

Testing Available for Specific Dwarfism Gene in Miniature Horses

The University of Kentucky Animal Genetic Testing and Research Laboratory (AGTRL) is now offering DNA-based tests for four mutations in the aggrecan gene (ACAN) associated with dwarfism in Miniature Horses. John Eberth, MS, a PhD student of Ernie Bailey, PhD, professor in genetics and genomics at the UK Gluck Equine Research Center, discovered the mutations.

It is important to note that these mutations are not associated with another type of dwarfism known as skeletal atavism seen in Miniature Horses and Shetland Ponies. The ACAN mutations are also not associated with the osteochondrodysplasia dwarfism found in some breeds such as Friesians.

A horse that is a carrier for any one of the four ACAN mutations appears to be normal and does not exhibit any dwarf traits. Because carriers have the normal phenotype (physical characteristics), it is important to test breeding stock for these mutations to avoid matings that might produce a dwarf or aborted/absorbed fetus. One of these mutations (D1) is lethal in combination with any of the other mutations and will cause early pregnancy loss. Breeders should also avoid mating two horses that are carriers for the other ACAN mutations, as two mutations in any combination

will produce a dwarf foal with a range of physical ailments. Some of these defects seriously affect the horse's health and include breathing problems, malformed mouths that cause eating difficulties, and abnormal bone growth leading to chronic soundness issues.

The four identified mutations are designated D1, D2, D3, and D4. The normal copy of the gene is designated as N.

The following table summarizes the effects of the various mutation combinations:

Normal phenotype	Dwarf phenotype	Lethal (aborted/absorbed fetus)
N/D1	D2/D2	D1/D1
N/D2	D2/D3	D1/D2
N/D3	D2/D4	D1/D3
N/D4	D3/D4	D1/D4

The D3/D3 and D4/D4 genotypes have unknown effects, as no samples with these genotypes have been found.

Again, because of the serious health problems associated with the dwarf phenotype and the potential for aborted pregnancies, researchers strongly recommend against breeding carriers to carriers.

Carriers can be used in a breeding program safely if they are bred only to horses with normal genotypes (N/N).

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Information on test price and instructions for sample submission are available at www2.ca.uky.edu/gluck/AGTRL.asp#Dwarfism.

For questions regarding the dwarfism test, please contact Kathryn Graves, PhD, assistant clinical professor and director of the AGTRL, at ktgraves@uky.edu or 859/218-1193. **UK**

>Kathryn Graves, PhD, assistant clinical professor and director of the University of Kentucky Animal Genetic Testing and Research Laboratory, provided this information.

EXAMPLES OF DWARF PHENOTYPES



D2/D2 Dwarf



D3/D4 Dwarf



D2/D4 Dwarf



D2/D3 Dwarf



D1/D1 Dwarf (aborted)

EXAMPLES OF NORMAL PHENOTYPES



Health Problems in Newborn Foals

A foal's birth marks the start of something exciting: a new partner to train, a clean slate with which to begin, and potential just waiting to be tapped. But something exciting can quickly turn to something disappointing if that foal isn't healthy.

At the 2014 Kentucky Breeders' Short Course, held Feb. 8 in Lexington, Bonnie Barr, VMD, Dipl. ACVIM, an equine internal medicine specialist at Rood & Riddle Equine Hospital, also in Lexington, reviewed four common health problems newborn foals face. She also described what owners and breeding managers should watch for in each scenario and when to seek veterinary attention.

Predisposing Factors

It's often impossible to discern whether the foal about to pop out of a mare in labor will have a health problem. There are, however, a few predisposing factors that could indicate a potential problem.

"Most disorders of the newborn foal result from high-risk pregnancies," Barr explained. "Conditions that affect fetal development and maturity, delivery, or the peripartum period may result in severe neonatal illness."

Such conditions can include:

- Maternal illness;
- Placentitis (placenta inflammation);
- Vaginal discharge;
- Twinning;
- Dystocia (prolonged or difficult births);
- Premature placental separation (commonly known as a "red bag" delivery);
- Premature births;
- Hypothermia;
- Stress; and
- Localized disease in the neonate.

Additionally, Barr said, environmental conditions including unsanitary foaling conditions, poor husbandry, exposure to pathogens the mare isn't immune to, and poor nutrition could also predispose a foal to developing disease.

Normal vs. Abnormal

Once a foal is born, it's important to determine whether he's acting normally or if there might be something wrong. Normal, healthy foals should have a good attitude, be willing to nurse, be active in the stall, and interact with the mare. If the foal doesn't display such characteristics,



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Even if a foal appears healthy, have a veterinarian examine him shortly after birth to ensure there are no unapparent or underlying health problems.

the owner or manager should seek immediate veterinary attention.

Even if foals appear healthy, a veterinarian should examine them shortly after birth to ensure there are no unapparent or underlying health problems.

Foal Health Concerns

Next, Barr reviewed four common health problems newborn foals are susceptible to:

Failure of Passive Transfer Failure of passive transfer (or FPT) is the most common immunodeficiency in horses and occurs in 3-20% of foals, Barr said.

“Most disorders of the newborn foal result from high-risk pregnancies.”

Dr. Bonnie Barr

Foals are born without immune protection against infectious disease organisms and require passive transfer of antibodies found in the mare's colostrum (first milk). If a foal doesn't receive enough quality colostrum, he doesn't receive the antibodies he needs for protection against viruses and bacteria; this is termed FPT.

