University of Kentucky

Bluegrass Equine DIGEST

theHORSE.com
YOUR GUIDE TO EQUINE HEALTH CARE

CA.UKY.EDU/EQUINE | THEHORSE.com | APRIL 2019

AHP Equine Media Awards 2017 Winner

BROUGHT TO YOU BY zoetis

$100,000 Grant Will Establish Equine Surfaces and Safety Laboratory at UK

SAM GELLER, UK AG EQUINE PROGRAMS INTERN

Funds will be used to renovate space in the UK College of Agriculture, Food and Environment to create the NTRA Charities Equine Surfaces and Safety Laboratory.

A gift of $100,000, announced April 17 by the National Thoroughbred Racing Association (NTRA) Charities, will enable the University of Kentucky (UK) to further support equine surfaces and safety research under the direction of Mick Peterson, PhD.

The funds will be used to renovate existing space within the UK College of Agriculture, Food and Environment to create the NTRA Charities Equine Surfaces and Safety Laboratory. The investment will allow UK to impact the sport of horse racing through surface and safety research conducted by Peterson, a nationally known expert in surface safety, director of UK Ag Equine programs, and a faculty member in the UK Department of Biosystems and Agricultural Engineering.

"NTRA Charities is excited to support UK's new Equine Surfaces and Safety Research Laboratory, which through its important work will absolutely lead to a safer racing environment for our human and equine athletes," said NTRA president and CEO Alex Waldrop. "This presents a unique opportunity to achieve significant advancements in the science of creating and maintaining safer racetrack surfaces. This lab will also help us train the next generation of track maintenance personnel to analyze the wealth of data that will soon be available to keep racing surfaces as safe as possible."

In 2016, UK acted upon the recognized need to expand its surface safety research capabilities and recruited Peterson. He brought the Racing Surfaces Testing Laboratory (RSTL) to Kentucky and continues his work to improve horse and rider safety in horse racing and sporting endeavors.

"NTRA has reviewed variations on this proposal for nearly two years, and we are very pleased to see it go forward," said Steve Koch, executive director of the NTRA Safety and Integrity Alliance. "The job does not end here. We anticipate continued calls on the industry to fund specific surfaces research projects undertaken in this new laboratory."

Nancy Cox, MS, PhD, dean of the UK College of Agriculture, Food and Environment, added, "The UK College of Agriculture, Food and Environment is committed to our signature equine industry in all ways. In particular, we are dedicated to all aspects of safety in our sport. This gift allows us to do important research to assist Thoroughbred racing and to create a pipeline of experts to serve racetrack safety."

Under Peterson's direction, the RSTL has been particularly effective at reinforcing the welfare and safety commitment through its central testing laboratory for dirt, turf, and synthetic racing surface materials. To date, testing has included more than 70 racing and training tracks around the world. Equipment development from the lab includes riding crop design assessment, testing maintenance equipment, and performance tests of starting gate and rail padding.

The RSTL materials laboratory inspired efforts by the Fédération

In This Issue

SURFACES AND SAFETY LABORATORY

Équestre Internationale that have now expanded to arena surfaces testing, including large-scale sample analysis that is available only in Sweden.

"This laboratory will allow us to do racetrack surfaces testing on a larger scale to permit us to replicate surface properties using maintenance equipment on the surfaces, which have been observed on racetracks but are not well-understood," Peterson said. "Understanding racetrack maintenance is key to providing a consistent racing surface regardless of the weather."

Laboratory staff will work to solve current surface and safety problems through research. Projects that are currently funded but have previously been space constrained include:

- The development of real-time moisture sensors for racing surfaces;
- Shoeing effects on swing-phase joint loading;
- Real-time gait parameter sensing;
- Subsurface racetrack design;
- The effect of harrowing on the racetrack hardpan's formation; and
- New tools for measuring cushion depth on dirt racetracks and moisture and penetration resistance on turf tracks.

The laboratory has the potential to offer substantial new areas for industry development, including:

- The effect of a harrowed racing surface on optimal helmet design;
- The potential for new horseshoe designs to reduce loading rate for arteriosclerosis risk reduction; and
- The development of new sensors for fan engagement and handicapping data using "internet of things" technologies.

Additionally, the expanded laboratory will provide space for undergraduate and graduate students to learn from and participate in innovative research and for important entities within the industry, such as track superintendents, to advance their knowledge and skills in a hands-on setting.

Renovation is expected to begin by summer, with space beginning to be used for research within a few months. UK

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

Commentary: How Computer Models Could Change Horse Parasite Control

Resistance to dewormers is a huge problem when it comes to equine intestinal parasites. No single product is free from resistance, and the situation is slowly getting worse. No new dewormer product classes have been introduced to the equine market for more than 30 years, and we do not expect any new products in foreseeable future.

