

2010's Top Equine Studies

BY CHRISTY WEST

What would be your pick for the most groundbreaking news in equine veterinary medicine for 2010? Not sure? Find out what three top equine veterinarians deemed the most important news in equine reproduction, lameness, surgery, and medicine in 2010.

These three veterinarians presented the popular Kester News Hour session:

- Margo L. Macpherson, DVM, MS, Dipl. ACT, associate professor/section chief in Reproduction at the University of Florida, and past president of the American College of Theriogenologists;
- Scott E. Palmer, VMD, Dipl. ABVP (Equine Practice), hospital director and a staff surgeon of the New Jersey Equine Clinic in Clarksburg, N.J., and past president of the AAEP and American Board of Veterinary Practitioners; and
- Steve Reed, DVM, Dipl. ACVIM, Rood & Riddle Equine Hospital, Lexington, Ky.

Top Reproduction Studies

Oviductal Patency In a study Macpherson termed “attention-getting,” researchers inserted tiny colored fluorescent beads into mares’ oviducts, then performed uterine lavage one and two days later, to assess whether the oviducts were patent (open, or allowing the beads to pass along the oviduct to the uterus). Beads were only recovered from 40% of mares, suggesting blockage of one or both oviducts was present in the other 60% of mares (which averaged 8 years of age compared to 4 years for the patent mares).

“While this isn’t a first line of defense for the barren mare, this novel approach could provide answers for mares with long-standing, unexplained infertility,” Macpherson commented. “Similar studies have also shown that oviductal flushing can sometimes resolve obstruction and result in future pregnancy.”

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Drs. Macpherson, Palmer, and Reed (left to right) discussed more than 80 studies.

Endometritis “Work from several investigators in the past five years has suggested that clinical diagnosis of a uterine infection can vary depending on the organism involved,” said Macpherson. In other words, different bacteria cause different levels of inflammation in the uterus (endometritis), causing veterinarians to diagnose them differently. She described an *Animal Reproduction Science* (ARS) study in which researchers reported that *Streptococcus zooepidemicus* bacteria caused significantly more inflammation than *Escherichia coli* in susceptible mares (those that tend to get uterine inflammation/infection more easily than others).

Also, resistant mares (those that do not get uterine infections as easily) did not have any bacteria recovered from their uteri, meaning they were able to clear the infection on their own. However, their susceptible counterparts yielded *Strep* after infection with that bacterium, but generally did not have *E. coli* cultured even after infection with that bacterium.

Researchers on two more studies (in the

Journal of Equine Veterinary Science, *JEVS*, and *ARS*) also evaluated uterine infections; both reinforced the findings of more positive culture results with *Streptococcus* compared to *E. coli*. Also, endometrial biopsy samples were found to be better for cytology and culture testing than guarded swab samples. “All uterine infections are not created equally,” said Macpherson. “*E. coli* infections may be more insidious in nature and require more aggressive diagnostic procedures to detect.”

In a related study researchers from Colorado State University validated a polymerase chain reaction (PCR) test for detecting bacteria in the uterus. This is a “highly sensitive tool” that identified bacteria in 33% of mares with endometritis, whereas standard culture identified bacteria in only 22% of cases.

“PCR has great potential as an adjunct tool for mares with a long-standing history of infertility,” Macpherson commented. Also, she added, “Preliminary data from a PCR test used to detect fungal DNA from uterine samples shows great promise for difficult-to-detect fungal organisms.”



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Placentitis/Mare Management One group of scientists researched treating placentitis (placental infection/inflammation, a leading cause of foal loss). Veterinarians treated mares with clinical signs of induced placentitis using a combination of trimethoprim sulfamethoxazole, pentoxifylline, and altrenogest at standard doses. Treatment continued from the onset of clinical signs until foals were born or aborted.

According to Macpherson, 83% of the treated mares delivered live foals compared to zero control mares. Ten of 12 live foals of treated mares had no bacteria in their bloodstreams, whereas all of the aborted foals had bacteria in at least one of the following locations: Blood, stomach contents, and/or chest fluids.

"The workers attributed the rapid and aggressive treatment, within 96 hours of infection, to the successful delivery of live foals in treated mares," said Macpherson.

Another group of researchers tested several drugs against induced placentitis, using antibiotics alone (such as trimethoprim sulfamethoxazole) or in combination with immunomodulators (in this case, immune system boosters) such as the corticosteroid dexamethasone, aspirin, and progestins (synthetic hormones similar to progesterone). Treatment was initiated with onset of clinical signs (within 48 hours of infection), and two-thirds of the mares delivered viable foals regardless of which treatment they received.

