

Understanding the Differences between EMS and PPID

As our understanding of the equine endocrine system advances, so does the demand for research on diagnosis, discovery, and efficacy of treatment for the most common endocrine disorders equine practitioners and owners deal with: equine metabolic syndrome (EMS) and pituitary pars intermedia dysfunction (PPID, or equine Cushing's disease).

Horse owner and practitioner education about these diseases, however, is lagging behind. There continues to be a great amount of confusion in the horse world surrounding these two disorders. It is critical to understand each of them in order to properly treat and manage affected horses. In this article we will discuss the differences between EMS and PPID as well as relevant studies under way at the University of Kentucky Gluck Equine Research Center.

Pituitary Pars Intermedia Dysfunction

Cushing's disease is the most common equine endocrine disorder. The veterinary community prefers to call it by the more accurate acronym PPID because the pars intermedia cells of the pituitary gland are literally

dysfunctional. This disorder typically occurs in older horses, with the average age of onset being 19 years and the frequency of diagnosis generally increasing with age. Although veterinarians rarely see PPID in horses younger than 10, it has been reported anecdotally. To understand the condition, you first have to understand how the endocrine system works.

The endocrine system is comprised of glands that communicate with other glands, which then communicate with organs—all through hormone signals sent through the bloodstream. In PPID-affected horses, this system of pituitary-adrenal gland communication functions abnormally. These horses have a loss of dopaminergic inhibition, leading to an overgrowth (hyperplasia) of cells in the pars intermedia region of the pituitary gland. This lack of communication in the pituitary-adrenal gland axis contributes to the production of abnormally high levels of many pituitary hormones, including adrenocorticotrophic hormone (ACTH), melanocyte stimulating hormone (α -MSH), and other products of a large precursor hormone called proopiomelanocortin. Excess ACTH

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likely interferes with a horse's ability to regulate cortisol synthesis from the adrenal glands. Although the exact pathophysiology is yet unclear, these processes lead to the long list of problems seen in affected animals. A horse diagnosed with PPID can exhibit some of these common clinical signs:

1. Changes in hair coat, such as failure to shed fully and timely and long, sometimes curly hair (once called hirsutism, now called hypertrichosis);
2. Chronic infections;
3. Hoof abscesses;
4. Excess or inappropriate sweating;
5. Increased water intake and urination, called polyuria/polydipsia;
6. Lethargy;
7. Loss of muscle mass;



"Roanie" and "Biscuit" are two of UK's PPID and EMS research horses, respectively.

EMS and PPID Differences

8. Pot-bellied appearance;
9. Infertility or lack of estrus cycles and abnormal mammary gland function; and
10. In some cases a predisposition to laminitis if hyperinsulinemia (high blood insulin levels) is involved.

There are two categories of diagnostic tests available for determining if a horse has PPID. The first is dynamic testing involving either the overnight dexamethasone suppression test (DST) measuring cortisol, the thyrotropin-releasing hormone (TRH) stimulation test measuring ACTH, or the diurnal rhythm test measuring cortisol—all of which assess the endocrine glands' responsiveness. The second category is single testing, which serves as more of a screening assessment measuring basal levels of hormones such as ACTH, α -MSH, or cortisol. None of these tests, however, are 100% accurate for diagnosing PPID. In horses with more advanced PPID, the common sign of the long, curly hair coat is key in making the diagnosis. Other caveats include season's effects on hormone production, which can create false positives; some hormone assays' limited sensitivity; improper sample handling that can alter the results; and the fact that only a few labs in the United States can provide the assays. Thus, many equine endocrine disease researchers' primary focus is on developing improved diagnostic tests with increased sensitivity, repeatability, and availability.

For PPID horses, pergolide is considered the gold standard treatment.

Pergolide is a dopamine agonist, acting to restore inhibition to the pars intermedia, thereby decreasing the production of hormones such as ACTH. Proper management of PPID horses includes body clipping when needed; monitoring for signs of infection; proactive monitoring of basal hormone levels such as ACTH to ensure appropriate pergolide treatment; ensuring proper nutrition based on the horse's body condition; and screening and monitoring for insulin resistance to prevent laminitis.

“An active area of research involving the Gluck Center’s herd of PPID horses is trying to further understand how the disease affects the immune system.”

If your PPID horse is insulin resistant, he will require a low-carbohydrate diet and might need further treatment. If your PPID horse is underweight and not insulin resistant, it is safe to increase his calorie intake to improve body condition.

An active area of research involving the Gluck Center's herd of PPID horses is trying to further understand how the disease affects the immune system. One poorly understood negative effect of PPID is the associated long-term high levels of endocrine hormone concentrations and their effect on the immune

system. Gluck researchers want to further understand how PPID affects immune responses and, in particular, immune responses to annual vaccinations. Perhaps these horses do not respond as well to vaccination compared to horses that do not suffer from PPID. Gluck scientists also want to further understand pergolide's impact on these horses' immune function. Another area of research is improved understanding and use of PPID diagnostics.

Equine Metabolic Syndrome

Equine metabolic syndrome is a recently described collection of clinical abnormalities involving altered metabolism. It is typically seen in middle-aged horses 8 to 10 years old. However, it can affect a wide range of horses from 5 to 20 years old. Veterinarians observe EMS more frequently in pony breeds, domesticated Spanish mustangs, Peruvian Pasos, Paso Finos, Andalusians, European Warmbloods, American Saddlebreds, Morgans, and American Quarter Horses.

