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the HORSE

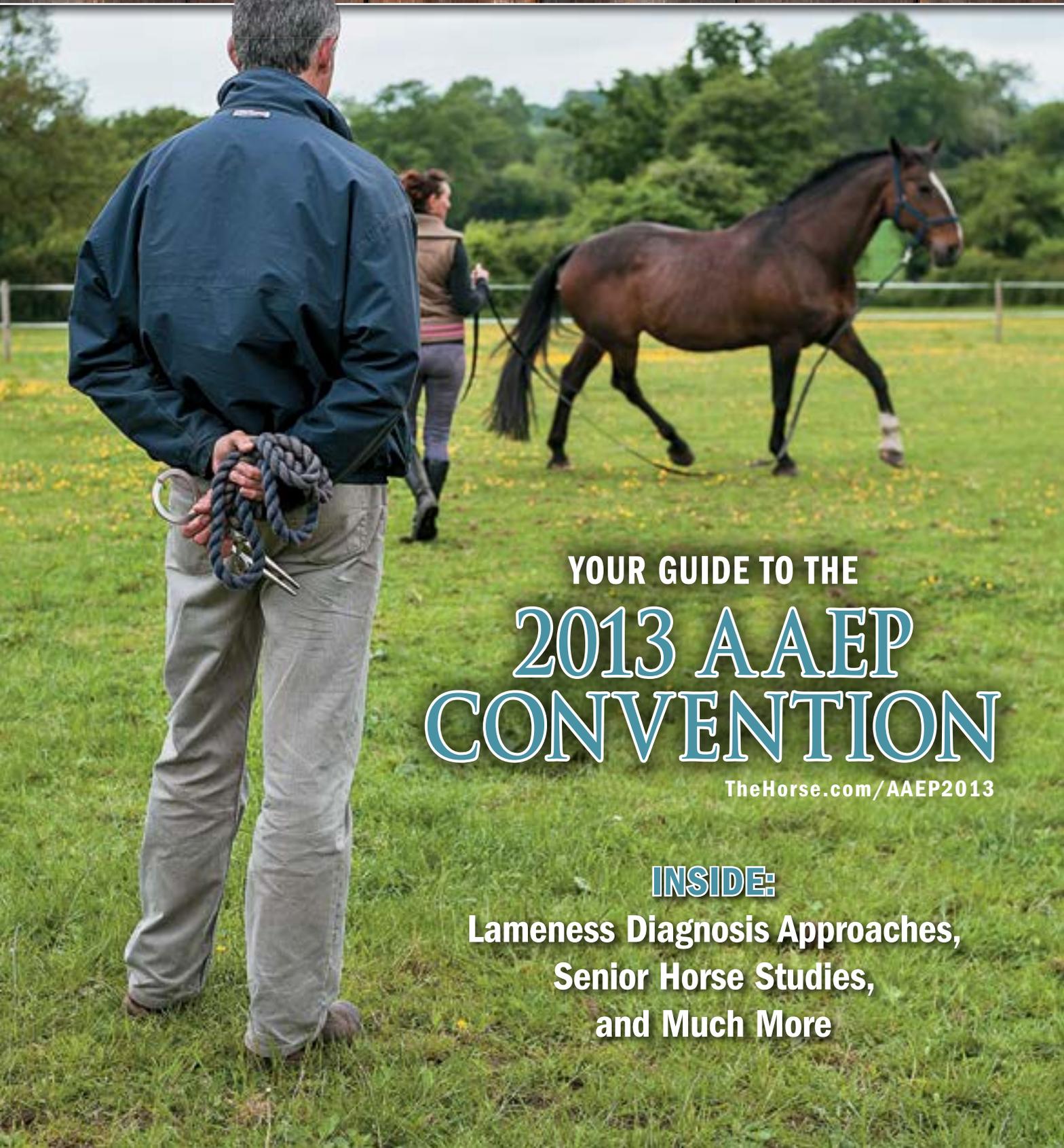
YOUR GUIDE TO EQUINE HEALTH CARE

MARCH 2014



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YOUR GUIDE TO THE
**2013 AAEP
CONVENTION**

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INSIDE:

**Lameness Diagnosis Approaches,
Senior Horse Studies,
and Much More**

YOUR GUIDE TO THE 2013 AAEP CONVENTION

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Steeped in Knowledge

STEPHANIE L. CHURCH, *Editor-in-Chief*



“It’s a marathon, not a sprint.” Over the span of the five-day American Association of Equine Practitioners’ (AAEP) annual convention, this is a phrase you’ll hear more than once, from veterinarians, AAEP staff, trade show exhibitors, *The Horse* team, and anyone else assigned to convention detail.

The 2013 edition of the convention, held Dec. 7-11 at the Gaylord Opryland Resort & Convention Center, in Nashville, Tenn., was no exception: Packed meeting rooms, some standing-room-only, a massive trade show awchirl with activity, early morning meetings, and late-night dinners signified a successful event for the organizers (and, probably, coffee vendors within a three-mile radius!). The robust program did not disappoint. Veterinarians I spoke to seemed most excited about the following:

Lameness Diagnostics featured strongly in the lineup, with Dr. Sue Dyson of Great Britain’s Animal Health Trust delivering the Frank J. Milne State-of-the-Art Lecture and sharing what she’s learned from her in-depth studies of clinical cases using MRI and other advanced diagnostic imaging techniques (see page 8). Understanding what is going on in the smallest of equine limb structures translates to better treatment and preventive techniques down the road.

Lessons Learned: An Interactive Session with the AAEP Past-Presidents Even though it was the 59th edition of the convention, organizers found a way to put a fresh spin on perpetual topics. Several of the greats presented practical take-home messages for veterinarians based on their extensive practice experience. We organized our material based on topic, but you can find a few of the summaries on pages 26 (Dr. Harry Werner on melanomas and prepurchase exams) and page 49 (Dr. Marvin Beeman on a new approach to a common nerve block).

Current Controversies in Equine Practice Similarly, more of the greats debated topics ranging from exercise-induced pulmonary hemorrhage (Dr. Rick Arthur, page 32) to managing femoral condylar cysts (Dr. Wayne McIlwraith, page 33). The session offered a unique interactive opportunity for panelists and the audience.

Though the convention might be a five-day marathon at the beginning of December, my team and I, along with our freelancers, spend two months processing the material that comes out of the event. We come away from the experience soaked in information from experts who are steeped in knowledge. We hope that you’re able to draw from what we’ve compiled and distilled, and that you’ll be able to apply some aspect of it in caring for your horses. 🐾

the **HORSE**

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MORE FROM THE CONVENTION

- Many more articles and blog posts on the latest news in equine veterinary medicine.
- Compilations of the top tweets from each day's sessions.
- Downloadable convention coverage report. *Sponsored by Merck Animal Health*

COVER PHOTO BY PAULA DA SILVA

BY THE NUMBERS



6,592

veterinary professionals, students, guests, and exhibitors attended the convention, making it the **4TH LARGEST** in AAEP history.

Famed horse trainer
Buck Brannaman
was the **Keynote Speaker**

TheHorse.com/33033



COURTESY AAEP

THE FOUR-DAY CONVENTION featured

200
Presentations

34
Educational Sessions

\$2,500

in scholarships donated by the AAEP Foundation and Markel went to eight veterinary students committed to careers in equine medicine.

5 of the awards presented at the President's Luncheon:

- Distinguished Life Member:* Dr. Benjamin Franklin Jr.
- Distinguished Service Award:* Dr. Harry W. Werner
- Distinguished Educator Awards:* Dr. Frank Nickels and Dr. Barry D. Grant
- President's Award:* Dr. Edward W. Kanara

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\$84,000

Money raised to benefit the AAEP Foundation's outreach programs from a live auction held during the Foundation Celebration, along with a sporting clay tournament and individual donations.

The **60th** Annual Convention will take place **DECEMBER 6-10, 2014**, in Salt Lake City, Utah

MILNE Lecture

Equine LAMENESS

Clinical Judgment Meets Advanced Diagnostic Imaging

Dyson, who studies the art and science of diagnosing lameness, imparted what she's learned from her intensive work with MRI.

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NANCY S. LOVING, DVM

The equine athlete is subject to a variety of injuries and expresses resulting pain in various ways, from behaviors to lameness. Subtle lameness can be especially challenging to identify.

During the Frank J. Milne State-of-the-Art lecture, Sue Dyson, MA, Vet MB, PhD, DEO, FRCVS, of the Animal Health Trust in Great Britain, described the tools available for making educated clinical judgments about lamenesses, their structural causes, and prognoses.

Clinical Observations

During a lameness exam Dyson views the horse from the front, behind, and side. She listens to the footfalls for gait irregularity while the horse is longeing rather than trotting in hand. "It is easier to assess how the horse is holding its body as an adaptation to pain," she said.

Dyson reminded the audience to scrutinize downward transitions from canter to trot, as well: "Alterations in body posture and balance during transitions are telling." She also recommended exercising the horse on a fine gravel surface with some traction rather than concrete so the horse isn't tentative and instead strides freely.

“A good rider can mask lameness while a bad rider can induce it.”

DR. SUE DYSON

"In most cases, foot lameness worsens in circles as compared to straight lines," she remarked, adding that about 20% of the time, the lameness worsens when the lame foot is on the outside of the circle.

Exercise under saddle often exacerbates

unsoundness—in fact, riding is the only circumstance in which lameness is evident in some scenarios—so it can be another useful tool. "But," Dyson cautioned, remember that "a good rider can mask lameness while a bad rider can induce it."

As practitioners evaluate horses' paces, rhythm, and swing through the back, Dyson recommended they take note of head carriage steadiness and any overbending and "curling up" in front. She commented that a horse that ducks his head behind the vertical is likely displaying discomfort.

While most veterinarians focus their lameness evaluations on the trot, Dyson also finds the canter useful, because it places different biomechanical loads on limbs. She urged the examiner to look for behavioral resistance, loss of three-time canter, or difficulty with lead changes. "Failure to extend the hind fetlocks (during the stance phase) is another important hint of a musculoskeletal problem," she said.

Performing lateral work can bring out the worst in a sore limb, she added.

Many times it can help to reassess the horse after he exercises and then stands for at least an hour. An injury that might have loosened up could get tight again, and this will become evident in gait alterations as he begins another round of exercise.

Another observable feature Dyson described as useful for diagnosis is saddle slip. While this might be a manifestation of an ill-fitting saddle or a crooked rider, it is often related to back asymmetry and/or hind-limb lameness.

Diagnostic Anesthesia

Nerve blocks are a useful tool that can help pinpoint an area of discomfort. Dyson said that for best results a systematic approach is necessary—the veterinarian numbs each area of the lame limb in a methodical manner, starting from the ground and working up. While diagnostic anesthesia is crucial to lameness investigation, she said it has its limitations. For instance, some pain is difficult to abolish altogether. And there may be more than one source of pain causing lameness.

Dyson reported on a study with unexpected results: Five percent of horses with primary foot pain required anesthesia above the fetlock to improve and, thus, help the veterinarian pinpoint the lameness. Usually, foot lameness is localized by diagnostic nerve blocks below the fetlock.

She said nerve block responses don't seem to differ based on injection approach, whether it's in the weight-bearing or flexed limb or if the horse walks or stands for a few minutes after injection. Inadvertent injection into the wrong structure can result in no change, or at the very least there might be delayed numbing of the region or unintended anesthesia of other structures.

MRI Studies

Dyson has been using MRI for as long as it has been available in veterinary medicine, so she has many years of insight to impart on imaging a variety of injuries.

Collateral ligament (CL) injuries These ligaments are at risk of damage when the horse places his foot asymmetrically, particularly when the hooves' quarters are different heights. The results of using diagnostic nerve blocks to isolate CL injuries can be disappointing, and she noted that ultrasound exam only provides a limited view of the foot structures; 27% of these

Convention Tweet

Dr. Scott Spaulding
 @Scott_Spaulding

Not all lame horses need MRI, learn to better interpret other diagnostic imaging modalities! - Dr. Sue Dyson

exams miss the pertinent injury. Also, the longer the hoof capsule's length, the more difficult it is to obtain effective ultrasound views. Dyson reported that in comparing MRI findings to histopathology (microscopic examination of ligament tissue slices) from euthanized horses, she observed a good correlation to actual damage within the collateral ligament, thereby confirming the value of MRI for diagnosis. In general, MRI reveals that chronic CL lesions are degenerative in nature.

Sidebone Another condition practitioners have historically overlooked is collateral cartilage ossification (conversion to bone), referred to as sidebone. Dyson said there is often an association between sidebone and CL injury: "Extensive sidebone increases the risk of injury to the collateral ligaments and their coffin bone attachments as well as the ossified cartilage being susceptible to fracture from trauma."

DDFT injuries Dyson said MRI is useful for assessing the deep digital flexor tendon (DDFT); in nearly 83% of horses with foot-related lameness, she identified DDFT lesions around the navicular bone with MRI.

She noted that elite show jumpers are at particular risk for DDFT injury within the hoof, with increased strain on the tendons as fences are raised. Also, 10- to 15-year-old horses are most at risk of these injuries, as opposed to horses younger than six. This is probably due to cumulative loading or age-related degeneration in the distal (lower) part of the tendon. Affected horses show more lameness when turned on a circle or exercised on firm footing, and lameness improves with rest. Horses with DDFT injuries often point the lame foot, much like those with navicular disease.

Dyson also noted there is no definite relationship between foot conformation, including coffin bone angle, and DDFT injury. That said, she added, "Of horses with DDFT lesions, about 15% have low

heels and/or broken-back hoof-pastern axis." Veterinarians can miss these on ultrasound but see them clearly with MRI.

Navicular problems Navicular disease has been challenging for practitioners to diagnose and manage, in part due to the extensive interconnection of soft tissues around the navicular bone and coffin joint. "A normal radiographic appearance of the navicular region does not preclude the presence of significant abnormal pathology (damage or disease)," Dyson stressed. She offered information about a "new form of navicular disease: Abnormalities are restricted to the marrow fat and the thin struts of bone within the navicular bone," and only visible using MRI.

Additional navicular area pathology MRI reveals also has relevance. "Distal border fragments are now considered significant to lameness," Dyson said. In nearly half of radiographic studies, veterinarians miss these, only identifying them with MRI. Also, the distal sesamoidean impar ligament, attached to the navicular bone, is at risk of injury; distal border fragments are found within the ligament, which may have adjacent tears (from where the ligament has pulled away and taken fragments of bone with it). The ligament is highly innervated, so this is likely to be painful.

Lessons Learned

In summary, Dyson said that we have learned much from MRI over the years. Some findings might seem common-sense, but we can now confirm these conclusions with definitive information:

- There are limitless structures that can be injured in many different ways.
- There is much more to learn about how lesions develop and cause pain.
- Signal intensity changes of MRI imaging might not resolve over time; veterinarians need to determine what chronic pathology is significant and what isn't.
- Not all horses need an MRI!
- Veterinarians' current ability to diagnose far exceeds their ability to treat.

"Discovery consists of looking at the same thing as everyone else and thinking something different," Dyson said, quoting Nobel Prize-winning physiologist Albert Szent-Gyorgi. Approaching lameness diagnosis with just such an inquisitive and creative mind is what will generate advancements in this field, she noted.

To read about the Milne lecture in full, see TheHorse.com/33346. 🐾

TOP EQUINE STUDIES of 2013



COURTESY AAEP

ERICA LARSON
NANCY S. LOVING, DVM

While your veterinarian is stitching wounds, delivering foals, and monitoring colics, scientists from around the world are performing and publishing research to advance horse health care. So, to bring busy practitioners up to speed on the top studies in a variety of fields, a panel of veterinarians presents a program called the Kester News Hour each year at the convention.

This year, Lisa Fortier, DVM, PhD, Dipl. ACVS, professor of Large Animal Surgery at Cornell University's College of Veterinary Medicine, in Ithaca, N.Y., shared her picks for top surgery- and lameness-related studies; Carol Clark, DVM, Dipl. ACVIM, of Peterson & Smith Equine Hospital, in Ocala,

Fla., tackled medicine topics; and Pat McCue, DVM, PhD, Dipl. ACT, a professor of equine theriogenology at Colorado State University's Equine Reproduction Laboratory, in Fort Collins, described reproduction studies he deemed most important and useful to veterinarians.

“When investigating cases of ongoing noise and/or poor performance after tie-back surgery, exercising endoscopy should be performed.”