"These findings beg the question of whether drug choice is the determining factor in successful treatment of bacterial placentitis, or (if it is) early detection

of disease and rapid initiation of treatment," Macpherson said. She also noted that treated mares delivered about 10 days earlier than healthy mares, suggesting that accelerated foal maturation occurred with the disease.

Lastly, she discussed an Australian study in *ARS* which mares were classified as being at "high-risk" of placentitis if they had less than a 50% live foal rate within the last three years. High-risk mares were monitored with ultrasound and visual observation starting at five months of gestation, and treated with antibiotics and altrenogest if they showed any signs of placentitis. More persistent cases also got anti-inflammatory medications.

With this treatment protocol, more than 80% of high-risk mares delivered live foals, compared to only about 25% before the study.

"Monitor mares at risk for premature delivery to ensure prompt diagnosis," recommended Macpherson. "Initiate treatment early, treat aggressively and for the duration of pregnancy. To ensure continued reproductive health for the mare, she should also be treated in the postpartum period—clean those mares up!"

Another mare management study (in *Theriogenology*) involved evaluating the effects of Regu-Mate (altrenogest, a progesterone hormone product). "Many of us use Regu-Mate, liberally at times, for support of pregnancy," Macpherson said.

Researchers found no difference in pregnancy rates with Regu-Mate, but they did find that older mares (which had smaller embryos at all time points) that were given the product had significantly larger embryos from Days 30-45 of gestation compared to older mares that didn't get Regu-Mate. Also, some mares then produced more equine chorionic gonadotropin hormone (which also helps support pregnancy).

"Early treatment (no later than Days 5-6) of pregnant mares, particularly aged ones, with altrenogest may have a positive effect on embryo and placental development," Macpherson noted.

Macpherson also reported that an injectable, sustained-release deslorelin product (for managing estrus in mares, using the same primary ingredient as the product Ovuplant, which has been off the market for some time) gained Food and Drug Administration approval in the week before

the convention, and was expected to be available by January 18, 2011. The product, called SucroMate, is being distributed by Bioniche Life Sciences.

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Broodmares and Financial Return In the financial arena, Macpherson reported that the general economic downturn has not spared the Florida horse production industry, which saw a "staggering drop in Thoroughbred production," nearly a 30% reduction in foal crops was noted from 2009 to 2010.

"I am guessing that few of us in this room are prepared to give up breeding mares, racing horses, or being equine veterinarians," she commented. "Instead, we need to make better decisions about what we do and how we do it. A first start is evaluating our breeding practices."

In that vein, Macpherson described a recent production data study in *Equine Veterinary Journal (EVJ)* in which researchers evaluated mare value and productivity, with an eye toward helping breeders maximize returns and mare productivity.

Most mares' foaling dates tend to drift later in the year with subsequent seasons, often resulting in a missed or barren season, she noted. Of the 1,176 mares in the study, 63% failed to produce a registered foal every season within the seven-year study period. For those mares, the average time to a barren season was 3.4 years.

Factors including increasing mare age, foaling after April 1, requiring multiple breedings in a season, and producing fewer foals in previous years were associated with reduced foal production during the study. Additionally, the researchers found that a mare must produce a live foal in at least six out of seven years to recoup



the breeder's investment in her, and that higher-value mares yield better financial gains.

"Mares are long-term investments," concluded the study authors. "Improving our understanding of mare, stallion, and management factors that affect the likelihood of producing a live foal is critical to ensuring a positive financial return."

Also, Macpherson reported that breeding earlier in the year yielded higher pregnancy rates, and that early breeding was especially important for maiden and barren mares. Foal heat breeding was also effective in reproductively healthy mares in one study, but not in another.

On the stallion side of things, some stallions were found to be more fertile than others in one study, and reinforcement breeding was again found to improve pregnancy rates when used in a natural cover program. Later covers in the day were associated with decreased pregnancy rates, as was the presence of neutrophils (a type of immune cell) in the dismount sample (possibly indicating uterine inflammation in the mare). Tranquilizers given to mares also had a detrimental effect (it was not clear whether that was because mares were not ready for breeding or because of a pharmacologic effect of the tranquilizer drug).

"The majority of factors associated with variation of fertility in this study, both positive and negative, were attributable to the mare," said Macpherson.

