BLUEGRASS EQUINE DIGEST

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$1.1 Million in Grants For UK's Equine Research

James MacLeod, VMD, PhD, who is the John S. and Elizabeth A. Knight Chair, professor of veterinary science at the Maxwell H. Gluck Equine Research Center, and the director of UK's Equine Initiative, was recently awarded two grants totaling more than $1.1 million over three years. Three other equine researchers in UK's College of Agriculture were also collectively awarded more than $500,000.

Dr. James MacLeod was recently awarded two grants totaling more than $1.1 million over three years.

The National Science Foundation awarded the grant to MacLeod's in support of his and a team of collaborators' computational work on the mRNA transcriptome.

"As an equine scientist, it is very gratifying to obtain a large grant from the National Science Foundation for a project with direct relevance to equine health research," MacLeod said.

MacLeod said research that determined the primary DNA base sequence of the horse genome was completed in 2007 and 2008. And while it is a major accomplishment, in many ways it is just the beginning. Distributed within the 2.7 billion bases of DNA that compose the equine genome are approximately 20,000 protein-encoding genes. Understanding the structure of these 20,000 genes, what tissues express which genes, when the genes are expressed, and how much they are expressed represent functional parameters that many scientists working on equine health and disease are studying.

Researchers will use the grant will be used to develop computer-based analytical methods to study gene expression. MacLeod and other collaborators are using data generated from a number of horse tissues through a process called RNA sequencing, a new technology for analyzing gene expression that enables an assessment of all genes concurrently, not just individual genes or small groups of genes. Funding from the grant also will go toward software development, student support, and experimental testing of the new computational algorithms.

ARTICLES OF INTEREST

(Grants ...)

MacLeod's collaborators for this grant are Jinze Liu, faculty member in UK's Department of Computer Science; Arne Bathke, faculty member in UK's Department of Statistics; and Jans Prins, department chair of Computer Science at The University of North Carolina, Chapel Hill.

"Determining the nucleotide sequence of the equine genome and several emergent DNA sequencing technologies is opening exciting new opportunities to study gene expression," MacLeod said. "Changes in gene expression underlie many disease processes and treatment mechanisms. The computational algorithms that we are working to develop will greatly facilitate the analysis of gene expression based on direct RNA sequencing approaches."

The second grant, a fellowship grant totaling $100,000 to be paid over two years, was awarded by the Morris Animal Foundation. This grant will provide stipend support for graduate student Jennifer Janes, DVM, and her project on equine cervical stenosis, commonly known as wobbler syndrome, a structural narrowing of the spinal canal in the neck that produces severe neurologic deficits through spinal cord compression.

Wobbler syndrome is a devastating disease targeting the equine musculoskeletal and neurologic systems. It is a distressing disease for owners of affected horses, and there are limited treatment options. Multiple factors are thought to contribute to development of this disease, including genetics, high planes of nutrition, trauma, rapid growth and altered copper/zinc levels. The cause and development are not well understood. Janes will focus on examining of the role of abnormal bone and cartilage formation in neck vertebrae, as well as the identification of regions of DNA and specific genes that are involved in the disease process.

"Malformations of vertebrae in the neck of horses that pinch the spinal cord are all too common," MacLeod said. "The resulting neurological deficits can be very serious, even to a point where the horse is a danger to itself and anyone around it. Sadly, euthanasia is a frequent outcome. New imaging and genomic technologies developed over the last several years will enable us to re-examine this disease with the aim of improving our understanding of its cause and progression."

Collaborators are veterinarians Steve Reed, DVM, Dipl. ACVIM, and Katie Garrett, DVM, of Rood & Riddle Equine Hospital in Lexington, Ky., and Neil Williams, DVM, PhD, associate director of UK's Livestock Disease Diagnostic Center.

"I think it is a good example of collaboration between Gluck, LDDC, and veterinary practitioners," MacLeod said. "Also, the training of the next generation of veterinary scientists is a critical issue for everyone concerned about advances in equine health going forward.

"The Morris Animal Foundation has been a leader in developing funding opportunities that encourage young veterinarians such as Dr. Janes to pursue career paths that include discovery research on animal health problems," he added.

Other UK Researchers Receive Grants

MacLeod's grants follow on the heels of two other large competitive research grants secured by scientists in the Gluck Center. Chuck Issel, DVM, PhD, the Wright-Markey Chair in Equine Infectious Diseases at the Gluck Center, was awarded $347,500 per year for a multiyear project funded by the National Institutes of Health for research into "Equine Infectious Anemia Virus Envelope Variation and Vaccine Efficacy." Ernie Bailey, PhD, was awarded $28,125 from the Morris Animal Foundation for "Continuation of SNP Gene Mapping Projects."