DR. LISA FORTIER

Upper Airway Issues

The first study Fortier described involved a recently identified upper respiratory condition called **ventrostral displacement of the dorsal laryngeal mucosa**. The condition occurs when the mucosa on top of the arytenoids (flappers) progressively obstructs the airway during exercise. The researchers performing the study identified the condition in 12 of 600 racehorses presenting with owner complaints of poor performance and/or abnormal respiratory noise. Most of the affected horses had another concurrent respiratory issue, Fortier said. The condition's etiology (set of causes) remains unclear, and treatment isn't immediately necessary.

She said six of the horses' conditions resolved in six to nine weeks, suggesting

transient airway instability could be related to the level of training, immaturity, and airway disease in young Thoroughbred racehorses.

Next, Fortier described a study in which scientists evaluated 41 horses that had previously undergone **tie-back surgery** (a procedure used to treat “roaring”—in which the muscles that open and close the left side of the larynx as the horse breathes are paralyzed—which involves placing one or more sutures to permanently abduct, or keep open, the left arytenoid cartilage). They used video endoscopy during exercise under saddle to evaluate arytenoid abduction and stability, diagnose any concurrent upper airway problems, and correlate these with the owners’ perception of surgery success, she said.

Although 93% of owners thought the surgery was beneficial and 90% believed they saw improved performance post-surgery, the researchers found that 79% of horses still had respiratory abnormalities at exercise, and they identified multiple abnormalities in 41% of the horses, Fortier said.

“When investigating cases of ongoing respiratory noise and/or poor performance after tie-back surgery, exercising endoscopy should be performed (to ensure there’s not another respiratory problem present) before consideration is given to tie-back revision or retirement of the horse,” Fortier concluded.

Moving forward, Fortier described a study in which researchers evaluated 98 horses presenting with poor performance to garner a better understanding of the clinical and diagnostic features of **lower inflammatory airway disease** (IAD).

“The objectives of this retrospective study ... were to identify differences in age, career, season of admission, and upper airway endoscopic, and cytological finding between horses with mixed airway inflammation compared with noninflammatory bronchoalveolar lavage fluid (or BALF),” Fortier said.

The researchers reviewed the results of the horses’ standardized high-speed treadmill tests, lameness evaluations, cardiac evaluations, and post-exercise bronchoalveolar lavages (BAL), but ultimately found that post-exercise BAL isn’t very informative when it comes to evaluating poor performance. Fortier suggested veterinarians consider evaluating BAL or serum cytokine profiles instead.

Lameness

Fortier described a study in which researchers compared **two needle placement approaches for either injection or centesis** (sampling the synovial fluid in the coffin joint, navicular bursa, and digital tendon sheath) of the digital flexor tendon sheath: the basilar sesamoidean approach (BSA) and the axial sesamoidean approach (ASA)—basically, injections from two different directions. The team found that

the BSA was faster, 100% successful for injections, and six times more successful when performing centesis than the ASA approach. Thus, Fortier suggested practitioners consider using the BSA approach with an 18-gauge needle.

She then presented a study in which researchers evaluated **techniques for injecting diagnostic analgesia** (nerve blocks) into the lateral femorotibial stifle joint (the lower outside of the three stifle



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joints). Fortier said the traditional method can be challenging, so a team of veterinary students tested whether they could accomplish the same effects by injecting the joint through the long digital extensor tendon (LDE).

Fortier said the team achieved a 100% success rate in administering diagnostic analgesia through the LDE, while the success rates for other traditional approaches were lower. She concluded that this approach provides good anatomic landmarks for veterinarians to work with, avoids cartilage and meniscus injury, and is a reliable technique even for inexperienced veterinarians.

Then Fortier described a study in which researchers evaluated the pharmacokinetic and pharmacodynamic variables and local tolerance at the intravenous regional limb perfusion (IVRLP) injection site of **the antibiotic marbofloxacin**, which is used to treat infections and bacterial issues.

“We would love the ability to use a fluoroquinolone (a class of antibiotic) for efficacy against many Gram-negative and many *Staph* bacteria,” Fortier said. However, researchers have previously found that 70% of horses treated with the cousin drug, enrofloxacin, via IVRLP developed vasculitis (inflammation of blood vessels). So the team on the current study tested marbofloxacin’s efficacy instead.

They found that none of the horses tested developed vasculitis, and the synovial fluid concentrations of the drug were well above the level required to combat enterobacteria and *Staphylococcus aureus*. She also noted that current availability of this drug in the United States is low.

Colic Surgery

Fortier described a study in which scientists evaluated **return to use rates after exploratory celiotomy**, or colic surgery. Looking at surgical data and six- and 12-month follow-ups, the team found that 77% of the 195 study horses returned to use as athletes. The team determined that horses developing hernias were seven times less likely to return to function, those that developed laminitis were nine times less likely, and those that required colic surgery while on stall rest for a musculoskeletal injury were 11 times less likely.

Along similar lines, Fortier described a study into **85 racehorses’ performance after colic surgery**. She said researchers found that 70% of horses that underwent colic surgery returned to racing, compared to 73% of controls, and determined that colic surgery had no significant effect on race performance.

Bone and Joint Issues

Fortier described a study in which scientists evaluated the risk of infection after 16,624 **intra-articular injections** in 1,103 Thoroughbred racehorses. Ultimately, 0.0008% of joints developed infections after injections, she said. Risk factors included the individual veterinarian administering the injections and the use of methylprednisolone (or Depo-Medrol) or triamcinolone (0.003% and 0.0002%, respectively). She noted the researchers reported no infections after amikacin injection, but the drug was used in only 5% of the injections.

Next, Fortier described a study in which



LORI SCHWIDT

Researchers evaluated the antibiotic marbofloxacin’s efficacy for treating infections.

researchers examined whether early or increased intensity of training and racing would lead to **palmar/plantar osteochondral disease (POD)** in Thoroughbreds. “POD is a degenerative condition affecting the distal (lower) condyles of the distal cannon bones,” she said. “The condition is believed to be due to injury of subchondral (beneath the cartilage) bone associated with repetitive high strains and strain rate in bone during high-speed racing and training.”

Based on their review of 1,288 condyles, the team found that POD severity was associated with an increased number of lifetime starts, increased gallops in one training session, number of seasons raced, and time between races. Essentially, she said, horses that run too hard, too frequently are more likely to develop POD. She concluded that “cumulative racing exposure may be more important than age at first exercise” for POD development.

Finally, Fortier presented a study designed to describe cases that block to the basi-sesamoid (at the base of the proximal sesamoid bones), but had pathology proximal to the block site. Essentially, the researchers evaluated instances in which diagnostic analgesia administered in the basi-sesamoid area spread to areas above, or proximal to, the injection site.

By using MRI, the team confirmed that basi-sesamoid blocks can desensitize the suspensory branches, the distal aspect of the cannon bone, proximal long pastern bone, and the proximal sesamoid bones.



DR. ERIN GILLAM

Several research groups studied horses’ return to use and prognosis post-colic surgery to correct problems such as a large colon torsion (seen here after correction).

Ophthalmology

Clark highlighted a paper in which researchers reviewed the clinical signs, diagnostic methods, and treatment options for **equine subepithelial keratomycosis**, a fungal infection of the eye. They found that one-quarter of these cases have a “punctuate” appearance (with little specks dotting the eye), Clark reported, while half the cases have a more diffuse appearance. The remaining one-quarter of cases present with both features. The team also found that the best way to diagnose these cases is by obtaining a cellular sample for culture and evaluating the structure of the cultured fungus to identify it, she said. Another helpful diagnostic tool is horses’ response to antifungal treatment—Clark said nearly all the cases resolved within four to five weeks of using this approach. She remarked, “It is yet unknown if this is the beginning of an ulcerative fungal infection or its own disease entity.”

Next, Clark shared a study in which researchers evaluated the use of topical anesthetics for **numbing the horse’s eye** for veterinary ophthalmic procedures. While proparacaine has always been the preferred ophthalmic anesthetic, the authors indicated that other topical choices are just as effective, such as lidocaine and bupivacaine. They determined that mepivacaine does not achieve complete anesthesia, Clark cautioned, but the other anesthetics’ effects were usually apparent within a minute, with a maximum effect observed within five minutes of treatment.

EPM

Clark then moved to **equine protozoal myeloencephalitis (EPM) diagnosis** in the living horse. In one study, researchers determined that the most accurate means of detecting EPM is to use a simple titer ratio of antibodies in serum to those in cerebrospinal fluid (CSF). The team concluded that using this titer ratio offered excellent sensitivity and specificity for diagnosing EPM in the live horse, she said.

Clark also reported on a study in which researchers further examined the usefulness of serum testing, CSF testing, and serum to CSF titer ratios. The authors similarly confirmed that serum testing very poorly correlates with post-mortem confirmation of disease, she said, and while CSF testing alone has been standard for a long time, the best diagnostic test to use appears to be the serum:CSF ratio titer.



WIKIMEDIA COMMONS

Do not administer mineral oil to horses suspected of suffering from blister beetle toxicity.

Clark stressed that evidence of antibody production within the CSF is important for diagnosing EPM, and serum testing alone is not at all reliable.

Hydration

Clark described a paper in which authors compared the effects of **oral vs. IV fluid therapy** on whole body hydration. They concluded that both “maintenance” (the standard volume used to maintain a sick horse’s hydration to keep normal metabolism and organs functional) and

“ (POD) is believed to be due to injury of the subchondral bone associated with repetitive high strains and strain rate in bone during high-speed racing and training.”

DR. LISA FORTIER

double-maintenance dose IV fluids are effective volumes for restoring hydration in dehydrated horses. However, Clark said, the team found that a triple-maintenance dose of IV fluids did not improve horses’ hydration status and increased urine output; ultimately, horses receiving triple-maintenance doses of IV fluids were less hydrated than those receiving a maintenance or double dose once IV fluid therapy was stopped. Clark also mentioned that the researchers showed that oral fluid replacement—passing fluid through

a nasogastric tube into the animal’s stomach—is an excellent means of restoring intestinal water levels.

Blister Beetle Toxicosis

It takes just three ingested blister beetles from hay or pasture to kill an adult horse and, in the next study Clark described, researchers evaluated which treatments work best for treating so-called **blister beetle toxicosis**. They examined the effectiveness of three gastrointestinal therapies—mineral oil, charcoal, and smectite (or Biosponge)—in rats that had received cantharidin, the toxic substance found in blister beetles. They found that mineral oil was associated with the highest mortality rate: six of eight treated animals died. Three of eight rats died after receiving toxin and no treatment (the control group), Clark said, while two of eight rats died after treatment with charcoal or smectite. The bottom line: Mineral oil—or any lipid soluble—should not be used in suspect cases of blister beetle toxicity because it appears to exacerbate cantharidin absorption and increase mortality.

Long Distance Hauling and the Respiratory Tract

Horses that travel long distances are prone to developing **respiratory infections**, often due to damage to their respiratory tract epithelium caused by environmental factors within the trailer (such as hay or dust), stress, and holding the head in an elevated, fixed position. Clark described a study in which authors evaluated if administration of the bronchodilator clenbuterol could provide relief to traveling horses. The research team administered clenbuterol 12 hours prior to transport and then every 12 hours over the next 48 hours and found it improved tracheal clearance of debris by at least 50%. The drug can reduce respiratory disease development following transport, she said. However, allow for appropriate withdrawal times in competition horses.

Inflammatory Mediator Inhibitors

Matrix metalloproteinases (MMPs) are inflammatory mediators that play an important role in the development of equine conditions such as laminitis, recurrent airway disease, hepatitis, and osteoarthritis. Clark described the results from a study in which authors compared potential **MMP inhibitors**—specifically, doxycycline, oxytetracycline, flunixin

meglumine, and pentoxifylline—to suppress specific MMP components that cause inflammation. Clark said the team found pentoxifylline to be the most useful MMP inhibitor used in the study, followed by oxytetracycline.

Equine Metabolic Syndrome (EMS)

Clark shared a study in which the authors tried to find ways to blunt **abnormal insulin responses**. Healthy horses (not EMS-affected) were given a large dose of dexamethasone to elicit insulin resistance. Then these horses received metformin (30 mg/kg) one hour prior to receiving oral sugar. The team found that metformin reduced the horses' insulin response. Clark said the researchers believe metformin has a local intestinal effect on reducing sugar absorption and might be a useful pre-turnout approach to preventing insulin spikes in horses that are at risk for developing EMS or EMS-induced laminitis.

Equine vs. Canine Firocoxib

When prescribing the NSAID (non-steroidal anti-inflammatory drug) **firocoxib for horses**, some veterinarians have opted for the canine pill version, Previcox, rather than the more expensive equine version of the same pharmaceutical agent, Equioxx paste. Researchers who completed the next study Clark described found that the canine tablet is just as effective as the equine paste. But she noted one major problem: It is illegal to use or prescribe the canine version for use in the horse. The FDA claims that “cost is not a justification for using an off-label drug,” particularly when an equine formulation is available.

Clark added that Previcox and Equioxx's manufacturer is working on developing another, less-expensive equine oral firocoxib form. She also pointed out that three times the recommended dose of Equioxx may better serve as a loading dose to achieve maintenance levels more quickly.

Broodmares and Pregnancy

McCue reported on research in which scientists evaluated whether **laparoscopic application of the hormone prostaglandin E2** (or PGE2) to the uterine tube surface could improve fertility in some subfertile mares. The team tested their theory in 20 barren embryo donor mares and eight barren mares bred to carry their own foals.

McCue said 17 of the 20 donor mares produced an embryo and seven of the



Convention Tweet

Alexandra Beckstett
@TH_ABeckstett

McKerney: Sesamoid fractures most common cause of catastrophic injury in California racehorses from 2011-13.

eight mares bred to carry a foal became pregnant after veterinarians applied 0.2 mg of PGE2 to the mares' uterine tubes.

“This is not a panacea for all cases,” he said—case selection is critical—but this technique could help improve fertility in mares with unexplained infertility.

Moving forward, McCue described a study in which researchers evaluated factors affecting live foal rates in mares that underwent **manual twin elimination**. Researchers looked at 129 twin pregnancies, he said, and found that live foaling rates were not significantly different between adjacent and nonadjacent embryos (whether

“Decisions on twin reduction should be made before 35 days of gestation.”

DR. PAT MCCUE

embryos are fixed together or not); however, the mare's age impacted live foaling rates: Live foal rates in mares nine years of age or older were lower than in mares younger than nine years. For best results, McCue stressed that practitioners should never delay in reducing twin pregnancies.

Along the same lines, McCue presented the results of a study in which researchers evaluated pregnancy and foaling rates after another method of twin reduction: **transvaginal ultrasound-guided aspiration** (TUA). The team found that 49% of the 44 mares evaluated in the study delivered one live foal after TUA and that the highest live foaling rates occurred in mares that underwent TUA before Day 42 of pregnancy.

“Decisions on twin reduction should be made before 35 days,” McCue concluded,

adding that reductions should take place between Day 30 and Day 35, if possible.

In a recently published review of **breeding-induced endometritis** (inflammation of the uterine lining), McCue said the researchers diagnosed the condition in 10-15% of mares and that factors such as advanced age, poor perineal conformation, a pendulous (i.e., downward facing or slanted) uterus, and a compromised immune response put mares at a greater risk for developing this condition. He said the researchers identified six hours as the critical time frame for clearing breeding-induced uterine inflammation; mares that failed to clear inflammation by six hours after breeding remained inflamed.

McCue described a study in which researchers set out to test whether **mares' milk pH** could be a useful indicator of impending foaling. Their results suggest that if the milk's pH is above 6.4, she's not yet ready to foal, he explained. However, once the pH drops below 6.4, the mare will likely foal in the following few days.

McCue said owners can use test strips on the farm to determine mares' milk pH. He said he'd suggest using strips that focus on the mid-section of the pH scale (i.e., 5.5 to 8.0), rather than ones that measure ranges from 1 to 10.

Semen Processing Techniques

McCue then turned his attention to a study in which scientists evaluated whether the use of **single-layer density centrifugation** (SLC) could improve frozen, thawed semen quality. The researchers found that the procedure improved total and progressive motility (forward movement), viability, morphology (structure), and DNA integrity compared to control samples; however, the amount of sperm recovered after SLC decreased. Nonetheless, he said this technique might be beneficial for some stallions with poor sperm quality. 🐾

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VACCINE Developments

ALEXANDRA BECKSTETT
ERICA LARSON

Can Vaccination Protect Horses from Neurologic EHV-1?