COURTESY DR. MARTIN NIELSEN

The New Zealand group with Nielsen (third from the right) and colleagues Leathwick (second from right) and Sauermann (far right)

To mitigate the situation, parasitologists and veterinarians have long recommended reducing anthelmintic (dewormer) use and switching to deworming strategies involving parasite egg-count-based approaches, in which veterinarians monitor horses' response to anthelmintic treatment and their level of strongyle parasite egg shedding. This is all great, but the problem is that dewormer resistance is very slow to develop—it typically takes a few decades to establish. This means that it is very challenging to study how we can best slow the development of resistance and maintain effective products for our horses at the same time.

Masthead

University of Kentucky Ag Equine Programs

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

Bluegrass Equine Digest Advisory Board

Bob Coleman, PhD, PAS, associate professor and extension horse specialist

David Horohov, MS, PhD, chair of UK's Department of Veterinary Science and director of the UK Gluck Equine Research Center

Michael "Mick" Peterson, PhD, director of UK Ag Equine Programs and professor in the department of biosystems and agricultural engineering

Ray Smith, PhD, professor and forage extension specialist in the department of plant and soil sciences

Jill Stowe, PhD, associate professor in the department of agricultural economics

Bluegrass Equine Digest Editorial Committee

Craig Carter, DVM, PhD, Dipl. ACVPM, director and professor of the UK Veterinary Diagnostic Laboratory

Laurie Lawrence, PhD, professor in the department of animal and food sciences

Krista Lea, MS, coordinator of UK's Horse Pasture Evaluation Program in the department of plant and soil sciences

Martin Nielsen, DVM, PhD, Dipl. EVPC, ACVM, associate professor at the UK Gluck Equine Research Center

The Horse: Your Guide To Equine Health Care

Erica Larson, News Editor

Brian Turner, Layout and Design

The *Bluegrass Equine Digest* is a registered trademark of the University of Kentucky Ag Equine Programs and Gluck Equine Research Center. The *Bluegrass Equine Digest* is produced by the University of Kentucky in partnership with TheHorse.com and sponsor Zoetis. It is published monthly to provide up-to-date information on equine research from the University of Kentucky's College of Agriculture, Food and Environment.

Past issues of the Bluegrass Equine Digest are available at www2.ca.uky.edu/equine/bed.

PARASITE CONTROL

Research study funding sources usually cover projects going over a year, two years, and in rare cases, up to about five years in length. We don't have access to funding that allows us to set up a study going over 10 to 20 years, which is what we would need to study dewormer resistance development in horse parasites. This is where the computer model comes into play.

In constructing the model, we carefully read through every study ever published about the biology, life cycle, epidemiology, and immunology related to equine small strongyle parasites. Following this, we started defining the "rules" the parasites appear to be following, how they respond to weather conditions and climate, how horses respond to parasites, and how parasites progress through their life cycle stages. We then validated these assumptions against published data from several studies to assure the model generated reasonable outputs. The next step was to incorporate genetic resistance mechanisms and their mode of inheritance.

The end result: We now have a model that allows us to evaluate all possible parasite control strategies. We can import data from any weather station in the world and produce model outputs relevant to the given location. We can evaluate the impact of treatment intensity, drug rotation, combination deworming, egg-count-based strategies, etc. We can take into account how old the horses are and when they are turned out on pasture. We can study the impact of parasite control programs over periods of 40 years to fully understand the long-term consequences of our parasite control efforts. We can evaluate the development of resistance as well as the reduction of parasite burdens. We have a powerful tool allowing us to ask questions we haven't been able to ask before.

In our recently published papers, we demonstrate this model's utility. We show how controlling small strongyle parasites requires entirely different approaches in different climates and in different age groups. Handling a group of yearlings is substantially different from handling a group of mature adult horses. Dewormer resistance develops more quickly in younger horses and in warmer climates. We have also documented how the time of year plays a big role in how quickly resistance develops. In colder climates, treatments administered during spring lead to resistance much more quickly than treating with the same dewormer products in the fall—this has never been shown before. We have more simulation studies in the pipeline and will keep exploring questions pertaining to equine parasite control going forward.

The work is a result of a collaboration between my lab, which includes my graduate students, most notably Jessica Scare, and Dave Leathwick, PhD, from AgResearch in New Zealand. Dave is a world-renowned ruminant parasitologist with vast experience and expertise in sheep, cattle, and deer parasitology. He has led the scientific field of parasite computer simulation for the past several decades. He reached out to me several years ago as he was about to venture into horse parasitology. He felt he didn't know enough about horse parasites to comfortably start working on a model, so he scouted me out. This led to a wonderful collaboration with him and his research associate Christian Sauermann, PhD.

