Understanding the differences between Equine Metabolic Syndrome (EMS) vs. Pituitary Pars Intermedia Dysfunction (PPID), a.k.a. Equine Cushing’s Disease

Our understanding of the equine endocrine system is currently advancing with great attention and demand for research on the topics of diagnosis, discovery, and efficacy of treatment for the most common endocrine disorders dealt with today by equine practitioners and owners, equine metabolic syndrome (EMS) and pituitary pars intermedia dysfunction (PPID, which is also commonly known as Equine Cushing's Syndrome).

While the understanding of these diseases advances, the education of horse owners and practitioners is lagging behind. There continues to be a great amount of confusion in the horse world surrounding these two endocrine diseases. It is critical to understand each of these diseases in order to ensure proper treatment and management of horses with endocrine disorders. This article will discuss the differences between these common endocrine diseases and current studies underway at the University of Kentucky Gluck Equine Research Center.

PPID/Cushing’s Disease is the most common endocrine disorder in the equine species. The acronym PPID is preferred in the veterinary community because it provides a more accurate name for the disorder, as the cells of pars intermedia of the pituitary gland are dysfunctional. Typically this is a disorder in the older horse, with the average onset being 19 years old and the frequency of diagnosis generally increasing with age. Although

The mare facility was dedicated in honor of Dr. Walter W. Zent on October 15.

UK’s Maine Chance Equine Campus facility renamed in honor of area veterinarian

The University of Kentucky Board of Trustees recently approved the official naming of a research facility at UK’s Maine Chance Equine Campus as the Dr. Walter W. Zent Mare Reproductive Health Facility to honor Zent, DVM, Dipl. ACT (hon.), a veterinarian and former partner at Hagyard Equine Medical Institute. Zent served on the Gluck Equine Research Foundation’s Board of Directors from 2000 to 2012 and as chair from 2006 to 2012.

“The college is honored to have Walter Zent’s name on this research facility. Walter is a successful veterinarian who has not only used research information from the Gluck Equine Research Center but has contributed to the research,” said Nancy Cox, PhD, associate dean for research in UK’s College of Agriculture, Food and Environment, Kentucky Agricultural Experiment Station director and administrative leader for UK’s Ag Equine Programs. “He is a top-notch field veterinarian and a respected contributor to new research-based practices. Not only that, he has been a supporter of the UK’s Department of Veterinary Science for many decades including a distinguished leader of the Gluck Foundation Board of Directors.”

As the Gluck Equine Research Foundation chair, Zent saw a strong need for increased research in equine reproductive health and understood a first-class research program with excellent facilities was needed. He helped obtain $600,000 in private donations, which were matched by the state, for remodeling of UK’s Equine Reproductive Health Facilities. He and his wife, June Zent, donated to the facilities.

“Dr. Zent served the Gluck Equine Research Foundation during a time that saw a change in leadership, expansion of research facilities at Maine Chance Zent, p. 8
The mission of the Gluck Equine Research Center is scientific discovery, education and dissemination of knowledge for the benefit of the health and well-being of horses.

The UK Gluck Equine Research & Service Report is produced by UKGERF and the Department of Veterinary Science. It is published twice a year on behalf of all equine researchers and veterinarians and others in the horse industry who are committed to the continued improvements in equine research and technology.

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A LETTER FROM THE DIRECTOR

The Maxwell H. Gluck Equine Research Center has served as a valuable resource to the equine industry and veterinary community with regards to new discovery and knowledge in equine health and well-being for over a quarter of a century. Equine scientists have conducted research resulting in the development of vaccines and diagnostics for infectious diseases, recommendations to prevent transmission of diseases, improved fertility and efficient reproductive management of horses, effective parasite control, basic understanding of regenerative medicine, establishment of reference standards for drug detection in racing and performance horses, and faculty at the Gluck Center have taken leadership in pioneer work on equine genomics and cytogenetics.

Our past and current success is the result of the Gluck Center’s ability to attract exceptionally talented researchers to Kentucky. These world-renowned faculty and staff have raised the current research productivity to one of the highest levels in the history of the Gluck Center. However, much more needs to be done and the challenge we face is to expand our research efforts and to provide information to the global equine community during times of shrinking resources in an already underfunded area of equine research.