Barr said there are several reasons why a foal might not receive enough colostrum at birth:

1. **Production failure** This occurs when the mare does not produce enough good-quality colostrum. Thus, it's important for managers to evaluate a mare's colostrum quality using a gross assessment ("good-quality colostrum is yellow and sticky," Barr said) and a stall-side test (either a colostrometer or a refractometer) to ensure their foal consumes appropriate colostrum.
2. **Ingestion failure** This happens when the foal isn't able to consume the mare's colostrum. Compromised or weak foals or those with musculoskeletal problems might not be able to stand to nurse. This can also happen if a mare rejects a foal and doesn't allow him to nurse.
3. **Absorption failure** This occurs when the foal's system isn't able to absorb the colostrum consumed. Premature foals and those with a hypoxic gastrointestinal (GI) injury, inflammatory injury, or other illness can have problems absorbing colostrum appropriately.

Veterinarians diagnose FPT by measuring the foal's antibody levels shortly after birth. Barr recommended measuring foals' serum immunoglobulin (IgG, another term for antibody) concentrations at 8 to 24 hours of age to determine if FPT has occurred:

- Serum IgG levels greater than 800 milligrams per deciliter (mg/dL) represent adequate antibody transfer;
- Levels ranging from 400 to 800 mg/dL represent partial transfer; and

Newborn Foals

- Levels below 400 mg/dL represent failure of passive transfer.

While many foals with FPT remain healthy without treatment, Barr said researchers have identified that many foals with FPT also develop sepsis. Therefore, veterinarians treat most FPT foals.

Veterinarians typically administer frozen colostrum or colostrum replacer if the foal is less than 12 hours old. Previous research has shown that newborn foals' GI tracts absorb various macromolecules (including IgG) at a rate of 100% starting at birth. However, this rate decreases to less than 1% by the time the foal is 20 hours old. Thus, for the foal to absorb the required amount of IgG, he must consume the colostrum while his GI tract can still absorb appropriate antibody quantities.

For foals that have missed the "oral window," Barr said, veterinarians generally use intravenous therapy with either fresh plasma, frozen hyperimmune plasma, or IgG concentrates. These are less desirable options, however, because they don't contain all the other beneficial immunologic factors foals receive from colostrum, including proteins, immune modulators, and pro- and anti-inflammatory substances. So it's important to identify FPT foals early to allow them the best chance at consuming colostrum and gaining its immunologic benefits.

Although it's difficult to prevent FPT altogether, breeders can take steps to minimize the chance of it occurring, including:

- Providing mares and foals with a clean environment and proper nutrition;
- Ensuring mares receive appropriate vaccines in the tenth month of gestation; and
- Making sure the foal receives quality colostrum shortly after birth and keeping some frozen colostrum on hand in case the mare doesn't provide a suitable option.

Neonatal Sepsis The most common cause of illness and death in foals is neonatal sepsis (or a systemic inflammatory response in the presence or as a result of a suspected or diagnosed infection), Barr said. While sepsis can be caused by bacteria, viruses, or fungus, the majority of neonatal cases are bacterial in origin.

There are several routes of infection for neonatal sepsis, Barr said, including:

- The GI tract (foals ingest bacteria);

MASTHEAD

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The Horse: Your Guide to Equine Health Care

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- The respiratory tract and secondary aspiration;

- The placenta (prior to birth); and

- The umbilicus.

Clinical signs generally develop when the foal is 7-10 days old and are widely variable but rapidly progressive, Barr said. Early signs include a loss of suckle, fever or hypothermia, lethargy, weakness, and injected sclera or oral membranes (meaning the sclera of the eyes or the gums are peppered with broken blood vessels). Later clinical signs can include:

- Tachycardia (increased heart rate);
- Tachypnea (increased respiratory rate);
- Petechia (purplish red blood spots) in the oral, sclera, or aural (ear) membranes;
- Coronary band hyperemia (reddening caused by increased blood flow);
- Increased or decreased capillary refill time;
- Septic shock; and
- Multi-organ system failure.

The gold standard for diagnosing neonatal sepsis is a blood culture to identify the presence of a pathogen. "But," Barr said, "it's not quick. It takes several days,

and many foals don't have several days."

Therefore, many veterinarians will use diagnostics that are suggestive of neonatal sepsis, including:

- Identifying blood work abnormalities including leukopenia (a reduced white blood cell count), hypoglycemia (low blood sugar), azotemia (elevated blood urea nitrogen and creatinine concentrations), increased lactate levels (which indicate low oxygen levels), and FPT—all of which signify a foal in shock, Barr said;
- A modified sepsis score, which is a point system modified from human medicine and based on factors from the foal's history, clinical signs, blood work, and laboratory data; and
- Infection localized to a body system (most commonly the lungs).

Veterinarians treat neonatal sepsis with antibiotics, fluids, proper nutrition (either oral or intravenous, if need be), plasma administration, and supportive care.

As veterinarians on the whole gain experience in treating neonatal sepsis, the prognosis for affected foals has improved, Barr said. From 1990 to 1995,

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72% of septic foals treated at the University of Pennsylvania School of Veterinary Medicine New Bolton Center survived to discharge, and by 2006 Rood & Riddle had a 70% survival to discharge rate. Barr said foals with more complications are less likely to survive, and early recognition and referral are keys to survival.

Like FPT, it's difficult to definitively prevent neonatal sepsis; however, owners and managers can take steps to reduce their foals' risk of developing disease, including:

- Vaccinating the broodmare properly;
- Maintaining a clean environment for the mare and foal;
- Reducing the potential bacterial load introduced during udder seeking (during this process foals can ingest bacteria that enter the intestinal tract and are absorbed by the GI tract);
- Cleaning and caring for the umbilicus appropriately; and
- Ensuring foals receive appropriate amounts of colostrum to prevent FPT.