In addition, Kristine Urschel, PhD, of UK's Department of Animal and Food Sciences, was awarded a First Award Grant for Young Investigators from the Morris Animal Foundation. Using the two-year grant totaling $100,000, she will examine maintaining muscle mass in older horses and will be overseen by David Horohov, PhD, the William Robert Mills Chair in Equine Immunology at the Gluck Center.

"As horses age, they experience declines in muscle mass that affect their health and performance," Urschel explained. "We will investigate how age, inflammation, and Cushing's disease affect the horse's protein metabolism. This research will provide valuable information about protein metabolism in older horses and allow for improved diet formulation and management strategies."

Nancy Cox, PhD, who is associate dean of research in UK's College of Agriculture and

(GRANTS ...)

Agricultural Experiment Station director, said, "The accomplishments of these talented faculty attest to the confidence the College of Agriculture has placed in its array of programs that make up the Equine Initiative. These projects are relevant to Kentucky's signature industry, but they also confirm that our faculty are competitive in national and international arenas."

Mats Troedsson, DVM, PhD, Dipl. ACT, chair of UK's Department of Veterinary Science, and director of the Gluck Center, said, "I congratulate faculty at the Gluck Equine Research Center and across the College of Agriculture for their success in attracting significant research support from federal and industry-based research agents. Their success is a testimony of the quality and the importance of their work to the scientific community and equine industry. We are fortunate to have some of the best faculty, staff and graduate students in the world here." UK

Holly Wiemers is the Equine Initiative communications director, and James MacLeod, VMD, PhD, is the John S. and Elizabeth A. Knight Chair, a professor of veterinary science at UK's Maxwell H. Gluck Equine Research Center, and director of UK's Equine Initiative.

WEED OF THE MONTH

Common name: Spiny pigweed
Other names: Spiny amaranth
Scientific name: *Amaranthus spinosus*
Life cycle: Warm season annul
Origin: Tropical America
Poisonous: No

Spiny pigweed

Spiny pigweed is distributed widely across the United States and grows most frequently along fence borders, feeding and watering areas, and other compacted areas. Spiny pigweed can sometimes infest entire pastures that are overgrazed. Seed germination occurs in late spring or early summer. Stems are reddish, stout, and branched. Mature plants may reach 3 feet tall. Sharp spines that inhibit grazing are found in axils of stems and are surrounded by a dense cluster of female flowers. The male flowers are long terminal clusters.

Spiny pigweed control is relatively easy with herbicides when applied to plants less than 12 inches tall. Mowing and hand weeding are effective if done before flower production to prevent seeding. Consult your local Cooperative Extension Service personnel (http://ces.ca.uky.edu/ces/) for herbicidal control in your area. UK

William W. Witt, PhD, a researcher in Plant and Soil Sciences, provided this information.

MRLS FOAL LOSSES INCREASED SLIGHTLY IN 2009

Between May 5 and June 15, the Livestock Disease Diagnostic Center (LDDC) reported 13 foal loss cases caused by mare reproductive loss syndrome (MRLS) in Central Kentucky. This number was up slightly from 2003-2008 when only three to five cases were reported each breeding season.

Research in the past five years concluded the stiff hairs on Eastern tent caterpillars consumed by pregnant mares pierce the horses' digestive tracts, possibly allowing bacteria to enter the bloodstream. The bacteria can then attack the placenta and spread to the fetus. MRLS can cause early-term fetal losses, late-term foal losses, and weak foals. Fetal death from infection by these alimentary tract bacteria is the hallmark of MRLS.

"This year, before we saw the first case of MRLS, entomology researchers at UK predicted an increase in caterpillar numbers this spring," said Neil Williams, DVM, PhD, Dipl. ACVP (see extension report www.ca.uky.edu/news/?c=n&d=328). "With our ability to predict increases in caterpillars and diagnose abortions, we at the university try to help the industry by putting out information to alert horsemen."

This spring, six of the 13 cases were early fetal losses and seven were late-term foal losses, according to Williams. Of the 13 cases, seven were Thoroughbreds. Other breeds, which included one case each, were American Saddlebred, Standardbred, Rocky Mountain Horse, Oldenburg, Gotland, and one mixed-breed fetus. The numbers of cases by county were: Woodford County, four; Scott and Jessamine Counties, two apiece; and Bourbon, Boyle, Fayette, Oldham, and Rockcastle Counties, one apiece.

Researchers have established the link between caterpillars and MRLS.

"Although an investigation was not conducted, several of the involved farms reported high numbers of caterpillars," Williams said. "Compared to recent years, this represents a slight increase in number of cases and corresponds to the increase in Eastern tent caterpillar population this spring."

A Brief History Of MRLS In Kentucky

During 2001, when MRLS hit Central Kentucky hard, an estimated 30% of the 2001-2002 Thoroughbred foal crop was lost, and the state suffered an economic hit of approximately $336 million due to losses suffered in all breeds of horses.

