and

algae utilize the phosphorus, which results in blooms. When these plants and algae die, the water is depleted of oxygen, which negatively affects water quality and could kill fish.

Specific horse industry BMPs vary among farms, but their implementation can help reduce water pollution caused by horses. Examples include good pasture utilization and management, soil testing to determine nutrient concentrations prior to applying fertilizer, proper manure application on fields (which includes proper setback distances from water or sink holes), proper manure storage and composting, and refraining from mowing near creek and pond edges. Brewster-Barnes also recommended owners keep horses away from streams, sinkholes, ponds, forestland, and eroded areas by fencing them off.

She also said certain plants can help mitigate erosion near water sources and create a riparian zone to filter pollutants from pastures before they enter streams, ponds, and sinkholes. “Let plants and grasses do their job,” she said. “That's going



ERICA LARSON/THE HORSE

Keeping horse away from streams and ponds can help reduce water pollution.

**PREVENTING WATER POLLUTION**

to be your filter system.”

Learn more about riparian areas at [www2.ca.uky.edu/agcomm/pubs/id/id175/id175.pdf](http://www2.ca.uky.edu/agcomm/pubs/id/id175/id175.pdf).

**Additional Benefits**

Complying with the Kentucky AWQA has many benefits for farm owners, Brewster-Barnes said, including the ability to participate in cost-sharing programs such as the Kentucky Soil Erosion and Water Quality Cost Share Program, the Natural Resource

Conservation Service’s Environmental Quality Incentives Program, and others. These programs can help farm owners with the costs of implementing BMPs to divert runoff and improve existing pasturelands.

To participate in cost-shares farm owners will likely need to provide a Kentucky agricultural water quality plan; if the property stores manure, a nutrient management plan; a practice plan or goal; and a completed application.

Brewster-Barnes encouraged farm owners to think critically about their properties and identify if they had any issues,

such as manure handling problems, erosion, or low crop or hay yields. Then, she said, they should consider what aspects they could improve upon to boost their property’s productivity and subsequently work on a nutrient and water quality management plan.

There’s no required frequency for plan updates. Brewster-Barnes recommended owners reassess plans every three to five years and/or every time they make significant property changes to ensure they remain up-to-date.

She also emphasized the importance of using resources available to local farms through their county’s Cooperative Extension Service or Conservation District Office. These professionals are familiar with the act and the statewide plan, as well as with how to implement plans at farms, she said.

“I do not look at the Kentucky Ag Water Quality Act like a regulation,” Brewster-Barnes said. “I look at it like a tool.”

The UK Biosystems and Agricultural Engineering Department offers planning tools for landowners to assess their operations and identify BMPs to be included in their water quality plan at [uky.edu/bae/awqp](http://uky.edu/bae/awqp). **UK**

>Samantha Geller, a senior double-majoring in equine science and management and environmental and sustainability studies, is a communications intern with UK Ag Equine Programs and the Gluck Equine Research Center.

**GRAD STUDENT SPOTLIGHT**

**STACI MCGILL**

**From: Chesapeake, Virginia**  
**Degrees and institute where received: BS in Agricultural Biotechnology and Biology and a minor in English, UK**



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Staci McGill had three top choices for her undergraduate studies, but when she came to UK for a College of Agriculture, Food and Environment pre-veterinary information day, she felt like she had come home.

“I always thought people were crazy when they said you wouldn’t know where you were supposed to be until that moment,” she said.

McGill is currently pursuing her master’s in Biosystems and Agricultural Engineering under the direction of Morgan Hayes, PhD, PE, assistant extension professor. She has several research projects in progress, but they all center around ventilation, air quality, and air movement.

In her first study, she examined how different fans and different fan orientations affect the stall environment, specifically temperature, relative humidity, and ammonia levels.

In the second project, she sought to determine if adding air movement across horses during cool-out increases the cooling rate after intense exercise.

Finally, McGill has been working on a two-part study (including an online survey and site visits) on indoor arenas. She hopes to gather information regarding common indoor arena characteristics to make better recommendations for future designs to improve horse and human health.