Neonatal Encephalopathy This disorder has gone by several different names in the past, including neonatal maladjustment syndrome, hypoxic ischemic encephalopathy, and "dummy foal" syndrome, among others. But now, Barr said, the disease is termed neonatal encephalopathy (NE). The syndrome is the same, but the terminology has been simplified—it now describes the age group (neonatal foals) and body system (the brain and central nervous system) affected.

Previously, Barr said, veterinarians thought affected foals resulted from a hypoxic-ischemic event (where the foal was deprived of oxygen), such as a red bag delivery or dystocia. But, not all dummy foals had a history of a hypoxic-ischemic event. Recent research results, however, showed that an upregulated fetal inflammatory response can also cause a foal to display signs of NE.

Clinical signs of NE generally appear between birth and 36 hours of birth and vary from very mild to very severe based on what part and how much of the brain is affected, Barr said. Central nervous system signs include:

- Loss of tongue curl;
- Loss of suckle;
- Disorientation;
- Wandering;
- Hyperresponsiveness (an abnormal degree of responsiveness to stimuli);



ALEXANDRA BECKSTETT

The most common cause of abdominal pain and distension in neonatal foals is meconium (first manure) impaction.

- Abnormal breathing patterns; and
- Seizures.

Affected foals also can develop renal (kidney) and GI issues, Barr said. Renal problems are often subtle and transient, she said. GI issues, on the other hand, can range from mild indigestion to severe diarrhea, she explained, and often appear a few days after nervous system signs.

Veterinarians diagnose NE based on the foal's history and clinical signs, Barr said, and treatment typically includes antimicrobial, fluid, and plasma administration; supportive nursing care; and therapy to stop seizures.

If foals only develop neurologic signs, they're typically hospitalized for about 10 days and have an 80-90% survival rate to discharge, Barr said. If foals develop further clinical signs and secondary complications, however, the survival rate drops. Fortunately, Barr added, if foals survive they generally have a good long-term prognosis with few to no lasting effects.

NE isn't necessarily easy to prevent, Barr said; however, there are some things breeders can do to help reduce its likelihood. First, she said, it's important to recognize, diagnose, and treat placentitis in mares promptly, as researchers have shown that treatment appears to reduce the incidence of neonatal diseases. Next, be on hand to manage dystocias quickly or call for veterinary assistance at the first sign of trouble during foaling. And finally, use good management techniques for mares and foals, including providing proper nutrition, maintaining a sanitary environment, and treating fevers and illnesses promptly.

Meconium Impactions Finally, Barr described meconium impactions—the most common cause of abdominal pain

and distension (swelling) in neonatal foals. A variety of factors can cause meconium (the first manure a foal will pass) impactions, she said, including:

- An excessive amount of meconium;
 - Impaired gastrointestinal motility; and
 - Prolonged recumbency, dehydration, or medication administration.
- Clinical signs can appear from the time a foal is a few hours old to when he's a few days old and include:
- Straining to defecate with an arched back;
 - Restlessness;
 - Tail swishing;
 - Changes in nursing behavior;
 - Depression;
 - Rolling; and
 - Abdominal distension.

Veterinarians diagnose meconium impactions using a combination of the foal's history, abdominal ultrasound, and contrast radiography. Treatment includes:

- Antimicrobial administration;
- Fluid administration;
- Nursing restriction;
- Analgesics (pain killers);
- Intravenous nutrition;
- Supportive care; and
- Enemas.

Barr said there are several types of enemas veterinarian can use, including phosphate enemas (however, there's a risk of the foal developing hyperphosphatemia), soapy water enemas, and acetylcystine retention enemas. She said researchers have shown that acetylcystine enemas have a high success rate (93%) when coupled with intravenous fluids and pain management.

Veterinarians can successfully manage most foals with meconium impactions medically, she said; however, some foals with severe impactions might require surgery. A complication associated with meconium impactions is a ruptured bladder from the foal straining to defecate. The long-term prognosis for affected foals is good.

Take-Home Message

Tiny foals can have some big health problems. When you're expecting a foal, knowing what health problems to watch for, understanding how to manage them, and knowing when to call a veterinarian can mean the difference between life and death for your new arrival. **UK**

>Erica Larson is the news editor for The Horse.

Deworming: Less is More

QUESTION

Last spring my veterinarian requested her clients stop deworming their horses. We now do no deworming and have her perform two fecal egg counts per year—one in the spring and one in the fall. I'm concerned this isn't comprehensive. I own two horses and one is a 31-year-old senior with recurring uveitis and Cushing's disease. Is this program of not deworming okay for my horses?

Heather
Pittsburgh, Pa.

ANSWER

Your veterinarian has a point: There's no doubt that the majority of horses in North America are overdewormed, and the large majority of adult horses require very little deworming if at all.

Although all horses get internal parasites, the risks of actual disease caused by these are very low in adult horses. Foals and yearlings are more susceptible to infection and, hence, more at risk. However, in our guidelines for equine parasite control (published by American Association of Equine Practitioners) we do recommend a baseline of one to two annual dewormings that all adult horses should receive. The reason is that the fecal egg count mainly reflects the level of egg shedding with small strongyles, which are by far the most common and abundant parasites infecting horses. But other potentially important parasites such as tapeworms and large strongyles (bloodworms) are not readily reflected by egg counts.

Our research has shown that the bloodworms can become more common if horses are left completely untreated. Therefore, we recommend these treatments as a safety precaution (discuss the specific class of anthelmintic drug you should use with your veterinarian). The most relevant time to consider a treatment for your horse is in the early to mid-fall, after he has grazed all summer. During the grazing season both tapeworm and strongyle burdens will accumulate to reach peak levels in the fall, so this is a good time to break the life cycle and lower the parasite burdens.