Recently, a panel of equine researchers and endocrinology experts reached a consensus defining EMS by the following three main criteria:

1. Insulin resistance (IR), now called insulin dysregulation;
2. A history of or active laminitis; and
3. Increased adiposity (excess fat depositions in typical regions of neck crest and fat pads at the base of the tail).

In addition, EMS horses can have dyslipidemia (abnormal amounts of lipids, or fat, in the blood), hyperleptinemia (elevated plasma leptin levels), arterial hypertension (high blood pressure), or increased system inflammation.

Category of Differences	Equine Metabolic Syndrome (EMS)	Equine Cushing's Disease/PPID
Breed	Can be any breed; however, pony breeds, domesticated Spanish mustangs, Peruvian Pasos, Paso Finos, Andalusians, European Warmbloods, American Saddlebreds, Morgans, and American Quarter Horses are more prone to developing EMS than others.	Any breed
Age	Tends to occur in adult horses younger than 15 years.	Typically an older horse problem with an average onset at 15 years.
Classic clinical signs	Insulin resistance, history of or active laminitis, increased adiposity or fat depositions in regions such as the neck crest, fat pads at the base of the tail, and over the ribs	Long, curly hair coat (hirsutism, now called hypertrichosis), loss of muscle mass, pot-bellied appearance, and polyuria/polydipsia
Diagnosis	Oral sugar test, basal and fasting insulin levels, and ruling out PPID	Overnight dexamethasone suppression test, thyrotropin-releasing hormone stimulation test, basal levels of adrenocorticotrophic hormone or cortisol, and ruling out insulin resistance
Treatment	Dietary modification (i.e., reduce caloric intake, low-starch diets, avoid non-structural carbohydrates), exercise if possible, medical therapy with levothyroxine or metformin	Pergolide

EMS and PPID Differences

Insulin resistance, or decreased insulin sensitivity, is a failure of insulin to stimulate glucose uptake by metabolically active tissues (muscle, adipose, and liver) when nutrients are abundant after feeding. The end result is elevated basal insulin levels. Therefore, the goal when diagnosing EMS is to determine if the horse is insulin resistant. This is critical given that IR contributes to an increased risk of developing laminitis, a degenerative inflammatory condition of the hoof that often leads to euthanasia. To evaluate a horse for IR, the veterinarian generally measures the horse's resting insulin concentration and performs an insulin-glucose sensitivity test. Two test options are the intravenous glucose tolerance test (IVGTT) and the combined glucose-insulin test (CGIT). Both require several blood samples to be collected over a relatively short period of time, which is not practical for the busy, ambulatory veterinarian. Thus, scientists recently developed an oral sugar test (now recommended over the above methods) that involves collecting a blood sample during the morning hours, followed by orally administering light karo syrup (15 cc per 100 kg/bw) and collecting another blood sample 60 to 90 minutes later. Blood samples are evaluated for insulin levels.

Dietary management and exercise (which help reduce the risk for developing laminitis) are the two gold standards of managing horses with EMS. Dietary adjustments, such as decreasing a horse's caloric intake, can help limit the stimulus for insulin production. Feeding hay at 1.5-2.0% of body weight is considered a restricted diet for IR. Veterinarians and nutritionists recommend feeding grass hay or other feed sources that are low in water-soluble carbohydrates (WSC) or nonstructural carbohydrates (NSC). They also encourage forage analysis of your hay to accurately determine the WSC/NSC content. NSC content below 12% is suggested for IR horses and ponies, and soaking hay for 30 to 60 minutes can help remove these sugars.

Limiting pasture access using a grazing muzzle or by confining the horse to a drylot is especially important during the spring seasons. If only feeding hay, make sure to also feed a balancer pellet. If the horse requires more calories, choose fat

sources instead of grains and feeds with high carbohydrate/sugar content. Veterinarians and nutritionists also encourage feeding higher fiber content in these horses' daily diets.

Medical management of EMS includes administration of levothyroxine or metformin to increase metabolism, which helps horses lose weight and, in turn, reduces basal insulin values.

An active area of research within the Gluck Center's herd of EMS horses is the study of novel therapies to modulate both the metabolic and inflammation aspect of EMS. Recently, researchers performed a study in EMS horses determining the effects of resveratrol, a natural polyphenol compound that scientists have identified as a key activator of important metabolic hormones, causing beneficial downstream signaling events that mimic protective mechanisms induced by caloric restriction. Resveratrol therapy decreased inflammation and serum leptin and triglyceride levels and improved insulin responses in EMS horses when compared to horses receiving the control therapy. While this 45-

day resveratrol treatment did not return horses to a normal metabolic state, it did improve their metabolic and inflammatory responses. Discovering novel therapies is an exciting area of research, as there is a critical need for safer and more effective means of treating both the insulin resistance and inflammatory components of EMS.

Occasionally, both disorders can occur together. PPID horses can be IR, but EMS horses are unlikely to be PPID. With this said, anecdotal evidence suggests that EMS horses are more likely to develop PPID at an older age (over 20); however, supporting research is lacking.

With any PPID or EMS patient, regular health checkups are critical to long-term care. This includes basic blood work, dental care, and regular foot/hoof trimming. It is critical to work with your veterinarian to differentiate between PPID and EMS in your horse to ensure proper treatment and management. **UK**

>Amanda Adams, PhD, an assistant research professor at the University of Kentucky Gluck Equine Research Center, provided this information.