In the equine industry three simple letters, when said in order, can silence a room of horsemen, turn a showground into a ghost town, and send shock waves through barns. They're E, H, and V, and they stand for equine herpesvirus-1, a contagious equine virus that can cause serious neurologic problems in infected horses. Lara Maxwell, DVM, PhD, Dipl. ACVCP, presented the results of some recent research that horse owners might find encouraging: One EHV-1 vaccine could have at least some protective properties against the neurologic form of the virus.

The highly contagious virus can also

cause rhinopneumonitis (a respiratory disease), usually in young horses, and abortion in broodmares. Current vaccines are not labeled for use in preventing the neurologic form, called equine herpesvirus myeloencephalopathy (EHM)—only

“Vaccination plans should take into account the current evidence, the likely level of viral exposure for that horse, and vaccination requirements of particular equine events.”

DR. LARA MAXWELL

rhinopneumonitis and abortion—and clinical signs of EHM have been observed in well-vaccinated horses.

Maxwell, an associate professor of pharmacology at the Oklahoma State University's (OSU) Center for Veterinary Health Sciences; Lyndi Gilliam, DVM, an associate professor of internal medicine at OSU; and colleagues vaccinated one group of aged mares with the EHV-1 vaccine Pneumabort K three times at one-month intervals. They also gave one control group saline at the same time intervals before inoculating six control and six vaccinated mares with a neuropathogenic EHV-1 strain. After challenge, they monitored horses for disease and to see if vaccination impacted clinical signs. Key findings included:

■ Control mares exhibited more severe

neurologic signs than vaccinated mares;
 ■ Viral load in neurologic tissues was lower in vaccinated mares than in control mares; and

■ Vaccinated mares' viremia (virus circulating in the bloodstream) levels were lower than those in control mares.

Other disease indicators (including body temperature and nasal virus shedding, among others) were lower in the vaccinated mares, but as a pilot project this study lacked sufficient horse numbers for authors to confidently state that there was a difference between the groups in these other indicators, Maxwell cautioned. She noted that while vaccination appeared to decrease clinical signs of EHM, "the differences were not statistically significant." Nonetheless, "the consistent positive trend for all parameters measured did suggest that vaccination was protective," she said.

So should owners add the EHV vaccine to their horses' annual schedules?

"There are presently epidemiological data suggesting that frequent vaccination might actually increase the risk of neurological disease ... so veterinarians are understandably cautious about recommending frequent vaccination to protect horses from EHM," Maxwell said. "However, these retrospective studies can be difficult to assess, and it may be that some vaccines are more protective than others."

She also said that investigators might be missing "which factors are really important for an individual horse to get sick."

"Our positive results should encourage more study of the protective effects of vaccination that would provide more definitive recommendations to guide owners and practitioners."

Of course, she said, it's still best to proceed with caution: "Any drug or vaccine has the potential to cause harm, so I view it as a risk versus benefit question."

"Right now, owners should discuss with their veterinarians the best vaccination plan for their individual horse," she said. "Plans should take into account the current evidence, the likely level of viral exposure for that horse, and vaccination requirements of particular equine events."

Study: Not All WNV Vaccines Render the Same Immune Response

When getting shots, a single needle prick might seem more appealing than multiple pokes. But with horses' West Nile virus (WNV) vaccinations, multiple

NSAIDS MIGHT IMPAIR RESPONSE TO FLU VACCINES

Although vaccinating against infectious disease is a routine component of horse care, many owners still voice concerns about adverse reactions to these injections. For this reason, veterinarians sometimes administer non-steroidal anti-inflammatories (NSAIDs) before vaccinating horses to reduce the risk and severity of such reactions.

Researchers from the University of Kentucky (UK) recently hypothesized, however, that because NSAIDs inhibit COX inflammatory mediators, they might also inhibit horses' immune responses to vaccination. Whitney Zoll, BS, a veterinary student at Michigan State University's College of Veterinary Medicine, teamed up with UK researchers to assess NSAIDs' effect on horses' response to a commercially available equine influenza vaccine.

NSAIDs can reduce a vaccine's efficacy in stimulating antibody and cell-mediated immune responses.

In the first of the two-part study, she and colleagues employed 18 adult horses ages 2 to 5 that had been previously exposed to equine influenza. They administered the NSAID flunixin meglumine (Banamine) to nine horses prior to vaccination, and the

other nine animals served as controls, receiving only the vaccine.

In the second part of the study they used 18 influenza-naive yearlings. They co-administered the vaccine and flunixin meglumine to six yearlings, administered only the vaccine to another six, and the remaining six animals served as unvaccinated controls.

The researchers collected blood samples from all study horses before the initial vaccination as well as seven, 14, 21, and 28 days after vaccination and used two methods—enzyme-linked immunoassay and hemagglutination inhibition—to detect equine influenza-specific antibodies. They also used real-time polymerase chain reaction testing to measure cell-mediated immune response to the vaccine.

Based on their results, Zoll said the team found that: "NSAID administration caused a significant decrease in immune response to influenza vaccine in both previously exposed and naive horses. Thus, concurrent administration of NSAIDs when vaccinating can negatively impact a horse's immune response to the vaccine."

The study authors emphasized that veterinarians should take care when administering NSAIDs with vaccines and possibly vaccinate these animals more frequently to account for the lowered immune response.

injections might be the way to go: Researchers recently tested horses' serologic (blood) response to six WNV vaccination regimens and found significant differences in horses' immune responses when vaccinated with a combination vaccine versus one administered separately but at the same time as other vaccines.

Kevin G. Hankins, DVM, MBA, a senior veterinarian in Equine Veterinary Operations with Zoetis, described the full research, results, and recommendations.

To test the immune response triggered by six different vaccine regimens, Hankins and colleagues studied 280 WNV-free Quarter Horses—aged 2 to 17 years—placed in seven groups. In the study they:

■ Vaccinated the horses in three treatment groups with three different commercially available vaccines that contained WNV, EEE (Eastern equine encephalomyelitis), WEE (Western

equine encephalomyelitis), and tetanus antigens (substances that trigger an immune response) in a single shot;

■ Vaccinated the horses in three other treatment groups with a WNV-specific vaccine concurrently with a combination EEE, WEE, and tetanus vaccine; and

■ Treated one group with saline; these horses served as unvaccinated controls.

The team vaccinated all horses twice, 21 days apart, with their assigned regimen. They collected blood samples on six occasions during the 42-day study to evaluate the horses' WNV antibody titer levels.

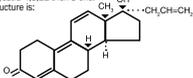
The researchers found that all of the vaccinated horses showed consistently elevated WNV antibody titers compared to controls, meaning all WNV vaccines elicited an immune response. However, the researchers found that by Day 28, horses vaccinated with a combination WNV vaccine

Regu-Mate® (altrenogest)

Solution 0.22% (2.2 mg/mL)

CAUTION: Federal law restricts this drug to use by or on the order of a licensed veterinarian.

DESCRIPTION: Regu-Mate® (altrenogest) Solution 0.22% contains the active synthetic progestin, altrenogest. The chemical name is 17 α -allyl-17 β -hydroxyestra-4,9,11-trien-3-one. The CAS Registry Number is 85052-2. The chemical structure is:



Each mL of Regu-Mate® (altrenogest) Solution 0.22% contains 2.2 mg of altrenogest in an oil solution.

ACTIONS: Regu-Mate® (altrenogest) Solution 0.22% produces a progestational effect in mares.

INDICATIONS: Regu-Mate® (altrenogest) Solution 0.22% is indicated to suppress estrus in mares. Suppression of estrus allows for a predictable occurrence of estrus following drug withdrawal. This facilitates the attainment of regular cyclicity during the transition from winter anestrus to the physiological breeding season. Suppression of estrus will also facilitate management of prolonged estrus conditions. Suppression of estrus may be used to facilitate scheduled breeding during the physiological breeding season.

CONTRAINDICATIONS: Regu-Mate® (altrenogest) Solution 0.22% is contraindicated for use in mares having a previous or current history of uterine inflammation (i.e., acute, subacute, or chronic endometritis). Natural or synthetic gestagen therapy may exacerbate existing low-grade or "smoldering" uterine inflammation into a fulminating uterine infection in some instances.

PRECAUTIONS: Various synthetic progestins, including altrenogest, when administered to rats during the embryogenic stage of pregnancy at doses manyfold greater than the recommended equine dose caused fetal anomalies, specifically masculinization of the female genitalia.

DOSE AND ADMINISTRATION: While wearing protective gloves, remove shipping cap and seal; replace with enclosed plastic dispensing cap. Remove cover from bottle dispensing tip and connect laser lock syringe (without needle). Draw out appropriate volume of Regu-Mate solution. (Note: Do not remove syringe while bottle is inverted as leakage may result.) Detach syringe and administer solution orally at the rate of 1 mL per 110 pounds body weight (0.044 mg/kg) once daily for 15 consecutive days. Administer solution directly on the base of the mare's tongue or on the mare's usual grain ration. Replace cover on bottle dispensing tip to prevent leakage. Excessive use of a syringe may cause the syringe to stick; therefore, replace syringe as necessary.

WHICH MARES WILL RESPOND TO REGU-MATE® (altrenogest) SOLUTION 0.22%: Extensive clinical trials have demonstrated that estrus will be suppressed in approximately 95% of the mares within three days; however, the post-treatment response depended on the level of ovarian activity when treatment was initiated. Estrus in mares exhibiting regular estrus cycles during the breeding season will be suppressed during treatment; these mares return to estrus four to five days following treatment and continue to cycle normally. Mares in winter anestrus with small follicles continued in anestrus and failed to exhibit normal estrus following withdrawal.

Response in mares in the transition phase between winter anestrus and the summer breeding season depended on the degree of follicular activity. Mares with inactive ovaries and small follicles failed to respond with normal cycles post-treatment, whereas a higher proportion of mares with ovarian follicles 20 mm or greater in diameter exhibited normal estrus cycles post-treatment. Regu-Mate® (altrenogest) Solution 0.22% was very effective for suppressing the prolonged estrus behavior frequently observed in mares during the transition period (February, March and April). In addition, a high proportion of these mares responded with regular estrus cycles post-treatment.

SPECIFIC USES FOR REGU-MATE® (altrenogest) SOLUTION 0.22%:

SUPPRESSION OF ESTRUS TO:

1. Facilitate attainment of regular cycles during the transition period from winter anestrus to the physiological breeding season. To facilitate attainment of regular cycles during the transition phase, mares should be examined to determine the degree of ovarian activity. Estrus in mares with inactive ovaries (no follicles greater than 20 mm in diameter) will be suppressed but these mares may not begin regular cycles following treatment. Mares with inactive ovaries and small follicles (less than 20 mm in diameter) frequently respond with regular post-treatment estrus cycles.

DOSEAGE CHART:	
Approximate Weight in Pounds	Dose in mL
770	7
880	8
990	9
1100	10
1210	11
1320	12

2. Facilitate management of the mare exhibiting prolonged estrus during the transition period. Estrus in mares exhibiting prolonged behavioral estrus either early or late during the transition period. Again, the post-treatment response depends on the level of ovarian activity. Mares with greater ovarian activity initiate regular cycles and conceive sooner than the inactive ovaries. Regu-Mate® (altrenogest) Solution 0.22% may be administered early in the transition period to suppress estrus in mares with inactive ovaries to aid in the management of these mares. Mares may be administered later in the transition period with active ovaries to prepare and schedule the mare for breeding.

3. Permit scheduled breeding of mares during the physiological breeding season. To permit scheduled breeding, mares which are regularly cycling or which have active ovarian function should be given Regu-Mate® (altrenogest) Solution 0.22% daily for 15 consecutive days beginning 20 days before the date of the planned estrus. Ovulation will occur 5 to 7 days following the onset of estrus as expected for untreated mares. Breeding should follow usual procedures for mares in estrus. Mares may be regulated and scheduled either individually or in groups.

ADDITIONAL INFORMATION: A 3-year well controlled reproductive safety study was conducted in 27 pregnant mares, and compared with 24 untreated control mares. Treated mares received 2 mL Regu-Mate® (altrenogest) Solution 0.22% /110 lb body weight (2x dose recommended for estrus suppression) from day 20 to day 325 of gestation. This study provided the following data:

1. In fully offspring (all ages) of treated mares, litter size was increased.
2. Fully offspring from treated mares had shorter interval from Feb. 1 to first ovulation than filled from their untreated mare counterparts.
3. There were no significant differences in reproductive performance between treated and untreated animals (mares & their respective offspring) measuring the following parameters:
 - interval from Feb. 1 to first ovulation, in mares only.
 - mean interovulatory interval from first to second cycle and second to third cycle, mares only.
 - follicle size, mares only.
 - at 50 days gestation, pregnancy rate in treated mares was 81.8% (9/11) and untreated mares was 100% (4/4).
 - after 3 cycles, 11/12 treated mares were pregnant (91.7%) and 4/4 untreated mares were pregnant (100%).
 - colt offspring of treated and control mares reached puberty at approximately the same age (82 & 84 weeks respectively).
 - stallion offspring from treated and control mares showed no differences in seminal volume, spermatozoal concentration, spermatozoal motility, and total sperm per ejaculate.
 - stallion offspring from treated and control mares showed no difference in sexual behavior.
 - testicular characteristics (scrotal width, testis weight, perinephal weight, epididymal weight and height, testicular height, width & length) were the same between stallion offspring of treated and control mares.

REFERENCES: Shemmler, C.F., E.L. Squires, and R.K. Shideler. 1989. Safety of Altrenogest in Pregnant Mares and on Health and Development of Offspring. *Eq. Vet. Sci.* (9): No. 2: 69-72. Squires, E.L., R.K. Shideler, and A.O. McKinnon. 1989. Reproductive Performance of Offspring from Mares Administered Altrenogest During Gestation. *Eq. Vet. Sci.* (9): No. 2: 73-76.

WARNING: Do not use in horses intended for food.

HUMAN WARNINGS: Skin contact must be avoided as Regu-Mate® (altrenogest) Solution 0.22% is readily absorbed through unbroken skin. Protective gloves must be worn by all persons handling this product. Pregnant women or women who suspect they are pregnant should not handle Regu-Mate® (altrenogest) Solution 0.22%. Women of child bearing age should exercise extreme caution when handling this product. Accidental absorption could lead to a disruption of the menstrual cycle or prolongation of pregnancy. Direct contact with the skin should therefore be avoided. Accidental spillage on the skin should be washed off immediately with soap and water.

INFORMATION FOR HANDLERS:

WARNING: Regu-Mate® (altrenogest) Solution 0.22% is readily absorbed by the skin. Skin contact must be avoided; protective gloves must be worn when handling this product.

Effects of Overexposure: There has been no human use of this specific product. The information contained in this section is extrapolated from data available on other products of the same pharmacological class that have been used in humans. Effects anticipated are due to the progestational activity of altrenogest. Acute effects after a single exposure are possible; however, continued daily exposure has the potential for more pronounced effects such as disruption of the menstrual cycle, uterine or adnexal cramping, increased or decreased uterine bleeding, prolongation of pregnancy and headaches. The oil base may also cause complications if swallowed. In addition, the list of people who should not use this product (see below) is based upon the known effects of progestins used in humans on a chronic basis.

PEOPLE WHO SHOULD NOT HANDLE THIS PRODUCT:

1. Women who are or suspect they are pregnant.
2. Anyone with thrombophlebitis or thromboembolic disorders or with a history of these events.
3. Anyone with cardiovascular or coronary artery disease.
4. Women with known or suspected carcinoma of the breast.
5. People with known or suspected estrogen-dependent neoplasia.
6. Women with undiagnosed vaginal bleeding.
7. People with benign or malignant tumors which developed during the use of oral contraceptives or other estrogen-containing products.
8. Anyone with liver dysfunction or disease.

ACCIDENTAL EXPOSURE: Altrenogest is readily absorbed from contact with the skin. In addition, this oil based product can penetrate porous gloves. Altrenogest should not penetrate nitrile rubber or impervious gloves; however, if there is leakage (i.e., pinholes, spillage, etc.), the contaminated area covered by such occlusive materials may have increased absorption. The following measures are recommended in case of accidental exposure.

Skin Exposure: Wash immediately with soap and water.
Eye Exposure: Immediately flush with plenty of water for 15 minutes. Get medical attention.
If Swallowed: Do not induce vomiting. Regu-Mate® (altrenogest) Solution 0.22% contains an oil. Call a physician. Vomiting should be supervised by a physician because of the potential for pulmonary damage via aspiration of the oil base. If possible, bring the container and labeling to the physician.

CAUTION: For oral use in horses only. Keep this and all medication out of the reach of children.

Store at or below 25°C (77°F).