The Gluck Center is not alone in this challenge, and we have reached out and explored partnerships with other universities, research foundations, and pharmaceutical industries with a strong commitment to equine health and well-being.

We have developed a dual PhD degree program with the University of Copenhagen, in which graduate students will be trained in equine research as well as in a clinical setting in Kentucky and in Denmark. We hope this program will produce new leaders in the field of equine clinical sciences at an international level.

We have also signed a partnership agreement with Hippola, the European equine research consortium, in an attempt to bring together expertise in critical areas of equine research. We are currently discussing a partnership with the Qatar Foundation and its equine branch, Al Shaqab. This is a very exciting opportunity with great potential to obtain research and graduate student support for the Gluck Center, and to work closely together with a well-established international research foundation in an emerging equine region of the world.

Domestically, we have entered into a partnership with the University of Florida Equine Soundness Program, which will allow us to expand into an area of great importance to the racing and show horse industry and build on the past success of this program in the College of Veterinary Medicine at the University of Florida.

We are also continuing our long-standing collaborative relationships with the pharmaceutical industry. In addition to research support through grants and contracts, Zoetis (formerly Pfizer Animal Health) is providing the Gluck Center with a graduate student fellowship for a clinical veterinarian seeking a PhD.

Finally, we have recently been engaged in discussions on the possibility of an affiliation with Lincoln Memorial University, College of Veterinary Comparative Medicine. The program would add valuable resources to the Gluck Center and provide an opportunity for veterinary students to obtain research training in laboratories at the Gluck Center. We are very excited about the possibility to directly contribute to the quality of future generations of veterinarians by working together with a veterinary educational institution.

A recent survey by the College of Agriculture, Food, and Environment at the University of Kentucky concluded that the local horse industry contribute $3 billion to the state of Kentucky. Central Kentucky is without any doubts one of the most prominent horse regions in the world, and the infrastructure for horse activities in Kentucky is second to none.

The Gluck Center is located in the heart of Kentucky horse land. We recognize that the importance of what we do is not limited to Kentucky, but has an impact on the global equine industry. We are committed to an international leadership role in equine research and firmly believe that the more successful we are in bringing great minds together, the better we will serve the industry and veterinary profession, which translates into healthier horses around the world.

Thank you for your support. By making a donation to the Gluck Center, your gift benefits equine research, facility updates, equipment needed for research and graduate student scholarships. To donate to the Gluck Center, visit http:www.uky.edu/GiveNow/welcome.htm. Under the gift information section, first select “Agriculture” and then select “Gluck Equine Research Enrichment Fund.”

Dr. Mats Troedsson, DVM, PhD, Dipl. ACT
Gluck Equine Research Center Director
and Department of Veterinary Science Chair
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EMS, continued

PPID is rarely seen in horses younger than 10 years old, it has been reported anecdotally. To understand PPID, you first have to understand the concept of how the endocrine system works.

The endocrine system is composed of glands communicating with other glands, which then communicate with organs, all through hormone signals (hormones) sent through the bloodstream. The system of pituitary-adrenal gland communication is abnormally functioning as a result of PPID. It is the overgrowth (hyperplasia) of cells of the pituitary gland called the pars intermedia that contributes to the lack of communication in the pituitary-adrenal gland axis and thus leads to production of abnormally high levels of many pituitary hormones, including adrenocorticotropic hormone (ACTH), melanocyte stimulating hormone (α-MSH), β-endorphin, and other products of a large precursor hormone, called Pro-OpioMelanOcotin, or POMC. ACTH overstimulates a horse’s cortisol synthesis by the adrenal glands. The hyper-cortisolemic state leads to the long list of outward problems in the affected animal, although exact pathophysiology remains to be determined, the end result in the horse diagnosed with PPID can involve some of these common signs: changes in hair coat, such as failure to shed fully and timely and long, sometimes curly, hair termed hirsutism; chronic infections; hoof abscesses; excess or inappropriate sweating; increased water intake and urination, called polyuria/polydipsia (PU/PD); lethargy; loss of muscle mass; “pot-bellied” appearance; infertility, or lack of estrus cycles and abnormal mammary gland function; and, in some cases, a predisposition to laminitis if hyperinsulinemia is involved.