MASTHEAD

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Agriculture's Impact on Kentucky is Worth Billions

The importance of Kentucky agriculture extends well beyond the farm. The total economic impact of agriculture production, inputs, processing, and manufacturing in Kentucky totals nearly \$46.3 billion and represents 263,000 jobs, based on a recent analysis by the University of Kentucky College of Agriculture.

Kentucky is one of a growing number of southern states where an emerging agbioscience industry is proving to be a boon to the economy, according to a recent survey conducted by Battelle, the world's largest independent research and development organization. Agbioscience encompasses a broad continuum of development, production, and value-added use of plants and animals for food, health, fuel, and industrial applications.

Historically, employment associated with Kentucky agriculture has been limited to production agriculture, said Alison Davis, PhD, agricultural economist and director for the college's Community and Economic Development Initiative of Kentucky. This sector's value in Kentucky is \$6.1 billion and includes cash receipts from commodities as well as revenues from additional sources of farm income, such as custom work, machinery hire, and farm rental values. In 2011, cash receipts totaled nearly \$5 billion, including \$2 billion in agricultural exports. The largest agricultural export originating from Kentucky is soybeans, followed by tobacco and corn.

It's important, however, to recognize food and fiber processing and manufacturing that value-added enterprises represent beyond the farm gate.

"Ignoring these businesses underestimates the value of the agricultural sector," Davis said.

Defining the Kentucky agriculture cluster to include these sectors adds 143,776 workers to the more than 90,000 individuals who work directly in agriculture production and \$24 billion in direct revenues. This impact does not include service-based industries such as banking, insurance, or legal sectors. This number also does not include the nearly \$10 billion impact of the forestry and wood products sector and the more than 51,000 jobs that support it, Davis noted.

"The current and future importance of the agbiosciences is hard to overstate."

Simon Tripp

The Battelle study, "Impact and Innovation: Agbioscience in the Southern United States," determined that agriculture, forestry, and fisheries production generate \$240 billion in economic activity within the southern region and support more than 2.2 million jobs, with labor income totaling \$62 billion.

Downstream processing of agriculture, forestry, and fisheries output into value-added food and industrial products adds an additional \$1 trillion in output to the South's economy, and almost 4.6 million jobs with labor income

totaling more than \$200 billion.

"In our science- and technology-based economic development practice at Battelle, we have observed the consistent rise of agbioscience as a core driver of economic growth and business expansion opportunities for the U.S.," said Simon Tripp, co-author of the report. "This is an extremely dynamic sector, leveraging sustainable biobased resources to produce goods that meet large-scale market needs. The southern region is a global leader in traditional agricultural economic activity and can count itself as one of a select few regions in the world that is also leading the charge in emerging areas of the modern bioeconomy."

The study's findings show that agbioscience, its value-chain in production, and the downstream industrial activity are vital to the country's sustainable global and domestic economic future, with the southern region helping drive that activity.

"The current and future importance of the agbiosciences is hard to overstate," Tripp said. "For instance, this science and industry sector is fundamental to the survival of the world's expanding population, the food security of our nation and the health of our population."

Battelle conducted the report on behalf of the Southern Association of Agricultural Experiment Station Directors and the Association of Southern Regional Extension Directors. [UK](#)

>Laura Skillman is the director of Agricultural Communications Services within UK's College of Agriculture.

Digestive Capacity in Weanling and Mature Horses Studied

Equine researchers have evaluated common horse feeds' digestibility (the percentage of the digestion and absorption of various nutrients present in a feed source) primarily in mature horses, and little is known about the digestive capacity of young, growing horses. Previous research suggests mature and young horses utilize high-fiber diets differently, mainly because

younger horses have a shorter retention time in the large intestine. A team of University of Kentucky (UK) researchers recently set out to compare the digestibility of a high-forage diet when fed to weanling versus mature horses.

The research team paired six weanling colts with six mature geldings (with an average age of 13.2 years) and allowed them to adapt for 21 days to a diet



Weanlings had similar digestive capacities as mature horses.

Agriculture Impact

comprised of 67% alfalfa cubes and 33% commercial concentrate. On Day 1 of the study's five-day collection period, the team fed each pair the same amount of two indigestible markers—Co-EDTA and Yb—mixed with molasses and a portion of their concentrate for palatability. According to Laurie Lawrence, PhD, professor of equine nutrition at the University of Kentucky, "These markers are used to estimate the average period of feed retention in the digestive tract (also called mean retention time, or MRT)."

The researchers then fitted the horses with fecal collection harnesses and offered them the remaining concentrate and alfalfa cubes. The team collected feces from the harness every one to two hours throughout the entire collection period. They analyzed all the fecal samples for indigestible markers, as well as for dry matter (DM, calculated by the weight of the feed minus the water content) digestibility, organic matter (OM, feed minus the mineral content) digestibility, and neutral detergent fiber (NDF, an indicator of feed digestibility comprised of the least digestible parts of the plant) digestibility. Researchers also measured the horses' water intake during the collection period.

The researchers based daily feed amount offered and calculated DM intake on each individual horse's metabolic body weight, which refers to the percentage of metabolically active tissue in the horse's body, such as muscles. This calculation allowed the team to compare the digestive capacity of two horses on an equal basis, even if they weren't the same weight or height.

In the current study, the team concluded that colts and geldings had similar daily DM intake, and age did not appear to affect either DM or OM digestibility. They also found that NDF digestibility did not differ between weanlings and mature horses, although the team noted that different results

could occur with a larger number of animals, lower-quality diets, long-stemmed forage, or different feeding rates.