When asked what her most valuable takeaway from her program was, McGill said, “Research can be completed outside of the lab in ways that directly impact the community in valuable and unique ways.

“I have been in the horse industry for 20 years in a variety of different capacities, from horse owner to breeder, to trainer and groom, and now I get to conduct exciting research to help improve the lives of horses and the people who love them,” she said. “(Studying) biosystems and agricultural engineering allows me to give back in a new and innovative way.”

McGill will finish her master’s this spring and plans to pursue a PhD in biosystems and agricultural engineering. **UK**

>Alexandra Harper, MBA, is the operations and communications coordinator for the UK Ag Equine Programs.

**Improving the Understanding of Equine Parasitology**

Martin Nielsen DVM, PhD, Dipl. ACVM, associate professor at the Gluck Equine Research Center, recently completed a sabbatical in New Zealand. He worked with AgResearch and Massey University, as well as other equine practitioners and farm managers in that country. He also provided secondary education about parasite control at seminars and meetings around the country.

His sabbatical was an extension of a well-established research collaboration with Dave Leathwick, PhD, at AgResearch Grasslands, in Palmerston North. Leathwick, a world-renowned ruminant parasitologist with expertise in disease modelling and predicting parasite transmission and drug resistance development,

**EQUINE PARASITOLOGY**

has worked with Nielsen to develop unique computer models of two major equine parasites: cyathostomins (small strongyles) and ascarids (large roundworms). The collaboration has led to several peer-reviewed studies and conference abstracts.

**Research in New Zealand**

Nielsen and Leathwick refined their existing models and tested predictions in the field by evaluating anthelmintic treatment regimens.

At participating farms, Nielsen separated mares and foals into groups treated with either traditional and currently recommended deworming programs. He evaluated the horses over the next six months, conducting clinical evaluations, body condition scoring, and parasite diagnostics, including a novel test not evaluated for use in horses before. The pair also evaluated new treatment recommendations.

“The New Zealand parasitology research environment is leading in the ruminant field, and the expertise there is very beneficial for my research program,” Nielsen said. “At the same time, New Zealand does not currently possess the same level of



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**The AgResearch group (L to R): Alex Chambers, Chris Miller, Killiana Bekelaar, Tania Waghorn, Luis Carvalho, Nick Palevich, Martin Nielsen, Dave Leathwick, and Christian Sauer mann.**

expertise in equine parasitology, so the benefits of this collaboration have been mutual.”

During his trip, Nielsen also expanded his collaborations with researchers in neighboring Australia, allowing him to stay at the cutting edge in research providing solutions for equine parasite control.

Nielsen’s work was funded by the New Zealand Equine Trust, which supports equine education and research and is a

collaboration between Nielsen, Leathwick, Massey University Veterinary School faculty, and equine veterinary practitioners in the country. [UK](#)

>Samantha Geller, a senior double-majoring in equine science and management and environmental and sustainability studies, is a communications intern with UK Ag Equine Programs and the Gluck Equine Research Center

**Tall Fescue: Endophyte-Infected, Endophyte-Free, and Novel-Endophyte**

Tall fescue (*Lolium arundinaceum*) is one of the most widely grown perennial grasses in the world and covers approximately 37 million acres in the United States alone. It can be infected with an endophytic fungus (*Epichloë coenophiala*), which in a symbiotic relationship with the plant produces chemicals called alkaloids that confer benefits to the plant.

This tall fescue, native to Europe, was introduced into the United States in the 1800s. In 1931, E.N. Fergus, a UK agronomist, collected tall fescue seed from the Suiter farm in Menifee County, Kentucky, on the basis of winter hardiness, persistence in high-traffic areas, and drought resistance, giving rise to the cultivar of fescue known as Kentucky 31 (KY31). However, some of the alkaloids, primarily the ergot alkaloids produced by infected plants, are detrimental to grazing animals, including horses.