There are two categories of diagnostic tests available for determining if your horse is PPID which include 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 responsiveness of the endocrine glands in that horse or pony. The second category is single testing, which serves as more of a screening assessment involving measurement of basal levels of hormones including ACTH, α-MSH, or cortisol. It must be noted that none of these tests are 100% accurate for diagnosis of PPID. In horses with more advanced PPID, the common sign of the long, curly hair coat is an indicator in making the diagnosis. Moreover, other caveats are the effects of season on hormone production, which can create false positives, limited sensitivity of some of the hormones assays, handling of samples that can alter the results because these hormones require specific handling, and that only a select few labs in the U.S. can provide the assays. Thus, the current, primary focus of many equine endocrine disease researchers is to develop 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 the inhibition to the pars intermedia, thereby decreasing the production of hormones like ACTH. In addition, proper management of these PPID horses includes body clipping when needed; monitoring for signs of infection, proactive monitoring of basal hormone levels such as ACTH or cortisol to ensure appropriate pergolide treatment levels; ensuring proper nutrition based on the horse’s body condition, and screening and monitoring for insulin resistance to prevent laminitis, which can be worsened with the improper dietary management.

If your PPID horse is insulin resistant (described below), he or she will require a diet with low carbohydrates and might need further treatment to manage the insulin resistance. If your PPID horse is underweight and not insulin resistant, it is safe to increase the calorie intake to improve body condition.

An active area of current research investigation at the Gluck Center involving our herd of PPID horses is to further understand how PPID affects the immune system. One poorly understood consequence of PPID is the effect of long-term high blood cortisol concentrations. Cortisol is called a “stress” hormone and leads to immune system suppression, likely playing a role in increased chronic infections of PPID-affected horses or ponies. We want to further understand how PPID specifically affects the immune responses and in particular the immune response to annual vaccinations. Perhaps these horses do not respond as well to vaccination compared to an older horse that doesn’t suffer from PPID. We also want to further understand the impact of Pergolide treatment on immune function in these horses. Another area of research is to improve our knowledge and use of diagnostics for PPID.

Insulin Resistance and Equine Metabolic Syndrome

EMS is a recently-described collection of clinical abnormalities involving altered metabolism. EMS is typically seen in middle-aged horses 8 to 10 years old. However, it can affect a wide range of horses 5 to 20 years old. EMS is also observed more often in pony breeds, domesticated Spanish mustangs, Peruvian Pasos, Paso Finos, Andalusians, European Warmbloods, American Saddlebreds, and Arabians.

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EMS, continued

breds, Morgans, and American Quarter Horses.

Recently, a consensus was reached by a panel of equine endocrine researchers and experts, defining EMS by the following three main criteria: 1) insulin resistance (IR); 2) 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 tail.) In addition, EMS horses can have dyslipidemia or altered lipid metabolism, hyperleptinemia, arterial hypertension, or increased systemic inflammation.

IR 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 of diagnosis for 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. In order to evaluate a horse or pony for IR, it is recommended to measure the horse’s resting insulin concentration as well as perform an insulin-glucose sensitivity test. Two test options are the IV glucose tolerance test (IVGTT) or the combined glucose-insulin test (CGIT). Both tests require several blood samples to be collected over a relatively short period of time, which is not practical for the busy, ambulatory veterinarian. Thus, an oral sugar test was recently developed, which 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 levels of insulin.

Dietary management and exercise are the two gold standards of managing horses and ponies with EMS, which aid in reducing the risk for developing laminitis. Dietary adjustments aim to limit the stimulus for insulin production, which involves decreasing calorie intake. An important recommendation is to feed grass hay or other feed sources which are low in water-soluble carbohydrates (WSC) or non-structural carbohydrates (NSC). Forage analysis of your hay is strongly encouraged to accurately determine the WSC/NSC content. NSC content below 12% is suggested for IR horses and ponies. Soaking hay for 30 to 60 minutes can help remove sugars. Limiting access to pasture by muzzle or confining to a drylot is especially important during the spring seasons. Feeding hay at 1.5-2.0% of body weight is considered a restricted diet for IR. If only feeding hay, make sure to feed a balancer pellet. Also, if more calories are needed, fat sources are excellent choices instead of grains and feeds with high carbohydrate/sugar content. Higher fiber content in the daily diet is also encouraged. Medical management of EMS involves the supervised use of Thyro-L or Metformin to increase metabolism, which aids in decreasing body weight and in turn basal insulin values. Prevention of laminitis is key with an EMS horse.