The team used the two indigestible markers, Co-EDTA and Yb, to estimate the MRT of two phases of digestion: the particulate phase (digesting fiber components) and the fluid phase (digesting water). Although they hypothesized that the MRT of both phases would be shorter for weanlings than mature horses, the researchers found no difference in MRT between the colts and geldings. They found that the MRT for the particulate phase was significantly longer than that of the fluid phase, but age was not a factor in these differences. The researchers concluded that when consuming a good-quality diet, weanlings and mature horses have similar MRTs for both phases.

One trend the team observed during the study was that colts appeared to consume more water than geldings (0.29 vs. 0.21 L/kg body weight). This finding could indicate that growing horses might require more water than mature horses.

The team noted that because the weanlings appeared to have similar digestive capacities as mature horses, further studies are needed to determine the exact age at which young horses' digestive capacity nears that of mature horses.

The study, "Digestive capacity in weanling and mature horses," will appear in an upcoming issue of the *Journal of Animal Science*. [UK](#)

>Kristen M. Janicki, MS, PAS, is an equine nutritionist in Versailles, Ky.

WEED OF THE MONTH

Common name: Musk thistle

Scientific name: *Carduus nutans* L.

Other names: Nodding thistle

Life Cycle: Biennial; sometimes annual

Origin: Eurasia

Poisonous: No

Musk thistle, also known as nodding thistle in some areas, is distributed across the United States and is listed as noxious in many states. This invasive species can reach heights of 6 feet and grows in pastures, rangeland, and along roadsides. Its light, windborne seeds can move great distances to infest adjacent areas. One of this plant's only redeeming qualities is its bright red to purple flowers that bloom from May to September.

Seeds germinate in the fall or spring and form rosettes. Generally, the flowering plants are 2 years old, although some plants act as annuals and produce seeds after one year of growth. Controlling musk thistle in pastures is relatively easy with herbicides that kill the thistle yet do not harm pasture grasses. Consult your local [Cooperative Extension Service](#) agent for a list of herbicidal controls in your area. Mowing is only effective if done after the stem elongates but before seed heads are produced. Thistlehead weevil larvae eat this thistle's seeds and are an effective biological control in some areas of the United States. [UK](#)

>William W. Witt is a retired professor and researcher in the University of Kentucky College of Agriculture's Plant and Soil Sciences Department.

Musk Thistle Growth Stages



Seedling



Rosette



Mature, flowering plant

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U.S. Rabies Cases During 2011

The National Center for Emerging and Zoonotic Infectious Disease at the Centers for Disease Control and Prevention published 2011 data on 6,037 cases of confirmed animal rabies in 49 states and Puerto Rico. Hawaii is a rabies-free state. Of these cases, 92% were confirmed in wildlife and 8% in domestic species. These do not represent all rabies cases in the United States since many, especially in wildlife, go unobserved and undetected.

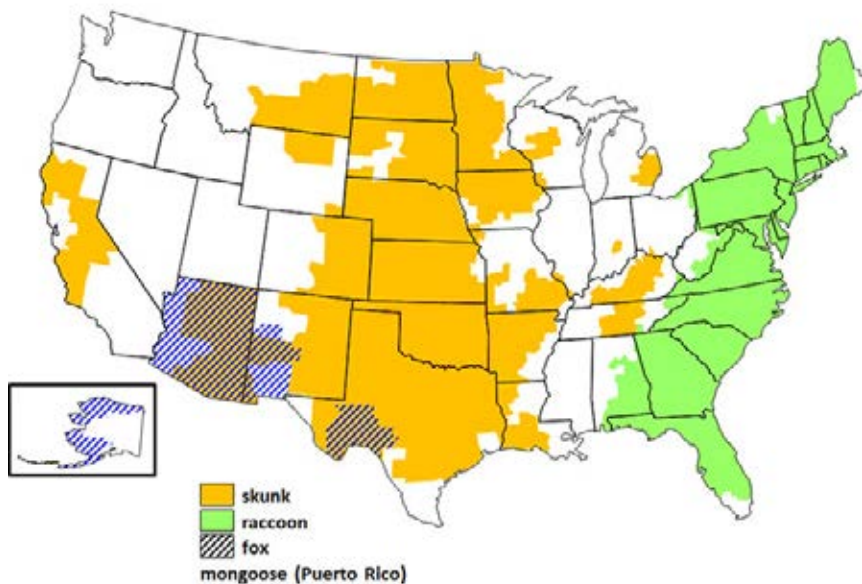
Twelve states and Puerto Rico reported 44 rabid equids in 2011: Florida (1); Georgia (1); Kentucky (1); Maine (1); Nebraska (4); New Jersey (1); North Carolina (3); Oklahoma (1); Puerto Rico (4); South Dakota (1); Tennessee (2); Texas (22); and Virginia (2).

Canada reported two cases in equids, and Mexico reported three.

Rabies is a viral disease that is reportable in the United States for humans and animals.

In the continental U.S. the primary reservoirs of rabies virus are raccoons, skunks, foxes, and bats (Figure 1). Historically, bat rabies has been confirmed in all 49 continental states. In Puerto Rico, the mongoose is the wildlife reservoir. [UK](#)

Figure 1. Distribution of Major Rabies Reservoirs in the United States and Puerto Rico, 2007-2011. Adapted from JAVMA, Vol 241, No 6, p 712-722



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2013 Update on Nocardioform Placentitis in Kentucky Mares

Approximately 20,000 mares are bred in Kentucky each year, which means that it is literally "raining foals" in the spring, as long as things go as planned. Unfortunately, late-term abortions and even abortion storms can occur, resulting in massive economic and emotional mayhem.