NADA# 133-310, Approved by FDA.

HOW SUPPLIED:

Regu-Mate® (altrenogest) Solution 0.22% (2.2 mg/mL). Each mL contains 2.2 mg altrenogest in an oil solution. Available in 1000 mL plastic bottles.

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had three- to fourfold lower antibody titers than horses vaccinated with a WNV-only product at the same time as a combination EEE, WEE, and tetanus vaccine.

The researchers believe the reduction in antibody titers could be due to antigen interference, antigen load (the horses' total exposure to substances that trigger an immune response), or some other unknown factors, Hankins said. But regardless of the cause, he said, veterinarians should consider the possible implications of the combination vaccine's lower WNV antibody response when developing and implementing vaccine protocols.

So are combination vaccines still better than no vaccines at all?

"Absolutely," Hankins said. "This study was not to show that the combination vaccines were not effective, but that the monovalent (protects against one disease) vaccines might provide a higher degree of protection. Not vaccinating your horse would not be recommended, especially when all available WNV vaccines have shown to be effective."

He recommended that owners work with their veterinarians to determine the best vaccination plans for their horses.

Some Vaccines Safe to Administer to Younger Foals

By the time foals are 4 to 6 months old, they are probably just beginning to receive immunizations—if their dams were properly vaccinated—as recommended by the American Association of Equine Practitioners' (AAEP) vaccination guidelines.

But what about foals born later in the year, in the midst of mosquito season? Should owners wait to vaccinate them until this four- to six-month time point? New research suggests that earlier vaccination might help ensure foals are well-protected against mosquito-borne disease.

Elizabeth Davis, DVM, PhD, Dipl. ACVIM, professor and head of equine medicine and surgery at Kansas State University's College of Veterinary Medicine, presented a study in which she and colleagues determined that veterinarians can vaccinate foals sooner than once thought.

In most cases, foals born to well-vaccinated mares aren't vaccinated until maternal antibodies from colostrum—which provide immune protection to the foal, but can also inhibit the foals' ability to respond to vaccinations—wane to a sufficient level, typically within six months

after birth. Therefore, the AAEP currently recommends starting tetanus, EEE, WEE, WNV, and EHV vaccines in that four- to six-month time point, and rabies and influenza when the foal is 6 months old.

To determine if it's possible to protect foals against these potentially deadly diseases sooner, the team compared foals vaccinated at 90 days (3 months) of age versus those vaccinated at 180 days (6 months).

They found that foals vaccinated at 3 months old with the Fluvax Innovator EHV1/4 vaccine and the West Nile-Innovator EWT vaccine showed similar immune responses during the vaccination series and when boosted at 11 months to foals initially vaccinated at 6 months old.

Davis cautioned that "based on the data from this investigation and previous studies, tetanus and influenza vaccines are harder for foals to respond to in the face of maternal antibodies, and these two vaccines in particular should be administered at 4 to 6 months of age whenever possible to induce optimal immunity in the majority of foals." On the other hand, vaccines for diseases that foals, especially those born later in the year, could get sick from during warmer months, such as EEE and WNV, might best initiated earlier in life (3 to 4 months of age) so foals can develop their own immune protection prior to viral exposure, she said.

She said that when using this new protocol, foals must receive a booster four weeks after the initial vaccine, as well as a third vaccine 60 days later to complete the three-dose series. She said veterinarians should then administer the 11-month booster early in the foal's yearling year, followed by annual or bi-annual boosters, based on the horse's risk of contracting disease.

Davis noted that owners and veterinarians should still follow current AAEP vaccination guidelines for foals born early in the foaling season. 🐾



SENIOR Horse Care

CLIX PHOTOGRAPHY

ALEXANDRA BECKSTETT
 ERICA LARSON

Maintaining Aged Horses' Health

The senior horse population is, and has been, on the rise, due to better preventive care and advancing veterinary treatment techniques. With aging comes the potential for health problems, so a researcher who has studied aging offered some insight on ways to ensure senior horses (those 20 years old and up) stay healthy through their golden years.

Mary Rose Paradis, DVM, MS, Dipl. ACVIM, an associate professor in the Department of Clinical Sciences at Tufts, in N. Grafton, Mass., said, "In the past 20 years, we appear to be seeing more horses over the age of 20 years in our hospital.

A small study indicated that from 1989 to 1999 we saw an almost sixfold increase in horses presenting with problems who were 20 years of age or older."

Paradis said that it can be difficult to determine if health problems seen in older horses are caused by age itself or by a disease process. Additionally, she said, "older horses have many of the same medical

“ Often, feeding the geriatric horse comes down to feeding whatever they will eat. ”

DR. MARY ROSE PARADIS

issues as young horses, but some conditions appear to increase with age."

She also noted that old horses appear to be more medicated than younger horses: "When owners were asked about the use of medications for chronic problems, 25% of old horses versus 6% of young horses were on regular medications," she said.

Nonetheless, "older horses can lead healthy lives into their 30s, particularly if care is taken to address the problems as soon as they're recognized," Paradis said. Seniors should undergo annual or biannual veterinary assessments, including:

- A thorough physical exam, focusing on body condition, dental wear, appetite, hair coat abnormalities, musculoskeletal stiffness or lameness, ophthalmic abnormalities, and cardiac health;

- Blood work, including a complete blood count, chemistry profile, and checks on adrenocorticotropic hormone levels and insulin levels; and
- A fecal egg count.

Next Paradis described some common health conditions in horses older than 20 and the best ways to manage them.

Gastrointestinal and Dental Problems
Paradis said that in one study colic was the most common reason for senior horses to be evaluated at a referral center, and another study showed that gastrointestinal lesions were the most common reason for death in horses 15 years old and up.

Dental disease, Paradis said, likely plays a significant role in the development of colic and choke in older horses. To attempt to reduce the incidence of dental disease and related gastrointestinal problems, owners and veterinarians should monitor horses' dental health regularly and proceed with caution when problems arise.

"Radical correction of severe dental disease may not be effective in improving the animal's ability to eat forage," Paradis said. Instead, shorten overgrown, sharp teeth carefully and gradually to improve the horse's comfort, and change the diet as necessary.

Body Condition, Weight Loss, and Nutrition
Although many people associate weight loss with aging, Paradis said researchers showed in one study that obesity is typically a bigger problem in aging horses than weight loss.

Should an senior start to lose body condition, however, she recommended a diagnostic work-up to identify the problem. Horses lose weight because of decreased caloric intake or increased caloric needs.

"The caloric decreased intake in the older animal might be caused by a lack of good-quality feed, poor appetite secondary to a debilitating disease, poor dentition, maldigestion, and malabsorption," she explained. "Reasons an older horse may have an increased utilization of calories may be related to environmental cold, increased level of exercise, and increased catabolism (breakdown of complex molecules, such as protein and fat, to simpler compounds) secondary to a debilitating disease."

Once the veterinarian and owner identify the cause of weight loss, they can implement feeding adjustments with the goal of increasing body condition.

Paradis said a healthy senior's nutritional requirements might not differ from

those of younger adults. The diet should be based around forage with supplemental concentrates as needed.

Paradis said many senior horse feeds contain a variety of important components that build on the average horse's diet, including:

- Extruded ingredients to help improve digestion;
- Pre- and probiotics to increase the digestive flora population;

- Higher fat to increase caloric intake;
- Higher protein concentrations to help maintain or build muscle mass; and
- Amino acids to aid in muscle maintenance and support hoof and hair coat quality.

Because dental problems often preclude senior horses from properly consuming and digesting long-stem forage such as hay, Paradis said many senior feeds are advertised as complete—meaning they're



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designed to be fed without additional forage.

However, she said, "Often, feeding the geriatric horse comes down to feeding whatever they will eat. Horses with poor dentition will have problems with hay and whole grains. Alternative forages include grass, hays with minimal stem, and soaked hay cubes or haylage."

Paradis cautioned that feeding challenges arise when the senior horse develops health problems, such as equine metabolic syndrome (EMS) or insulin resistance, requiring a specialized diet.

Musculoskeletal Disorders Paradis said musculoskeletal disorders were the second-most-common presenting complaint in one study of seniors, and lameness causes included laminitis and degenerative disease. Additionally, she said, older horses were significantly more likely to be on medications long-term for musculoskeletal pain than younger horses.

"It is hypothesized that earlier injury to joints, muscles, tendons, and ligaments set up the geriatric horse for progressive degenerative changes," she relayed.

Paradis offered these recommendations for managing osteoarthritis-related and other musculoskeletal pain in seniors:

- Provide non-steroidal anti-inflammatory drugs judiciously;
- Increase mobility to reduce pain, and avoid stall rest;
- Modify training programs so they don't overtax senior bodies;
- Work horses consistently, rather than infrequently or just on the weekends;
- Consider adding a nutraceutical, such as glucosamine-chondroitin sulfate, which has been shown to improve lameness



Incidence of squamous cell carcinoma formation increases with age.

COURTESY DR. DENNIS BROOKS



Convention Tweet

Erica Larson

@TH_EricaLarson

There's a full house for the geriatric horse sessions this afternoon. Must be lots of awesome senior horses out there!

grades, flexion test scores, and increase stride length; and

- Contemplate adding complementary therapies such as acupuncture, chiropractic, or massage therapy.

Respiratory Disorders The third-most-common presenting complaint from owners of geriatric horses was respiratory disease, Paradis said. "Although recurrent airway obstruction (RAO) or heaves is not restricted to old horses, age has also been determined to be a risk factor for RAO," she noted.

Decreasing inflammation and bronchoconstriction (airway tightening) in these cases can be accomplished by:

- Reducing environmental allergens, such as dust;
- Providing 24-hour turnout;
- Eliminating hay—which can contain dust—from the horse's diet;
- Improving ventilation if the horse must be stalled; and
- Administering oral or inhaled corticosteroids and bronchodilators.

Other Health Concerns Paradis said ophthalmic problems and neoplasia (tumors) are also common health issues for senior horses. Ireland et al. determined in a study that the most common ocular problems among aging horses were vitreous degeneration (loss of the gel that fills the eyeball between the lens and the retina), senile retinopathy (age-related noninflammatory damage to the retina), and cataracts, Paradis said.

As far as incidence of neoplasia formation, both squamous cell carcinoma (SCC) and melanoma increase with age, Paradis said, with SCC being the most prevalent and with melanomas mostly seen in gray horses.

End-of-Life Decisions Researchers on one study found that the top six reasons for euthanizing aged horses were lameness, colic, chronic illness, acute illness, laminitis,

and bone fracture. Influencing factors, Paradis said, included a "hopeless" prognosis, veterinary advice, and poor quality of life. Ultimately, the decision to euthanize a horse rests with horse owners in consultation with their veterinarians and should be treated as an individual decision for each animal and situation.

Understanding Immunosenescence

Dianne McFarlane, DVM, PhD, Dipl. ACVIM, ABVP, associate professor in physiological sciences at Oklahoma State University's Center for Veterinary Health Science, reviewed what veterinarians know and are learning about the effects of aging on the immune system in horses, known as immunosenescence.

One of the challenges veterinarians face when studying immunosenescence is age itself: "What chronological age is 'aged'?" she asked. "Age-induced changes may be missed if the study group is too young. Less intuitively, a study population that is too old may cause age-related immune deficits to be missed because the selected population may have survived to extreme old age as the result of exceptional immune function."

Also, in evaluating seniors, "it is difficult to know if changes that occur are due to age or a subclinical disease," she said. "In an aged population, this can be difficult because of the high prevalence of co-morbidities that contribute to chronic, low-grade inflammation."

Despite these challenges, veterinarians have accrued some important knowledge about the aging equid's immune function:

Infectious Disease While there's not a lot of supporting data available on aging's effect on equine disease, seniors could be more susceptible to contracting West Nile virus, McFarlane said. And in experimental settings, aged mares contracted neurologic equine herpesvirus-1 more frequently than young animals. But, "we just don't have any solid data suggesting old horses are significantly more susceptible to infectious disease than younger horses," she said.

Parasites Researchers have determined that healthy old horses have fecal egg shedding rates similar to younger ones. However, McFarlane said, seniors with pituitary pars intermedia dysfunction (PPID, or equine Cushing's disease) have higher fecal egg counts than healthy aged horses both before and after anthelmintic

administration, meaning these horses shed more eggs.

Immune System Researchers have also studied cytokine (an inflammatory mediator) and neutrophil (a white blood cell capable of engulfing and destroying disease agents) function in middle-aged, old, and PPID-affected horses, McFarlane said. They found that PPID-affected horses had reduced immunity as compared to healthy middle-aged and old horses.

Vaccine Response In one study researchers found no difference in aged horses' response to rabies vaccines, McFarlane said. She also described a study showing that influenza titers in response to vaccination appear "less robust" in aged horses than younger horses.

McFarlane recommended a few tips for maintaining aged horses to minimize disease infection risk:

- Employ the same biosecurity methods and vaccination protocols for old horses and mature adult horses;
- Perform routine fecal egg counts and deworm based on the results;
- Monitor weight, body condition score, and hair coat regularly for changes;
- Test for endocrine disorders; and
- Be vigilant in monitoring for disease.

EOTRH Risk Factors Identified

Equine odontoclastic tooth resorption and hypercementosis (EOTRH) is a newly recognized condition that is very painful and primarily affects horses' incisors and canines. Ann Pearson, MS, DVM, and her colleagues at Reata Equine Veterinary Group, in Tucson, Ariz., recently conducted a study to identify risk factors and help veterinarians recognize and understand the condition better.

"In our experience, the teeth appear bulbous, irregular, and discolored," she said. "Gingival receding is often seen, along with shifting of incisor positioning."

In previous reports, disease has tended to appear in horses older than 15 and more commonly in Thoroughbreds and Warmbloods than in other breeds. Treatment for EOTRH includes removing the affected teeth, a potentially painful procedure for the horse and a difficult one for the veterinarian, Pearson said.

She and her colleagues analyzed Reata records on more than 13,000 veterinary calls (3,461 horses) for any reason from 2000 to 2012. Pearson determined



EOTRH is a very painful disease that causes teeth roots to appear bulbous, irregular, and discolored.

whether these horses exhibited any of her hypothesized EOTRH risk factors: excessive dental work; periodontal disease; a low-mastication diet (one that doesn't require much chewing); endocrine disorders; laminitis; clinical behavioral signs of frequent involvement (e.g., playing) with water; excessive salivation or foaming of the mouth; breed; sex; and age. She then sent follow-up surveys to owners of horses

“Although recurrent airway obstruction (RAO) or heaves is not restricted to old horses, age has also been determined to be a risk factor for RAO.”

DR. MARY ROSE PARADIS

diagnosed as having EOTRH. She said that with the survey results and histories, she was able to confirm the risk factors as useful for predicting which horses might be affected by the condition. She focused in on what she considered four main risks:

1. **Excessive dentistry** "Horses with excessive dentistry were five times more likely to have EOTRH," she said. "Dr. Carsten Staszuk (DrMedVet) in 2010 hypothesized that mechanical stress within the periodontal ligament (anchors teeth in sockets) may be the initiating factor."
2. **Periodontal disease/lack of grazing** Pearson said horses with prior periodontal disease were five times more likely to develop EOTRH, possibly due

to lack of saliva bathing and blood supply to the gums. "We are hypothesizing that a lack of grazing time will not allow the horse to have his head down in proper position to allow the saliva to have the full effect of bathing the incisors and removing stagnant feed," she explained.

3. **A primarily alfalfa hay diet** Horses fed alfalfa, which requires little mastication, without grazing are twice as likely to have EOTRH, Pearson said. "The lack of chewing time and difference in elevation of the head will decrease the amount, time, and path of bathing the teeth and gums with saliva," she said.
4. **Endocrine disease** Horses with EMS or PPID were 2.3 and 2 times more likely to develop EOTRH, respectively, due to the effects of hormones, glucose, and insulin on periodontal structures.

Other notable findings she described included that Arabians appear at greater risk of developing EOTRH than other breeds, and that mares and geldings are less prone than stallions. Age, however, was not a significant predictor of EOTRH.

"This is, perhaps, somewhat surprising but tells us that it's not maturation in and of itself that puts a horse at risk of EOTRH," she said. "Rather, it's the other risk factors that (tend to go along with) aging." 🐾

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EYE Issues

DUSTY PERIN

ERICA LARSON

Prepurchase Examinations: Don't Forget the Eyes

Clean legs? Check. Healthy heart? Check. Strong back? Check. But before you sign the papers for your new horse, don't forget to have your veterinarian look the horse in the eye.