An active area of current research investigation at the Gluck Center involving our herd of EMS horses is to study novel therapies that will modulate both the metabolic and inflammation aspect of EMS. Recently, we performed a study in EMS horses determining the effects of resveratrol, a natural polyphenol compound which has been identified as a key activator of important metabolic hormones, causing beneficial downstream signaling events that mimic protective mechanisms induced by caloric restriction. Overall, resveratrol therapy decreased inflammation and serum leptin and tryglerceride levels and improved insulin responses in EMS horses when compared to EMS 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. Discovery of 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 component of EMS. Occasionally, both disorders can occur together. Typically if this is the case, a PPID horse may also be IR. EMS horses are rarely PPID. With this said, anecdotal evidence has suggested that EMS horses are more likely to develop PPID at an older age (more than 20 years old), however the research to support this does not exist.

With any PPID and EMS patient, regular health check-ups are critical to long-term care. This includes the performance of basic blood work, dental care, and regular foot/hoof trimming. Of great importance, it is critical to work with your veterinarian to differentiate between PPID and EMS in your horse to ensure proper treatment and management. --Amanda Adams
A more accurate diagnosis of equine infectious anemia

Equine infectious anemia (EIA), also known as swamp fever, is an infectious and potentially fatal viral disease that affects all equines. The infection is blood-borne and transmitted by blood feeding insects with the virus. Researchers from the University of Kentucky, in conjunction with researchers at the University of Pittsburgh and Istituto Zooprofilattico Sperimentale delle Regioni Lazio e Toscana Rome, Italy, have been looking into options for more accurate diagnosis of EIA.

By comparing results from current testing methods, the researchers recommend a three-tiered approach to test for EIA.

In the 1970s, Leroy Coggins, DVM, invented the first reliable assay to diagnose EIA, the commonly known and popular ‘Coggins test,’ that determines the presence of EIA antibodies in the blood sample. For decades the Coggins test has been required in movement of all horses and is currently the gold standard as a serological diagnosis of EIA. A negative Coggins test is usually required for the importation of a horse from another state or country. A positive test result, however, requires that the horse be euthanized or quarantined for the rest of its life, affecting the horse industry significantly.

Testing has expanded to about two million samples each year. The good news is that it has become rare to find animals with clinical signs associated with the infection. The major problem today is primarily the hard-to-find and unapparent carriers of the virus. Optimized assays to detect the disease have therefore become increasingly important to the horse industry.

However, since the Coggins test was introduced, several new ELISA assays have been developed and some of them have proven to have fewer false negatives than the Coggins, said Charles Issel, DVM, PhD, professor at the UK Gluck Equine Research Center.

“Data from our studies has shown the benefits of using the combined strengths of the Coggins test, several enzyme-linked immunosorbent assay tests (ELISAs), and an immunoblot test to diagnose EIA. In combination with the immunoblot, ELISA assays identified up to 20% more cases of EIA,” Issel said.

The studies involved samples from experimental studies at UK, which were tested using Coggins and ELISA test formats, as well as a group of mules naturally exposed to EIA. These results indicated that some of the serum samples that were positive with the Coggins tests tested positive with several commercially available ELISA assays as well as with immunobLOTS. These animals were also found positive for genetic material of the virus (proven carriers).

It was a national surveillance program conducted in Italy from 2007-2010 that provided 96,468 blood samples for validation of the Competition-ELISA (C-ELISA) assay. Overall, 331 of the 96,468 samples proved positive in C-ELISA, but only 124 of those were interpreted as positive by the Coggins test. Therefore, the 207 samples testing positive with the C-ELISA but negative with the Coggins test were investigated further with immunoblots in conjunction with meticulous evaluation of history information for each horse. These examinations concluded that 182 samples had tested falsely positive on the C-ELISA.