"It was observed there was a huge increase of Eastern tent caterpillars (in 2001 and 2002) that coincided with the unusual foal losses," Williams said. "At first, caterpillars were not considered to be the cause."

Epidemiological and field studies conducted by UK researchers demonstrated that MRLS was associated with unprecedented populations of Eastern tent caterpillars, wild black cherry trees, and waterfowl on horse farms in Kentucky. Later research established the link between consumption of caterpillars and abortion. Williams said as a result of MRLS, a lot of farms in Central Kentucky have taken action and implement procedures to reduce caterpillar numbers on the farms each spring.

Now, the LDDC compiles a yearly surveillance of the number of MRLS cases each breeding season. UK

Neil Williams, DVM, PhD, Dipl. ACVP, is the associate director at the LDDC. Jenny Blandford is the Gluck Foundation Assistant at the Gluck Center.

STUDIES OF HEREDITARY TRAITS IN HORSES USING NEW TOOLS

The horse industry in the United States is diverse. Horses are used for racing, competitive riding, showing, recreational riding, and working cattle. Today the number of horses in the United States is estimated at 9.2 million, down from 21 million around 1900, when horses were a primary source of power and transportation, but up from 4.5 million in 1959 (the last time the United States Department of Agriculture counted horses). According to an American Horse Council study, in 2004 the horse industry had a $102-billion impact on the U.S. economy and provided 1.4 million jobs. The horse industry is growing and important. More than ever, we need each horse to be athletically sound and healthy. Consequently, the thrust of equine genetics research on horses during the last half century has been related to health and physiology.

Advances in biotechnology have provided powerful new tools. In 2006, the entire DNA sequence was determined for a Thoroughbred mare. That sequence was assembled and can be viewed online at several Web sites, including genome.ucsc.edu, ensembl.org, and ncbi.nlm.nih.gov/genome/guide/horse/index.html, uky.edu/Ag/Horsemap.

In addition, scientists performed partial DNA sequences on seven more horses, including another

Dysmorphology of the mouth (parrot mouth) is another cause of foal loss that is thought to have a hereditary component.

Thoroughbred, Quarter Horse, Akal-Teke, Andalusian, Arabian, Icelandic, and Standardbred. Comparing the DNA sequences led to the discovery of more than 1 million genetic differences among these horses. The significance of this work is apparent. Prior to 1990, only 50 genes had known genetic variation; following more than a decade of molecular genetics work on horses, variation had been discovered for an additional 3,000 sites by 2005.

The DNA sequencing work was done by the National Human Genome Research Institute to aid the investigation of human gene function. This work is the largest—ever—single contribution to equine research. DNA sequencing enables studies in all areas of equine research.

Those of us working at the University of Kentucky Gluck Equine Research Center played major roles in the development of this resource, and we are well-situated to use the tool and solve problems which have resisted earlier technologies.

Coat Color Genes

Our initial studies focused on hereditary traits that were well understood, such as coat color. We wanted to determine if our gene map was sufficiently powerful to find the precise molecular cause for these traits. These studies also formed the basis for training graduate students to use the new molecular tools.

Among the discoveries made during this period:

- Rebecca Bellone, PhD, former graduate student and now a faculty member at the University of Tampa, mapped the gene for Appaloosa spotting;
- Samantha Brooks, PhD, former graduate student and now a faculty member at Cornell University, identified the molecular basis for tobiano, sabino, and several forms of dominant white (she is currently using molecular genetics to investigate laminitis); and
- Deborah Cook, MS, a current graduate student, identified the molecular basis for champagne dilution of coat color.

Collectively, these studies demonstrated the power and efficacy of the gene information to discover the molecular basis of these traits.

(HEREDITARY TRAITS ...)

Commercial tests are available for breeders interested in selecting for these traits.

Simple Disease Genes

Following the success of the hair color investigations, we investigated health traits that were easily characterized and thought to have a simple hereditary basis. The work was conducted through funding from interested breeders and breed registries. We have had three successes in this area:

1) ***Junctional epidermolysis bullosa (JEB)*** Kathryn Graves, PhD, director of the Animal Genetic Testing Laboratory at the Gluck Center, discovered the molecular basis for this skin disease of American Saddlebred horses. This research was done based on samples from fewer than 10 affected foals. The work was recently reported and commercial tests are available to detect the trait and allow breeders to avoid this disease.

Former Gluck Equine Research Center graduate student Samantha Brooks, PhD, identified the molecular basis for tobiano, which is shown in the photo.

2) ***Swayback among Saddlebred horses*** Cook has mapped a DNA region that appears to contain the gene for this trait. She is currently conducting investigations on the mutation involved and determining what other effects this gene might have on performance. The most significant aspect of this work was mapping the gene based on testing 40 American Saddlebred horses selected for their back conformation and not on the basis of complete family studies.