The most common cause of late-term abortion is placentitis—an inflammation of the placenta. Frequently, placentitis is caused by bacteria found in the environment ascending through the vagina and cervix, subsequently

spreading from the part of the placenta referred to as the cervical star. Signs of this "ascending placentitis" are early mammary development and lactation and eventually vulvar discharge.

Another, but less common, type of placentitis is called nocardioform placentitis.

"Nocardioform placentitis involves specific types of filamentous, branching bacteria, called actinomycetes, and the disease is very different from an ascending placentitis in that only the interface between the placenta and the uterine lining is affected, and only the lower (ventral) part of the uterine body and the base of the uterine horn is affected," explained Mats H.T. Troedsson, DVM, PhD, Dipl. ACT, ECAR, the director of the Gluck Equine Re-

search Center at the University of Kentucky. "In the case of an ascending placentitis, the lesions are found around the cervical star and bacteria invade the placenta, fetal fluids, and infect the foal."

Nocardioform placentitis therefore does not directly affect the foal. Instead, it deprives the foal of nutritional support from the placenta, resulting in starvation and abortion or the birth of a small and underdeveloped foal.

"Nocardioform placentitis has been diagnosed at several locations in the U.S., and we only intermittently see a larger number of nocardioform placentitis cases here in Kentucky," relayed Troedsson. "In this area, where we breed at least 20,000 horses, we usually only see about 15-25 case a year. In a bad year, the number

of cases can increase to between 100 and 200, which is what happened last in 2011."

Subsequent to the nocardioform placentitis surge in 2011, research in this field has progressed, yet exactly how the infection is established remains a mystery. According to Troedsson, researchers have conducted a number of experiments to establish how the nocardioform actinomycetes cause placentitis. Examples of such studies included the following:

- Inoculating mares' uteri with the bacteria at the time of breeding;
- Inoculating mares' uteri at Day 270 of gestation;
- Infecting mares using an intranasal spray containing the bacteria;

Nocardioform Placentitis

- Feeding the bacteria to mares; and
- Directly injecting the bacteria into mares' bloodstreams.

"Not one of the mares treated via these routes developed a placentitis," Troedsson lamented. "Without a model of the disease, it is not possible to study the mechanisms of the disease. Our

data suggest that the bacteria associated with nocardioform placentitis is fairly harmless in most instances, suggesting that there is something else in either the mare or the environment that makes these bacteria harmful. Even more puzzling is the fact that we have not even been able to culture the bacteria from the environment in Central Kentucky. We obviously have a problem and have associated the bacteria with a disease, yet we can't find

it or reliably cause the disease to study and create an effective vaccine or other treatment or management strategies to prevent nocardioform placentitis."

In suspected placentitis cases (e.g., if a mare bags up early), Troedsson recommends a trans-abdominal ultrasound (across the body wall rather than through the rectum, which is needed for an ascending placentitis).

"The ultrasound will show a separation of the two layers of the

placenta and a very, very thick mucus," he described. Following diagnosis, mares can be treated with antibiotics, an anti-inflammatory, and a high dose of a progestinlike hormone (e.g., Regumate).

"When the condition is caught early, the majority of mares do not abort and the foals survive," Troedsson said. **UK**

>Stacey Oke, DVM, MSc, is a freelance medical writer based out of Canada.

Feed Choices Can Mean Cost Savings for Horse Owners

Few horse owners have remained unchallenged by the intractable recession. Rising fuel and feed costs have pushed horse ownership expenses skyward. And with no end in sight, it's no wonder horse owners are looking for ways to trim their routine horse-keeping expenses without sacrificing the quality of their animal's care. Bob Coleman, PhD, PAS, associate professor in equine extension for the University of Kentucky College of Agriculture Department of Animal and Food Sciences, believes food and feeding techniques are good places to start.

Hay is a staple of most equines' diets. But generally, owners pay for more hay than their horses actually consume. As a result, most owners can realize savings



A suitable hay feeder is money well-spent.

simply by paying attention to the way they dispense hay to their horses, Coleman said.

"In many cases, horses are fed hay on the ground, which can result in losses of up to 50%," Coleman said. "If you need to feed 2 pounds of hay, so the horse can consume 1 pound, that makes the hay very, very expensive."

Instead, owners can conserve both cash and hay resources by purchasing a feeder suitable to their horses' needs.

"It's money well-spent," Coleman said.

At the same time, Coleman advises owners to rethink the way they purchase hay to feed their horses. Most owners purchase hay by the bale. But bale weight can fluctuate, and when the weight of the bale changes, so does the cost of feeding the horse, he said.

"For example, \$5 per bale hay may be a good buy if the bale weighs 70

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Feed Choices

pounds,” Coleman said. “But it may not be as good a buy at 50 pounds.”

Owners might also realize horse-keeping savings by reconsidering what, other than hay, they feed their horses, Coleman said. Many owners feed their horses a daily concentrate ration. But most owners fail to determine what the ration contains and whether their horses actually require what it provides, he said.

Coleman recommends that rather than simply providing feed, owners select and dispense feed that meets each individual horse’s nutritional needs.

“Also, look at what you’re feeding by reading the labels of what you are using,” he said. “There is no need for duplication.”

Owners can also reduce costs by only feeding what each individual horse requires nutritionally every day.

“If the concentrate feed you are using and the forage you are providing meet the nutrient needs of your horse, there is

no benefit to feed extra,” Coleman said.