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Stallion Vocalizations for Teasing? Could farm managers tease mares to assess estrus by simply playing tape recordings of stallion vocalizations? The results of a recent study confirm the effectiveness of this practice, which could be used by some

breeding farms.

Researchers on an ARS study played taped stallion vocalizations to broodmares and were thereby able to identify estrous behavior. The effectiveness of this practice was improved when the mares were also presented with stallion scent, with a successful estrus detection rate of over 80%.

"This tactic might provide a less threatening environment for mares, which could be especially important for maiden or timid mares or on small farms with no stallions," Macpherson added. "Further, if physical findings of the reproductive tract were combined with behavioral responses, as is typical in practice, one would expect the sensitivity of this tool to be even better."

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Semen Processing Stallion semen is generally centrifuged, or spun at high speeds, during processing for extending/shipment so sperm are concentrated. However, this procedure can crush some sperm depending on the technique used, so researchers often evaluate techniques to reduce this sperm loss, such as by using a cushion medium in the tube.

Macpherson discussed one study in which researchers modified cushioned centrifugation procedures to use less cushion medium (1 mL instead of 3.5) and larger sperm samples (3 billion instead of 1), and found that sperm recovery rates were still higher than 90% regardless of cushion volume or sperm number. Sperm characteristics were also unaffected even after cooling for 24 hours.

"More sperm and less cushion means less tubes to process, which can increase efficiency and reduce costs," explained Macpherson.

Another study she was "particularly excited about" looked at increasing the concentrations of sperm in cooled, shipped semen from 25 million sperm per milliliter of shipped semen to 250 million sperm/mL. No negative impact on sperm characteristics was noted with this protocol.

"So we can ship more sperm, perhaps even up to 20 billion sperm," Macpherson noted. "This could be useful for providing more sperm for traditional artificial

insemination (AI) or for low-dose AI. The one qualifier for both of these studies is that these protocol changes have not been tested for fertility."

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Contagious Equine Metritis Macpherson also discussed a study of contagious equine metritis (CEM), a highly contagious bacterial infection that causes acute endometritis in mares and subsequently impacts fertility. The disease caused significant consternation recently in the U.S. breeding industry (see "CEM Investigation: 23 Positive Stallions," TheHorse.com/16078). For this study, researchers evaluated whether mixing antibiotics with semen extender would prevent transmission of the bacterium that causes CEM, *Taylorella equigenitalis*, from infected stallions to mares. They found that growth of the bacterium was "significantly inhibited" by the antibiotics and that mares bred with this semen did not become ill, whereas all mares bred with raw (not extended), infected semen developed CEM.

"The risk of transmission of CEM can be significantly reduced by mixing semen with extenders containing antibiotics," summarized Macpherson.

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Embryo Biopsy "Exciting advances in embryo biopsy techniques for diagnosing genetic diseases were revealed in 2010," said Macpherson. In humans, she added, this technique is commonly used to screen for genetic disease before implanting embryos created by *in vitro* fertilization.

Texas A&M University researchers have found good success with biopsying equine embryos that were 6-8 days old, then transferring the embryos into mares or freezing them for later use. Fresh, shipped embryos still yielded better than 75% pregnancy rates.

Diseases detected in the biopsied cells



included hyperkalemic periodic paralysis (HYPP) and hereditary equine regional dermal asthenia (HERDA). Embryo sex was also determined.

“This laboratory is working hard to perfect gene amplification procedures to allow for diagnosis of additional diseases,” Macpherson said. (For more information, see “Assisted Reproduction in Horses: Practical Usage,” TheHorse.com/17738)

Another study, this one from the University of Kentucky, also looked at vitrification (freezing) of biopsied embryos.

“In this groundbreaking study, transfer of frozen/thawed embryos subjected to biopsy resulted in a 75% pregnancy rate at Day 14,” reported Macpherson. “Three live foals were born from these biopsied embryos, including the first reported live foal following these procedures. Successful embryo biopsy for pre-implantation genetic diagnosis of equine diseases may revolutionize the way we manage genetic diseases in horses.”

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ANNE M. EBERHARDT

Early breeding is especially important for maiden and barren mares to give them optimal earlier foaling dates and reduce the chances they'll miss a season.

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Top Lameness/Surgery Studies

Diagnostic Techniques Veterinarians are always looking for improved diagnostic methods. Palmer discussed several studies on diagnostic techniques, including one study from *Equine Veterinary Journal (EVJ)* in which researchers compared different culture techniques for growing bacteria from synovial (joint) fluid. They found that use of enriched blood culture media increased the likelihood of obtaining a positive culture, which can help veterinarians be more successful in treating joint infections.