I must admit I was a bit skeptical about computer modeling at first, but this has been such an eye-opener to me. Working with constructing a model has been an incredibly effective way to organize all the information and identify our knowledge gaps. As such, the model is not only an extremely useful research tool but it also highlights our research needs and, thus, serves as an excellent source of inspiration for new research projects.

Find the collaborative research paper at authors.elsevier.com/a/1Yt4Z15DeCMHAJ, where it is available in full for free for 50 days. UK

>Martin Nielsen, DVM, PhD, Dipl. ACVM, is the Schlaikjer Professor of Equine Infectious Disease and Associate Professor at the Gluck Equine Research Center.

Commentary: Racing Surfaces: Risks and Research

By Mick Peterson, PhD, director of UK Ag Equine Programs, executive director of the Racing Surfaces Testing Laboratory, and professor of biosystems and agricultural engineering at UK; and C. Wayne McIlwraith, BVSc, PhD, DSc, FRCVS, Dipl. ACVS, an equine orthopedic surgeon and a University Distinguished Professor and Barbara Cox Anthony University Chair in Orthopaedics at Colorado State University (CSU).

While the development of an optimal racing surface remains elusive, the last 20 years have seen considerable progress. On the topic of racing surfaces, we have during this time published 14 studies in refereed journals, advised two PhD dissertations and four master's theses, and, whenever possible, put these ideas into practice. The challenge remains; we must reduce the inconsistency of racing surfaces in a range of climates and weather.

This somewhat eclectic mixture of an engineer and an equine orthopedic surgeon first got together at CSU in 1998. We started with the biological question of cyclic trauma and bone microdamage leading to fracture (characterized by Dr. Chris Kawcak [DVM, PhD, Dipl. ACVS, ACVSMR] in his PhD work at CSU) and then started on the best engineering approach. Our first study examined the possible effects of different dirt racetrack surfaces by using dynamic modeling of the horse and track to quantify the

ANNE M. EBERHARDT/THE HORSE

While the development of an optimal racing surface remains elusive, the last 20 years have seen considerable progress.

vertical loading of the lower limb, which was published in 2000.

With the support of AQHA (American Quarter Horse Association) Racing, we then developed a biomechanical test machine to replicate the loads and speeds of a Thoroughbred forelimb at the gallop. This machine was used to evaluate hoof track interface in racehorses as well as the effects of track maintenance on mechanical properties at Hollywood Park, Santa Anita, and Del Mar, all in California. Like many studies, this effort raised more questions than it answered. However, we quickly moved from understanding to trying to reduce the inconsistency we observed.

Our first attempt at reducing variation took the form of developing a way to inspect the track base. With support from the Southern California Equine Foundation, we pioneered the use of ground-penetrating radar to inspect the base of the racetrack. The next challenge was the inconsistency of the track composition. At that time, different material testing labs were used throughout the industry with inconsistent test methods. The first material testing laboratory in the world focused on racetrack materials was established with leadership from Dan Fick at The Jockey Club. With funding from an industry consortium, we co-founded the nonprofit Racing Surfaces Testing Laboratory. Progress continued as a part of Churchill Downs' Safety from Start to Finish initiative. This support allowed us to develop the first standard test protocol for racing surfaces, which combined material testing, base inspection, and biomechanical testing of the surfaces. More recently, the New York Governor's Task Force emphasized the need for electronic records and consistency of daily testing. Throughout this work, one theme repeated: The consistency of racing surfaces needs to improve.

From a pragmatic perspective, each source of variation in the surfaces was systematically addressed. Borrowing the language of American manufacturing, we were addressing our process variation to move toward a six-sigma process. It is impossible to eliminate defects; in manufacturing, a six-sigma process reduces defects to a statistical chance of one defect in 3.4 million parts. In manufacturing, a six-sigma process means most workers and consumers will never encounter a defective part. We need to make sure the same is true of a catastrophic injury. When lives are at risk on an airplane or from a horse racing surface, risk minimization must be central.

The death of a racehorse from a catastrophic injury is far too common at 1.6 horses per 1,000 starts on all surfaces. Catastrophic injuries are difficult to study because of the uncertainty of their occurrence and multiple causes. Therefore, it is critical that every veterinary check and every piece of maintenance equipment is perfect every day. The injury of a horse or rider is a failure of multiple systems, including pre-race exams, the inability to recognize early microdamage, medication rules, and preparation of the racing surface. In other words, either the nearly perfect horse on an imperfect surface or an imperfect horse on the nearly perfect surface provides opportunity for catastrophic injury. How do we improve this one part of the multifactorial equation and obtain a nearly perfect, or six-sigma perfect, surface?

"The most comprehensive academic paper on the Equine Injury Database controlled for all the other known variables found the same result: Synthetic surfaces are safer."