3) ***Dwarfism among Miniature Horses*** John Eberth, a current graduate student at the Gluck Center, has mapped a gene for this trait. Again, the discovery was made on the by testing 40 Miniature Horses, 20 with dwarfism and 20 without, but not using family studies. He is currently sequencing a gene in the region that is known to cause dwarfism in other species. Hopefully, genetic variants will be identified that are responsible for the dwarfism trait, enabling breeders to select against that gene.

Success with such a small set of samples was remarkable. About 10 years ago, such genetic studies required collecting dozens to hundreds of samples and amassing pedigree records that would demonstrate the mode of inheritance and implicate founding stallions and dams. Since breeders avoid matings of horses known to carry disease genes, this is not a viable approach to study horse diseases. However, with the advent of the whole genome sequence for the horse and associated genetic tools, we have new approaches that require fewer samples and, in some cases, do not require families.

Researchers are designing studies for more complex traits with suspected hereditary influences. Two of these are listed below.

Contracted Foals

Teri Lear, PhD, is collaborating with scientists at the UK Livestock Disease Diagnostic Center to investigate the condition often referred to as contracted foal syndrome. This condition is one of the most common sources of foal loss. Sometimes the condition is minor and can be corrected by splinting or surgery. Other times the contractures are so severe they cause dystocia (difficult birth) and even death of the broodmare. The condition might have multiple causes, so the challenge to Lear and her collaborators is to divide the affected foals into several categories based on pathology and pedigree, then investigate each category for a discrete (individually distinct) genetic basis. They might all have one common cause or each category might have some combination of nutrition, genetic, or other environmental cause. Today Lear can use the whole genome sequence and associated molecular tools to parse out the genetic component.

(HEREDITARY TRAITS ...)

Parrot Mouth

Dysmorphology (congenital malformation) of the mouth is another cause of foal loss that is thought to have a hereditary component. There are a wide range of problems that can occur in the mouth of the horse, and there might also be a variety of genetic and environmental causes. As with contracted foal syndrome, we are devising studies to evaluate the hereditary contribution to the condition in these foals. We are collaborating with Jack Easley, DVM, MS, Dipl. ABVP, to evaluate affected horses, categorize them, obtain DNA samples, and initiate genetic investigations.

The work on these conditions is under way, but only at preliminary stages; we need funding from private donors and agencies that fund equine research.

In the future we anticipate investigating variation in response to infectious diseases, variation leading to developmental bone diseases, nutritional responses, hoof quality, and aspects of physiology, including reproduction and performance.

A humerous way to remind us that understanding the equine "G gnome" potentially can unlock the secrets of solving genetically based diseases of the horse.

What Does This Mean?

Does all of this information mean horse owners need to become molecular geneticists? Absolutely not! After all, we do not need to become mechanics to drive a car. These tests will simply be one more tool a breeder can use, in addition to advice from bloodstock agents and veterinarians who, in turn, use radiographs, pedigree analyses, and other tools.

Molecular genetics information is already being used in agriculture and medicine. When bull studs have two attractive bulls but can keep only one, they use DNA tests to determine which one has the better genetic potential. Physicians treating human diseases make a preliminary diagnosis based on all available clinical tests; then they might add a DNA test to include or exclude a hereditary condition.

We want to provide the horse breeder with the same opportunities for success. UK

Ernie Bailey, PhD, is a professor in the Veterinary Science Department at the Gluck Center.

ENDOMETRITIS IN THE MARE

Endometritis, an inflammation of the interior lining of the uterus, continues to be a major cause of subfertility or infertility in the mare.

There are many diagnostic tools that have been developed to determine if a mare has endometritis. These include ultrasonography, examination of the cervix with a speculum, examining vaginal discharge, uterine culture, cytology of the uterus, and endometrial biopsy. The most common methods are culture and cytology.

Endometritis is generally divided into infectious and non-infectious causes. Infectious endometritis is the result of bacterial invasion into the uterus. Treatment is directed toward eliminating bacteria with suitable antibiotics, and most infections respond well to this treatment.

Recurrent infectious endometritis has been suggested to be caused by bacterial biofilms or an invasion of bacteria into the tissue. Bacteria can survive in a dormant state under these conditions for a long time without being sensitive to antibiotic treatment.

Non-infectious endometritis is usually in response to a mare being bred or artificially inseminated. This is called post-breeding endometritis. When sperm are placed in the uterus, within a few hours a small portion of the ejaculated or inseminated sperm reach the oviduct. However, the majority of the sperm is eliminated and fails to reach the oviduct. Mares that remove all products of breeding from the uterus within 24

hours are considered as having a normal reaction to semen, whereas mares that do not remove the products are considered susceptible mares to persistent post-breeding endometritis.