Finally, he advised owners do their homework to realize the greatest horse-keeping savings without sacrificing horse care: “Horse owners need to determine how much the feed costs and how much it costs to feed their horses per day.”

Beyond that, cost-trimming must take place on an individual basis, Coleman said. **UK**

>Pat Raia is a professional journalist who covers horse industry and equestrian topics.

Equine Neurologic Disease in Kentucky

The necropsy records of the University of Kentucky Veterinary Diagnostic Laboratory (UKVDL) for the years 2011 and 2012 were searched for equine cases having a clinical diagnosis of neurologic disease. The search revealed 38 cases in 2011 and 50 cases in 2012. These represent 2.2% and 3.1%, respectively, of the total equine necropsy cases examined at the UKVDL during the last two years. Although the percentages are small, the accurate diagnosis of equine neurologic disease is important because these cases often result from infection with specific pathogens, some of which are communicable to other horses and might even pose a zoonotic risk to people.

The most common diagnosis by far was a noninfectious condition, cervical vertebral stenotic myelopathy, or wobbler syndrome. There were 42 total cases of stenotic myelopathy (21 each year). Thirty-six of the cases (86%) were male and five (12%) were female (in one case the gender was not recorded). The ages of the horses at time of necropsy were skewed to younger animals. Six were juveniles (younger than 1 year), 20 were yearlings, and 10 were two-year-olds. Four horses were three years or older (ranging from three to seven years). In keeping with the predominate breed in Central Kentucky, 18 of the cases were Thoroughbreds; however, other breeds were also involved. Five of the cases were Quarter Horses, and there were individual cases in American Saddlebreds, Tennessee Walking Horses, and Standardbreds.

Wobbler syndrome is associated with abnormalities of the cervical vertebrae, which result in spinal cord compression in one or more areas leading to neurologic signs. No predominant site of compression in the cases was recorded in this two-year period. Based on the findings at necropsy and microscopic examination of the spinal cord, 13 of the cases had compression at C 3-4 (the junction of the 3rd and 4th cervical vertebrae), 13 cases had compression at C 4-5, 11 cases at C 5-6, and 12 cases at C 6-7.

The next most commonly diagnosed group of neurologic diseases was encephalomyelitis/myelitis cases. Equine protozoal myeloencephalitis (EPM) caused by *Sarcocystis neurona* was the principal disease diagnosed. Some 12 cases occurred in 2011 and 18 in 2012. Most involved adult horses ranging in age from juvenile to 20 years. Six yearling horses and several different breeds were represented. The causative agent was visualized in tissue in a small percentage of the cases, while diagnosis in the majority was based on the characteristic microscopic pattern of inflammation and damage in the spinal cord and brain stem, which is typical of EPM. Many of the horses had received EPM treatment, and this likely contributed to the difficulty in demonstrating the agent.

Other causes of encephalitis/myelitis included four West Nile virus

cases in 2012, one case of equine herpesvirus (EHV-1) myeloencephalopathy in 2011, and one encephalitis case of undetermined etiology in 2012. The WNV-associated disease was seen in three adult horses and one yearling. The WNV and EHV-1 diagnoses were made on the basis of microscopic examination of the brain and spinal cord tissue and a positive polymerase chain reaction (PCR) test result.

Inflammation of the membranes covering the brain (meningitis) or the membranes plus the brain tissue (meningoencephalitis) were occasionally diagnosed in horses submitted to the UKVDL. There were five cases in 2011 and 10 cases in 2012. Eight were in adult horses, and seven were in foals. The majority were caused by bacteria, with eight cases attributed to bacterial infection. Isolates included *Streptococcus*, *Staphylococcus*, *Salmonella*, *Klebsiella*, and *Actinobacillus* genera. Two cases involved fungal infection, and five were idiopathic (no known cause).

Encephalopathy (neuronal dysfunction resulting from a variety of causes) was diagnosed in three cases in 2011 and six in 2012. Pathologically, there typically is neuronal degeneration with inflammation not being a component. In all cases the encephalopathy was believed to be secondary to another process. The cases included four adult horses, four foals, and one juvenile horse. The adult cases were all secondary to liver disease and were classified as hepatic encephalopathy. The cause in the foals was believed to be encephalopathy secondary to neuronal degeneration as the result of hypoxia (lack of oxygen) at birth.

Over the two-year period, 46 horses were tested for rabies because of antemortem clinical signs but no cases were diagnosed. There were two cases of cauda equina neuritis (polyneuritis equi), in a yearling and an adult horse. This idiopathic condition results from inflammation of the peripheral nerve roots at the termination of the spinal cord.

In a prior issue of the *Equine Disease Quarterly* (July 2003, Volume 12, Number 3) that reviewed cases over a three-year period, neurologic diseases (excluding trauma to the central nervous system) comprised 5% of equine cases, which is slightly more but similar to the current report. As in 2003, when wobbler syndrome accounted for a third of the neurologic cases, it was the most common diagnosis in the present group. EPM remains the most common infectious/inflammatory condition. **UK**

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UK Ag Equine Programs at Annual Equine Science Society Symposium

Eighteen members of the University of Kentucky Ag Equine Programs attended the annual Equine Science Society Symposium, held May 28-31 in Mescalero, N.M.