DRS. MICK PETERSON AND WAYNE MCILWRAITH

"Synthetic Surfaces Are Safer"

Based on more than two decades of work with racing surfaces, the single most significant variable on a dirt or turf racing surface is moisture content. To provide an optimal footing, the moisture content of the surface must be consistent. Like walking on a beach, the wet areas near the water result in deeper footprints as do the drier areas away from the water. Synthetic surfaces reduce the effect of water dramatically. The wax coating not only assists in the movement of water through the surface but also reduces the role of water in friction between the grain particles. The effect is undeniable. In the annual results from The Jockey Club's Equine Injury Database, synthetic surfaces reduce overall injury rates from 2.0/1,000 starts on dirt to 1.2/1,000 starts on synthetic. The most comprehensive academic paper on the Equine Injury Database controlled for all other known variables found the same result: Synthetic surfaces are safer. For the 380,000 starts over the last decade on synthetic surfaces, that difference in injury rates represents 300 fewer horses lost and 300 riders who were not put at risk.

However, questions remain with synthetic surfaces: They become difficult to maintain with age, and trainers continue to question if the careers are genuinely longer for horses who race on synthetic surfaces. It has been speculated that a different pattern of injuries is leading to shorter careers from racing on synthetic surfaces. Research by John Bridge (PhD, PE) at University of Washington Bothell has looked at the mechanisms of wax degradation in racetracks. This approach has the potential to extend the life of these surfaces to ensure a consistently safe surface over time. Concerns by trainers about the length of racing careers must also be addressed. If the biomechanics of these surfaces lead to a different pattern of career-ending injuries, a redesigned synthetic might produce better biomechanics. However, the data are clear: Synthetic surfaces are safer.

Dirt and Turf Dominate

While synthetic surfaces are obvious solutions for a number of locations and racing conditions, unanswered questions and the short life span limits their applicability. Turf and dirt racing currently dominate the horse racing industry. Closing the gap in catastrophic injuries from 2.0/1,000 starts on dirt to 1.2/1,000 starts on synthetic or reducing the rate of 1.5/1,000 starts on turf requires a multipronged approach. The Equine Injury Database data show a large variation in injury rates between years on both dirt and turf surfaces. In some cases, differences between years result from the small number of starts, but the consistent performance of synthetic surfaces eliminates most explanations. While many risk factors vary between years, the most obvious cause is weather, which results in different moisture contents.

Moisture variation is a defect for dirt and turf racing surfaces that causes uncertainty. Too wet, too dry, or inconsistent moisture content dominates risk for a natural racing surface. Maintenance can address some of the differences, but timing with changes in moisture content is critical. Moisture content and the reduction of moisture variation in the surface

is almost certainly the way in which the safety of dirt and turf tracks can rival that of synthetics. While tens of millions of dollars have been spent on synthetic surfaces, best practices such as overhead watering of turf tracks have not been adopted.

For dirt tracks, a complete new approach is needed. Technology to produce consistent moisture content must be developed and deployed. Current use of water trucks and sealed tracks are inadequate to provide an appropriate racing surface under any weather conditions. More information is needed to improve decision-making regarding watering and for critical maintenance decisions. Moisture variation in the track due to shadows or wind must be better reduced. For a fraction of the cost of a synthetic track surface, advanced water trucks and sensor networks can provide the tools for safer racetracks. Real-time measurements of the track surface can both protect the athletes and contribute data to our understanding of the sport.

Horse-Level Factors

It is to be recognized that there are other causative factors to injury, and these can potentially be mitigated against the risk.

A good example we have been working on at CSU for over 20 years is fluid biomarkers that can identify an at-risk horse. Drs. McIlwraith and David Frisbie (DVM, PhD, Dipl. ACVS, ACSMR) at CSU published a study with equine practitioners in Southern California looking prospectively at blood biomarkers to predict injury. In a study published in 2010, we demonstrated a 79% predictability six weeks ahead of an injury that something was awry and further imaging evaluation was indicated.

Unfortunately, it was difficult to combine the seven assays into a commercial test that was inexpensive enough to be used routinely, but our vision remains that we will ultimately have a blood panel that can identify a horse at risk, and then we could go ahead with more sophisticated imaging to define the damage and, hence, risk. We are currently collaborating with other investigators with expertise in metabolomics, and our results so far indicate that we can separate the horse with early damage from the horse without damage and, hence, risk.

The Bottom Line

Clearly, while surfaces are only a part of a complex equation, they must be improved. The idea of six-sigma in manufacturing is the reduction of variation so we never see a defective part. The defects in a racing surface must also become so infrequent that fans and owners will be unlikely to experience a track without an optimal surface. Improved certainty in the track surfaces will also reduce the chance that a fan will ever see a catastrophic injury of a horse and the associated risk to a rider.