Historically, the endocrine hallmark of fescue toxicosis in several animal species is a decrease in the circulating concentration

of the hormone prolactin. Prolactin is secreted by the pituitary gland, and control of its secretion is complex and not completely understood. Prolactin exerts effects on a variety of systems including milk production, steroidogenesis (estrogens, progesterone, and testosterone), hair growth and shedding, libido, and synthesis of surfactant by the fetal lungs. Importantly, prolactin may also exert an effect on the fetoplacental unit by altering steroid synthesis and/or metabolism and maturation of the fetal adrenal-pituitary axis, which is necessary for parturition. One major regulator of prolactin secretion is dopamine, a hormone produced by the hypothalamus. Dopamine interacts with receptors in the pituitary gland and inhibits the secretion of prolactin.

Ergovaline is the most abundant ergot alkaloid in tall fescue. Ergovaline, and several other alkaloids from fescue, have similar chemical structures to dopamine and can bind to dopamine receptors, thereby causing a decrease in prolactin secretion, resulting in partial or complete agalactia (the inability to produce milk) in foaling mares. Additional problems associated with KY31 fescue consumption in foaling mares include altered hormone concentrations, extended gestation, thickened placenta, placental retention, dystocia (difficult birth), birth of dysmature foals, and increased foal and placental weights.



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**Tall fescue is one of the most widely grown perennial grasses in the world.**

## TALL FESCUE

Dopamine receptors have been found in tissues other than the pituitary, including ovarian tissues and the corpus luteum, but the roles of those receptors in fescue toxicosis, if any, have not been fully elucidated. The drug domperidone is frequently used in broodmares that are exposed to KY31 fescue and prevents or reverses the adverse reactions of ergovaline. Domperidone functions by binding to dopamine receptors, but rather than suppressing prolactin production, it competes with dopamine and allows for normal prolactin secretion.

Because of the adverse health effects of common endophyte infected fescue in grazing animals, varieties of tall fescue which do not contain the fungal endophyte have been identified. Even though these endophyte-free varieties

do not produce ergot alkaloids, animal performance is excellent. However, the plants do not persist well in pastures or compete well with other pasture grasses. More recently, endophyte strains that do not produce the alkaloids that are harmful to animals but still confer vigor and persistence to the plant, have been identified and inserted into tall fescue. These are called novel-endophyte varieties of fescue, and some of these are commercially marketed as “Jesup Max Q,” “Texoma Max QII,” and “Baroptima Plus E34.” More recently, “Lacefield Max QII” was released by Tim Phillips, PhD, in the UK Department of Plant and Soil Sciences.

The Alliance for Grassland Renewal is an association of seed companies, universities, and government agencies that regulate themselves by establishing certain quality control standards for novel endophyte tall fescues. For example, all

seeds sold under the alliance tag must be 95% pure, have 70% live (viable) endophyte, and have independent confirmation that the fescue variety does not cause fescue toxicosis in animals and will persist well under conventional grazing conditions.

Although this article emphasizes the effects of ergot alkaloids on a dopaminergic receptor, it is important to remember that some of the alkaloids also bind to other receptor types, including adrenergic and serotonergic receptors, and thus may affect additional body systems.

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*This is an excerpt from Equine Disease Quarterly, funded by underwriters at Lloyd's, London.*

## Will Diatomaceous Earth Kill Worms in Horses?

**Q** Many articles are about deworming horses and how worms are getting immune to the dewormers we're giving them. But how about an old dewormer: diatomaceous earth? Worms will never get “used” to this dewormer because it slices the worms into small pieces. Every morning for about two months in spring and fall I add one heaped spoon of it to my horses' feed.

The larvae-counting manure test does not tell the whole story, as the test cannot count what is left behind in the intestines. In concert with my vet, I had one of my horse's blood tested before the diatomaceous earth and after. Before he tested high on worms. After two months his blood count was back to normal. Mind that I remove the manure from the paddocks every day.

—Irene Louw, *The Netherlands*

**A** Thank you for your comments about parasite control remedies. I do agree that we need reliable alternatives to existing dewormers, as equine parasites have developed some degree of resistance to all of them.