The second study correlated bacterial cultures from synovial fluid to survival rates of horses with joint infection. “Twenty-one percent of horses with positive cultures (containing bacteria) were euthanized vs. 1.4% of controls,” commented Palmer. He also noted that horses with *Staphylococcus aureus* cultured from their joints did not fare as well as those without.

Another *EVJ* study evaluated the potential use of biomarkers found in a horse's serum for predicting musculoskeletal injury. “Biomarkers have the potential to be used

as a screening aid prior to musculoskeletal injury,” wrote the authors. The researchers found seven markers that often correlated with injury, and that were deemed “promising but still not ready for prime time” according to Palmer.

Another potential screening tool was discussed in an *American Journal of Veterinary Research (AJVR)* study where researchers investigated whether fragments of certain types of collagen (a structural protein) found in synovial (joint) fluid and/or serum might indicate joint injury in that horse. The investigators determined that levels of these collagen fragments in serum and synovial fluid, along with the ratio between them, “could be used to detect horses with joint injury,” wrote the authors.

Palmer also discussed a study of diagnostic analgesia (nerve blocks) in horses, specifically the low four-point block used to numb structures at and below the fetlock joint. The researchers' goal was to determine if this block might also inadvertently anesthetize other structures higher in the limb, using contrast radiography to see where the anesthetic solution might spread after injection. They found that anesthetic from this block was unlikely to spread upward and anesthetize the upper cannon bone region. They also noted that the deep digital flexor tendon sheath was often inadvertently punctured when performing this block. “For this reason, it's extremely important to use aseptic



technique (when performing this block)," advised Palmer.

An *EVJ* study on flexion tests for localizing lameness to the fetlock joint found that pain in the fetlock joint itself was most likely to contribute to a positive test. The researchers found that flexion of the distal interphalangeal joints was unlikely to cause a positive flexion test in normal horses and urged veterinarians and horse owners to interpret positive fetlock flexion tests with caution during a pre-purchase examination.

However, Palmer commented, "Don't throw the baby out with the bathwater." In his experience, inflammation of the coffin joint can also result in a positive flexion test in some cases. Palmer felt that the flexion test remains an important part of the pre-purchase examination.

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Racing Topics

Palmer discussed a number of studies on racehorses, including one in the *AJVR* on the effects of early exercise on future soundness. "Moderate, controlled exercise can be safe at an early age (from 3 weeks to 18 months of age)," summarized Palmer. Indeed, the authors of this study suggested that early exercise might even help

protect joints from future injury (although more research is needed).

Another report presented during The Jockey Club Safety and Welfare Summit in 2010 (based on information in the Equine Injury Database) looked at racing surfaces (i.e., turf [grass] vs. dirt vs. synthetic). Palmer described four myths dispelled by this preliminary study:

Myth 1 Synthetic surfaces reduce fatal musculoskeletal injury (no difference was actually found)

Myth 2 Injuries occur when horses move from turf to other surfaces (the data disagree).

Myth 3 2-year-old horses are at greater risk of injury than older horses (the data say it's the other way around).

Myth 4 Fillies are at greater risk of injury than colts (again, the data say the opposite is true).

"One thing is for sure: Track maintenance is key," said Palmer.

Identifying horses at risk for fracture at the racetrack is a high priority. In the past

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year a number of papers compared diagnostic techniques for detection of changes in bone that might predispose a horse to fracture.

An *AJVR* study investigated proximal sesamoid bone fractures (behind the fetlock) and found that racehorses with these fractures had evidence of excessive remodeling and porosity of their sesamoid bones that likely predisposed these horses to complete fracture and catastrophic injury. The authors also suggested that detection of these focal areas of injury/remodeling could help to identify horses at risk for this type of fracture and prevent catastrophic injury (i.e., by not racing horses with this type of injury as they are more likely to break down).

Another study that evaluated early injury detection by use of scintigraphy (bone scan) in racehorses found increased radio-isotope uptake (indicating bone remodeling) in the lower joint surface of the cannon bone. Researchers on this study (published in *EVJ*) found that scintigraphy was good for detecting horses with this early bone injury, but it did not help veterinarians determine which horses should safely continue in training and which ones should be taken out of training to prevent further injury.