A more accurate diagnosis of equine infectious anemia

“The role of interferon gamma in foals

A recent study by researchers at the University of Kentucky Gluck Equine Research Center linked a foal’s environment with its ability to produce interferon gamma, a key protein in the immune response. Interferon-gamma is important to foals because reduced interferon-gamma production is associated with an increased risk for intracellular bacterial infections, such as the pneumonia-causing bacterium Rhodococcus equi.

In humans, exposure to microbial antigens in the environment affects interferon-gamma production through the stimulation of white blood cells (lymphocytes). The Gluck Center research examined whether the same process occurs in foals.

“In this study, we determined the effect of the foal’s environment on its ability to produce interferon-gamma early in life,” said David Horohov, PhD, Jes E. and Clementine M. Schlaikjer Endowed Chair and professor at the Gluck Center.

The research was part of the dissertation project performed by Lingshuang Sun, PhD, while she was a graduate student in Horohov’s laboratory. Horohov’s team had previously found newborn foals are born with a limited capacity to produce interferon-gamma and that production increases after birth. Since interferon-gamma is a key cytokine in the immune response to R. equi, this could explain why adult horses are resistant to this bacterium.
whereas foals are uniquely susceptible to this pathogen. Increasing interferon-gamma production in foals could prevent mortality and financial losses due to *R. equi* infections, Horohov said.

The results of the study showed that foals that were exposed to higher levels of microbial antigens (bacteria and fungi) had an increased production of interferon-gamma as well as an increased number of lymphocytes, when compared to foals with low exposure to microbial antigens.

According to Horohov, this is the first data to actually identify a relationship between environment, increased lymphoproliferation, and elevated interferon-gamma expression in foals.

Horohov said the results showed that the environment of the foal can influence its ability to produce interferon-gamma early in life and the effect was associated with an increase in the lymphoproliferative response of these foals. The foals were responding to the microbial antigens, resulting in increased interferon-gamma expression and these data are consistent with the known mechanism of interferon-gamma regulation in other species.

In addition to playing a possible role in resistance to infection by *R. equi*, increased interferon-gamma production early in life could also be associated with a reduced risk for developing other diseases.

“There is good evidence in humans that delayed production of interferon-gamma in children is associated with an increased risk for asthma. We don’t know whether this also happens in horses. But it is an intriguing possibility that should be investigated further,” Horohov said. --Shaila Sigsgaard

### Guidelines for equine parasite control launched

The first official set of guidelines for parasite control in horses is now available on the American Association for Equine Practitioners’ (AAEP) website. A subcommittee appointed by AAEP includes researchers, clinicians, industry representatives, and veterinary practitioners who spent the last several years formulating the document.

“We are facing a significant paradigm shift in equine parasitology, and there has been lots of confusion and controversy in our field in recent years,” said Martin K. Nielsen DVM, PhD, DipEVPC, assistant professor in the Department of Veterinary Science at the University of Kentucky Gluck Equine Research Center. Nielsen is chair of the subcommittee.

According to Nielsen, guidelines for parasite control in horses are highly needed to help veterinarians and their clients maneuver in the challenging landscape between the many different parasite species infecting horses, and the different increasing levels of drug resistance in several of these. Parasite control is not as straightforward as it was once believed.

“We have long been emphasizing there is no one-size-fits-all program for parasite control, which is a true statement but does not provide much help for the veterinarian in the field,” Nielsen said.

The guideline document clearly states that the goal should never be to eradicate any parasite. Not only is this impossible to achieve, the inevitable result is accelerated development of parasite drug resistance. Instead, the goals are to: minimize the risk of parasitic disease, control parasite egg shedding, and maintain effective drug control and avoid further development of anthelmintic (drugs used to treat infections with parasitic worms) resistance as much as possible.

For adult horses, the guidelines state that one or two yearly treatments are sufficient to prevent occurrence of large strongyles. Cyathostomin (small strongyle) parasites can be treated based on strategically performed fecal egg counts. Tapeworm treatments should be included annually in most regions. In foals, it is not recommended to base treatments on egg counts. Instead, foals should receive about four anthelmintic treatments the first year. Information on the timing and choice of anthelmintic drug is given in the guideline document. Yearlings and 2-year-olds should continue to be treated as “high” shedders, and receive about three yearly treatments with effective drugs. In all age groups it is highly recommended to perform routine screenings of anthelmintic efficacy with the fecal egg count reduction test.