It's important to routinely check the efficacy of your deworming drugs to make sure that they work as intended. Many people are living with a false sense of security by routinely using dewormers that have lost their effect. You can check your dewormers to see if they're working by running two egg counts: one at the time of deworming and another about 14 days later. We recommend testing at least six horses on every farm.

Martin Krarup Nielsen, DVM, PhD, Dipl. EVPC
Equine parasitologist, veterinarian, and
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WEED OF THE MONTH

Common name: Chicory

Scientific name: *Cichorium intybus L.*

Life Cycle: Perennial

Origin: Mediterranean region

Poisonous: None reported

Chicory is widespread across North America and is a commonly occurring plant in all types of pastures and rough turfs. This erect, branched simple perennial weed grows 2 to 4 feet in height at maturity and has milky sap. Chicory flowers have distinctive bright blue petals and bloom from mid-June through October. Chicory develops from a basal rosette



(similar to dandelion), has a deep, fleshy taproot, and reproduces from buds on the root. Chicory is primarily spread by seeds. It is not as common as many weeds in horse pastures but occurs in more abundance in unmowed pastures.

Chicory is relatively easy to control with several herbicides. Mowing in pastures might reduce flower formation but is generally ineffective in killing the plant. Hoeing or digging the tap root is successful and should be done before the seed heads are formed. Many people consider chicory to be less "weedy" and want it to grow in pastures, while others desire it to be removed. Consult your local Cooperative Extension Service personnel for herbicidal control in your area. [UK](#)

>William W. Witt, PhD, professor emeritus in the department of plant and soil sciences at the University of Kentucky, provided this information.

Study Results: Antibiotics in Semen Extenders can Prevent CEM Bacteria Transmission

Researchers from the University of Kentucky Gluck Equine Research Center recently investigated whether antibiotics in a semen extender could inhibit the growth of the bacteria *Tayorella equigenitalis*, which causes contagious equine metritis (CEM), and escape detection of the bacteria in horses bred by artificial insemination.

Contagious equine metritis is a highly contagious sexually transmitted disease. It is spread through breeding or contaminated instruments and causes temporary infertility in mares, and a nonsymptomatic carrier state in stallions. In addition to costs associated with infertility of the mares, infected stallions need to be treated and rigorously tested free from the disease before they can breed again. The disease can be catastrophic to the horse industry if it goes undetected. Stallions show no clinical signs, but can carry the CEM bacteria on their genitalia for months or even years. If tested positive, they need to be taken out of breeding for several weeks or even months.

Study Results

The United States has largely been considered CEM-free since 1978, when an outbreak occurred in Kentucky with significant costs to the Thoroughbred industry. Importation regulations currently apply to horses imported from countries considered endemic for the disease.

"Although there is no current threat to the U.S. horse population, it always raises concerns that imported horses may bring the disease into the U.S.," said Mats Troedsson, DVM, PhD, Dipl. ACT, director of the Gluck Center and chair and of the Department of Veterinary Science.

In 2006, three imported stallions in Wisconsin tested positive for *T. equigenitalis*. All stallions had tested negative prior to exportation to the U.S. and again upon arrival. They had bred several mares resulting in normal fertility and no clinical signs of disease, Troedsson said. In 2008, a Quarter Horse stallion tested positive for *T. equigenitalis* upon routine testing required for frozen semen to be exported to Brazil. However, no clinical observations of disease or infertility had been reported in mares bred to this stallion.

Following a subsequent national disease investigation, 22 stallions tested positive for *T. equigenitalis*, resulting in

The Study

In the study, the researchers compared *T. equigenitalis* growth in raw semen from a CEM-positive stallion and the same semen extended in media containing antibiotics. They also assessed the outcome in mares inseminated with raw, extended, or frozen semen from the same stallion.

The team chose at random 21 adult mares and assigned each one into three different groups to be inseminated with either raw, extended, or frozen/thawed and extended CEM-positive semen or CEM-negative semen (control group). Additionally, the researchers cultured semen from an experimentally infected stallion to test the effect of antibiotics in extenders on the growth of *T. equigenitalis*.

Upon analyzing the data, the researchers found the following:

- Commercial semen extender (EquiPro with amikacin and penicillin) contained enough antibiotics to prevent *T. equigenitalis* transmission to any of the mares in the study through artificial insemination with fresh, cooled, and frozen semen.
- Six mares inseminated with raw CEM-positive semen had clinical signs of CEM (e.g., vaginal discharge) at each sampling point after artificial insemination.
- In contrast, none of the mares inseminated with extended or frozen semen from the CEM-positive stallion or mares in the control group inseminated with raw CEM-negative semen developed clinical signs of vaginitis.

715 mares having been exposed, Troedsson said, while only five of these mares (0.7%) tested positive for *T. equigenitalis*. This is in sharp contrast to previous outbreaks in Thoroughbred populations in the United States, France, Great Britain, etc., where natural breeding is practiced exclusively.

Troedsson said a possible explanation for the low CEM transmission during these outbreaks in 2006 and 2008 was that all mares were bred by artificial insemination with the semen extended

in antibiotic-containing media. Semen extenders with antibiotics are routinely used for artificial insemination in order to minimize any contaminating bacteria's effect on semen quality. However, CEM can potentially go undetected when semen is extended in media with antibiotics. If CEM becomes endemic in breeds that practice artificial insemination, it could potentially spread with devastating consequences and even enter the Thoroughbred population through cross breeding using natural breeding.



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Study Results

Therefore, the rationale for conducting the present study was the low CEM transmission in mares bred via artificial insemination in an antibiotic-containing extender during these outbreaks.