Yet another study focusing on the early detection of bone damage in the fetlock joint compared digital radiography, magnetic resonance imaging and computed tomography as screening techniques to identify changes in the cannon bone that often lead to fracture. Researchers found that digital radiography underestimated such damage, while computed tomography (CT) and magnetic resonance imaging (MRI) were able to detect it. Unfortunately, CT and MRI with high-resolution capability require use of general anesthesia, which prevents them from being used as routine screening tools.

“Standing MRI may be a good tool [for identifying horses at risk for fracture], but it is very operator-dependent and false negative results are a significant concern,” Palmer commented.

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Musculoskeletal Therapy

Finding problems is important, and so is treating them properly. Palmer next discussed treatments for a number of musculoskeletal problems, starting with a review of literature on the use of corticosteroids for reducing joint inflammation in the horse (published in *EVJ*).

“Intra-articular corticosteroids (injected within the joint) are a hot button in practice,” Palmer commented. “Used in conjunction with disease-modifying medications like hyaluronic acid, they are extremely useful to reduce joint inflammation.”

Another study on corticosteroids (in *AJVR*) evaluated whether triamcinolone acetonide (TCA) injected into the coffin (distal interphalangeal) joint would diffuse into the navicular bursa (thus potentially medicating both areas). The researchers found that TCA did migrate into the navicular bursa of sound horses, even when hyaluronic acid was mixed with it. This strategy “can potentially be used for treatment of navicular syndrome, but further studies are needed,” wrote the researchers.

One such study was presented during the American College of Veterinary Surgeons (ACVS) symposium and evaluated the same question in horses with clinical navicular syndrome. The authors of this paper found that diffusion of TCA from the coffin joint to the navicular bursa worked in clinical cases as well as in normal horses.

The next study he discussed evaluated the use of intra-articular vs. intravenous morphine for experimentally induced synovitis (joint inflammation), and found that the intra-articular route was more effective in reducing lameness. “Intra-articular morphine treatment may be a useful adjunct to other pain management modes after a painful joint surgery,” Palmer noted.

Stem cells are a hot topic for treating

various injuries, and two studies focused on this area. One published in *EVJ* compared embryonic stem cells and mesenchymal stromal (bone marrow) cells in terms of their behavior when injected into an experimentally induced injury in the superficial digital flexor tendon. Researchers found that embryonic stem cells did not cause immune reactions in the 90-day study period, and they migrated to other areas of damage while mesenchymal stromal cells did not.

The second stem cell study also supported the use of embryonic stem cells for healing tendon injuries, noted Palmer.

The final study he discussed evaluated the use of biophosphonates in horses; this class of drug is used to prevent bone loss (for example, to prevent or combat osteoporosis in older women). In horses, it has been used to treat navicular syndrome, subchondral bone cysts, osteoarthritis, stress remodeling and other lameness conditions. This study, published in the *ACVS Proceedings*, evaluated the use of zoledronic acid for treatment of 23 horses with a variety of lameness conditions and reported that 16 of them returned to their original use.

“Zoledronic acid may be useful to treat certain lameness conditions, but controlled studies are warranted,” noted Palmer. “We don’t know a lot about this medication. It’s being used to treat a variety of conditions in horses in the belief that it will decrease osteolytic (bone-destroying) processes that may contribute to lameness problems in horses, some of which may play a role in catastrophic injury.”

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Additional Topics

Palmer also discussed a few surgical techniques and other studies as follows:

One study in *AJVR* on common wound flushing techniques found that the ideal fluid pressure for flushing joints was best achieved by use of a one-liter bag and pressurized cuff. Use of syringes to flush wounds can produce high enough fluid pressures to damage tissues.

A *Journal of the American Veterinary Medical Association (JAVMA)* study on a technique for partial phallectomy (partial removal of the penis) found that linear urethrostomy followed by placement of a band tourniquet above the area of disease or injury, then removal of the part of the penis below the tourniquet, was an effective method. "This can be done in the standing horse, which is good for older or debilitated horses that can't undergo general anesthesia," said Palmer.

Mitomycin C was found to be effective for combating squamous cell carcinomas near equine eyes in a *Veterinary Record* study, whether used alone or in conjunction with surgical removal of the lesion.

Researchers in one study published in *Veterinary Surgery* found that the interior of mares' abdomens could be easily and safely visualized by inserting an

endoscope through a small incision made in the vagina (thus creating no external incisions). Palmer reported that the technique provided good visibility of abdominal contents and the incisions healed without incident.

One study discussed a surgical technique for stitching together the ends of a severed tendon. This novel technique required patience to learn, said Palmer, but it showed superior strength to conventional suture patterns.