“We hope these guidelines will reduce the confusion and controversy about parasite control and hope to continue to update this document as we generate more information,” Nielsen said.


*Photo by Laurel Mastro*
Strongyulus vulgaris, commonly known as the bloodworm, is considered the most pathogenic parasite infecting horses worldwide. No diagnostic method has proven reliable for detecting migrating larvae of S. vulgaris so far.

A group of scientists from the University of Kentucky Gluck Equine Research Center and the Department of Large Animal Sciences at the University of Copenhagen in Denmark have developed a novel, reliable assay for detection of S. vulgaris in the blood stream. According to Martin Nielsen, DVM, PhD, DipEVPC, assistant professor at the Gluck Equine Research Center, S. vulgaris is the most dangerous of all equine parasites, largely due to the extensive larval migrations in the arterial system of the horse. The larvae make their way to the bloodstream of the horse, and spend about four months before they return to the intestine. During their migration, the larvae cause a pronounced inflammation in the arterial wall, and large blood clots are formed. Smaller clots can detach and be carried down larger blood vessels until they block smaller vessels. This can deprive parts of the intestinal tract from oxygen and nutrients and cause life-threatening colic.

Currently, detection of S. vulgaris infection is based on a time consuming larval culture with subsequent microscopic examination or a recently developed PCR detecting DNA extracted from parasite eggs. No diagnostic method has been proven useful for detecting migrating larvae of S. vulgaris while still in the blood, Nielsen said. The larval culture and PCR assay both detect the adult worms present in the intestine. Adult worms are not believed to cause disease, and when these are detected in a horse, serious damage in the blood vessels may have occurred right away before any further damage occurs. Overall, this is a major advancement over currently available diagnostic methods, Nielsen said.

These issues highlighted a need for reliable and improved diagnostic tools to diagnose S. vulgaris while still in the blood, Nielsen said. “We used gene technology to identify potential diagnostic molecules and found one interesting antigen, which we named rSvSXP after characterizing and expressing it as a recombinant protein,” he said.

The scientists extracted RNA from S. vulgaris worms and larvae and used this to construct a S. vulgaris genetic library consisting of about five million expressed genes. They identified one of these gene products to have diagnostic potential. The protein was then fully sequenced, expressed recombinantly, and validated with serum samples from 102 horses with known infection status. Additionally, they constructed an ELISA assay with sensitivity and specificity of 73.3% and 81%, respectively.

The ELISA assay has been proven capable of diagnosing the larvae while migrating in the blood vessels, so the horse can be diagnosed and treated right away before any further damage occurs. Overall, this is a major advancement over currently available diagnostic methods, Nielsen said.

“Our first results are very promising and we are hoping we can further develop diagnostic assays using this protein,” Nielsen said.

According to Nielsen, a patent has been filed and the researchers are currently seeking financial partners in an attempt to make a test commercially available. They have gained interest from potential partners, but it will probably take a couple of years before a diagnostic product will be launched.

--Shaila Sigsgaard
The use of recombinant follicle stimulating hormone (reFSH) to advance the breeding season

Researchers from the University of Kentucky Gluck Equine Research Center have studied the use of recombinant hormones to induce reproductive cyclicity and advance the breeding season in mares. The study, done in collaboration with the University of California and Colorado State University, was to determine the efficacy of an equine recombinant follicle stimulating hormone, reFSH, in non-cycling mares that were housed under natural light conditions. The transition from reproductive inactivity during the winter to the breeding season can be a lengthy and complicated process. Increased daylight suppresses melatonin and allows secretion of reproductive hormones that are necessary to induce ovulation and reproductive cycles. Mares under natural light do not enter the breeding season until late April. The onset of the transition period is characterized by an increase in follicle development and uterine edema.

Various management and therapeutic strategies have been developed to facilitate a shift of the first ovulation of the year from April to February. The most common management is light treatment, which should begin in December for mares to begin their reproductive cycles in mid-February.