"We hypothesized that the inclusion of

antibiotics in semen extender prevents growth of *T. equigenitalis* in extended semen and therefore reduces the risk of CEM transmission. It also makes it difficult to diagnose CEM in horses that are bred exclusively with artificial insemination," Troedsson said. "However, the purpose of the present study was not to show that it is possible to treat semen

from infected carrier stallions. That could potentially make the disease endemic in the U.S., largely because of the difficulties to diagnose CEM in mares bred to a stallion." **UK**

>Shaila Sigsgaard is an editorial assistant for the Bluegrass Equine Digest.

Tall Fescue Testing: Understanding the Numbers

Most horse breeders are aware of endophyte-infected tall fescue's toxic effects on late-term pregnant mares. Prolonged gestation; difficulty foaling; thick, retained placentas; and depressed milk production are a few of the more common clinical signs seen in mares grazing infected tall fescue.

Property managers often test their pastures to evaluate the risk of fescue toxicity; however, testing isn't all that simple, and how you test can produce drastically different results. Here are some things to remember when testing horse pastures for infected tall fescue.

Understanding Tall Fescue Infection

A few key concepts about infected tall fescue:

1. Tall fescue itself is actually nutritious forage that is not harmful to horses.
2. Plants are either infected with an endophyte or they are not; there is no in between. An infected plant will always be infected, and a non-infected plant will always be non-infected. Infected and non-infected plants can be found next to each other and their status will not change.
3. Non-infected plants will always produce non-infected seed; however, infected plants can produce infected or non-infected seed. Plants that grow from infected seed are also infected.



Broodmares grazing endophyte-infected tall fescue might experience prolonged gestation, difficulty foaling, retained placentas, and depressed milk production.

4. You cannot determine if a plant is infected or non-infected by looking at it in the field, and neither can your horse, cow, sheep, or neighbor.
5. The endophyte itself is not harmful, but it produces many compounds, some of which are toxic to livestock.
6. The compounds that horse owners are concerned with are called ergot alkaloids. There are many ergot alkaloids, but the most prevalent is ergovaline (representing 84-97% of all ergot alkaloids present). Therefore, this is the one most laboratories focus on.
7. Ergovaline can "transform" into its isomer—or chemically identical with a different structure—ergovalinine and back again in a process known as isomerization when in solution in the laboratory.
8. Novel endophyte tall fescue varieties have been developed that produce little or no ergovaline.

Endophyte Infection

As stated, a plant's infection status will not change. However, the percentage of infected plants across a pasture can change over time. Pastures that have not been managed to reduce infected tall fescue will generally show 75% or more infection rates (meaning 75% of the plants are infected and 25% are not) in areas where infected tall fescue is common, such as the southeastern United States.

Most laboratories that perform endophyte testing request that property managers submit 30-60 individual tillers or grass shoots from a pasture. Each tiller will be tested using immunoblot and will be determined

to be infected or not. Your results will be expressed as a percentage of tillers submitted that are infected with the endophyte. But we must consider what else is in the pasture (and what isn't) to interpret these numbers.

For example, if pasture No. 1 contained 80% desirable forages (such as bluegrass and orchardgrass) and only 10% tall fescue that was 100% infected, we would call this a low-risk pasture because horses will likely be consuming mostly bluegrass. However, if pasture No. 2 is mostly bare, with only 10% desirable forages and 10% tall fescue that is 100% infected, as much as half of the horses' diets contain infected tall fescue. That would be considered a high-risk pasture. Finally, pasture No. 3 contains 70% desirable forages and 20% tall fescue, but only half of the tall fescue is infected. In that instance only about 10% of the total forage in the pasture is infected, so we would call this a medium- to low-risk pasture.

Here are a few things to remember when sampling and testing pasture for endophyte presence:

- Test results are only as good as the samples taken. Select tillers at random from throughout the field, not just in one location. For details, check out "Sampling for Tall Fescue Endophyte in Pasture or Hay Stands" at uky.edu/ag/forage/horselinks.

Tall Fescue Testing

- Keep tillers cool (preferably in a cooler or freezer) and transport to the testing facility as soon as possible.
- Perform endophyte testing when the plant is growing vigorously. Testing in the winter or early spring can result in false low endophyte infection results and should be avoided.
- Be sure you are sampling tall fescue only and cutting at the soil surface, as most of the endophyte is found at the base of the plant. For assistance in plant identification, see "Forage Identification and Use Guide," at www2.ca.uky.edu/agc/pubs/agr/agr175/agr175.htm.

Ergot Alkaloid Analysis

Sample analysis for ergot alkaloids can be complex and confusing. However, these results are often used to make cost-saving management decisions; therefore, it is important to make sure they are done correctly, from sampling to interpretation. While a pasture's endophyte status will change very little over time, ergot alkaloids will change daily depending on many variables. Thus, it is important to consider the alkaloid concentrations a snapshot of what is happening in the pasture at a specific time. Keep in mind that alkaloid production follows plant growth, and levels are expected to be highest in the spring and fall when tall fescue is growing most vigorously. Ergot alkaloid concentrations are generally very low in winter.

Similar to endophyte testing, take tall fescue samples from throughout the field. But rather than cutting at the soil surface, clip to get a representative sample of what your horse will be eating. Collect material at the

Pasture	% Desirable Forages	% Tall Fescue	Endophyte infection rate (%)	% Weeds and Bare Soil	Overall risk to mares
1	80	10	100	10	Low
2	10	10	100	80	High
3	70	20	50	10	Medium

grazing height of animals—generally 2-3 inches above the soil surface—and keep samples on ice. Researchers have indicated that sample handling is crucial. Ideally, you should take samples to the laboratory the day of cutting; if this is not possible, store the sample in a freezer until it can be transported. If testing dry stored hay, these samples can be left at room temperature. Many ergot alkaloids have been shown to be stable in hay after the curing process but very volatile in fresh tall fescue plants. For more information on sampling pastures, see, "Tall Fescue Sampling for Ergovaline," at uky.edu/ag/forage/horselinks.