As an equine parasite research scientist, I get many questions from horse owners and veterinarians every year, and diatomaceous earth (a silica-rich powder that's supposedly abrasive to worms) is a clear top scorer. Many people are using it, and lots believe they experience good effects. Unfortunately, this is not backed up by scientific evidence. Several studies have been performed to evaluate this alleged antiparasitic effect, and none of them have shown any effect. My qualified opinion is that the suggested mechanical disruption of parasites is unlikely to occur within the horse's intestine. It might be that the product contains sharp edges, but ingesta will dilute it to a degree where it would be quite easy for the worms to avoid being cut. These worms and larvae are very small, often too small to see with the naked eye, so they would have plenty of chances to avoid any potentially



ALEXANDRA BECKSTETT/THE HORSE

**Removing feces from paddocks dramatically reduces horse parasite burdens, as it constantly removes the source of infection.**

sharp edges. Besides, if the particles are really that sharp, one would expect them to cause lesions in the mucosal membranes of the horse, and that does not appear to be the case. Furthermore, all horses ingest soil and sand, which also can have edges, but we don't see any reduction of parasite loads in response.

Some have suggested that diatomaceous earth would actively disrupt developing parasitic larvae within the fecal pile on pasture. Again, a number of my colleagues evaluated this in controlled studies and found no such effect. All in all, there are no sound biological reasons to expect an antiparasitic effect of diatomaceous earth, and this is supported by research.

I commend you for removing manure from your horses' paddocks every day. That is quite a commitment. Removing feces

**DIATOMACEOUS EARTH**

dramatically reduces parasite burdens, as it constantly removes the source of infection. This is backed up by science, and it is likely the reason you are experiencing low parasite counts. I know of examples where people were able to skip deworming their horses completely as the manure removal effectively kept the parasites at an absolute minimum.

You mention that worms are unlikely to become resistant to a remedy like diatomaceous earth. I often hear people claim this incorrectly. Resistance can develop to any type of treatment remedy, provided it works to begin with, and it does not matter how the remedy works. This is a true example of Darwin's Law of survival of the fittest. Mechanisms for resistance are

countless. If a treatment remedy would indeed effectively reduce parasite burdens by "cutting worms," parasites with different movement patterns or more durable cuticles (flexible exoskeletons) may have an advantage and survive the treatment. Then, these traits will be passed on to the next generation of parasites, and we have selected for a resistant population. Resistance will always develop, no matter the treatment. It is just a matter of how quickly it happens. The only thing parasites will not be able to develop resistance to is pasture and paddock hygiene. So keep up the good work! **UK**

>Martin Nielsen, DVM, PhD, Dipl. ACVM, is an associate professor of parasitology and the Schlaikjer professor in equine infectious disease at the UK Gluck Equine Research Center.

**Who's Involved With Horses? Researchers Finding Out**

Karin Pekarchik, MS, and Kimberly Tumlin, PhD, MPH, MS, both from UK, are seeking participation for an online research survey to better understand who participates in horse activities and sports.

"Portrait of a Rider: Characterizing Active Participants in Horse Activities and Horse Sports" is a survey that will help qualify socioeconomic factors and type of participation of equestrians, which includes any person (rider, handler, worker, etc.) who interacts with horses. Compared to the number of studies carried out on horses and their health, there's been little research conducted on equestrians, despite the industry's global economic importance.

"This survey is an important step in making sure we understand who participates in the industry, where they are, and generally get more detail on their backgrounds," Pekarchik said. "There are some pressures to participation rates and workforce development in different areas of the industry, and this is one way to give everyone an opportunity to be counted."



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**While there are currently generalizations about who participates in equine sports, the researchers hope to determine if they accurately reflect socioeconomic factors or are simply perceptions based on stereotypes.**

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## WHO'S INVOLVED WITH HORSES?

Although there are generalizations about who participates in equine sports, the researchers say it's unclear if they accurately reflect socioeconomic factors or are simply perceptions based on stereotypes. Pekarchik and Tumlin said they hope to receive completed surveys from at least 1,000 participants, which would allow them to create a statistically valid portrait of horse activity participants.

"There are many preconceived notions that being involved in the equine industry is precluded by having economic stability," Tumlin said. "This survey is aimed at understanding potential disparities that we have observed but are not widely documented in the various sectors of equestrian participation."