Lastly, Palmer referenced a study on cryotherapy (cold therapy) for treating laminitis. This study found that ice bags and water boots each cooled blood within the blood vessels of the foot by 20 degrees (F) for a two-hour period. The study was also discussed during the AAEP's Joints and Foot Lameness session.

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Top Equine Medicine Studies

Metabolic Syndrome, Equine Cushing's Disease, and Laminitis Metabolic syndrome is a widespread problem in horses, as is the laminitis that's often associated with it.

"Laminitis is one of the most important issues facing all of us in veterinary practice," said Reed. He discussed several studies and scientific communications related to metabolic syndrome and equine Cushing's disease, starting with a consensus statement from the American College of Veterinary Internal Medicine (published in the *Journal of Veterinary Internal Medicine, JVIM*) covering characteristics, diagnosis, and management of equine metabolic syndrome (EMS).

"Equine metabolic syndrome is characterized by regional adiposity (fat deposits), insulin resistance, and a predisposition to developing laminitis," summarized Reed. "Insulin resistance is characterized by hyperinsulinemia (high levels of insulin in the blood) and abnormal response to glucose/insulin testing. These horses have hyperinsulinemia in the absence of stress, pain, or recent feeding; sometimes the blood samples even look different grossly (to the naked eye). Dietary management includes reducing the energy provided in the diet, feeding lower levels of nonstructural carbohydrates (NSC), limiting access to pasture grass. Increasing physical activity is critical."

Veterinarians on a *JVIM* study compared the composition of fat in different places on EMS-affected horses' bodies, and they found that fat in the nuchal ligament (in the neck) had higher levels of pro-inflammatory cytokines (mediators of inflammation) than fat in other locations,



Horses with large crests of fat on their necks were at higher risk for insulin resistance, and this area of the horse seems to adopt an inflammatory state more quickly than other areas.

CHRISTY WEST



and that these levels seemed unaffected by the horse's systemic (body-wide) level of insulin resistance. Reed commented that horses with large crests of fat on their necks were at higher risk for insulin resistance, and that this area of the horse seems to adopt an inflammatory state more quickly than other areas.

One issue with studying metabolic syndrome is that it can be hard to differentiate from pituitary pars intermedia dysfunction (also called equine Cushing's disease), noted Reed. While discussing two JVIM studies on hormone testing in horses presumed to have Cushing's disease, he commented that Cushing's disease often affects older horses than EMS does, and diagnosis can be difficult due to seasonal variations in the hormone levels used for diagnosis. However, insulin levels did not vary by season, so high levels "should raise suspicion of EMS, ECD, or both," wrote the study authors.

Cushing's horses "have cresty necks, long coats that fail to shed properly, polyuria (excessive urination) and polydipsia (excessive thirst), ravenous appetites, are prone to laminitis, and may or may not be obese," Reed noted.

Back to insulin resistance, another study in this area (in *AJVR*) found that pre-treatment of horses at risk for endotoxemia (such as those with colic or carbohydrate overload) with levothyroxine could inhibit laminitis caused by endotoxemia-induced insulin resistance. "Figuring out ways to prevent secondary laminitis is critical," Reed commented.

Metformin is one medication that's sometimes recommended for treating insulin resistance. However, researchers on a study published in *AJVR* reported that metformin has low bioavailability in horses, which could be why it sometimes garners poor long-term results.

Investigators completing an *AJVR* study on the effects of weight gain on hormone profiles found, unsurprisingly, that feeding horses double the calories recommended resulted in increased insulin resistance that was compensated for by increased insulin secretion (hyperinsulinemia). Hyperleptinemia (high levels of leptin hormone, which reduces appetite) was also observed.

"Preventing obesity is a potential strategy to help avoid insulin resistance, hyperinsulinemia, and hyperleptinemia in

horses," wrote the study authors.

Finally, Reed touched on a paper published in *EVJ* regarding equine clinical genomics, or study of the horse's genetic code and inherited diseases. "Several groups are using the horse's genetic sequence to study diseases such as hyperkalemic periodic paralysis, and people are also interested in using this to investigate EMS," said Reed. "We can submit blood samples to Dr. Molly McCue at Minnesota for horses that have the characteristic EMS phenotype, so perhaps they can identify a genetic marker for the disease."

All three presenters acknowledged the difficulty in managing and feeding horses with EMS. Palmer commented, "Owner compliance can be a real problem; they might say, 'Doc, he only gets a handful of this or that, so how do you restrict them further?'"