The right technologies should make it possible to reduce, or even eliminate, the gap in safety between synthetic and other surfaces. Increasing the number of synthetic surfaces and extending the life of current synthetic surfaces will also move racing safety in the right direction. Safe racing must be possible even when the weather is uncertain. No track has been, or will ever be, 100% ready for racing, but uncertainty can be reduced and track defects can be minimized. UK

Boil-Water Notices: What About Horses?

Q My boarding barn uses a water utility, and this is the source of drinking water for the horses. There is currently a boil-water notice for all the utility's customers. I understand the risk to humans if there are microbes in the water and that boiling the water will kill those microbes, but are our horses also at risk if they drink unboiled water?

—Nicole, Oregon

A The question raised is whether it would be safe to allow horses to drink water sourced from a public utility that is currently the subject of a boil-water notice if used for human consumption.

In the absence of any information on the basis for the boil-water notice, it is very difficult to assess the level of risk for horses drinking nonboiled water from this source. It is conceivable that the water supply may have been contaminated with human or animal effluent, in which instance it could constitute a source of an infectious disease transmissible to humans and/or animals, including horses. An example in point would be the bacterial disease salmonellosis. A highly important and common species of *Salmonella* is *S. typhimurium*, which can cause disease in humans and horses and have fatal consequences.

Since a boil-source notice has been issued, it must be presumed that a sample of water coming from the public utility has been tested and certain pathogenic agents of public health significance have been detected. It is possible that *S. typhimurium*, among other organisms, may have been identified. Under such circumstances, the prudent source of action would be to eliminate any risk by boiling water from the public utility before making it available to horses.

ISTOCK.COM

Failure to take appropriate measures to safeguard the health of the horses at risk of contracting a serious disease, such as the example provided, from drinking unboiled water could have potential legal implications. For example, some of the horses at the facility might be owned by one or more owners other than the property owner or manager. Should the latter decide to allow the horses on the property access to unboiled water from the public utility unbeknownst to the owner of one of these horses, and the water happened to be contaminated with *S. typhimurium*, the result could be illness and possibly death in one or more animals belonging to that owner. In such a situation, it could be argued legally that the person allowing horses access to unboiled water took an unjustifiable risk in doing so and was responsible for the consequences to the owner's horse. UK

>Peter J. Timoney, MVB, MS, PhD, FRCVS, is a professor and Frederick Van Lennep Chair in Equine Veterinary Science at the UK Gluck Equine Research Center.

How to Protect Your Horse From Equine Influenza

Equine influenza (EI) is considered endemic in both the U.S. and Europe, but the viruses causing EI differ slightly. For many years, the viruses in circulation in the U.S. have been "Florida clade 1" (FC1) whereas in Europe they have been "Florida clade 2" (FC2). These clades split apart in 2003; circulation of FC2 ceased in the U.S. around 2005 and, by 2010, there was no evidence of FC1 in circulation in Europe. Because of the extensive movement of horses between North America and Europe, the international panel of EI experts has recommended for the last 10 years that EI vaccines contain representatives of both FC1 and FC2. Some (but not all) available EI vaccines meet this recommendation.

Equine influenza virus activity has recently increased in the U.S., Europe, and Nigeria. Normally, the virus circulates at a variable, but fairly low, level in the United States, but virus activity surged in the last three months of 2018 with outbreaks in 12 states. Additionally, an extensive EI event occurred in a donkey sanctuary in Nigeria. And, for the first time since 2015, multiple outbreaks of EI were reported during January and February of 2019 in France, Belgium, the Netherlands, Germany, Ireland, England, and Scotland.

In England, it resulted in a temporary lockdown of at least 174 premises and cancellation of racing for six days in February. Outbreaks were also reported in California, Arizona, Ohio, Indiana, and Washington state.

Some of the horses in these outbreaks, in both the U.S. and Europe, had been vaccinated against EI, raising the question: Is this a new strain that is not in the vaccines? The answer appears to be no. While the virus causing the Nigerian EI event is still uncharacterized, genetic analysis of isolates from both England and the U.S. confirms these as FC1.

ERICA LARSON/THE HORSE

Horses' antibody responses to vaccination do not last indefinitely, so they should be vaccinated against EI every six months to help keep immunity at its peak.

There are two mutations that make them different from the recommended vaccines strains, but are these important? That is still under investigation.

The absence of FC1 from European circulation means their horses have no natural immunity and are dependent on vaccination for protection. The reports from England indicate that the clinical disease is of shorter duration and less severe in vaccinated horses; this would indicate the vaccines are working, at least partially. Milder disease in vaccinated horses may reflect an inadequate level of protective immunity following exposure to unvaccinated horses shedding large quantities of virus.

What should owners and veterinarians do to protect their horses from EI?

Familiarize yourself with the clinical signs of EI.