"An important yet commonly overlooked portion of the prepurchase is the ocular examination," explained Nicole Scherrer, DVM, an ophthalmology resident at the University of Pennsylvania School of Veterinary Medicine's New Bolton Center, in Kennett Square. "It is important for veterinarians to be able to recognize lesions that may affect vision or function of the horse." Such problems include:

- Eyelid tumors;
- Globe (eyeball) size abnormalities;
- Exophthalmos (the eye bulging out of the orbit) or enophthalmos (the eye sinking into the orbit);
- Corneal edema (swelling);
- Corneal opacities;
- Aqueous flare (inflammation within the front chamber of the eye);

- Hyphema (blood in the eye) or hypopyon (pus in the eye);
- Iris synechia (iris adherence to the cornea);
- Cataracts;
- Vitreous opacities (opacities in the jelly-like substance behind the lens);
- Chorioretinal scars (scars in the layer between the retina and sclera that furnishes the blood supply); and
- Retinal detachment.

Scherrer recommended veterinarians follow a step-by-step diagnostic approach to ensure they cover all ocular bases:

Step 1: Examine Facial (and Globe) Symmetry, as any asymmetries could indicate issues that could negatively impact the horse's future. She also recommended taking a close look at the horse's face to check for signs of past or present tearing.

Step 2: Palpation can be used to investigate any asymmetry and to characterize the globe's ability to move. She also encouraged veterinarians to ensure the horse has a third eyelid—lack of such a structure could indicate the horse had neoplasia (tumors such as squamous cell carcinoma [SCC]) in the past.

Step 3: Check Vision by noting how the horse reacts to its surroundings, Scherrer explained. "This can be difficult to interpret because many horses adapt well to loss of vision and continue to perform well despite a loss of vision, especially if vision loss is chronic (over time)."

Step 4: Check Pupillary Size and Light Reflexes, poor results of which can indicate past or present inflammation, or nerve or retinal disease.

Step 5: Evaluate Eyelids and Conjunctiva (the latter being the same delicate membrane that lines the eyelids) for tumors, such as sarcoids and SCC. "Horses are quite prone to eyelid lacerations, and if these are not repaired correctly they can result in margin irregularities that can cause recurrent corneal ulceration in the future," she said.

Step 6: Examine the Cornea and Anterior Chamber for corneal opacities, which could be associated with conditions such as keratitis or uveitis and, if large enough, could interfere with horses' vision. Aqueous flare created by cells in the anterior chamber (located between the cornea and iris) is a characteristic sign of uveitis.

Step 7: Check the Lens for abnormalities. "Pharmacologic dilation of the pupil is not typically part of the prepurchase examination, but without it the lens cannot be viewed in its entirety," Scherrer explained. Some conditions, such as cataracts, are easier to identify when the pupil is dilated. **Step 8: Evaluate the Fundus**, or the back of the eye, for abnormalities such as retinal detachment, optic nerve atrophy, and chorioretinitis.

Based on the results of the ophthalmic exam, the veterinarian can inform the buyer if any eye abnormalities are present, and if those abnormalities could pose future problems.

"The ophthalmic portion of the prepurchase examination is frequently overlooked, but its importance should not be underrated," Scherrer said. "Chronic ocular disease can result in temporary or permanent loss of use and frustration for the owner. On the other hand, it is important that normal variants not be interpreted as lesions of clinical significance."

Managing Excessive Tearing

Amber Labelle, DVM, MS, Dipl. ACVO, assistant professor and veterinary ophthalmologist at the University of Illinois Veterinary Teaching Hospital, took an

up-close look at excessive tearing in horses and what conditions it might indicate.

“The eye can only do so many things—it squints, tears, and gets red; it’s a three-trick pony,” she explained. And the horse’s nasolacrimal (or tear) system and tear film play a very important role in maintaining ocular health. The tear film works by:

- Providing oxygen and nutrients to the corneal epithelium;
- Removing debris and waste products from the cornea;
- Lubricating the ocular surface; and
- Allowing light to pass from the external environment directly into the eye.

“The old adage ‘no foot, no horse,’ is certainly true; its ocular equivalent is ‘no tear film, no eye,’” Labelle said.

The horse’s tear film is replaced regularly throughout the day, during which the used tears drain through the nasolacrimal system. Labelle explained that the nasolacrimal system includes the ocular puncta, the canaliculi, the lacrimal sac, the nasolacrimal duct, and the nasal puncta. The ocular puncta are like a drain that takes tears away from the eye’s surface, the nasolacrimal duct is the pipe through which tears drain, and the nasal puncta is the final drain where the tears exit into the nose.

“Think of it like a bathtub,” Labelle said. “Tears come out of the ‘faucet,’ the canaliculi and lacrimal sac are the tub, and the nasolacrimal duct is the drain.”

If any of those structures malfunction, excessive tearing occurs.

With excessive tearing, “you’re either making too many tears or they’re not draining away,” Labelle said.

To assess the situation and determine which is happening, Labelle suggested veterinarians perform a few diagnostic assessments:

A nasolacrimal duct lavage (flushing the tear ducts) tests the system’s patency (whether there’s a blockage), and veterinarians can use CT or MRI to evaluate the nasolacrimal system’s state, as well.

Labelle also described a Jones test, in which the veterinarian instills fluorescein stain on the ocular surface and waits to see how long it takes for the stain to come out the nasal puncta.

“This test is widely variable and not overly reliable,” Labelle said. “Don’t automatically think a negative test (if no fluorescein appears) means that the horse has an obstruction—it could be normal for the horse.”



Erica Larson
@TH_EricaLarson

Eye problems can go bad fast—call your vet ASAP, says Dr. Allbaugh.

Once the veterinarian has completed an eye exam, he or she can start narrowing down the possible causes.

If tear overflow appears to be the problem, Labelle said it could be caused by “pretty much any ocular discomfort.”

Do a thorough exam, look for the reason for pain, and consider environmental irritants, such as dust, other allergens, wind, and ultraviolet light, Labelle said. Then, implement treatment as needed.

Decreased drainage could be caused by a wider variety of problems, Labelle said, including:

- **Congenital punctal atresia** Horses with this condition have no nasal puncta. Though rare in its overall instance, the condition is the most common nasolacrimal disease and is found most often in young horses with a comfortable eye. Veterinarians can treat it by placing a stent to facilitate drainage.

■ **Functional duct obstruction** In this condition a foreign body obstructs the nasolacrimal duct. Affected horses generally have a comfortable eye but are unable to flush tears, Labelle said. Treatment includes flushing the duct manually, administering systemic anti-inflammatories for 10 to 14 days, and potentially removing the foreign body surgically in severe cases.

■ **Malpositioned globe** A smaller-than-



Fibrosis, or scarring, caused by a variety of eye conditions can result in cloudiness.

Regu-Mate® (altrenogest)

Solution 0.22% (2.2 mg/mL)

CAUTION: Federal law restricts this drug to use by or on the order of a licensed veterinarian.

DESCRIPTION: Regu-Mate® (altrenogest) Solution 0.22% contains the active synthetic progestin, altrenogest. The chemical name is 17 α -allyl-17 β -hydroxyestra-4,9,11-trien-3-one. The CAS Registry Number is 85032-2. The chemical structure is:



Each mL of Regu-Mate® (altrenogest) Solution 0.22% contains 2.2 mg of altrenogest in an oil solution.

ACTIONS: Regu-Mate® (altrenogest) Solution 0.22% produces a progestational effect in mares.

INDICATIONS: Regu-Mate® (altrenogest) Solution 0.22% is indicated to suppress estrus in mares. Suppression of estrus allows for a predictable occurrence of estrus following drug withdrawal. This facilitates the attainment of regular cycling during the transition from winter anestrus to the physiological breeding season. Suppression of estrus will also facilitate management of prolonged estrus conditions. Suppression of estrus may be used to facilitate scheduled breeding during the physiological breeding season.

CONTRAINDICATIONS: Regu-Mate® (altrenogest) Solution 0.22% is contraindicated for use in mares having a previous or current history of uterine inflammation (i.e., acute, subacute, or chronic endometritis). Natural or synthetic gestagen therapy may exacerbate existing low-grade or “smoldering” uterine inflammation into a fulminating uterine infection in some instances.

PRECAUTIONS: Various synthetic progestins, including altrenogest, when administered to rats during the embryonic stage of pregnancy at doses manyfold greater than the recommended equine dose caused fetal anomalies, specifically masculinization of the female genitalia.

DOSEAGE AND ADMINISTRATION: While wearing protective gloves, remove shipping cap and seal; replace with enclosed plastic dispensing cap. Remove cover from bottle dispensing tip and connect luer lock syringe (without needle). Draw out appropriate volume of Regu-Mate solution. (Note: Do not remove syringe while mares in menses; spillage may occur.) Inject into each mare intravenously orally at the rate of 1 mL per 110 pounds body weight (0.044 mg/kg) once daily for 15 consecutive days. Administer solution directly on the base of the mare’s tongue or on the mare’s usual grain ration. Replace cover on bottle dispensing tip to prevent leakage. Excessive use of a syringe may cause the syringe to stick; therefore, replace syringe as necessary.

WHICH MARES WILL RESPOND TO REGU-MATE® (altrenogest) SOLUTION 0.22%: Extensive clinical trials have demonstrated that estrus will be suppressed in approximately 95% of the mares within three days; however, the post-treatment response depended on the level of ovarian activity when treatment was initiated. Estrus in mares exhibiting regular estrus cycles during the breeding season will be suppressed during treatment; these mares return to estrus four to five days following treatment and continue to cycle normally. Mares in winter anestrus with small follicles continued in anestrus and failed to exhibit normal estrus following withdrawal. Response in mares in the transition phase between winter anestrus and the summer breeding season depended on the degree of follicular activity. Mares with inactive ovaries and small follicles failed to respond with normal cycles post-treatment, whereas a higher proportion of mares with ovarian follicles 20 mm or greater in diameter exhibited normal cycles post-treatment. Regu-Mate® (altrenogest) Solution 0.22% was very effective for suppressing the prolonged estrus behavior frequently observed in mares during the transition period (February, March and April). In addition, a high proportion of these mares responded with regular estrus post-treatment.

SPECIFIC USES FOR REGU-MATE® (altrenogest) SOLUTION 0.22%:

SUPPRESSION OF ESTRUS TO:

1. Facilitate attainment of regular cycles during the transition period from winter anestrus to the physiological breeding season. To facilitate attainment of regular cycles during the transition phase, mares should be examined to determine the degree of ovarian activity. Estrus in mares with inactive ovaries (no follicles greater than 20 mm in diameter) will be suppressed but these mares may not return to regular cycles following treatment. However, mares with ovarian follicles greater than 20 mm in diameter) frequently respond with regular post-treatment estrus cycles.
2. Facilitate management of the mare exhibiting prolonged estrus during the transition period. Estrus will be suppressed in mares exhibiting prolonged behavioral estrus either early or late during the transition period. Again, the post-treatment response depends on the level of ovarian activity. Mares with greater ovarian activity initiate regular cycles and conceive sooner than the inactive mares. Regu-Mate® (altrenogest) Solution 0.22% may be administered early in the transition period to suppress estrus in mares with inactive ovaries. Mares with inactive ovaries should be treated later in the transition period with active ovaries to prepare and schedule the mare for breeding.
3. Permit scheduled breeding of mares during the physiological breeding season. To permit scheduled breeding, mares which are regularly cycling or which have active ovarian function should be given Regu-Mate® (altrenogest) Solution 0.22% daily for 15 consecutive days beginning 20 days before the date of the planned estrus. Ovulation will occur 5 to 7 days following the onset of estrus as expected for untreated mares. Breeding should follow usual procedures for mares in groups. Mares may be regulated and scheduled either individually or in groups.

DOSEAGE CHART:	
Approximate Weight in Pounds	Dose in mL
770	7
880	8
990	9
1100	10
1210	11
1320	12

ADDITIONAL INFORMATION: A 3-year well controlled reproductive study was conducted in 27 pregnant mares, and compared with 24 untreated control mares. Treated mares received 2 mL Regu-Mate® (altrenogest) Solution 0.22% /110 lb body weight (2x dosage recommended for estrus suppression) from day 20 to day 325 of gestation. This study provided the following data:

1. In filly offspring (all ages) of treated mares, litter size was increased.
2. Filly offspring from treated mares had a shorter interval from Feb. 1 to first ovulation than fillies from their untreated mare counterparts.
3. There were no significant differences in reproductive performance between treated and untreated mares (mares & their respective offspring) measured by the following parameters:
 - interval from Feb. 1 to first ovulation, in mares only.
 - mean interovulatory interval from first to second cycle and second to third cycle, mares only.
 - follicle size, mares only.
 - at 50 days gestation, pregnancy rate in treated mares was 81.8% (9/11) and untreated mares was 100% (4/4).
 - after 3 cycles, 11/12 treated mares were pregnant (91.7%) and 4/4 untreated mares were pregnant (100%).
 - colt offspring of treated and control mares reached puberty at approximately the same age (82 & 84 weeks respectively).
 - stallion offspring from treated and control mares showed no differences in seminal volume, spermatozoal concentration, spermatozoal motility, and total sperm per ejaculate.
 - stallion offspring from treated and control mares showed no difference in sexual behavior, testicular characteristics (scrotal width, testis weight), perineal urethral opening, weight and height, testicular height, width & length) were the same between stallion offspring of treated and control mares.

REFERENCES: Shemshaker, G.F., E.L. Squires, and R.K. Shideler. 1989 Stability of Altrenogest in Pregnant Mares and on Health and Development of Offspring. Eq. Vet. Sci. (9): No. 2: 69-72. Squires, E.L., R.K. Shideler, and A.O. McKinnon. 1989 Reproductive Performance of Offspring from Mares Administered Altrenogest During Gestation. Eq. Vet. Sci. (9): No. 2: 73-76.

WARNING: Do not use in horses intended for food.

HUMAN WARNINGS: Skin contact must be avoided as Regu-Mate® (altrenogest) Solution 0.22% is readily absorbed through unbroken skin. Protective gloves must be worn by all persons handling this product. Pregnant women or women who suspect they are pregnant should not handle Regu-Mate® (altrenogest) Solution 0.22%. Women of child bearing age should exercise extreme caution when handling this product. Accidental absorption could lead to a disruption of the menstrual cycle or prolongation of pregnancy. Direct contact with the skin should therefore be avoided. Accidental spillage on the skin should be washed off immediately with soap and water.

INFORMATION FOR HANDLERS: **WARNING:** Regu-Mate® (altrenogest) Solution 0.22% is readily absorbed by the skin. Skin contact must be avoided; protective gloves must be worn when handling this product.

Effects of Overexposure: There has been no human use of this specific product. The information contained in this section is extrapolated from data available on other products of the same pharmacological class that have been used in humans. Effects anticipated are due to the progestational activity of altrenogest. Acute effects after a single exposure are possible; however, continued daily exposure has the potential for more untoward effects such as disruption of the menstrual cycle, uterine or abdominal cramping, increased or decreased uterine bleeding, prolongation of pregnancy and headaches. The oil base may also cause complications if swallowed. In addition, the list of people who should not handle this product (see below) is based upon the known effects of progestins used in humans on a chronic basis.

- PEOPLE WHO SHOULD NOT HANDLE THIS PRODUCT:**
1. Women who are or suspect they are pregnant.
 2. Anyone with thrombophlebitis or thromboembolic disorders or with a history of these events.
 3. Anyone with cerebral-vascular or coronary artery disease.
 4. Women with known or suspected carcinoma of the breast.
 5. People with known or suspected estrogen-dependent neoplasia.
 6. Women with undiagnosed vaginal bleeding.
 7. People with benign or malignant tumors which developed during the use of oral contraceptives or other estrogen-containing products.
 8. Anyone with liver dysfunction or disease.

ACCIDENTAL EXPOSURE: Altrenogest is readily absorbed from contact with the skin. In addition, this oil based product can penetrate porous gloves. Altrenogest should not penetrate intact rubber or impervious gloves; however, if there is leakage (i.e., pinholes, spillage, etc.), the contaminated area covered by such occlusive materials may have increased absorption. The following measures are recommended in case of accidental exposure.

Skin Exposure: Wash immediately with soap and water.
Eye Exposure: Immediately flush with plenty of water for 15 minutes. Get medical attention.
If Swallowed: Do not induce vomiting. Regu-Mate® (altrenogest) Solution 0.22% contains an oil. Call a physician. Vomiting should be supervised by a physician because of possible pulmonary damage via aspiration of the oil base. If possible, bring the container and labeling to the physician.