“Even pasture is not always your horse's friend, because grass at certain times of the year can be a big predisposing factor to developing laminitis.”

DR. STEVE REED

"It's very difficult," admitted Reed. "Owners need to be aware that you're not being kind to these horses when you put them outside at certain times of the year. Even pasture is not always your horse's friend, because grass at certain times of the year can be a big predisposing factor to developing laminitis."

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INFECTIOUS DISEASE

Equine Herpesvirus Equine herpesvirus (EHV) can cause respiratory disease, neurologic disease, or abortion. It can become dormant in the horse's body but recrudescence (reactivate) when the horse is stressed, which has been suspected to cause outbreaks of associated disease. In one JVIM study, investigators infected horses with EHV, then stressed them four months later with dexamethasone (a corticosteroid, which reduces immune function and can be used to treat allergic reactions and other inflammatory conditions). The virus reactivated and subsequently was detected in blood and nasal secretions of all horses, and one developed a fever, but uninfected horses placed in contact with those horses did not become ill.

Another JVIM study on EHV highlighted the extremely contagious nature of the virus in the context of a nosocomial (hospital-acquired) outbreak of the disease at a university equine hospital following admission of an infected horse. The index case was handled with "strict infection control procedures," yet six other horses became infected and two caused outbreaks at their home farms afterward.

"We must have preplanned infection control programs and the virus may still move from horse to horse, so early detection and isolation with a strict protocol is essential," Reed commented.

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Lawsonia intracellularis *Lawsonia intracellularis* can cause weight loss, loose feces, edema, and hypoproteinemia (low



protein levels) in foals. Reed discussed a JVIM study that confirmed foals could acquire the disease from ingesting feces or food contaminated with feces from infected foals. The infected foals began shedding *L. intracellularis* in their feces 12-18 days after infection and shedding lasted for seven to 21 days.

"At least this disease is treatable with simple antibiotics, usually oxytetracycline," Reed commented.

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Salmonella Authors of another hospital infection report described an outbreak of *Salmonella* Newport that affected 61 animals in a veterinary teaching hospital, killing 36% of them and necessitating closure of the hospital for thorough decontamination and remediation of biosecurity. Study authors estimated the costs of the outbreak at \$4.12 million.

"The biggest benefits of rigorous infection control and surveillance strategies are earlier detection (of highly infectious organisms like *Salmonella*), earlier cessation (shorter outbreaks), and improved ability for aggressive intervention," said Reed.

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Equine Piroplasmiasis Piroplasmiasis, caused by the organisms *Babesia caballi* and *Theileria equi*, is a disease found worldwide that causes anorexia, anemia, fever, malaise, and icterus (jaundice) in horses. "This disease recently re-emerged in the United States; it's a persistent infection but often clinical signs are nonspecific," said Reed. Following discussion of a Parasitology Research paper, he added, "Serologic tests are useful for detecting latent infection."

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Antibiotic-Resistant *Rhodococcus equi* *Rhodococcus equi* causes sometimes-fatal pneumonia in foals, and is a "big problem in foals three weeks to five months of age," said Reed. In this study (published in *JAVMA*, researchers found that while infection with antibiotic-resistant *R. equi* was not common (3.7% of submitted *R. equi* samples), 63.2% of those resistant isolates were resistant to more than one antimicrobial, and foals infected with those strains were nearly seven times more likely to die from their infections. The study authors emphasized the value of culturing the causative organism in foal pneumonia cases, and determining susceptibility of the organism to antibiotics to treat the disease successfully.

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Heart Problems in Racehorses

Reed discussed three studies on cardiac (heart) function in racehorses, starting with one *JVIM* article in which veterinarians sought to investigate heartbeat variations in healthy racing Standardbreds. The researchers found that "arrhythmias occur frequently in racing Standardbreds during cardiac deceleration (when slowing down after a race). ... Circumstances imposing unusual demand and racing at the trot appear to predispose (horses to arrhythmia). These findings provide insight into possible mechanisms of sudden death."

Researchers on a second *JVIM* study with a similar goal used a sophisticated treadmill evaluation along with echocardiography, Doppler imaging, and speckle tracking to investigate left ventricular function (activity of the left lower chamber of the heart) in healthy horses. "This is important because if we could learn about stress echocardiography in horses, we could target certain diseases and investigate medications that are important in management and performance issues," explained Reed.