Often the very first sign is a harsh cough. Other signs include fever and nasal discharge, which is usually watery (serous) at first and then turns thick and yellow (mucopurulent). The horse may show unusually rapid breathing (tachypnea) or lose its appetite (anorexia). Sometimes there may be enlarged submandibular lymph nodes or dependent limb edema. Not all these signs may be present. Horses can be infected and still appear normal (subclinical infection), especially if they have been previously vaccinated. Other infectious agents can produce clinical signs that look like EI but aren't. Equine herpesvirus-1/4 and strangles *(Streptococcus equi)* are examples. Have your veterinarian collect a nasal swab, or ideally a

GRAD STUDENT *SPOTLIGHT*

SARANAJITH WANGISA DUNUWILLE, BVSC, MSC

From: Sri Lanka
Degrees and institutions where received:

- **Bachelor of Veterinary Science (BVSc) from the University of Peradeniya, Sri Lanka**
- **Master's degree (MSc) in Experimental Biotechnology from the University of Peradeniya Postgraduate Institute of Science**

Saranajith Wangisa Dunuwille, BVSc, MSc, chose to pursue his PhD at the University of Kentucky (UK) because of his passion for research and the opportunity to build a career in academia.

Dunuwille said there aren't many horses in Sri Lanka, so he only had a handful of equine encounters during his time as a vet student and practicing veterinarian.

"The horse was this rare and exotic animal I was very curious about," he said. "But what connected me with equine research was my interest in viruses."

His research is focused on understanding and comparing the vascular inflammatory process equine herpesvirus type 1 and equine arteritis virus induce. Both viruses can cause abortions in pregnant mares and vascular inflammation plays a major role in these losses.

"My most valuable takeaway from this program has been the training I got in designing and conducting research," Dunuwille said. "Also, it was a great experience working with lab mates from many different nationalities."

He plans to finish his studies this summer. After graduating, he hopes to continue his research career either in an academic or industrial setting. UK

>Samantha Geller is a communications intern for UK Ag Equine Programs.

EQUINE INFLUENZA

nasopharyngeal swab (which goes beyond the nostrils into the back of the throat), and send it to a veterinary diagnostic laboratory to confirm a diagnosis. Information on nasal-swabbing can be found at vetsci.ca.uky.edu/services. If your horse does develop clinical signs of EI, then the rule of thumb is that for every day of fever, it should be stall-rested for a week.

Vaccinate your horses using a vaccine that protects against both FC1 and FC2 viruses.

Horses' antibody responses to vaccination do not last indefinitely, so if your horse has not been vaccinated for six months or more, then he is due for a booster. If it has been three months or less since the last booster, then hopefully your horse's immunity should be at its peak. Consult your veterinarian and refer to the American Association of Equine Practitioners' Vaccination Guidelines. In the event of an EI outbreak, where your horse may potentially be exposed, vaccination in the immediate face of the event might help if there is sufficient time—at least a week—for the horse's immune system to start making antibodies.

Communicate with your veterinarian and with the manager or resident veterinarian at any facility to which you are taking your horse.

Is there an outbreak situation? If so, re-evaluate your horse's vaccination status, and re-evaluate exposing your horse to flu.

Biosecurity from infectious diseases is best enforced by avoiding exposure whenever possible.

For farms, the best biosecurity is obtained by quarantining newly arriving horses away from the general herd for sufficient time to assure that the new arrivals are not bringing diseases with them. EI is transmitted through the air by coughing and indirectly on hands or clothing/equipment (fomites) that have been in contact with an infected horse.

CONTACT—Thomas Chambers, PhD—tmcham1@uky.edu—859/218-1126—UK Gluck Equine Research Center

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

Minerals of the Month: Sodium and Chloride

It's common practice to provide the minerals sodium (Na) and chloride (Cl) together in the form of sodium chloride or common salt.

Interestingly, a substantial portion of history appears linked to the human race's desire to seek out and obtain salt. Historically, salt was associated with wealth and consequently a popular item used for trading purposes, and extracting salt from salt-containing water sources was already an established practice for thousands of years B.C.

Although often discussed together, Na and Cl play distinguished roles within the body. Sodium is involved in central nervous system function, which includes nerve impulse transmission and transporting numerous substances (e.g., glucose) across cell membranes. In addition, it is an important electrolyte involved in maintaining body fluids' acid-base balance and osmotic pressure regulation.

Similarly, Cl plays an important role in acid-base and osmotic regulation. However, Cl is also present in bile and hydrochloric acid in the stomach and is essential to digestion.