Faculty members who presented at the Symposium included:

- Amanda Adams, PhD, an assistant research professor at the Gluck Center: Identifying the role of a “caloric restriction mimetic,” resveratrol, in treating equine metabolic syndrome and its implications for targeted therapy.
- Bob Coleman, PhD, PAS, associate director for undergraduate education in equine science and management and extension horse specialist: A state-level study of Kentucky’s equine industry: the 2012 Kentucky Equine Survey.
- Mary Rossano, PhD, associate professor in UK’s Department of Animal and Food Sciences: Comparison of demographic characteristics, animal science subject knowledge, academic performance, and critical thinking skills in students majoring in animal science and equine science.
- Ed Squires, PhD, Dipl. ACT (hon.), executive director of the UK Gluck Equine Research Foundation: Effect of season and reproductive status on the incidence of equine dystocia.
- Jill Stowe, PhD, director of UK Ag Equine Programs and associate professor in agricultural economics at UK: The non-market valuation survey, an innovative addition to the Kentucky Equine Survey.

Rossano, Squires, and Stowe also were panel presenters.

Eleven graduate students from the UK College of Agriculture gave oral presentations. Presenting from the Department of Animal and Food Sciences were:

- Steffanie Burk, PhD candidate: Passive transfer of antibodies that recognize larval *Parascaris equorum* excretory/secretory antigens.
- Ashley Fowler, MS candidate: The availability of dietary phosphorus to long yearlings and mature horses.
- Taylor Hansen, MS candidate: Feed composition and animal factors affecting forage digestibility by horses; Effect of early exposure to maternal docosahexaenoic acid on memory and cognition in weaned foals.

- Brittany Harlow, PhD candidate: Effects of hops (*Humulus lupulus* L.) beta-acid extract on inulin fermentation by equine fecal microflora *in vitro*.
- Laurel Mastro, MS candidate: Pituitary pars intermedia dysfunction does not affect various measures of insulin sensitivity in old horses.
- Laura Strasinger, MS candidate: Foal behavior during the early neonatal period, and the relationship of coprophagy to fecal microbial species richness in neonatal foals.

selenium status, antioxidant capacity, and oxidative stress in the horse.

- Fowler: An *in vitro* method for determining phosphorus availability in horse feeds.
 - Harlow: Microbial species richness of equine fecal microflora in horses challenged with antibiotics.
- Several students also received graduate student competition awards, sponsored by the North American Equine Ranching Information Council. In the production and management competition, Hansen took top honors, Strasinger placed second, and Mastro placed third. In the nutrition competition, Siard placed third.



COURTESY THE UNIVERSITY OF KENTUCKY

Eighteen members of the UK Ag Equine Programs attended the Symposium.

- Sara Tanner, PhD candidate: Threonine supplementation does not increase protein synthesis in weanlings receiving a grass forage and commercial concentrate.
- Catherine Whitehouse, MS candidate: Responses in fecal pH from low to high starch intakes in healthy horses. Presenting from the Gluck Equine Research Center:
- Julianne Kalmar, MS candidate: Factors impacting stallion sperm freezability.
- Melissa Siard, PhD candidate: Effects of polyphenolic bioactive compounds (pterostilbene, resveratrol, curcuminoids, quercetin, and hydroxypterostilbene) on pro-inflammatory cytokine production *in vitro*. Graduate students who presented posters included:
- Mieke Brummer, PhD (already graduated): Interrelationships among

Also at the meeting, graduate students elected Harlow to the Board of Directors as the graduate student representative. Coleman was appointed executive secretary of the Equine Science Society.

The symposium included 209 researchers, extension personnel, and industry representatives from the United States and nine other countries. There were six invited speakers, 107 oral presentations, and 44 poster presentations. Proceedings from the meeting were published in the May issue of the *Journal of Equine Veterinary Science*.

Held every two years, the next symposium will be hosted by the University of Florida in 2015. **UK**

>Jenny Evans, an MFA candidate, is the Gluck Equine Research Foundation coordinator at the Gluck Center.

Like Us on Facebook

The University of Kentucky College of Agriculture has several equine-related pages on Facebook with the latest news and events information. Stay up-to-date with the latest happenings by following our activity on the following pages:

- [University of Kentucky Ag Equine Program](#): UK Ag Equine Programs is an overarching framework for all things equine at the University of Kentucky, including the undergraduate degree program, equine-related student organizations, equine research, and outreach activities.
- [University of Kentucky Maxwell H. Gluck Equine Research Center](#): The mission of the Gluck Center is scientific discovery, education and dissemination of knowledge for the benefit of the health and well-being of horses.

- [Kentucky Equine Networking Association](#) (created by the Kentucky Horse Council and University of Kentucky): The mission of the Kentucky Equine Networking Association (KENA) is to provide an educational and social venue for equine professionals and other horse enthusiasts from all disciplines to share ideas and business strategies, and obtain current knowledge on horse and farm management with the principal objective of enhancing individual horse ownership and the horse industry at large.
- [Saddle Up SAFELY](#): Saddle Up SAFELY is a new rider safety awareness program sponsored by UK HealthCare, UK College of Agriculture and many community organizations. It aims to make a great sport safer through education about safe riding and horse handling practices.
- [UK Horse Pasture Evaluation](#): The University of Kentucky Horse Pasture Evaluation Program is a service program offered to horse farms in Kentucky with the goal of overall improved pasture management.

Horses Teaching Humans about Leadership

If you were to ask students in any equine science and management program why they want to work in the horse industry, typical responses might include training race horses, working with sport horses, breeding, managing a stable, or becoming a veterinarian. Rarely do they mention a desire to collaborate with horses to teach humans about themselves, nor can they envision the horses they will work with becoming some of the best teachers for their own personal and professional development.