Lastly, investigators on an *AJVR* study evaluated the use of a horse-side analyzer for cardiac troponin I, a protein involved in heart muscle contraction. The authors found that the horse-side analyzer

compared well against a laboratory test, but Reed commented that it took significant induced cardiac disease to detect differences in cardiac troponin I levels.

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Respiratory Disease

To study treatments for a disease, one must be able to first induce the disease. Reed described one study from *AJVR* in which researchers found that a combination of certain fungal spores, lipopolysaccharide, and silica microspheres worsened recurrent airway obstruction (RAO) in susceptible horses.

"This appears to provide a useful model for future research," he commented.

A research team on another RAO study, this article from *JVIM*, reported an association between RAO and increased parasite resistance. A third study (from *EVJ*) was the first to show improvement in RAO-affected horses with oral prednisolone medication, and also found that low-dose oral dexamethasone was effective (even more so than prednisolone).

Researchers also investigated genetic markers for a form of RAO known as summer pasture-associated obstructive pulmonary disease (striking horses on summer pasture rather than those in dusty barn environments), and reported that the disease was a "multifactorial, complex form" with several genes involved."

Lastly, Reed discussed an *EVJ* study in which veterinarians compared horse owner-assessed respiratory signs (RAO-affected horses' clinical signs graded by owners on a scale of 1-4) with thorough veterinary examination of the lower respiratory tract. The researchers reported that horse owners' assessment of their horses' respiratory disease correlated well with the veterinary evaluation.

"Listen to owners—they know their horses," commented Reed.



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Neurologic Diseases

"I couldn't be here without talking a little about neurologic problems," said Reed—known for his interest in neurologic disease—with a smile as he began his final Kester News Hour segment. First, he described an *EVJ* study in which researchers described in detail the anatomy of the articular process joints in the neck, which had not previously been described. This has bearing on evaluation of horses with neurologic problems that could be attributed to compression of the spinal cord in the neck.

"By taking variations of straight lateral and angled radiographs of the neck, one could see bone changes (potential joint problems) and identify which side of the neck they were on," explained Reed.

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Equine Protozoal Myeloencephalitis Testing

Reed also discussed equine protozoal myeloencephalitis (EPM), which commonly affects horses yet is not easy to definitively diagnose in living animals. Researchers on a *JVIM* study compared two diagnostic tests for the disease in living horses, and they found that the immunofluorescent antibody test (IFAT, or Western



ANNE M. EBERHARDT

The anatomy of the articular process joints in the horse's neck has bearing on the evaluation of horses with neurologic problems.

blot) was more sensitive for detecting the disease than the enzyme-linked immunosorbent assay (ELISA).

Also in the realm of EPM testing, a report in *Veterinary Parasitology* described a modification of the ELISA test to detect more surface proteins characteristic of the causative organism *Sarcocystis neurona*, thus making the test able to account for slight genetic variations of the organism (and, thus, more sensitive for detecting the organism).

Yet another study (from *JVIM*) involved testing for antibodies to EPM rather than the causative organism itself, and researchers on the paper reported good results with this method. Additionally, this testing method was not compromised when a sample of cerebrospinal fluid (CSF, which surrounds the brain and spinal cord) was contaminated with blood by the sampling process.

Finally, Reed mentioned a study discussed at the 2010 American College of Veterinary Internal Medicine conference that showed a paired ELISA test developed at the University of Kentucky's Gluck Equine Research Center, designed to be run simultaneously on blood and cerebrospinal fluid, was effective at detecting EPM. Also, the researchers found that the ratio of antibodies in serum compared to CSF was an effective indicator of EPM.

"This study verified that analysis of both serum and CSF from horses suspected to have EPM is more beneficial than examination of serum alone," wrote the authors (including Reed).

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Kester Tips of the Hat

The Kester News Hour always features Tips of the Hat, which are salutes to outstanding veterinarians, programs, etc. This year the tips of the hat included Texas A&M University volunteers and students for supporting future veterinary students with wet labs for more than 200 students (these were "arguably the most comprehensive hands-on experience for students available," commented Reed). The labs are planned by a group of 18 veterinary students, and many university staff, private vets, and sponsors donate time and materials to educate these students at minimal cost to them.

The second Tip of the Hat went to the organizers and supporters of the Opportunities in Equine Practice seminar, held in Lexington, Ky. The seminar is organized by Bill Rood, DVM, co-owner of Rood & Riddle, with support from private practitioners and the AAEP Foundation, and more than 3,500 students have attended in its eight years of existence.

"It's the largest recruitment and career forum out there," said Reed. 🐾

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