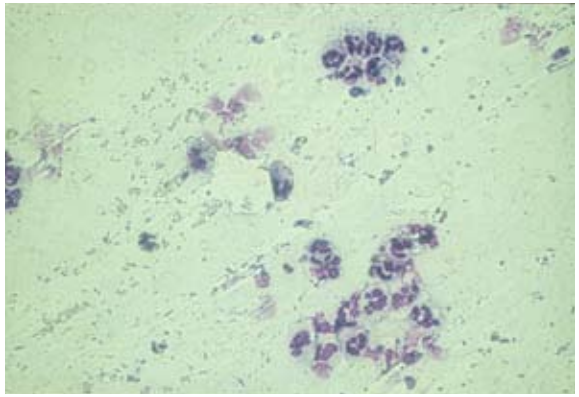
The elimination of sperm after breeding is a combination of immune response and mechanical clearance through uterine contraction. Sperm in a mare's uterus trigger an immune response, which results in neutrophils (white blood cells) coming into the uterine lumen. These neutrophils bind with sperm and phagocytize (kill) the sperm.

Also during the activation of the neutrophils, a hormone (prostaglandin F2 alpha) is released that causes the contraction of smooth muscles in the lining of the uterus. These uterine contractions assist in removing accumulated fluid and inflammatory products from the uterus.

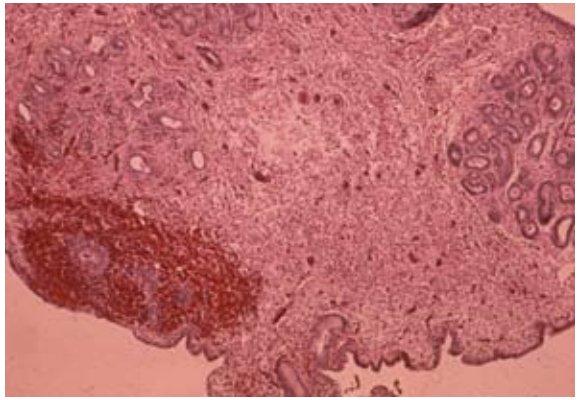
In a normal, endometritis-resistant mare, once the products are removed from the uterus the inflammation subsides and the uterine environment returns to its normal state. In about 10-15% of mares, there is failure in the uterine defense mechanism to eliminate these inflammatory products and the mare is considered susceptible to endometritis.

Current Research

Elizabeth Woodward, a graduate student at the Gluck Equine Research Center, is examining the mechanism of impaired uterine clearance of susceptible mares after breeding. Previous studies have shown that impaired uterine clearance



This cytology slide shows neutrophils, or white blood cells, from a mare with endometritis.



This is an endometrium uterine biopsy, grade 3, and shows fibrosis.

in susceptible mares was caused by reduced myometrial contraction in response to inflammation. However, the exact mechanism is not understood.

A recent study by the University of Kentucky Gluck Equine Research Center Director Mats Troedsson, DVM, PhD, Dipl. ACT, reported that susceptible mares had increased uterine accumulation of nitric oxide in the uterine lumen 13 hours after insemination. The nitric oxide causes smooth muscle relaxation and could possibly be the explanation for reduced uterine contraction in susceptible mares.

Woodward is conducting a follow-up study in which she is comparing nitric oxide levels in both resistant and susceptible mares after breeding. The goal is to identify 12 mares--six resistant and six susceptible--for use in this study. Each mare will then be challenged with insemination of dead sperm and evaluated at two, six, 12, and 24 hours after insemination. Measurements taken will include uterine fluid as measured by ultrasonography, number of neutrophils, and the level of nitric oxide in uterine secretions. Biopsies will be taken from the lining of the uterus and examined for nitric oxide synthase (iNOS) levels in the tissue. UK

Ed Squires, MS, PhD, Hon. Dipl. ACT, is the executive director of the Gluck Equine Research Foundation and director of development and industry relations at the Gluck Center.

APPLY NITROGEN TO HORSE PASTURES IN THE FALL

Nitrogen application research on horse pastures shows fall is a good time to improve pasture.

Fall nitrogen application has long been promoted within the turfgrass industry to improve stand density. A field study was conducted on four well-managed horse farm pastures in the Central Bluegrass region of Kentucky from September 2006 through March 2007, and it was repeated again during the same time frame in 2007 and 2008. The objective of this study was to determine if fall nitrogen application improves forage stand density the following spring in horse pastures.

Nitrogen treatments included a series of fall nitrogen applications in late September and/or early November at rates of 30 or 60 pounds of nitrogen per acre. Measurements of forage cover were made using two methods, visual percent and point-quadrat, and included fall and spring cover of desirable forage species: Kentucky bluegrass (*Poa pratensis*), orchardgrass (*Dactylis glomerata*), tall fescue (*Lolium arundinaceum*), and white clover (*Trifolium repens*). Weed species were measured, but they could not included in this analysis.