“Even housed under artificial barn light, the mares may still experience normal length of transition period lasting 50 to 70 days or more, prior to the first ovulation of the season,” said Mats Troedsson, DVM, PhD, director of the UK Gluck Equine Research Center and chair of the department of veterinary science. “Therefore, there may be a need for alternative treatments of shorter duration.

Sixty deep anestrous mares (winter time non-cycling mares) participated in the study initiated from the end of January until one or more pre-ovulatory follicles developed. Mares in California, Colorado, and Kentucky were divided into two groups that were administered 0.65 mg of reFSH or a placebo by random selection. The scientists closely monitored the mares by ultrasound until a 35 mm follicle or larger was developed and reFSH treatment was discontinued and human chorionic gonadotropin (hCG) administered to induce ovulation. Mares treated with reFSH all developed follicles after a week, and 23 of 30 mares in this group ovulated within 72 hours after receiving hCG. The control group did not develop follicles during the period.

While reFSH proved successful in this study stimulating early dominant follicles and ovulation in the seasonally anestrous mares, a continued cyclicity failed to appear. “However, the treated mares returned to anestrus following the induced ovulation and followed the calendar of the control group,” Troedsson said. He suggested that continuous treatment may be necessary in mares that fail to become pregnant following breeding on the induced ovulation.

A second study: mobile light therapy
Use of artificial indoor light to speed up transition is time-consuming and costly in electricity, bedding, and labor. Researchers at the Gluck Center collaborated with Barbara Murphy, BSc, PhD, a researcher at the University College Dublin, Ireland, who recently developed a facemask with blue light directed at a single eye to suppress the production of melatonin (a natural hormone that prevents a mare from cycling in the winter) in mares under natural light. The study set out to determine if the facemask was as effective in advancing the breeding season as traditional indoor barn light.

Fifty-nine Thoroughbred mares at farms in Lexington, KY, ages 4 to 17 years old, were used. The study was conducted from mid-December until mid-February 2013. The mares were divided into three groups. One group was individually stalled under indoor barn light (250 Lux) that remained on until 11 p.m.; the second group was wearing the facemask with timed light (50 Lux blue light) from 4:30 p.m. until 11 p.m. daily outside. The third group was a control group and maintained outside in natural light. The researchers used transrectal ultrasound examinations of the reproductive tract to determine the presence and size of the follicles on the ovaries in conjunction with samples of serum progesterone to confirm ovulation.

In the group exposed to indoor barn light, 14 of 16 mares showed reproductive activity. Twenty of 25 mares wearing the light masks exhibited reproductive activity. In the control group only four of 19 mares showed reproductive activity. There was no statistical difference between the two light treatment groups, but all treated horses had advanced reproductive cycles compared to the control mares.

“We concluded that the timed low level blue light was as effective as traditional indoor barn light in advancing breeding,” Troedsson said. “In addition, we emphasize that the mobile head gear saves electricity and labor as the horse can remain in pasture.”

Troedsson added that the light facemask is an excellent alternative to indoor barn light as it also allows the horse more outdoor time in its natural environment. FAQ: The head piece provides 50 lux blue light to the right eye and consists of a leather headpiece with a semi-rigid rubber cup with a single blue LED fitted on the inside of the rubber eye cup. The mask is also provided with an adjustable velcro down the center of the head piece.

--Shaila Sigsgaard
Gluck Center’s Adams receives equine research grant

Amanda Adams, PhD, an assistant professor of equine immunology at the University of Kentucky Gluck Equine Research Center, received funding for research focused on characterizing the immune system of the geriatric horse by identifying mechanisms responsible for immunosenescence (gradual deterioration of the immune system due to natural age advancement), inflamm-aging and altered immune responses to vaccination. The project is funded by Buckeye® Nutrition and Waltham® Center for Pet Nutrition Awards 2013 Equine Research Grant.

“My goal is to improve the health and well-being of the aged horse by identifying interventions that have the potential to improve the function and redox state of the immune system,” Adams said.

Adams received her PhD in equine immunology at UK, where she has been employed since 2004. She received a bachelor’s degree from Stephens College in Columbia, Mo. Adams is a member of the American Association of Veterinary Immunologists and the American Quarter Horse Association. Grant recipients have the opportunity to work with Patricia Harris, PhD, director of science for the Waltham Center for Pet Nutrition, or Amber Moffett, MS, PAS, research and development manager for Mars Horsecare U.S. Inc., as external advisors.