Like humans, horses can sweat—an essential part of evaporative cooling. Sweat contains electrolytes, including Na and Cl, which means sweating contributes to Na and Cl losses. As such, exercising horses' dietary Na and Cl requirements differ from those of mature idle horses. In its *Nutrient Requirement of Horses* (2007), the National Research Council (NRC) recommends a dietary Na intake of 10

MINERALS OF THE MONTH

grams per day and a Cl intake of 40 grams per day for the mature idle horse weighing 500 kilograms (or 1,100 pounds). If this same horse is exercised at a moderate level, his requirements increase to 17.8 grams of Na per day and 53.3 grams of Cl. At the highest level of exercise intensity, the same horse would require 41 grams of Na and 93 grams of Cl each day.

Feed manufacturers typically add sodium chloride to concentrates to supplement the minerals often present in natural feedstuffs, but at levels insufficient to meet horses' requirements. Horse owners often provide salt in a free-choice form (e.g., a plain or iodized salt block).

There's some controversy as to whether a horse with very high Na/Cl requirements can meet his requirements in this free-choice form; however, such a horse will likely already be receiving a commercial concentrate feed to meet other elevated nutrient requirements. Your horse's Na and Cl requirements should be met when you feed these fortified commercial concentrates according to the manufacturer's recommendations. However, depending on your management situation, providing an additional salt block, especially if your horse does not require high levels of supplementation and, thus, might not be consuming concentrates with added salt, is a good practice. Also, always have fresh, clean water available to your horse.

STEPHANIE L. CHURCH/THE HORSE

Heavily exercising horses have higher dietary Na and Cl requirements than their idle counterparts.

The NRC (*Mineral Tolerance of Animals*, 2005) has set a horse's maximum tolerable sodium chloride level at 6% of total feed on a dry matter basis.

An equine nutritionist or veterinarian can help assess your horse's dietary Na and Cl levels, how they compare to his requirements, and what changes you could make to the diet, if necessary. UK

>Mieke Holder, PhD, is an assistant research professor within the UK Department of Animal and Food Sciences.

UK Gluck Center Grad Students Compete in Annual 3MT Competition

On April 4, UK Department of Veterinary Science grad students participated in its annual 3 Minute Thesis (3MT) competition.

Daniel Howe, PhD, a professor at the Gluck Equine Research center, said the competition showcases research being conducted by post-qualifying graduate students in the program.

"It is also a beneficial experience for the students in that it helps them to improve their communication skills," he said.

The competition, developed at the University of Queensland, has been hosted at various levels throughout UK, including departmental, college, and university-wide since 2013.

The rules are simple: Competitors have no more than three minutes to present their research and its significance to a general audience, and the presenter is allowed one static presentation slide and no props or costumes.

UK is one of nine Southeastern Conference schools to host 3MT competitions, ultimately sending the highest ranked presenter to the Conference of Southern Graduate Schools Annual Meeting, where they will compete with individuals from other universities.

"The 3MT challenges the students to communicate the significance of their research projects in a concise fashion that can be understood by a general, or nonscientific, audience," Howe said.

This year, eight PhD candidates participated.

"All of the presenters did a fantastic job, and I did not envy the judges their task of selecting the awardees," Howe said. "Ultimately, I think the judges chose the presenters who told the most clear and compelling story."

The winners were:

- **First—Ashton Miller** (from the lab of Amanda Adams, PhD, associate professor at the Gluck Center);
- **Second—ChanHee Mok** (from the lab of James MacLeod, VMD, PhD, John S. and Elizabeth A. Knight Chair and professor at the Gluck Center); and
- **Third—Yatta Linhares Boakari** (from the lab of Barry Ball, DVM, PhD, Dipl. ACT, Albert G. Clay Endowed Chair in Equine Reproduction and professor at the Gluck Center)

Competitors were encouraged to participate in the UK College of Agriculture, Food and Environment competition, held April 12, as well as the university-wide 3MT competition, which will be held at a later date.

Videos are available at:

- **Jennifer Bellaw**—youtu.be/55hRvOMVHPE
- **Wangisa Dunuwille**—youtu.be/p5R93F5ZBNc
- **Yatta Boakari**—youtu.be/nEabDxsbM-Q
- **Jessica Kenealy**—youtu.be/WXDGTx65z8k
- **ChanHee Mok**—youtu.be/bM9vzUwxVkg
- **Fatai Oladunni**—youtu.be/Dk0RQT0rwnc
- **Ashley Steuer**—youtu.be/nCCX-zSNXMQ

>Samantha Geller is a communications intern with UK Ag Equine Programs.

Potomac Horse Fever: Incidence in Kentucky in 2018

Equine neorickettsiosis, more commonly known as Potomac horse fever (PHF), is an equine-specific bacterial disease caused by *Neorickettsia risticii*.

The disease was first reported in the U.S. in 1979 as a sporadic condition observed in horses pastured in proximity to the Potomac River. Current distribution is now known to extend far beyond the northeastern United States and has been reported in 43 states; three provinces in Canada; Uruguay and Brazil in South America; France and the Netherlands in Europe; and in India.