Visual percent cover and point-quadrat methods were positively correlated. As a result, only visual percent cover data were used in the analysis due to ease of measurement and time efficiency.

Nitrogen treatments applied in fall 2006 showed a significant effect across all farms for March 2007. Fall split-application in September and November at 30 and 60 pounds of nitrogen per acre (each month) provided significantly more forage cover than a single application of 30 pounds of nitrogen per acre in September or November and the control. Single applications of 60 pounds of nitrogen per acre in September or November resulted in significantly more forage cover than the control. In treatments made the fall of 2007 and analyzed in the spring of 2008, there were no significant treatment effects.

In conclusion, these results suggest that forage stand density of cool season horse pastures in Kentucky can be improved with 30 pounds of nitrogen per acre applied in late September and again in November. Single nitrogen applications of 60 pounds of nitrogen per acre can provide similar benefits when applied in either late September or early November. Further research is necessary to validate these results within the region and in different growing seasons. UK

Ray Smith, PhD, is an associate professor and forage extension specialist at the University of Kentucky. Other staff involved in the study were graduate student Laura Schwer, BS; faculty member Tom Keene, BS; former graduate students Jessie Morrison, MS, and Chengjun Huo, PhD; and staff members Joy Lourie, MS, Gene Olsen, MS, and Gabe Roberts.

Further Reading

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TOXIC MUSHROOM RISK HIGHER IN KENTUCKY PASTURES DUE TO WET WEATHER

At the beginning of August, the Livestock Disease Diagnostic Center (LDDC) received several calls regarding the presence of mushrooms in pastures around eastern Kentucky. Callers were concerned about whether it presented a problem for livestock grazing on pastures with mushrooms.

"Mushrooms appear to be more prevalent this year due to the rainy wet weather," said Cynthia Gaskill, DVM, PhD, who is a clinical toxicologist at LDDC, in a statement released by the LDDC on Aug. 3. "Thousands of species of mushrooms exist, many of which do not pose a threat to animals. However, a number of poisonous mushroom species exist and can potentially cause poisoning in animals.

"Mushrooms can contain a variety of toxic substances, and clinical signs vary greatly depending on mushroom type and toxins present," the statement continued. "Identification of mushroom species is virtually impossible for the lay person and can even be difficult for experienced mycologists. Identification of mushrooms and determination of risk can be assisted by providing information on regional location, growth substrate, and tree type if growing in association with trees."

"Reducing exposure is always helpful with any potential toxicosis. Fortunately, mushroom toxicity in large animals is a rare occurrence. We see this more in small animals," Gaskill said.

Thousands of species of mushrooms exist, many of which do not pose a threat to animals. However, a number of poisonous mushroom species exist and can potentially cause poisoning. Can you tell if this mushroom is poisonous? Don't take a chance!

For more information on risks of toxic mushrooms, information on where to send mushrooms for identification, control of mushrooms, clinical signs associated with toxic mushrooms, and additional details, contact Gaskill at 859/253-0571, ext. 148, or cynthia.gaskill@uky.edu. UK

EXERCISING HORSES: EFFECTS OF EATING ENDOPHYTE-INFECTED TALL FESCUE

Known to withstand drought and high traffic, tall fescue is common forage in the southeastern United States. However, these resistant properties are partly associated with an endophytic fungus that infects the tall fescue plant. While the endophyte might offer benefits to the plant, it produces compounds that can have negative effects on animals. Cattle consuming endophyte-infected tall fescue have decreased heat tolerance and increased rectal temperatures during hot weather, for example.

Grey Parks, a graduate student working with Laurie Lawrence, PhD, at the University of Kentucky, conducted a study to determine if feeding endophyte-infected fescue would affect exercising horses, particularly their ability to recover from exercise in the heat.

Twelve healthy horses were studied from June to September 2008. Horses were adapted for six weeks to diet, housing, and an exercise regimen. Horses were carefully paired by age, body weight, body condition, and heart rate response to an exercise test at the end of the adaptation period. Within each pair, horses were randomly assigned to a diet containing either endophyte-infected or endophyte-free tall fescue seed. The fescue seed was mixed with sweet feed, water, and a small amount of liquid molasses. Seed was used in the experiment instead of pasture so the amount of

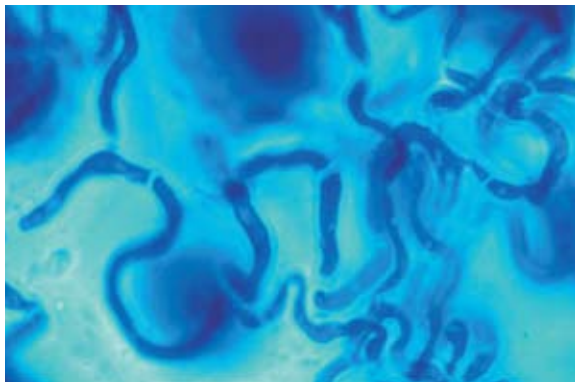
(EXERCISING...)

experiment instead of pasture so the amount of the endophyte consumed by the horses could be accurately assessed. Enough seed was given to each horse to mimic the amount of endophytic toxins that a horse would obtain from typical endophyte-infected tall fescue pasture or hay.