The online survey is open to anyone over the age of 18, will be distributed in the United States and internationally, and will be open until March 31. To participate, visit [uky.az1.qualtrics.com/jfe/form/SV\\_6qTJQ6H7CT5jMtn](http://uky.az1.qualtrics.com/jfe/form/SV_6qTJQ6H7CT5jMtn).

### About the Researchers

An interdisciplinary team, Pekarchik and Tumlin have been conducting equestrian research for several years. Previously, they mentored two UK student groups in an engineering senior design course to address equestrian bra design and used wireless sensor systems to quantify the lumbar impact of riding on the equestrian's spine.

Recently, Tumlin and Pekarchik, along with Mike Sama, PhD, PE, an engineer at UK, received funding from the Central Appalachian Regional Education and Research Center to explore impacts of biomechanical forces on the equestrian spine more fully. The funding will support a collaboration with the North American Racing Academy (NARA), a Lexington, Kentucky, race-training program. Students at NARA will participate in both riding and simulated racing experiences while wearing newly engineered sensor systems designed to measure spine impacts. Eventually, Pekarchik and Tumlin will compare the impacts of riding to other sports activities to better understand the effects on the body.

In 2018, Pekarchik and Tumlin co-founded an international community of practice focused on equestrian health. The community of practice members are researchers, instructors, and practitioners in fields related to equestrianism, and, as a group, they are writing a comprehensive

publication that will outline the strengths and weaknesses of the research currently available about equestrian/handler health, making recommendations to further address equestrians' health and wellness. Broadly, the publication will provide information about who participates in equestrian activities; riding and working with horses across their lifespan; the psychology of riding; and biomechanics,

saddle fit, and equipment. The final paper is expected to be published no later than 2021. To learn more about the Female Equestrian Community of Practice, visit [uky.edu/equestrians](http://uky.edu/equestrians). **UK**

>Karin Pekarchik, MS, is a senior extension associate for distance learning within the UK Department of Biosystems and Agricultural Engineering.

## Horse Industry Safety Summit to Promote Education

UK Ag Equine Programs, Saddle Up Safely, and other partnering organizations will host an inaugural Horse Industry Safety Summit on Tuesday, April 23, prior to the Land Rover Kentucky Three-Day Event, taking place at the Kentucky Horse Park, in Lexington.

The event will be held at Spindletop Hall, 3414 Iron Works Pike, also in Lexington, from 7:30 a.m. to 6:30 p.m. and will host researchers, equestrians, and other equine enthusiasts. Featuring panels of experts, individual speakers, and poster presentations, the summit will focus solely on ways to keep horse riders and handlers safe.

"Saddle Up Safely and the University of Kentucky are thrilled to gather this stellar lineup of professionals from all facets of equestrian sport to highlight the importance of safety in all aspects of equine interaction," said Fernanda Camargo, DVM, PhD, UK associate professor and equine extension specialist. "Working with horses inherently places riders and handlers at risk. We look forward to offering an event entirely focused on what can be done to keep people safe when working around horses."

Sessions will include discussions on:

- Helmets and helmet testing;
- Traumatic brain injuries;
- The safest way to fall from a horse;
- Concussion protocol;
- Protective vests; and
- How competitors and competition organizers view safety.

The summit organizing committee consists of representatives from the UK College of Agriculture, Food and Environment's Ag Equine Programs, the UK College of Health Science, Kentucky 4-H Horse Program, United States Pony Clubs, New Vocations Racehorse Adoption Program, Retired Racehorse Project, Saddle Up Safely, the North American Racing Academy, and the UK College of Public Health.

The Horse Industry Safety Summit is sponsored by the Kentucky Horse Council, the Kentucky Department of Agriculture, the National Horsemen's Benevolent and Protective Association, and Dinsmore Equine Law/Laura Holoubek.

Registration is \$50 per person and includes lunch. For more information and/or to register, visit [eventbrite.com/e/horse-industry-safety-summit-tickets-49906582933](http://eventbrite.com/e/horse-industry-safety-summit-tickets-49906582933). **UK**

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



ANNE M. EBERHARDT/THE HORSE

Sessions will include, among other topics, discussions on traumatic brain injuries and concussion protocol for equestrians.