CAUTION: For oral use in horses only. Keep this and all medication out of the reach of children. Store at or below 25°C (77°F).

NADA# 131-310, Approved by FDA.

HOW SUPPLIED: Regu-Mate® (altrenogest) Solution 0.22% (2.2 mg/mL). Each mL contains 2.2 mg altrenogest in an oil solution. Available in 1000 mL plastic bottles.

• US Patents 3,453,267; 3,478,067; 3,484,462

Manufactured by: DPT Laboratories, San Antonio, TX 78215
Distributed by: Intervet Inc., Millsboro, DE 19966



normal eyeball or an eye sunken in the skull could result in a malpositioned globe and, subsequently, problems with clearing irritants—and tears—from the surface (imagine if your car's windshield fell back from the reach of the wipers). Labelle said treatment options include improving body condition (which could improve globe position—yes, horses gain weight in their faces) and diligent facial hygiene.

■ **Ocular punctal occlusion** This condition, which is sometimes a birth defect, involves chronic conjunctival inflammation that leads to ocular puncta fibrosis (scarring) and occlusion. Veterinarians treat this rare condition via surgical creation of a new puncta.

Excessive tearing could suggest a number of potentially serious equine eye conditions. Veterinarians should examine cases carefully and then determine an appropriate treatment course.

Diagnosing the Cloudy Eye

Caroline Monk, DVM, an ophthalmology resident at the University of Florida's College of Veterinary Medicine, reviewed the diagnostic options and potential differential diagnoses (rule-outs) for cloudy eyes. "The nonulcerated cloudy eye is a frequent presenting complaint, and different etiologies have similar manifestations," she explained. Because the eye's condition can degenerate rapidly with incorrect or no treatment, a quick, accurate diagnosis is key.

During the initial exam, Monk said veterinarians should ask several questions that will help them reach diagnoses:

- Is the eye painful?
- Are the horse's pupils unequal in size?
- Is there miosis (pupillary constriction) or mydriasis (pupillary dilation)?
- Is there an ulcer?

Based on the answer to the first question, in particular, the veterinarian can start to narrow down differential diagnoses before running more advanced diagnostics to confirm the problem. If the horse's eye is minimally or not painful, a few disorders that should come to a veterinarian's mind, Monk said, including:

- Squamous cell carcinoma;
- Immune-mediated keratitis (IMK), an inflammation of the cornea;
- Subepithelial keratomycosis, a disease similar to IMK but of infectious origin;
- Fibrosis of the cornea; and

A BETTER WAY TO MEDICATE EYES: SUBPALPEBRAL LAVAGE

Anyone who's ever managed an equine eye issue knows how challenging it can be to treat. (Remember when you tried to put ointment in your horse's eye as he shook his head vigorously?) Fortunately, there's an easier way: the subpalpebral lavage (SPL) system, which one veterinarian considers an essential tool for treating serious equine ocular conditions.

Using this system involves passing flexible tubing through the upper or lower eyelid and stitching it into place, then administering medication via the other end of the tube. Ann Dwyer, DVM, owner of the Genesee Valley Equine Clinic, in Scottsville, N.Y., said SPLs can be used on any patient, "from babies to big drafts," and can be left in place for as long as 12-15 weeks. She noted that horses generally adapt quickly to having an SPL in place.

"SPL medication is delivered without the handler touching the face or periocular (the area around the eye) region," explained Dwyer. "Therefore, the treatment of fractious horses or painful eyes is simplified."

When a veterinarian inserts the SPL, the horse must be heavily sedated and the eyelid and eye surface numbed. Whether the lavage is placed through the top or bottom lid is the clinician's preference, she said.

Once the system is in place, the veterinarian and horse owner often work as a team to administer the medication and maintain the system. Dwyer offered the following tips:

- Wipe the catheter port—where the medication is administered—daily with an antiseptic solution, and use a plastic bag to keep the port clean and debris-free.
- Change the catheter port once a week to ensure bacteria do not build up.
- Always ensure you're administering the correct medication at the correct time.
- Follow each medication injection with administration of about 1.5 mL of air to ensure the medication reaches the eye and does not remain trapped in the tubing.
- When using multiple medications, wait a few minutes between administrations to ensure one drug doesn't wash another out of the eye.
- Consider using a hood or fly mask to help protect the SPL insertion site.

Ultimately, Dwyer said well-secured SPLs are easy to manage. Potential complications include corneal ulcers from the lavage's footplate (the part of the system located under the eyelid, closest to the eye) and the lavage tubing breaking.

In closing, she stressed that SPLs are only devices, and veterinary expertise is required for them to be effective. Practitioners should make a correct diagnosis, prescribe appropriate treatments, and ensure sufficient help is available to deliver medications.



COURTESY DR. ANN DWYER

■ End-stage glaucoma (increased fluid pressure within the eye to a level incompatible with eye health), although this is typically accompanied by buphthalmos (an enlarged globe), striae (stretch marks), and blindness.

If the horse's eye is moderately or severely painful, some other conditions should come to mind, including:

- Stromal abscesses, which are very serious and potentially vision-threatening and thought to follow penetrating trauma to the cornea (from a branch or piece of hay, for example);

■ Eosinophilic keratitis, a condition that occurs when eosinophils (a type of white blood cell that responds to allergic and parasitic stimuli) invade the cornea;

■ Uveitis, a painful and debilitating condition that is the leading cause of blindness in horses; and

■ Glaucoma.

Further diagnostics, based on what clinical signs suggest the problem could be, include:

- Cytology (examination of cells under a microscope);
- Tonometry (measurement of intraocular

COURTESY DR. DIANE HENDRIX/AAEP PROCEEDINGS



Veterinarians must be careful not to damage the delicate cornea while suturing eyelid lacerations.

- pressure);
- Biopsy;
- Culture (testing samples for pathogens);
- Rose bengal staining (used to evaluate the eye's tear film integrity);
- Keratectomy (surgical removal of a portion of the cornea)
- Treatment trial; and
- Referral to a specialist, if needed.

After reaching an accurate diagnosis, the veterinarian can prescribe appropriate treatment to help the horse recover.

“When a systemic and consistent approach is used to examine and diagnose ocular lesions, you are less likely to miss subtle clinical signs and prescribe inappropriate therapy,” Monk said. “Once the correct diagnosis is made, searching for current therapies is simplified.”

For horse owners, this means calling your veterinarian at the first sign of cloudy eyes to give your horse the best chance of recovery.

Repairing Eyelid Lacerations

Equine eye injuries, especially eyelid lacerations—no matter how small or innocuous they might seem—always warrant a call to a veterinarian. A horse's vision might depend on it.

Veterinarians should consider these lacerations surgical emergencies, said Diane Hendrix, DVM, Dipl. ACVO, a professor of ophthalmology at the University of Tennessee College of Veterinary Medicine. Repair is necessary to maintain a horse's ocular health. Often this procedure can be accomplished in a standing, sedated horse.

Hendrix said a veterinarian's first step with a lacerated eyelid is performing a physical and an initial ocular exam to determine the injury's extent.

Next, she said, sedate the horse and

administer an auriculopalpebral nerve block, which temporarily prevents eyelid movement, to complete a more thorough ocular exam.

“It is imperative to make sure the cornea is intact and that the pupillary light response is there,” she said. “If there is a corneal injury or the pupillary light responses are abnormal, then there is more to the injury than just an eyelid laceration, and therapy will be more intense.”

Also during the eye exam, the veterinarian should evaluate the eyelid margins closely to ensure he or she has identified and all lacerations; stain the cornea with fluorescein dye to check for ulcers or lacerations; and evaluate the eye's anterior chamber, lens (behind the iris), and posterior chamber (between the iris and the lens). The veterinarian should also prescribe treatment for any additional issues identified during the ocular exam.



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Once the exam is complete, the veterinarian can prepare to repair the lacerated eyelid. Hendrix stressed that when disinfecting the area around the eye, veterinarians should use a dilute Betadine solution and saline (both Betadine scrub and alcohol are toxic to the corneal epithelium and can cause ulcers, she cautioned). Then, he or she can numb the eye appropriately and begin surgery.

Hendrix reviewed several surgical repair procedures, making notes of a few special considerations:

- Avoid simply excising (removing) any potentially viable tissue, as serious complications can result. “Even if you think it’s dead, try to replace it,” she urged. “It’s better to try and fail than to not try at all.”
- Eyelid lacerations can bleed profusely, and hemorrhage can be a nuisance for veterinarians trying to repair defects.
- Use extreme caution when placing sutures. The delicate cornea can be damaged if it comes in contact with sutures, Hendrix said.

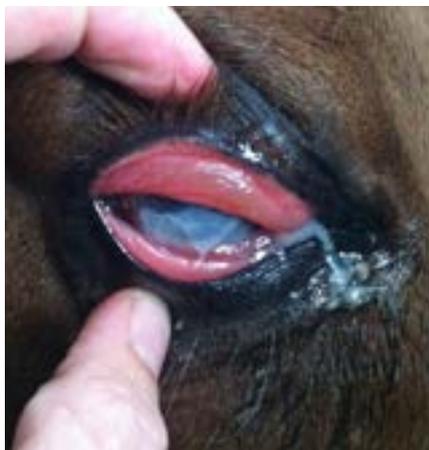
After the repair is complete, Hendrix recommended placing a protective hood with a hard cup over the affected eye, applying a topical broad-spectrum ophthalmic antibiotic ointment, administering flunixin meglumine or phenylbutazone, and, if the laceration is infected, administering systemic antibiotics. She also recommended giving the horse a tetanus booster if he has not been vaccinated in the preceding six months.

“The vast majority of eyelid lacerations can be easily and successfully repaired,” Hendrix concluded. “There are no retrospective studies discussing equine eyelid laceration repair in the peer-reviewed literature; however, years of experience have shown that the use of the described techniques produces excellent results.”

Managing Equine Eosinophilic Keratoconjunctivitis

Equine eye problems can be challenging for practitioners and owners to manage. They can be particularly difficult to treat when veterinarians are still just trying to determine problem’s root cause. One such issue is eosinophilic keratoconjunctivitis (EK).

Chelsey Miller, DVM, of Iron Will Mobile Veterinary Service, in Chapel Hill, N.C., described what veterinarians know about EK and how to currently best



COURTESY DR. CHELSEY MILLER

Signs of eosinophilic keratoconjunctivitis include conjunctivitis, corneal ulceration or edema, mucoid discharge, and white corneal plaques.

manage the condition medically.

Eosinophils are a type of white blood cell that respond to allergic and/or parasitic stimuli. Miller said that while exact etiology remains unknown, EK (also referred to as equine eosinophilic keratitis) occurs when eosinophils invade the horse’s cornea. Miller said the disease typically occurs seasonally (92% of cases are reported from June to October, she said) in well-managed horses and seems to be prevalent in the mid-Atlantic and midwestern states.

Miller said that many affected horses (44%) have a history of conjunctivitis (inflammation of the conjunctiva that lines the inner eyelids) or keratitis (corneal inflammation) in the past one to five years with a poor response to treatment for these conditions.

This very painful disease can occur in one or both eyes, Miller said. While she cautioned that lesions can be easy to miss, clinical signs include conjunctivitis, corneal ulceration or edema, mucoid (resembling mucus) discharge, and white corneal plaques.

Veterinarians diagnose EK using a combination of clinical signs identified on ophthalmic exam and characteristic cytology (examination of cells under a microscope), Miller said.

Unfortunately, EK generally doesn’t respond to treatment quickly. Treatment revolves around topical antifungal and antimicrobial medications in addition to a topical mydriatic (a drug that dilates the pupil), Miller said. Additionally, she said, systemic corticosteroids could shorten the treatment duration, and oral cetirizine (marketed for humans as Zyrtek) administration appears to help affected horses.

“At this point we have good evidence from the retrospective that Dr. Mary Uter (DVM, PhD, Dipl. ACVO) and I published that treating with cetirizine in the highest ‘at-risk’ months (June-August) will decrease recurrence of the disease,” Miller explained. “From anecdotal experience, I feel that treating during an active bout is helpful, in conjunction with other therapies.”

Miller recommended veterinarians evaluate affected horses every two to three days for the first 10 days to ensure the horse is responding appropriately. “Then,” she said, “once weekly until all clinical signs have resolved, and most importantly until the corneal ulcers have completely healed—which is the part of the disease that takes the longest to resolve, likely due to inhibition of normal wound healing resulting from eosinophilic major basic protein.”

One difficulty of treating EK—and any equine eye problem, for that matter—is administering topical medication.

“Is the horse actually getting the medication they’re supposed to be getting?” she asked.

While horses might tolerate short-term ocular medication administration, the longer treatment duration associated with EK could pose problematic. Horses might stop tolerating medication administration, which could negatively impact treatment.

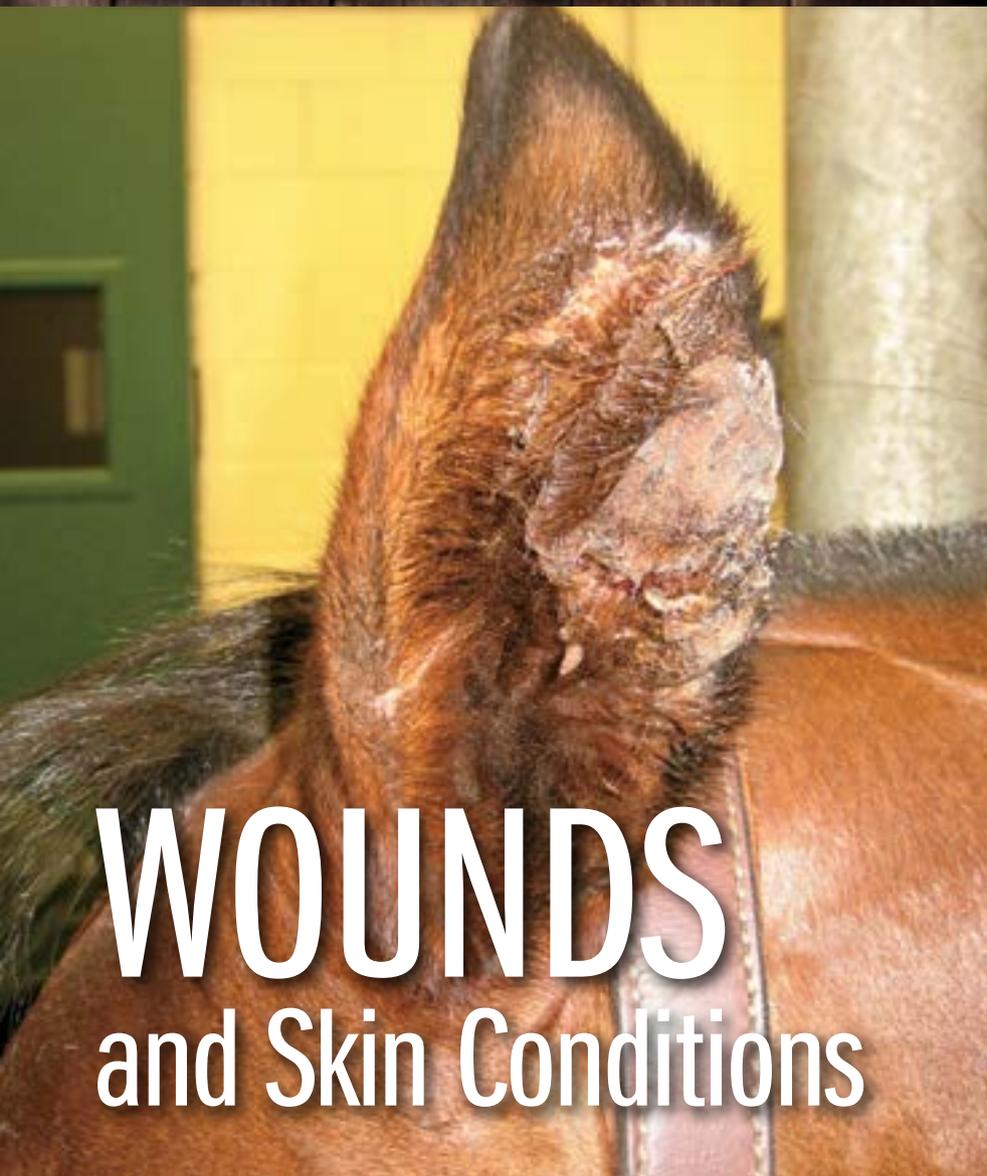
To ensure horses receive the medication they need to recover, Miller said veterinarians might need to insert a subpalpebral lavage system. Using this system, the veterinarian passes flexible tubing through the upper or lower eyelid and stitches it into place, allowing medication to be administered via the other end of the tube.