Why Results Don't Always Match

In a perfect world, every laboratory would give you the same answer, and it would mean the same thing. However, this is not true in many cases, including ergot alkaloid analysis. There are several accredited laboratories in the United States that regularly offer ergot alkaloid

analysis of pastures or hay. Here are some reasons why results and interpretations from one to the next might differ:

Test offered Some laboratories test for ergovaline only while others test for a number of other ergot alkaloids. Tall fescue infected with the endophyte *Neotyphodium coenophialum* will contain almost exclusively ergovaline and ergovalinine. However, other fungi, such as *Claviceps* spp., can infect many grains and grasses, including tall fescue, and produce other ergot alkaloids such as ergosine, ergotamine, ergocornine, and others. Each alkaloid, including ergovaline, affects animals to a different degree and scientists have observed an additive affect when multiple alkaloids are present. For those farms located in a region where other fungal infections are not common (such as Central Kentucky), ergovaline analysis is adequate; farms located in regions where other fungal infections are common (such as the northern great plains) should seek labs that perform a full alkaloid panel, which will likely cost more. Testing facilities generally offer the test that is most useful for their area, so begin by contacting a laboratory near you.

Sample handling How samples are handled in the lab is as important as how they are handled in the field. Fresh plant samples are the most sensitive to heat, air, and time. Ask each lab how it stores samples to minimize effects. Less storage time means better results.

Analysis method There is no standard analysis method

that each lab uses. Method details will vary from lab to lab and technician to technician performing the analysis. Unfortunately, there no real way to avoid this, so accurate interpretation is key in this instance.

Reporting results This is where many people can get frustrated. Each lab will report results in a slightly different way. Some report ergovaline only, while others report ergovaline and ergovalinine. Some report all ergot alkaloids individually or summed. Results can be reported in many different units such as parts per million (ppm), parts per billion (ppb), micrograms per kilogram (ug/kg), or nanograms per gram (ng/g). Samples can be analyzed on a dry matter or as fed basis. If the report is not clear, ask the lab exactly what it is reporting.

Interpretation Now that you have an answer, what does it mean? That depends on who you ask. Find a lab you are comfortable working with, and send samples exclusively to them. This will reduce inter-lab differences. Additionally, each lab will have different threshold values to compare to determine if the level in your pasture or hay puts your horses at risk. Differences in threshold values across labs exist for the same reasons that analysis results differ. Compare your analysis results only to threshold values published by the testing laboratory. If you have additional questions, direct these to the testing facility that did the work, because only they are familiar with how your samples were handled, analyzed, and reported.



UK COLLEGE OF AGRICULTURE

Tall fescue.

Tall Fescue Testing

Dilution Effect

Remember: Ergot alkaloid results are only part of the final equation. Cattle farmers in fescue-prone areas have long lived by the adage that “the solution to the pollution is dilution.” They often plant a mixture of grasses and clover in pastures or feed other

forage supplements to dilute the effects of tall fescue toxicity. The same principle can be applied to horses. Maintaining a desirable forage mix in your pasture will greatly dilute tall fescue toxicity.

Summary

Tall fescue toxicity is a complex issue on breeding farms, and hard, fast answers are not always realistic. Work

with a reputable, accredited laboratory in your area to perform the most beneficial tests for your situation. Discuss results with the laboratory toxicologist and your veterinarian to understand the meaning and limits of these values. Finally, keep up with new tall fescue toxicity research. Hundreds of scientists across the world are working to better understand

this complex challenge, all with the goal of giving you the most accurate, consistent, and concise information possible.

Testing Laboratories

The following is a list of a few laboratories that offer endophyte and/or ergot alkaloid analysis:

- **Agrinostics Ltd. Co.**
P.O. Box 882
Watkinsville, GA 30677
www.agrinostics.com
- **Iowa State University Veterinary Diagnostic Laboratory**
1600 South 16th
Ames, IA 50011
www.vetmed.iastate.edu/diagnostic-lab
- **Oregon State University Endophyte Service Laboratory**
139 Oak Creek Building
Corvallis, OR 97331
www.oregonstate.edu/endophyte-lab
- **University of Missouri Veterinary Medical Diagnostic Laboratory**
P.O. Box 6023
Columbia, MO 65205-6023
www.vmdl.missouri.edu
- **University of Kentucky Regulatory Services**
103 Regulatory Services Building
Lexington, KY 40546-0275
www.uky.edu/ag/regulatory-services
- **University of Kentucky Veterinary Diagnostic Laboratory**
1490 Bull Lea Rd.
Lexington, KY 40511
www.vdl.uky.edu

>Krista Lea, MS, UK's Department of Plant and Soil Sciences, Cynthia Gaskill, PhD, DVM, UK Veterinary Diagnostic Laboratory, and Ray Smith, PhD, UK Department of Plant and Soil Sciences provided this information.

COMMENTARY

Social Media and Equine Crisis Response

The explosion of social media has not changed human nature. The inclination to share rumors, speculation, gossip, and scandalous accusations—with or without credible verification—has been a part of human nature as long as language itself. The speed at which social media now moves such information through the horse industry is, however, both novel and alarming.