## Undergraduate Students Participate in Equine Research



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Urschel said students who want to get involved with research but might not have a lot of time due to classes are still welcome to join in research efforts, which might mean helping with horse care, collecting samples, and running lab work.

As a land-grant institution, one of UK's key missions is to facilitate learning through hands-on experience, expand knowledge through transformational research, and prepare its students of today to be the scientists of tomorrow.

Students who participate in research can break out of the normal classroom routine and apply their learning in new ways. Students gain hands-on skills by going into laboratories, pastures, and barns with research faculty that ultimately can translate into meaningful work in a future career.

Undergraduate students at UK have an unparalleled opportunity to participate in equine research through the Gluck Equine Research Center; the College of Engineering; the College of Agriculture, Food and Environment; and many other departments. Undergrads can take part in and learn from equine research in areas ranging from nutrition, parasitology, facility design, racetrack surfaces, and endocrinology to immunology, musculoskeletal science, plant and soil science, and more. Here's a look at how some students are jumping into equine research during their undergraduate studies.

### New Equine Surgical Tools

Kayla Danicki, a senior majoring in biosystems and agricultural engineering

and minoring in biomedical engineering, is working with Mick Peterson, PhD, director of UK Ag Equine Programs, as an undergraduate researcher.

Danicki, who has an interest in animal biomechanics, has been working with Peterson to develop an equine surgical tool, which she recently presented to her peers and renowned equine surgeon Elizabeth Santschi DVM, Dipl. ACVS, professor of equine surgery at the Kansas State University Veterinary Health Center, in Manhattan.

Santschi initially approached Peterson about the project. "She asked if we could work with her on this, and I said I needed to find the right person," he said.

Danicki noted, "The biggest thing that I have learned from my time as an undergraduate researcher is what it is like to be a research-based engineer. Within engineering, there are two types of engineers: engineers who work in the field and engineers who conduct research. Through my hands-on experience, I have learned that working as either type of engineer would be a good fit for me because I have completed tasks that would apply to both types."

### Equine Parasitology Advancements

Martin Nielsen, DVM, PhD, Dipl. ACVM, associate professor at the Gluck Equine

Research Center, who supervises four graduate students and around 10 undergraduates each year, typifies the passion many faculty have about being an integral part of the undergraduate experience.

"Supervising undergraduate students doing research projects is one of my most rewarding tasks," he said.

Nielsen works with his students to create meaningful research projects that not only seek to find answers to a question but will also help them improve their skills and provide hands-on research experience.

"Typically, I ask the student to think about some project ideas and do some reading before they meet with me," he said. "Then, during our subsequent discussions, we identify a project that may be more or less related to their initial idea. I then ask the student to work out a study protocol and we again meet to discuss.

"Eventually, they proceed with executing the study, generating the data, analyzing and interpreting the data, and finally writing the report."

Nielsen said his goal is to expose students to research and show them how good research ideas take time, collaboration, and discussion.

In his lab, Nielsen said he works hard to foster a healthy learning environment where he and his graduate and undergraduate students work together to get a true experience of working as part of a dynamic research laboratory with several ongoing activities.

"I never stop being impressed by these young people who show up with a great attitude just wanting to learn as much as possible," he said.

Jamie Norris, a current parasitology graduate student at the Gluck Center, was once an undergraduate researcher. He found his passion for research while working extensively in Nielsen's laboratory beginning in 2013. Norris was looking to fulfill his internship requirement for his degree in animal science with an equine specialization at UK. Norris met with Nielsen and, very soon after, began working in his lab.

"This, in a broad sense, exposed me to a new possibility which I hadn't really considered for what to pursue after graduation," Norris said. "It allowed me to experience what it was really like being able to put to use some of the information that I had acquired as an undergrad and to be able to apply creativity and abstract thought to questions arising from working in Dr. Nielsen's lab."

## UNDERGRAD EQUINE RESEARCH

Undergraduate students involved in research are encouraged to share their work with fellow students, publish their findings, or present at academic conferences. And, while working in the laboratory as an undergrad, Norris had the chance to present his research at the American Association of Veterinary Parasitologists conference.