“Eosinophilic keratoconjunctivitis in horses is a disease that can be frustrating for veterinarians, owners, and horses alike because of the severity of clinical signs and prolonged treatment often required to achieve resolution,” Miller concluded. Veterinarians should closely monitor treatment. While some horses recover well, many horses’ disease recurs. 🐾

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WOUNDS and Skin Conditions

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Leishmaniasis: No Longer Just a Foreign Animal Disease

There's a scary new disease out there that could potentially harm not only horses but also humans. Less than two years ago a team of Florida-based veterinarians published a report of the first equine cutaneous (affecting the skin) leishmaniasis case diagnosed in the United States in a horse without history of international travel. And recently, Sarah M. Reuss, VMD, Dipl. ACVIM, a clinical assistant professor at the University of Florida's College of Veterinary Medicine and a member of that team, shared her experience with the disease to raise veterinarian awareness about this potentially dangerous problem.

Leishmaniasis is well-documented as a potentially fatal zoonotic (transmissible between animals and people) disease in humans and dogs worldwide. Reuss and colleagues identified the autochthonous case—one that's not related to foreign travel—in a 10-year-old Morgan mare in 2012. Recently, she said, Florida veterinarians confirmed a second leishmaniasis case in a middle-aged rescue mare, also with no history of international travel.

"It's only two cases, but our interest was piqued," she said.

Reuss said the disease is endemic in many tropical and subtropical climates and can be caused by more than 30 species of *Leishmania* protozoan parasites. The parasite identified in the Florida horses' cases, *L. siamensis*, had previously been identified in southern Thailand and Central Europe, but it was new to North America.

Researchers know that sand flies can

transmit leishmaniasis to horses, Reuss said, and there are sand flies that are native to the United States. In horses leishmaniasis presents as nodules on the head, pinnae (upper portion of the horse's ears), scrotum, legs, and neck—the areas where sand flies commonly feed. These nodules can occur in groups or be solitary, and they often ulcerate.

Veterinarians must observe nodules and complete several other steps to diagnose leishmaniasis, including:

- Cytology;
- Histopathology;
- Electron microscopy;
- Immunohistochemistry;
- Polymerase chain reaction (PCR, a kind of DNA test) testing; and
- Culture.

Reuss said practitioners can also use serology (blood tests) in the diagnostic process, but veterinarians employ this method more commonly when working with humans and dogs.

Veterinarians in the United States don't currently have access to the drugs most commonly used to treat leishmaniasis in other parts of the world; in this country the pentavalent antimony compound can only be obtained for the military or investigational use from the Centers for Disease Control and Prevention.

Fortunately, Reuss said, many equine leishmaniasis lesions regress on their own.

In addition to pentavalent antimony therapy, she noted veterinarians have also used surgical resection and amphotericin and fluconazole (antifungal agents) administration to treat affected horses successfully, "but it is unclear how many would have resolved with no treatment."

Clinical signs in the Florida horses resolved in response to treatment with fluconazole and local amphotericin injections.

"Equine cutaneous leishmaniasis can no longer be considered just a foreign animal disease," Reuss said. "With climate change and the spread of vector habitats, emerging diseases will continue to infiltrate the United States equine population."

She also cautioned veterinarians that even though this disease is not fatal for horses, "we can and should consider our equine patients as sentinels for this potentially fatal zoonotic disease."

Melanomas and Prepurchase Exams

Small early-stage melanomas might seem insignificant, but many are extremely

invasive and even life-threatening. Harry Werner, VMD, of Werner Equine in North Granby, Conn., addressed the significance of identifying and describing melanomas during prepurchase exams.

Melanomas are common neoplasms (tumors) that develop in gray horses with age. Many are not particularly invasive, Werner said, while others can cause dysfunction or even death.

If a melanoma is detected during a prepurchase exam, "the practitioner must realistically inform the buyer without unfairly jeopardizing the sale by overstating the concern or understating in such a way as to incur unnecessary risk exposure for the examiner," Werner said.

To make his point, he described a case study of a 12-year-old gray Thoroughbred gelding. At the time of the prepurchase exam, the veterinarian identified a 1-cm melanoma on the sheath and a 4-cm swelling of the left temporal area near the horse's ear. Radiographs of the head showed no significant findings. The report stated that the swelling below the left ear base was structurally insignificant *at that time*.

For two years the horse showed no signs of ill health, but then he began to demonstrate panic behavior. The melanomas showed no further external changes as compared to their appearance at the time of the prepurchase exam. A thorough exam of the horse did not reveal any abnormal vital signs, general neurologic or cranial nerve function, or clinical pathology. However, on endoscopic examination of the guttural pouches (air-filled outpouches of the auditory system that connect the pharynx to the inner ear) the practitioner identified that the melanoma had spread over a large area. An MRI study of the horse's head demonstrated bony destruction of the zygomatic arch (cheek bone) and melanoma invading a portion of the skull along with the middle ear and the temporal lobe of the brain.

These serious abnormalities were associated with aggressive melanoma progression, Werner said. The practitioner had informed his client that significant problems were not present *at the time* of the prepurchase exam, and he had no way of predicting how the melanoma would progress.

Because of cases like this, Werner urges veterinarians to identify and explain all abnormalities on prepurchase exams and to inform buyers of typical and worst-case scenarios to help them make informed

purchasing decisions. "The veterinarian's role," said Werner, "is to provide perspective and explain the unpredictable biologic behavior of melanoma, the potential for local invasion, multiplication of additional lesions, as well as the potential for melanoma to target internal organs and tissues." That said, in most horses, melanoma pathology does not progress beyond external skin lesions, he added.

In summary, Werner said the veterinar-

ian's role in a purchase is to educate and inform through verbal and written communications, and the buyer should not hesitate to ask questions about his or her potential equine purchase.

Belgian JEB Carrier Rate Steady; Mare Testing To Be Required

Breed registry officials have taken steps over the last decade to reduce the number of Belgian foals born with a fatal skin



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disorder called junctional epidermolysis bullosa (JEB). And while veterinarians report anecdotally that they're seeing fewer cases, a new analysis of mandatory sire screening results has spurred the registries to expand testing requirements.

John D. Baird, BVSc, PhD, professor emeritus of the University of Guelph's Ontario Veterinary College, worked with researchers at the University of California (UC), Davis, Veterinary Genetics Laboratory to examine 10 years of data from both the Belgian Draft Horse Corporation of America (BDHCA) and the Canadian Belgian Horse Association (CBHA).

Junctional epidermolysis bullosa is one of a large group of inherited diseases that result from a failure to produce a protein essential for skin layer adhesion. Affected foals are "characterized clinically by a fragile skin that results in ulcers and erosions following minor trauma," he said. These diseases are named for where the level of separation takes place in the skin. Epidermolysis bullosa can occur in a variety of species, but Belgian horses experience a particular type at the level between the epidermis (outer layer of the skin) and the dermis, which is immediately beneath the epidermis. Often called "hairless foals," Belgian neonates with JEB have large lesions on the body that appear as if the skin is missing.

He said owners might notice a blood-tinged discharge coming from an affected newborn foal's mouth. Inside the mouth they'll often discover blisters and ulcers as the source of the blood. Foals with JEB also have incisor teeth visible at birth (normally, a newborn foal has no teeth) that are serrated from enamel erosion. Owners usually first notice the skin lesions over the joints and where there is contact pressure (mainly on areas where their skin makes contact with the ground when they lie down, such as over fetlock joints, hock joints, and even on the head). Lesions on the foals' legs often extend all the way down to the feet. Human researchers have suggested that leg rubbing *in utero* could be the cause of these lesions that might be present at birth. Some foals with JEB will lose one or more hooves due to absence of the protein.

In 2001 French human researchers identified in JEB-affected foals a mutation in a gene (LAMC2) that encodes the skin adhesion protein laminin-332 (whose function is to anchor the epidermis to the

MANAGING AXILLARY WOUNDS IN HORSES

Amanda-Jo Joswig, DVM, MPH, a postdoctoral research associate at the Texas A&M College of Veterinary Medicine & Biomedical Sciences, reviewed how veterinarians should manage equine axillary wounds—those that damage the space between the inside of the upper forelimb and the body wall, for instance, those resulting when a fence post impales a horse's chest.

Axillary wounds are common in horses, Joswig said. And while these insults might appear minor, they can be accompanied by severe complications, including:

- Pneumothorax (air in the chest cavity);
- Subcutaneous emphysema (air pockets beneath the skin);
- Hemothorax (blood pooling in the chest cavity); and
- Pneumomediastinum (air in the mediastinum, the space between the lungs).

An affected horse's prognosis for survival is generally good. Joswig and colleagues recently reviewed the medical records of seven horses, aged 8 months to 16 years, with axillary wounds examined at the Texas A&M Veterinary Medical Teaching Hospital.

They found that:

- All horses developed subcutaneous emphysema two to four days after wound occurrence;
- Via radiography, veterinarians diagnosed pneumomediastinum in three cases (and suspected it in two cases), bilateral pneumothorax in three cases, and unilateral pneumothorax in one case;
- All horses underwent similar treatment, including wound cleaning, exploration, packing, bandaging, and treatment with an NSAID and an antibiotic;
- Two horses underwent treatment for subcutaneous emphysema, and veterinarians aspirated air from the chest cavity in three of the four horses with pneumothorax. Joswig said the remaining horses with subcutaneous emphysema and pneumothorax "resolved on their own once the inciting cause (axillary wound) was addressed"; and
- All patients survived to discharge.

"An important finding of this study is recognition that there is a repeatable association between equine axillary wounds and the development of secondary complications," Joswig noted, adding that serial evaluations help ensure quick and efficient treatment of complications.

Be sure to contact your veterinarian immediately if your horse suffers an axillary wound.



COURTESY DR. AMANDA-JO JOSWIG

Veterinarians can suture a stent in place to cover and keep axillary wounds clean.

underlying dermal cells). They also established an autosomal recessive mode of inheritance, which means the foal must be homozygous—carrying two copies of the defective LAMC2 gene, one from each parent—to develop JEB. Scientists at UC Davis developed a PCR test that would detect carriers, and the BDHCA and CBHA put sire testing requirements in place in November 2002 and January 2003, respectively, for new foal registrations.

Baird said the aim of the requirements was and is to prevent the birth of JEB foals and reduce the number of carriers in the breed. "Tests are done through (the) corporation office," he said, "with all fees paid in advance. JEB testing of mares is voluntary, except when mares are bred by artificial insemination with frozen semen."

For the two Belgian herd books, the UC Davis team tested mane hair root samples from 2,554 horses for JEB from November 1, 2002, to December 31, 2012. Findings included:

- 319 (12.5%) were carriers, which breaks down as 206 (11.5%) of the 1,785 tested for BDHCA, and 47 (12%) of 391 tested for CBHA;
- In both registries, only 336 mares have been tested, with 65 (17.8%) identified as carriers;
- In the past three years, of the 42 carriers identified in the BDHCA registry, 21 (50%) were sired by noncarrier stallions and out of mares that had not been JEB-tested; and
- In 2012, of 132 horses that were JEB-tested, 12 (10 stallions and two mares)

were identified as carriers. Of the horses JEB-tested, 100 (75.8%) were sired by noncarrier stallions, 30 (22.7%) were sired by stallions born before mandatory testing was required, and two were sired by one known carrier stallion.

“There have been variations in numbers tested over the years,” Baird said. “It’s disappointing the low number of mares tested. The registries charge less for mare testing because they’re trying to encourage mares to be tested, but people are still relying on the stallion testing” to reduce their chance of having a JEB-affected foal.

While Baird and his team did not see a statistically significant trend of decline in carrier numbers over the 10 years of testing, “the good news is that, in 2012 of a total of 608 male registrations, 83% (504) were sired by noncarrier stallions,” he noted. “Anecdotally, I cannot prove it, but I know that less of these animals have foals with JEB. We don’t hear much of the condition anymore. Most people are now using noncarrier stallions; however, the bad news is that only 4% of broodmares are being JEB-tested. Many of the carriers that are now being detected are getting the mutation from their nontested dams.”

He said that in response to the findings, the BDHCA will introduce mandatory JEB and DNA testing of breeding-age mares on Jan. 1, 2015. “When both the sire and dam have been tested as noncarriers, the resulting foals will be recognized by the registry as noncarriers and will only need DNA testing to verify their parentage,” he said. “This will result in considerable financial savings to the breeders.”

Does Silver Dressing Improve Equine Leg Wound Healing?

Veterinarians report that many horse owners will try anything and everything to help wounds recover quickly—regardless of whether the approach has scientific backing. Recently, Maureen Kelleher, DVM, Dipl. ACVS, of the San Dieguito Equine Group, in San Marcos, Calif., and colleagues put some evidence behind one type of wound dressing: silver sodium zirconium phosphate polyurethane foam wound dressing or, simply, SPF (not to be confused with sunscreen) dressing.

The dressing is a semi-occlusive (the wound is protected, but water and gas can still pass through) polyurethane-based foam that includes ionic silver exchange resin and antimicrobial dyes believed to

help manage open wounds, Kelleher said. She and her team set out to determine if the dressing improved second-intention healing (leaving a wound open to heal, rather than suturing it) of experimentally induced wounds on horses’ lower limbs.

Kelleher and colleagues created 1-inch square wounds on each of six horses’ forelimbs—one of each horse’s legs served as a control and the other was treated with SPF foam. Then they bandaged each leg, adding a 1-inch square pad with SPF foam to the test legs’ wraps. Team members changed the bandages every three days until each wound had healed, and they collected aerobic culture swabs on days the wraps were changed. They found that:

- Treated wounds were significantly smaller throughout the study and had lower granulation tissue (proud flesh) scores than control wounds;

“The SPF dressing was associated with significantly improved measures of wound healing in this experimental model.”

DR. MAUREEN KELLEHER

- There was no significant difference in healing time between the two groups, although the majority of the SPF-treated wounds resolved slightly faster than control wounds; and
- Bacterial growth was detectable in all wounds at least once during the study.

Kelleher cautioned that the wounds in the study don’t reflect naturally occurring wounds and that additional studies are needed to evaluate the dressing’s effects on clinical wounds.

She also noted that the dressing might not be cost-effective for large, draining, or purulent (pus-containing) wounds; it is more beneficial in smaller wounds with a mild to moderate amount of exudates (a high-protein fluid derived from blood and deposited in tissues or on tissue surfaces, usually as a result of inflammation), more along the lines of the wounds in this study.

Kelleher said the product is marketed as RTD (or Retro-Tech Dressing) and is available through Pioneer Vet and Animal Wound Care Worldwide. ◀

PROTAZIL

ANTIPROTOZOAL PELLETS (1.56% diclazuril)

FOR ORAL USE IN HORSES ONLY

For the treatment of equine protozoal myeloencephalitis (EPM) caused by *Sarcocystis neurona* in horses.

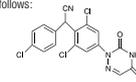
CAUTION

Federal (U.S.A.) law restricts this drug to use by or on the order of a licensed veterinarian.

NADA 141-268 Approved by FDA

DESCRIPTION

Diclazuril, (+)-2,6-dichloro-*o*-(4-chlorophenyl)-4-(4,5-dihydro-3,5-dioxo-1,2,4-triazin-2(3H)-yl)benzenacetamide, has a molecular formula of $C_{17}H_{14}Cl_3N_4O_2$, a molecular weight of 407.64, and a molecular structure as follows:



Diclazuril is an antiprotozoal (antiprotozoal) compound with activity against several genera of the phylum Apicomplexa. PROTAZIL[®] (diclazuril) is supplied as oral pellets containing 1.56% diclazuril to be mixed as a top-dress in feed. Inert ingredients include dehydrated alfalfa meal, wheat middlings, cane molasses and propionic acid (preservative).

INDICATIONS

PROTAZIL[®] (1.56% diclazuril) Antiprotozoal Pellets are indicated for the treatment of equine protozoal myeloencephalitis (EPM) caused by *Sarcocystis neurona* in horses.

DOSEAGE AND ADMINISTRATION

Dosage: PROTAZIL[®] (1.56% diclazuril) is administered as a top dress in the horse’s daily grain ration at a rate of 1 mg diclazuril per kg (0.45 mg diclazuril/lb) of body weight for 28 days. The quantity of PROTAZIL[®] necessary to deliver this dose is 64 mg pellets per kg (29 mg pellets/lb) of body weight.