Men and women alike are drawn to working with horses for many reasons, some of which are not easily put into words. As Winston Churchill so aptly said: "There is something about the outside of a horse that is good for the inside of a man."

To fully understand this "something" requires us to experience the horse-human relationship from a completely different perspective.

"This notion of horses enlightening humans about themselves is a relatively new one," said Lissa Pohl, MA, program and outreach associate and researcher with the University of Kentucky's Center for Leadership Development in the College of Agriculture. "However, horses have much to teach us, and it's really changing that old paradigm of horses being the receivers of what people know, to people being the receivers of what horses know and how, together, we can create collaborative learning relationships."



COURTESY UNIVERSITY OF KENTUCKY

Preliminary results are promising from the University of Kentucky's equine-assisted learning research.

Over the past two decades, the emerging field of Equine Assisted Activities (EAA) has seen explosive growth worldwide. As of 2008, more than 700 centers in the United States and several internationally recognized organizations provided some type of EAA program. In the United States this list includes the Professional Association for Therapeutic Horsemanship (PATH), Equine Assisted Growth and Learning Association

(EAGALA), Equine Guided Education Association (EGEA), EponaQuest, and Equine Experiential Education Association (E3A). These organizations teach, support, and certify individuals interested in collaborating with horses for healing and human growth and learning purposes, a field better known as Equine Assisted Learning (EAL).

Yet, while there is growing interest in EAL programming worldwide, evidence

Horses Teaching Leadership

that working with horses in a facilitated experiential learning situation actually changes a person's behavior is mostly anecdotal, and what little research exists in this field focuses mostly on the effectiveness of equine-human mental health therapies or on the physical therapeutic aspects of working with horses, known as hippotherapy. For EAL to gain legitimacy, credible research looking into how horses assist humans in their own personal and professional growth and development is needed.

In the forefront of this quest for creating credibility in the Equine Assisted Learning field are researchers Patricia Dyk, PhD, director of the Center for Leadership Development, and Pohl, along with nurse researchers Carol Noriega, MSN; Janine Lindgreen, APRN; and Robyn Cheung, PhD, RN, from UK HealthCare, who recently completed a pioneering research pilot study titled "The Effectiveness of Equine Guided Leadership Education In Developing Emotional Intelligence In Expert Nurses."

"With Lexington being known as the Horse Capital of the World, it is only fitting that the University of Kentucky is conducting pioneering research in the emerging field of equine assisted learning," Dyk said.

The project included a control group of 10 nurses from the Neuroscience Surgery Service Line and an intervention group of 11 nurses from the Trauma

and Acute Care Surgical Service Line at UK Chandler Hospital. At the start of the study and again six months later, both groups took an online assessment appraising emotional intelligence (EQ). Nurses in the intervention group participated in a one-day workshop that involved experiential learning with horses. Each exercise in the workshop was designed to develop the four emotional intelligence competency areas of self-awareness, self-management, social awareness, and relationship management. These nurses also filled out written surveys after their experience to provide further information about which competency areas were being developed.

The before and after results of the online EQ assessment showed that nurses who attended the workshop scored higher in all four competency areas when compared to the control group that did not. Though the pilot sample was small, qualitative responses from the nurses participating in the workshop clearly attribute changes in their bedside manner to lessons learned from interacting with the horses. One of the most common nurse statements was how the horse made them aware of the importance of their body language in communicating their thoughts, emotions, and intentions to others. These initial results are encouraging, and they lay the groundwork for subsequent studies that are larger in scope and evaluate diverse populations.

This type of research not only offers credibility to professionals offering Equine Assisted Activities and those

UPCOMING EVENTS

July 7-13

State 4-H Horse Show, Kentucky Exposition Center, Louisville

July 11

Kentucky Equine Networking Association (KENA) Meeting, networking 6 p.m., dinner 6:30 p.m., Sheraton Hotel, Lexington, Ky. Marketing and Business Promotion

July 25, 4 p.m.

Department of Veterinary Science Equine Diagnostic Research Seminar Series, Veterinary Diagnostic Laboratory, Podiatry, Scott Morrison, DVM, Rood & Riddle Equine Hospital

July 27

Hat's Off Day, Kentucky Horse Park

individuals and teams seeking this unique and effective personal and professional development experience, but it also gives these horses a new purpose in life.

To access the full research report and for more information on contributing to this research, visit www.ca.uky.edu/cfld/research.php. UK

Information provided by Lissa Pohl, MA, program and outreach associate and researcher, Center for Leadership Development within the University of Kentucky's College of Agriculture.

UK Ag Equine Programs Hosts its Fifth Annual Farm and Facilities Expo

The University of Kentucky Ag Equine Programs held its fifth annual Farm and Facilities Expo June 19 at Tollgate Farm in Georgetown, Ky. More than 200 people attended the horse owner-geared event. Highlights from the day included presentations by UK faculty and equine professionals about drainage and footing for exercise areas, how to set up temporary fences, benefits of rotational grazing, hay production and testing, and incorporating cattle into equine operations. Equine businesses and organizations as well as experts from UK in equine nutrition, equine immunology, and plant and soil sciences also attended to share information with attendees. Tollgate Farm is owned by Troy Rankin, who breeds, trains, and races Thoroughbreds and recently had two contenders in the Breeders' Cup World Championships. Tollgate Farm is a diverse operation that also produces hay for both on-farm use and sale, grows tobacco and row crops, and raises beef cattle.



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