Norris recalled that it was intimidating to meet such influential people in his field. But, after attending the same conference as a graduate student, he said the connections he made the first time helped him network with more industry professionals the second.

Nielsen requires his undergraduate students to submit written reports upon completion of their research project(s). As a result, a large proportion of his students have subsequently published their work in peer-reviewed scientific journals, which Nielsen said is a tremendous accomplishment for an undergraduate.

As an undergraduate, Norris published his study, “[Determination of the specific gravity of eggs of equine strongylids, \*Parascaris\* spp., and \*Anoplocephala perfoliata\*](#),” in *Veterinary Parasitology*. He will be publishing another report on studies from his undergraduate career in the near future.

Looking back, Norris said he believes beginning to work in Nielsen’s lab was a pivotal time in his life.

“I don’t think I would have considered graduate school as an option had I not worked for Dr. Nielsen,” he said.

Norris is now pursuing his doctorate under the direction of Dan Howe, PhD, professor and molecular parasitologist at the Gluck Center.

### All Hands On Deck

Kristine Urschel, PhD, associate professor in the UK Department of Animal and Food Sciences and director of undergraduate studies for the equine science and management undergraduate degree program, believes undergraduate research should be accessible to all students. She herself maintains an open door policy, where any student who wants to learn is welcome.

Urschel’s undergraduates can be found working in the lab or with horses at UK’s Maine Chance Farm. She said undergrad research allows students to get hand-on experience working in laboratories and with faculty mem-

bers. Students gain confidence in lab skills, horse-handling, troubleshooting, thinking on their feet, and experimental design, as well as learning the importance of following protocol, all of which students can use in their future careers or graduate studies.

She said she believes undergraduate research makes students more marketable to graduate school programs and future employers because it shows that the student has a good understanding of research. It also allows students the opportunity to decide if research is a path they’d like to follow.

“I’d at least encourage them to come out and watch, see what’s going on, and talk to a variety of researchers,” Urschel said.

Students who want to get involved with research but might not have much time due to classes are still welcome to join in Urschel’s efforts through helping with animal husbandry, collecting samples, and running lab work, she said. Those who want to be more involved with research can implement it into their coursework through experiential learning, internship experiences, or independent study courses, she said.

These students often work with their professor(s) to create a plan for how they will be involved in the ongoing research happening in the lab, or they might create their own project designed in conjunction with their professor.

“We rarely ever have the problem of too many hands,” Urschel said, adding that she welcomes any student who is interested in finding out more about equine research.

Students often find out about research opportunities through academic advisors, faculty, or staff who help plan coursework and connect them with research faculty. If a student is interested in getting involved, they are encouraged to contact their advisor or visit the Office of Undergraduate Research website at [uky.edu/chellgren/undergraduate-research](http://uky.edu/chellgren/undergraduate-research), where they can find information on how to get involved in research around campus. **UK**

>Samantha Geller, a senior double-majoring in equine science and management and environmental and sustainability studies, is a communications intern with UK Ag Equine Programs and the Gluck Equine Research Center.

## The Genetic Mutations Behind Dwarfism in Horses

Scientists categorize dwarfism in horses as being either proportional or disproportional. Proportional dwarfism is exactly like it sounds: Everything is smaller. With disproportional dwarfism, however, only some of the body parts are smaller, putting the individual visibly out of proportion.

Dwarfism results from a genetic mutation affecting growth. Proportionate dwarfism appears to be linked to the wither height gene—*HMG2* found on equine chromosome 6. Swiss geneticist Mirjam Frischknecht, PhD, of the University of Bern and of Agroscope in Avenches, announced her discovery of the gene’s connection with wither height in ponies in 2015.

The following year, Swedish researchers revealed the harmful effects of short stature homeobox (*SHOX*) gene mutations in Shetlands and Miniature Horses. When the *SHOX* gene or the nearby cytokine receptorlike factor 2 (*CRLF-2*) gene is deleted, the legs grow crookedly, in a condition known as skeletal atavism. Sometimes confused with true dwarfism, skeletal atavism causes Miniature Horses to have splayed limbs



COURTESY OF THE PEEPS FOUNDATION

Scientists categorize dwarfism in horses as being either proportional or disproportional.