The disease is often associated with horses grazing pastures bordering creeks or rivers. Potomac horse fever is seasonal in occurrence, with the majority of outbreaks in Kentucky reported in July through September.

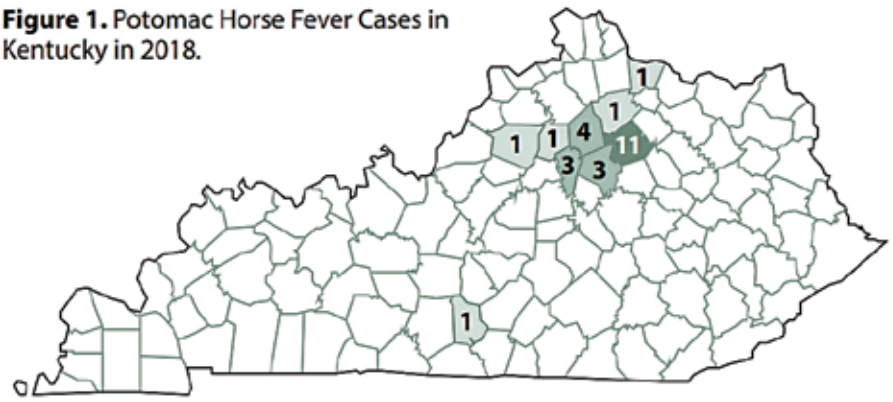
The disease is not contagious per se; infection is naturally acquired by horses accidentally ingesting aquatic insects harboring metacercariae (fluke larvae) infected with *N. risticii*. The bacterium's life cycle involves operculate freshwater snails and aquatic insects such as mayflies and caddisflies, the latter being the source of infection for horses.

Outbreaks of PHF comprise isolated or multiple cases of the disease on a premises. Experience has shown that the disease once confirmed on a premises or in a particular area, tends to recur in subsequent years. *Neorickettsia risticii* can cause an acute enterocolitis in susceptible horses that is clinically manifest by fever, colic of variable severity, and profuse diarrhea. All ages and breeds of horses are at risk of developing the disease. Infections in pregnant mares can give rise to abortion immediately following infection or months after the resolution of clinical signs.

Equine neorickettsiosis has been recorded in Kentucky for a significant number of years. Incidence of the disease can be very variable with increased case numbers frequently seen in years with high rainfalls in the spring followed by above average temperatures in late spring/early summer.

In 2018, the disease was first confirmed in Kentucky on June 1. Over the period extending through the week of Aug. 25, 26 cases were diagnosed. This figure is probably underrepresentative of the true incidence of the disease. The case definition for PHF was based on presence of characteristic clinical signs together with a positive polymerase chain reaction test result for the causal bacterium.

Figure 1. Potomac Horse Fever Cases in Kentucky in 2018.



26 Confirmed Cases:
1 case each.....Bracken, Franklin, Harrison, Shelby, and Metcalfe
3 cases each.....Fayette and Woodford
4 cases .....Scott
11 cases.....Bourbon

Office of the Kentucky State Veterinarian, Updated August 25, 2018

A breakdown of the total number of cases revealed that the disease was confirmed in nine counties, the majority in central Kentucky (Figure 1). Affected horses ranged from one to 17 years of age. The preponderance of cases (20) was seen in mares. Although the majority of cases were in Thoroughbreds (18), the disease was recorded in six other breeds. Of the 26 reported cases in the state, six died and the remainder survived.

To minimize losses from PHF, horsemen were encouraged to review the environment in which they kept their horses and to consult with their veterinarian on strategies that might be used to mitigate disease risk. Recommendation was also given to minimize the opportunity for horses to ingest aquatic insects by turning off lighting in and around barns and other areas at nighttime.

CONTACT—E.S. Rusty Ford—Rusty.ford@ky.gov—Office of the Kentucky State Veterinarian, Frankfort UK

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

Upcoming Events

May 30, 3:30-8 p.m.

UK Equine Farm & Facilities Expo

Olive Hill Sport Horses, 4746 Huffman Mill Pike, Lexington, KY

3:30 p.m.	Registration
4 p.m.	Exhibitor booths
5 p.m.	Welcome with dinner provided by Fayette County Cattleman's Association
5:30 p.m.	Olive Hill Sport Horses overview—Brian and Diana Conlon, owners
6–8 p.m.	Educational sessions (run concurrently every half hour):
	Harnessing on-farm solar potential—Brian Conlon
	Overseeding damaged pastures—Ray Smith, PhD
	Weed control on horse farms—Bill Witt, PhD
	Utilizing hay feeders to reduce waste—Bob Coleman, PhD