For example, the 2011 multistate equine herpesvirus-1 outbreak traced to a cutting horse event in Ogden, Utah, vividly reflects the financial and emotional impacts a crisis event can have on the horse industry. Some information shared on social media regarding the outbreak was accurate and served a legitimate purpose. Other postings were exaggerated or false and generated erroneous perceptions and unwarranted overreactions.

Successful crisis communication in a world obsessed with social media involves individuals at all levels of the horse industry. Two decades of research by risk and crisis communication experts offer some feasible suggestions for all of us in combating inaccurate messages shared during crises:

Those with knowledge should communicate openly and honestly. The disastrous impact of falsifying or withholding public information is well known. Doing so endangers the well-being of horses and undermines public trust.

Know your network and spokespersons in advance. Although every industry is vulnerable to crises, relatively few regularly engage in crisis planning. Having a network in place and the means for credible spokespersons to communicate through that network is essential. Social media outlets such as Twitter and Facebook give agencies and industry leaders an unprecedented opportunity to proactively establish such a network.

Acknowledge public concern. Even if we believe a problem making its way through social media is false, our failure to respond creates space for rumors to spread. We must often provide a substantial response to unsubstantiated problems.

Communicate early and often. Case studies and experiments reveal that sources are perceived more credibly if they communicate early in an event. Waiting until a story spreads widely to make a response significantly reduces credibility.

Acknowledge both sides of the story. Message testing research in crisis communication reveals an overwhelming advantage to speakers who acknowledge the accusations that are shared and then systematically explain why they are or are not true. Simply disregarding accusations presumed or known to be false and then advocating your position is seen as arrogant and far less credible by audiences.

Give those who are alarmed something meaningful to do. Surprisingly, an extensive review of crisis messages shared through traditional and new media reveal far more content emphasizing the threat than recommendations for self-protection. Providing suggestions for avoiding the threat or seeking treatment greatly enhances credibility and can legitimately diminish the impact of a crisis.

Following these six suggestions based on considerable research could make the difference between success and failure in a crisis response.

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Starting and Stopping a Mare's Estrous Cycle

While some breeders are content to let Mother Nature decide when a mare's body is ready for pregnancy, others take a more proactive approach. There are many reasons why an owner might seek closer control over a mare's estrous cycle, ranging from herd synchronization to a desired foaling date to putting a breeding career on hold for a performance career. And nearly as numerous as the reasons for starting or stopping an estrous cycle are the ways veterinarians and owners can accomplish the task.

At the 2014 Kentucky Breeders' Short Course, held Feb. 8 in Lexington, Ed Squires, DVM, PhD, Hon. Dipl. ACT, executive director of the Gluck Equine Research Foundation, reviewed methods owners have by which to control mares' estrous cycles.

Heat Cycle Review

Before talking about starting and stopping a mare's heat cycle, it's important to understand how the cycle works normally.

In early spring, as days get longer and temperatures rise, the mare's hypothalamus gland starts producing a gonadotropin releasing hormone (GnRH). GnRH stimulates the mare's pituitary gland, which secretes two hormones that affect the ovaries. The first hormone is follicle stimulating hormone (FSH), which stimulates development of one or more follicles.

When the follicles reach 20-25 mm in diameter they secrete estrogen, which stimulates estrual activity and stimulates the pituitary gland to release the second hormone—luteinizing hormone (LH). This hormone facilitates maturation and ovulation of the growing egg-bearing follicle.

Ovulation occurs when the mature egg leaves the follicle and travels through the oviduct. In the wake of ovulation, estrogen levels fall and the remains of the ovulated follicle are converted to form a corpus luteum (CL), which secrete the hormone progesterone. The progesterone shuts down the estrus-stimulating hormones and sets the stage for maintaining a pregnancy. After 12 to 14 days, if pregnancy has not occurred, the uterus secretes prostaglandin, which causes CL regression and a decline in progesterone



Motion and Davidson Speak at Distinguished Industry Lecture Series

H. Graham Motion and Bruce "Buck" Davidson Jr. spoke at the University of Kentucky Ag Equine Programs' Distinguished Industry Lecture Series on April 21. Approximately 200 people attended the event at Seay Auditorium in the Ag North Building on UK's campus. Hagyard Equine Medical Institute sponsored the event. Dan Liebman, former editor of *The Blood-Horse* magazine, interviewed Motion and Davidson, who spoke about similarities and contrasts in their respective sports, their journeys, and the power of personal relationships in the industry.

The Distinguished Lecture Series began in the fall of 2009 and has become a signature program of UK Ag Equine Programs. It is designed to showcase important figures from the equine industry in an informal setting. Past series participants include Keeneland President Nick Nicholson in November 2009, accomplished equestrienne Nina Bonnie in April 2010, Keeneland's Ted Bassett in April 2011, Zenyatta owners Jerry and Ann Moss in September 2011, and Olympian Reed Kessler in November 2013.

For more information about this event, including photos and video from the evening, please visit www.ca.uky.edu/equine.

secretion. This allows the mare to return to estrus and repeat the cycle.

Transitional Mares

Squires said that, left to her own devices, the average mare's first ovulation of the year is somewhere around May 1, which is much too late for breeders interested in having foals on the ground early in the year. Thus, some owners might seek to get transitional mares—those in the phase between winter anestrus (not cycling) and regular cyclic ovarian activity—cycling. And the most common and easiest method to encourage early cycling is by simply leaving the lights on longer.

In this common practice in the Thoroughbred industry, barn managers

maintain broodmares indoors under barn lighting until 11 p.m. for eight to 10 weeks beginning around Dec. 1. The artificially extended day length acts to inhibit the hormone melatonin and fools the mare's reproductive system into activating earlier in the year. Historically, managers have successfully induced estrus using light from a 100-watt light bulb in a 12-by-12-foot stall; researchers have loosely defined this amount of illumination as "enough light to read a newspaper."