**DWARFISM GENETICS**

that are sometimes so severe the animal must be euthanized, says Carl-Johan Rubin, PhD, of Uppsala University, in Sweden.

Meanwhile, John Eberth, MS, a PhD candidate at the Gluck Equine Research Center, has been conducting genetic studies on true disproportionate dwarfs in Miniature Horse herds. Having grown up on Miniature Horse farms and experienced firsthand the “tragedy” of dwarfism, he says he was determined to find the mutations responsible for the condition.

Mutations or deletions in the Aggrecan (ACAN) gene on equine chromosome 1 appear to be directly related to disproportionate dwarfism in these animals, Eberth says. His work has revealed two deletions and two nucleotide substitutions within the gene that would lead to dwarfism if both (apparently normal) parents passed on the mutation. Each mutation corresponds to a slightly different form of dwarfism (mainly in the proportions of body parts), he says. But some individuals have more than one type of mutation, so they end up with a mix of dwarfism features. As for breeding a carrier of the SHOX mutation to a carrier of the ACAN mutation, Eberth says, “we do not know of any dwarfs that result from those crosses.”

“The Aggrecan gene is responsible for the formation of the cartilage that turns into elongating bone during bone growth (a process known as ossification),” Eberth says. “But these deletions cause certain proteins to not work correctly, so they can’t create the proper matrix structure in the cartilage that leads to proper bone formation.” The result is stunted skeletal growth with short, thick bones and fused joints, he says. **UK**

>Christa Lesté-Lasserre, MA, is a freelance writer based in France.

**Upcoming Event**

**Feb. 27 – 9 a.m. – 4 p.m.**  
**The Kentucky Journal of Equine, Agricultural, & Natural Resources Law Fifth Annual Symposium**  
 Gatton Student Center Senate Chamber  
 Register at [kjeanrl.com/symposium-registration](http://kjeanrl.com/symposium-registration)

**UK Hosts 8th Equine Showcase**

On Jan. 26 UK Ag Equine Programs hosted its 8th Annual UK Equine Showcase at the Fayette County Extension office, in Lexington.

This year’s event, which highlighted equine studies being conducted by UK researchers, was designed to educate veterinarians, farm managers, horse owners, students, and equine enthusiasts on horse health topics, with an emphasis on pest management.

Lecture topics and presenters included:

- **Insects and Horse Health: What You Need to Know**, presented by Zainulabeduddin Syed, PhD, assistant professor in the Department of Entomology;
- **Important Equine Diseases Carried by Insects**, presented by Rebecca Ruby, MSc, BVSc, Dipl. AVCP, assistant professor in the Department of Veterinary Science;
- **Vector-Borne Disease Affecting Horses and Humans**, presented by Peter Timoney, MVB, PhD, FRCVS, Frederick Van Lennep Chair in Equine Veterinary Science at the Gluck Equine Research Center;
- **Making Your Barn Horse-Friendly and Insect-Averse**, presented by Morgan Hayes, PhD, PE, assistant extension professor in the Department of Biosystems and Agricultural Engineering;
- **Managing Mud and Manure**, presented by Steve Higgins, PhD, director of environmental compliance for the Agricultural Experiment Station, Department of Biosystems and Agricultural Engineering; and
- **Horses and the Ag Water Quality Act**, presented by Tammy Brewster-Barnes, MS, cooperative extension.

Hallway Feeds, McCauley Feeds, and Tribute Equine Nutrition sponsored the event. Hagyard Equine Medical Institute, Kentucky Performance Products, Rood & Riddle Equine Hospital, and The Pond Lady provided additional support.



PHOTOS COURTESY UNIVERSITY OF KENTUCKY

**Tammy Brewster-Barnes**



**Dr. Steve Higgins**



**Dr. Rebecca Ruby**



**Dr. Peter Timoney**



**Dr. Zainulabeduddin Syed**