After receiving the test diets for 21 days, horses were exercised for approximately one hour. Rectal temperatures increased approximately 2°F during exercise. Horses receiving the endophyte-infected tall fescue seed had slightly higher rectal temperatures in the recovery period following exercise. Heart rate responses during exercise and recovery were similar for the horses receiving the endophyte-infected seed and those receiving the endophyte-free seed. The horses receiving the endophyte-infected tall fescue seed had higher levels of T3, a hormone that helps regulate body metabolism, and they had lower levels of prolactin, a hormone that is commonly decreased in animals with fescue toxicosis.

The slightly higher rectal temperatures of horses receiving the endophyte-infected tall fescue seed suggest there is potential for an effect on thermal regulation, but there were minimal effects on other variables such as heart rate and respiration rate. The horses in this study were exercised at a level that would be typical for a recreational riding horse, so the intensity of the exercise was relatively low. In addition, even though the research was conducted in the summer, the daily temperatures on the testing days were not extremely high. Therefore, researchers concluded that if there had been higher environmental temperatures and a more intense exercise session on Day 21, dramatically different treatment groups might have emerged.

A field of tall fescue.



The endophyte fungus (seen here) cannot be removed without killing the fescue plant.

Further research is needed to determine what effects consumption of the endophyte might have on horses performing intense exercise under high ambient temperatures. UK

Laurie Lawrence, PhD, is a professor in the University of Kentucky's Department of Animal and Food Sciences.

UK LIVESTOCK DISEASE DIAGNOSTIC CENTER ATTAINS NATIONAL ACCREDITATION

For the past five years, the University of Kentucky Livestock Disease Diagnostic Center (LDDC) has worked toward attaining national accreditation. All the hard work paid off, as the center recently received its certificate of full accreditation from the American Association of Veterinary Laboratory Diagnosticians for all species.

The center's director and epidemiology professor, Craig Carter, DVM, PhD, said the accreditation will allow the center to better serve the people of Kentucky and beyond.

"This is our gold star," he said. "It elevates our status and also enhances the way those in the agricultural industry view us. It also enhances our international reputation. It means others can be confident that when we run a test, the results are reliable, accurate, and repeatable in other labs in this country and in other countries as well."

Carter said with accreditation comes the opportunity to join the National Animal Health Laboratory Network, an initiative of the U.S. Department of Agriculture. The network strengthens the United States' defense against large-scale foreign animal disease outbreaks and provides a way to track such threats, should they become an issue.

"We would be a part of a national strategy to coordinate our work with all organizations that

(ACCREDITATION ...)

provide animal disease surveillance and testing services," Carter said. "Being part of that network will also allow us to compete for grants we can use to purchase equipment that will make our lab even better."

"The College of Agriculture is very proud that the LDDC has accomplished this milestone, and we recognize the assistance of many stakeholders who helped us plan the new facility and hire new staff, including Dr. Carter," said Nancy Cox, MS, PhD, associate dean for research for the UK College of Agriculture and director of the Kentucky Agriculture Experiment Station. "In particular, we appreciate the confidence of our elected officials in the General Assembly for the building project, as this was critical to achieving accreditation."

The University of Kentucky Livestock Disease Diagnostic Center.

Although thrilled about the accreditation, Carter emphasized the team effort of the process.

"It's definitely not something I did on my own," he said. "Everyone in this lab had a part in it. They worked tirelessly preparing us for the accreditation process. This is something for everyone to be proud of."

David Switzer, executive director of the Kentucky Thoroughbred Association and Kentucky Thoroughbred Owners and Breeders, quoting past U.S. President Harry S. Truman, said, "It's amazing what you can achieve when you don't care who gets the credit.

"This is exactly the approach everyone involved in the accreditation process took," Switzer continued. "From securing the funding from the General Assembly to renovate the lab, to becoming accredited, and now through implementing an integrated reporting system—all of this allows the lab to be able to fulfill its role of providing the quality of service the Kentucky livestock industry deserves."

The lab staff have put a lot of effort over the past two years into developing and testing software for a laboratory information management system (LIMS). The newly implemented system will offer advanced electronic reporting capabilities that can get test results to veterinarians within seconds.

Carter said it's a powerful tool for early identification and for tracking and managing disease outbreaks, or even in responding to agroterrorist attacks.