“We have chosen to support research that aligns with our goals of producing quality equine feed to keep horses healthy and happy,” Moffett said. “Dr. Adams’ research will move senior horse care forward into the future.”

For more information or to apply for future grants, visit www.BuckeyeNutrition.com or www.Waltham.com.

Sri Lanka’s Ambassador Visits UK, Gluck Center

As our world continues to become increasingly interconnected via technology, opportunities for universities to collaborate across the globe also are increasing.

On Friday, July 12, the University of Kentucky hosted a visit by the Sri Lankan ambassador to the United States, Jaliya Wickramasuriya, and his wife, Priyanga Wickramasuriya, for the purpose of exploring the development of academic affiliations between UK and one or more universities in Sri Lanka, an island country of just over 20 million people located in the northern Indian Ocean, near India.

Ambassador Wickramasuriya and UK officials discussed proposals for joint cancer research projects between UK and the University of Peradeniya and the National Cancer Institute of Sri Lanka and, potentially, opportunities for mutually beneficial education and training programs in the two countries. The partnership may later be extended to include infectious diseases and equine management, or other disciplines related to agriculture and equine science.

The proposed affiliation between institutions in the two countries was initiated at the request of Frederick de Beer, MD, dean of the UK College of Medicine, with the goal of expanding UK’s international outreach program to developing countries in Asia. He requested that Marcus E. Randall, MD, FACR, FASTRO, professor and Markey Foundation Endowed Chair in Radiation Medicine in the UK College of Medicine, and Udeni Balasuriya, BVSc, MS, PhD, professor of virology at the Gluck Equine Research Center in UK’s Department of Veterinary Science in the UK College of Agriculture, Food and Environment, establish a link with academic and research institutions in Sri Lanka. Both are scheduled to visit Sri Lanka in August, when they will meet with collaborators and discuss research projects involving UK. During their visit, the ambassador also stopped by the Gluck Equine Research Center for a tour and to meet with Balasuriya and Mats Troedsson, DVM, PhD, Dipl. ACT, director of the Gluck Center and chair of the department of veterinary science at UK. Following the tour, Balasuriya, a native of Sri Lanka, hosted a dinner at his home.

Dr. Amanda Adams

Left to right: Udeni B.R. Balasuriya, professor at the Gluck Center; Eli Capilouto, UK President; Christine Riordan, UK Provost; Jaliya Wickramasuriya, Sri Lankan Ambassador to the United States; Mats Troedsson, Gluck Center Director; Nancy Cox, Associate Dean for Research in the College of Agriculture, Food and Environment; Ben Chandler, former United States Congressman; Mrs. Priyanga Wickramasuriya; Marcus E. Randall, professor in the College of Medicine, Fred DeBeer, Dean of the College of Medicine; Susan Carvalho, Vice Provost for International Programs; and Robert Means Jr., Executive Dean in the College of Medicine.
Eighteen members of the University of Kentucky Ag Equine Programs attended the annual Equine Science Society Symposium May 28-31 in Mescalero, N.M.

Oral presentations by faculty members included:
- Amanda Adams, PhD, an assistant research professor at the Gluck Center, Identifying the role of a “caloric restriction mimetic,” resveratrol, in 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, and 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.) β-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
- 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 freezability of stallion sperm
- Melissa Siard, PhD candidate, Effects of polyphenolic bioactive compounds (pterostilbene, resveratrol, curcuminoids, quercetin, and hydroxypterositilbene) on pro-inflammatory cytokine production in vitro
- Poster presentations by graduate students included:
  - Mieke Brummer, PhD (already graduated), Interrelationships among 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, which were sponsored by the North American Equine Ranching Information Council. In the production and management competition, Hansen took top honors while Strasinger placed second and Mastro placed third. In the nutrition competition, Siard placed third.

Also at the meeting, Harlow was elected by the graduate students 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 in 2015 in Florida. The symposium will be hosted by the University of Florida. --Jenny Evans

Eighteen members of the UK Ag Equine Programs attended ESS in May.
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