Recently, however, scientists evaluated a mobile blue-light mask's efficacy in suppressing mares' melatonin secretions, thereby inducing estrus earlier in the year. The team found that exposing mares to as little as 10 lux via

Estrous Cycle

a blue-light mask effectively induced estrus in healthy Thoroughbreds. This might mean managers can save money on lighting and stabling costs by maintaining mares at pasture with the mask; however, Squires noted the masks are expensive.

Veterinarians also have a number of pharmaceutical options for inducing estrus in transitional mares. The most common method used to bring transitional mares into estrus is a progestin, altrenogest, marketed as Regu-Mate or Altresyn. Squires said many managers and veterinarian put mares under artificial light for 60 days before administering altrenogest for 10 to 14 days. At that point, the mare should come into heat.

Squires cautioned that, while this method remains the gold standard for inducing estrus in transitional mares, some administration issues exist for humans handling the drug. The solution can be absorbed through human skin and adversely affect women's hormone activity, so always wear rubber gloves when handling altrenogest.

Administering GnRH twice daily can also help hasten the breeding season, Squires said. Veterinarians can choose from two GnRH analogues: deslorelin and busserelin.

Similarly, Squires said, administering human chorionic gonadotropin (hCG) has proven very successful in inducing ovulation in mares within 48 hours of administration if mares had a follicle measuring 35 mm prior to administration and evidence of being in estrus.

Study results have shown that recombinant follicle stimulating hormone (reFSH) is effective in inducing estrus in anestrus mares; however, availability is an issue as its no longer on the market.

Oral domperidone administration stimulates prolactin production and is also effective in bringing transitional mares into estrus.

Cycling Mares

Once a mare ovulates she's considered a cycling mare, and estrus and ovulation can be manipulated more easily. Again, veterinarians commonly employ altrenogest—the synthetic progestin—to cycling mares to aid in:

- Estrus suppression (more on this in a moment);
- Estrus synchronization (Squires noted

that veterinarians frequently administer the hormone prostaglandin F2- α after eight to 10 days of altrenogest administration when synchronizing estrous cycles; the progestin alone might not effectively inhibit follicle development, he said.);

- Pregnancy maintenance;
- Maintaining high-risk pregnancies;
- Embryo transfer;
- Post-surgery; and
- During transit (“The stress of transportation can lower progesterone in the blood, so altrenogest can protect the mare from experiencing low progesterone,” he explained).

Estrus Suppression

Owners might want to suppress estrus for many reasons, from eliminating behavioral issues associated with heat cycles to keeping an equine athlete out of heat during the competition season. Aside from administering altrenogest, veterinarians have several other options, including:

Oil infusions Researchers in one study showed that infusing plant oil (such as corn or coconut oil) in the uterus might extend corpus luteum function and suppress estrus;

Oxytocin injections When administered during diestrus (not in heat), oxytocin has been shown to increase the duration of mares' corpus luteum, thus keeping her out of heat;

GnRH vaccines “Vaccinating” mares against GnRH stops a mare from cycling by inactivating the GnRH she produces. Simply put, it temporarily interrupts the whole hormonal cascade and essentially deactivates the ovaries. However, Squires noted, there isn't an equine GnRH vaccine available in the United States, and it's generally impossible to predict when a mare might come back into heat after vaccination;

Intrauterine marbles These smooth glass balls extend corpus luteum function by, essentially, tricking the mare into pregnancy recognition. Mares return to heat once the marbles are removed. Squires said this method, while effective, can become problematic if the marble is forgotten in the mare's uterus;

Diestrus ovulation Inducing a mare to ovulate during diestrus results in a CL that is not old enough to respond to prostaglandin F2- α secreted late in diestrus;

Pregnancy Getting a mare pregnant and then eliminating the pregnancy at 16 to 20 days of gestation will suppress estrus

UPCOMING EVENTS

May 15

Kentucky Equine Networking Association (KENA) Meeting, networking, 6 p.m.; dinner, 6:30 p.m. Four Points by Sheraton Hotel, Lexington. Topic: Care of Pastures. Visit kentuckyhorse.org/kena to register.

May 8 and 15, July 24 and 31,

Aug. 15 and 22, and Sept. 19

2014 Hagyard Challenge Series, Kentucky Horse Park. <http://hagyard.com/Hagyard-Challenge-Series.html>

June 3

UK Equine Farm and Facilities Expo, Kentucky Equine Humane Center, Jessamine County

reliably for 60-90 days; however, Squires said, this technique is not overly practical; and

Ovariectomy Often, the last resort (because it's completely irreversible) in estrus control is an ovariectomy, or removing the mare's ovaries.

Postponing Ovulation

Finally, Squires said, there are some cases in which breeders might seek to postpone, but not stop, ovulation. If shipped semen hasn't arrived yet or their stallion of choice isn't available for breeding, for example, owners might want to delay estrus by a day or two. Squires said for this purpose, altrenogest can be administered for one or two days when the follicle is 30-35 mm. Researchers have shown that this can delay ovulation, with fertility rates remaining similar between test and control mares; however, some follicles (25%) became atretic (abnormal and fail to ovulate) when mares received altrenogest for this purpose, he cautioned.

Take-Home Message

Regardless the reason for seeking to start or stop an estrous cycle, your veterinarian will be able to help you through the process. With a variety of methods available, veterinarians have numerous options by which to “tailor” a mare's reproductive cycle to meet her and your needs. **UK**

>Erica Larson is the news editor for The Horse.