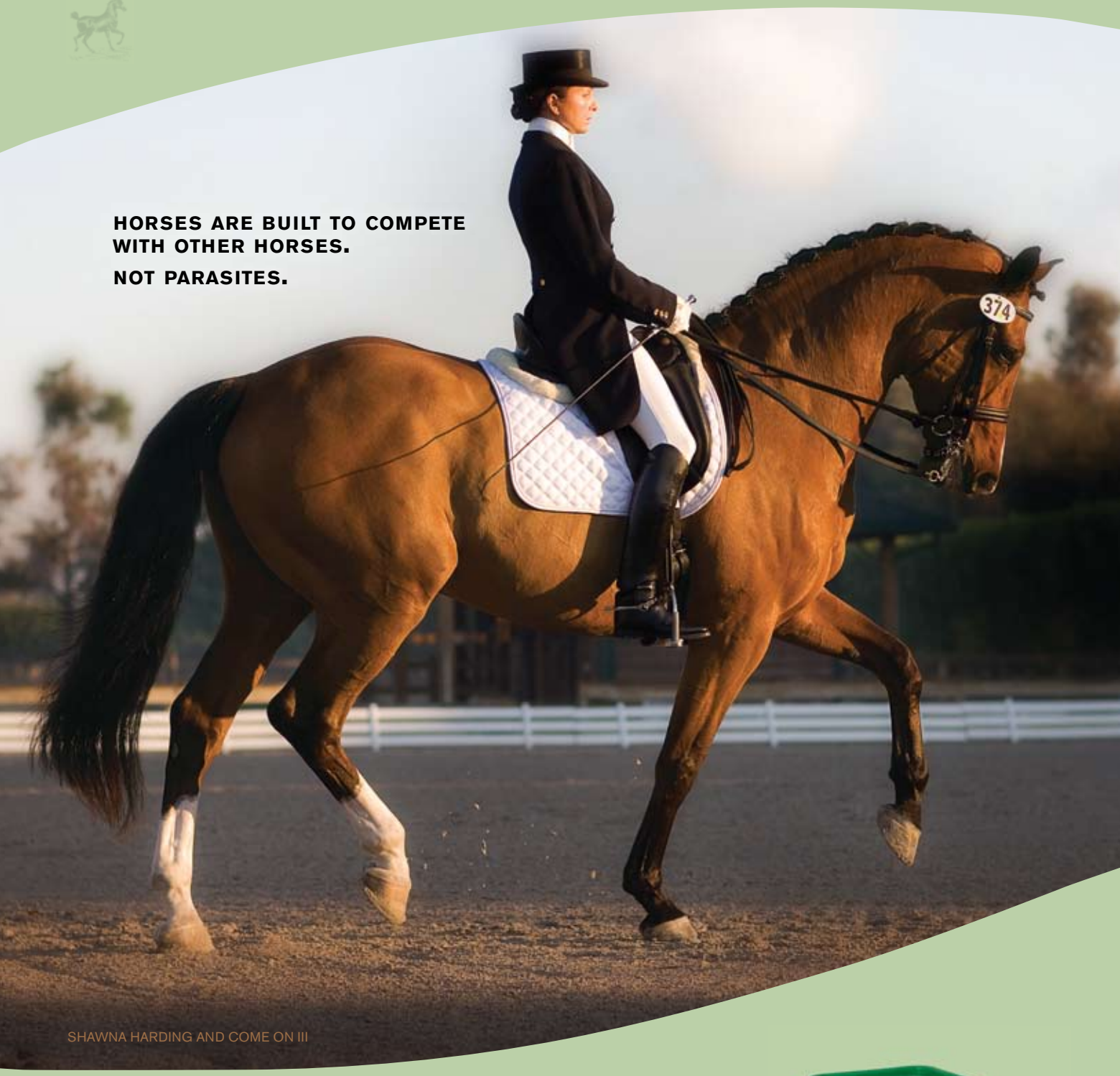
Because of the Bluegrass state's signature horse industry, the UK Livestock Disease Diagnostic Center currently has the largest equine necropsy caseload in the United States. UK

UPCOMING EVENTS

Sept. 19 Asbury Draft Horse Day, Asbury College Equine Center (just east of Wilmore, Ky.) Draft field work from 9 a.m. to 5 p.m., family events from 11 a.m. to 3 p.m., and workshops from noon to 5 p.m. Admission is free and food will be available for purchase. University of Kentucky researchers and extension faculty will present workshops geared toward the serious horse owner. The event will also be family-friendly, featuring horse pulling events, face painting, and other children's activities.

Sept. 24 "Equinomics," by Jill Stowe, PhD, and Kenny Burdine, extension specialist in the University of Kentucky's Agricultural Economics Department. This is a part of the Department of Veterinary Science Equine Diagnostic and Research Seminar series. Location: LDDC conference room.

The above are events in which staff members from the UK Equine Initiative and/or Gluck Equine Research Center are participating.



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