Administration: To achieve this dose, weigh the horse (or use a weigh tape). Scoop up PROTAZIL[®] to the level (cup mark) corresponding to the dose for the horse’s body weight using the following chart:

Weight Range of Horse (lb)	mLs of Pellets	Weight Range of Horse (lb)	mLs of Pellets
275 - 524	20	1275 - 1524	60
525 - 774	30	1525 - 1774	70
775 - 1024	40	1775 - 2074	80
1025 - 1274	50	-	-

One 2-lb bucket of PROTAZIL[®] will treat one 1100-lb horse for 28 days. One 10-lb bucket of PROTAZIL[®] will treat five 1100-lb horses for 28 days.

CONTRAINDICATIONS

Use of PROTAZIL[®] (1.56% diclazuril) Antiprotozoal Pellets is contraindicated in horses with known hypersensitivity to diclazuril.

WARNINGS

For use in horses only. Do not use in horses intended for human consumption. Not for human use. Keep out of reach of children.

PRECAUTIONS

The safety of PROTAZIL[®] (1.56% diclazuril) Antiprotozoal Pellets in horses used for breeding purposes, during pregnancy, or in lactating mares has not been evaluated. The safety of PROTAZIL[®] (1.56% diclazuril) Antiprotozoal Pellets with concomitant therapies in horses has not been evaluated.

ADVERSE REACTIONS

There were no adverse effects noted in the field study which could be ascribed to diclazuril.

To report suspected adverse reactions, to obtain a MSDS, or for technical assistance call 1-800-224-5318.

CLINICAL PHARMACOLOGY

The effectiveness of diclazuril in inhibiting merozoite production of *Sarcocystis neurona* and *S. falcatula* in bovine turinate cell cultures was studied by Lindsay and Dubey (2000). Diclazuril inhibited merozoite production by more than 80% in cultures of *S. neurona* or *S. falcatula* treated with 0.1 mg/mL diclazuril and greater than 95% inhibition of merozoite production (IC_{50}) was observed when infected cultures were treated with 1.0 mg/mL diclazuril. The clinical relevance of the in vitro cell culture data has not been determined.

PHARMACOKINETICS IN THE HORSE

The oral bioavailability of diclazuril from the PROTAZIL[®] (1.56% diclazuril) Antiprotozoal Pellets at a 5 mg/kg dose rate is approximately 5%. Related diclazuril concentrations in the cerebrospinal fluid (CSF) range between 1% and 5% of the concentrations observed in the plasma. Nevertheless, based upon equine pilot study data, CSF concentrations are expected to substantially exceed the in vitro IC_{50} estimates for merozoite production (Dirikolu et al., 1999). Due to its long terminal elimination half-life in horses (approximately 43-65 hours), diclazuril accumulation occurs with once-daily dosing. Corresponding steady state blood levels are achieved by approximately Day 10 of administration.

EFFECTIVENESS

Two hundred and fourteen mares, stallions, and geldings of various breeds, ranging in age from 9.6 months to 30 years, were enrolled in a multi-center field study. All horses were confirmed EPM-positive based on the results of clinical examinations and laboratory testing, including CSF Western Blot analyses. Horses were administered PROTAZIL[®] (1.56% diclazuril) Antiprotozoal Pellets at doses of 1, 5, or 10 mg diclazuril/kg body weight as a top-dress on their daily grain ration for 28 days. The horses were then evaluated for clinical changes via a modified Mayhew neurological scale on Day 48 as follows:

0. Normal, neurological deficits not detected.
1. Neurological deficits may be detectable at normal gaits; signs exacerbated with manipulative procedures (e.g., backing, turning in tight circles, walking with head elevation, truncal swaying, etc.).
2. Neurological deficit obvious at normal gaits or posture; signs exacerbated with manipulative procedures.
3. Neurological deficit very prominent at normal gaits; horses give the impression they may fall (but do not) and buckle or fall with manipulative procedures.
4. Neurological deficit is profound at normal gait; horse frequently stumbles or trips and may fall at normal gaits or when manipulative procedures were utilized.

Horses are recumbent, unable to rise.

Each horse’s response to treatment was compared to its pre-treatment values. Successful response to treatment was defined as clinical improvement of at least one grade by Day 48 ± conversion of CSF to Western Blot-negative status for *S. neurona* or achievement of Western Blot-negative CSF status without improvement of 1 ataxia grade.

Forty-two horses were initially evaluated for effectiveness and 214 horses were evaluated for safety. Clinical condition was evaluated by the clinical investigator’s subjective scoring and then corroborated by evaluation of the neurological examination videotapes by a masked panel of three equine veterinarians. Although 42 horses were evaluated for clinical effectiveness, corroboration of clinical effectiveness via videotape evaluation was not possible for one horse due to missing neurological examination videotapes. Therefore, this horse was not included in the success rate calculation.

Based on the numbers of horses that seroconverted to negative Western Blot status, and the numbers of horses classified as successes by the clinical investigators, 28 of 42 horses (67%) at 1 mg/kg were considered successes. With regard to independent expert masked videotape assessments, 10 of 24 horses (42%) at 1 mg/kg were considered successes. There was no clinical difference in effectiveness among the 1, 5, and 10 mg/kg treatment group results. Adverse events were reported for two of the 214 horses evaluated for safety. In the first case, a horse was enrolled showing severe neurologic signs. Within 24 hours of dosing, the horse was recumbent, biting, and exhibiting signs of dementia. The horse died, and no cause of death was determined. In the second case, the horse began walking stiffly approximately 13 days after the start of dosing. The referring veterinarian reported that the horse had been fed grass clippings and possibly had laminitis.

ANIMAL SAFETY

PROTAZIL[®] (1.56% diclazuril) Antiprotozoal Pellets were administered to 30 horses (15 males and 15 females, ranging from 5 to 9 months of age) in a target animal safety study. Five groups of three horses each (2 males and 3 females) received 0, 5 (5X), 15 (15X), 25 (25X) or 50 (50X) mg diclazuril/kg (2.27 mg/lb) body weight/day for 42 consecutive days as a top-dress on the grain ration of the horse. The variables measured during the study included: clinical and physical observations, body weights, food and water consumption, hematology, serum chemistry, urinalysis, fecal analysis, necropsy, organ weights, gross and histopathological examinations. The safety of diclazuril top-dress administered to horses at 1 mg/kg once daily cannot be determined based on this study because of the lack of an adequate control group (control horses tested positive for the test drug in plasma and CSF). However, possible findings associated with the drug were limited to elevations in BUN, creatinine, and SDH and less than anticipated weight gain. Definitive test article-related effects were decreased grain/top-dress consumption in horses in the 50 mg/kg group.

In a second target animal safety study, PROTAZIL[®] (1.56% diclazuril) Antiprotozoal Pellets were administered to 24 horses (12 males and 12 females, ranging from 2 to 8 years of age). Three groups of 4 horses/sex/group received 0, 1, or 5 mg diclazuril/kg body weight/day for 42 days as a top-dress on the grain ration of the horse. The variables measured during the study included physical examinations, body weights, food and water consumption, hematology, and serum chemistry. There were no test article-related findings seen during the study.

STORAGE INFORMATION

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HOW SUPPLIED

PROTAZIL[®] (1.56% diclazuril) Antiprotozoal Pellets are supplied in 2-lb (0.9 kg) and 10-lb (4.5 kg) buckets.

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ATHLETIC Injuries

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ALEXANDRA BECKSTETT
ERICA LARSON
NANCY LOVING, DVM

High-Speed Exercise and Bone Response

Bone was once considered an inert material with its structure defined by genetics. But there's a lot more at work, said Larry Bramlage, DVM, MS, Dipl. ACVS: "Selective breeding dictates the initial skeleton, but adaptive training in response to exercise modifies it further." He and other surgeons are striving to better understand the balance between tolerable and excessive damage—the adaptive kind that occurs naturally and the type that sidelines animals or ends their careers.

Bramlage, of Rood & Riddle Equine Hospital, in Lexington, Ky., explained that bone is the only tissue capable of entirely reconstituting itself. With this capacity to change, there are several ways long bones strengthen in response to training, including modeling and remodeling. Modeling is the process in which bone adds to itself, inside and out, while remodeling is how existing bone alters itself.

He described the dynamic nature of bone activity on a cellular level. Two cell types are involved in modeling and remodeling: osteoblasts and osteoclasts. Osteoblasts become trapped in the bone

and become osteocytes, which are key to sensing biomechanical loads on the skeleton during exercise and directing bone tissue response accordingly. As they detect mechanical loads, they prompt additions to (formation) or reductions in (dissolution) bone mass to achieve correct density for current demands. Osteoclasts then tunnel through and cut canals into the bone, with osteoblasts following to make new bone.

“Bone trains in a stair-step fashion with adaptations being work-specific.”

DR. LARRY BRAMLAGE

It's important to note that bone becomes stiffer as it ages. "This can become a problem when bone formation stops for a time and then is reinitiated due to changing stimuli," said Bramlage.

As bone loses its homogeneous structure, a distinct interface forms between new and old bone that can promote failure, similar to the interface of two pavement types in a patched pothole. "Bone trains in a stair-step fashion with adaptations being work-specific," he stressed.

"Overloading results in microfractures that stimulate bone to strengthen (osteoblasts create new tissue to fill and repair microfractures), but if there is inadequate repair in the face of exercise, damage accumulates."

This is "exercise debt" that must be paid, he said. Rest is effective treatment, as it enables overlying new bone to become as stiff as the old bone, repair damage, and add bone to better withstand exercise.

Researchers have shown in numerous studies that it's ideal to train 2-year old Thoroughbreds; otherwise, their bone growth stops, and the interface between old and new is more susceptible to stress fracture. "By converting growing bone into exercising bone before it stops growing, there isn't the interruption in the bone formation and, therefore, quality," he explained.

Further, bone trains to the exercise level instead of amount. Bramlage said this is not true of the cardiovascular system, which requires the animal to complete a volume of work before improvements in cardiovascular capacity are observable. Therefore, cardiovascular development must be balanced with bone training and not progress faster than the bone can respond; in the horse the heart and lungs are capable of responding much faster than the bone to large exercise loads. Trainers developed interval training programs,

which presented means of rapidly improving the cardiovascular system in people but resulted in too many destructive repetitive cycles on bone in horses.

“After a number of cycles necessary to stimulate bone strength, further repetitive work becomes traumatic,” he said. “We gallop too much and don’t vary gaits enough.” Repetitive cycling stress from high-speed exercise causes damage that must be repaired and causes the bone to remodel to prevent the damage from occurring again, but this takes time. For instance, he noted that a horse running 35 high-speed furlongs in a two-month period is four times more likely to experience fatal skeletal injury than a horse running 25 high-speed furlongs over the same time.

“All athletic horses get the same diseases in bone, but in the high-level racehorse the degree is magnified,” he added. This is particularly true in joints, he noted, because bones cannot enlarge or distort at joint surfaces because the body must preserve original joint anatomy. The bone must respond by changing internally, which it cannot do quickly enough during periods of too-intense training and repetitive stress. This can cause bruising at the ends of long bones, predisposing the areas to fractures and degeneration if there’s no intervention.

Bramlage also suggested that there might be a tendency among individuals in the racing industry to select against “durable” racehorses if the qualities they strive

for favor early brilliance and speed over longevity. The skeleton is “dead weight” during exercise, so a lighter horse is faster, he said, if all else is equal. As horses are selected for more speed, their lighter structures might not be able to withstand the wear and tear of intense exercise. Shoeing appliances, like toe grabs, and various track surface types can add to the problem by altering gait and concussion.

Increasing the rest time between races

improves the opportunity for bone injury healing, but Bramlage stressed that “for treatment, nothing compares to paddock turnout to resolve cumulative stress injury in significantly damaged bone.”

A Review of Fatal Fetlock Injuries

One of the most common sites of catastrophic injuries in Thoroughbred racehorses is the fetlock and its surrounding structures. Taking steps toward preventing

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COURTESY DR. DOUG HERTHEL

California racehorses that suffer catastrophic fetlock injuries usually fracture both sesamoids.

these injuries from happening, four veterinarians with the California Horse Racing Board (CHRB) and University of California (UC), Davis, Racing Injury Prevention Program recently studied past breakdowns and their causes. Erin McKerney, DVM, a veterinarian at the UC Davis J.D. Wheat Veterinary Orthopedic Research Laboratory, presented the team's findings.

"Fetlock injuries comprise over half of fatal musculoskeletal injuries among California racehorses," she said. "Repetitive loading and fetlock hyperextension associated with training and racing subject fetlock-supporting musculoskeletal structures to degenerative and adaptive changes. These changes can weaken key structures, thus predisposing the fetlock region to catastrophic fracture."

Knowing which pre-existing lesions put

these horses at most risk for breakdown and how to detect them before the worst happens would serve sport- and racehorse practitioners—and their patients—well. So, to this end, McKerney and her team analyzed post-mortem examination records of 358 California racehorses (Thoroughbreds, Quarter Horses, and one Arabian) that sustained catastrophic injuries from July 2011 to July 2013. Of these, she said 185 (52%) incurred fatal fetlock injuries. They categorized the 185 cases by injury site, fracture configuration, and pre-existing lesions and compared horses' age, breed, gender, limb injured, and the track surface on which the animals raced.

"Proximal sesamoid bone fracture (that of one of the two small bones at the base of the cannon in back of the fetlock joint)

was the most common cause of fetlock injury, followed by cannon bone (MC3) fracture, soft tissue injury, and long pastern bone (P1) fracture," McKerney said. "Eighty-eight percent of fetlock injuries included visible evidence of a pre-existing lesion, with visibly discrete lesions observed in 65% of fractured proximal sesamoids. The most common lesion was subchondral bone discoloration and porosity at the abaxial (outward facing) aspect of the medial (inner) proximal sesamoid bone."

McKerney listed other findings of note in the fetlock cases, including:

- Horses older than 5 were more likely to sustain soft tissue injuries;
- There was evidence of pre-existing lesions in most horses sustaining fatal fetlock injuries, particularly those with sesamoid and cannon bone fractures;
- Both sesamoid bones in the fetlock are usually fractured;
- Cannon bone fractures most commonly affected the lateral (outside) condyle;
- Rupture of the ligaments that connect the sesamoid bones to the pastern was the most common soft tissue injury;
- Sesamoid bone fracture was also the most common Quarter Horse injury;
- Ligament injuries were more common in Thoroughbreds than Quarter Horses;
- Fetlock injuries usually occurred in the front limbs;
- Injuries did not differ among track surfaces; and
- Most pastern bone fractures occurred during training, while most soft tissue injuries occurred during racing.

McKerney said researchers can use these observations to identify patterns that could help them detect problems early and prevent breakdowns.

COULD A SUPPLEMENT EASE THE EFFECTS OF TYING-UP?

Tying-up, or exertional rhabdomyolysis, is a muscle disorder that trainers try diligently to prevent through diet and exercise approaches. Japanese researchers recently tested a supplement designed to alleviate both tying-up episodes and muscle damage, with positive results.

The supplement included astaxanthin and L-carnitine, said Fumio Sato, DVM, PhD, of the Japan Racing Association's (JRA) Hidaka Training and Research Center. The former, he said, has strong antioxidant effects, while the latter has been shown to enhance fatty acid oxidation (a process the body uses for energy production and immune function).

Sato and colleagues studied the supplement's effects on blood serum markers of exercise-induced muscle damage and tying-up episodes in Thoroughbred racehorses in training.

The team fed the supplement—which contained 75 mg of astaxanthin and 3,000 mg of L-carnitine—to 31 horses in daily training for eight weeks; 32 control horses did not consume the supplement. The researchers collected blood samples from each horse before supplementation began and three days and eight weeks after it started. They also evaluated any instances of tying-up. Their key findings included:

- After eight weeks, the controls had significantly higher creatine kinase (CK, an enzyme indicative of muscle damage) activity compared to their levels at three days; the supplemented horses showed no difference in CK activity between three days and eight weeks;
- After eight weeks, the controls had significantly higher CK levels than supplemented horses;
- Supplemented horses tended to have lower lactate dehydrogenase-5 (another enzyme indicative of muscle damage) levels than control horses; and
- Supplemented horses experienced significantly fewer instances of tying-up (10.4%) during the eight-week period than control horses (34.5%).

Based on those findings, Sato concluded, "Continuous dietary administration of astaxanthin and L-carnitine attenuates exercise-induced muscle damage and can prevent the onset of tying-up syndrome in Thoroughbred horses."

Sato said the supplement studied is commercially available in Japan and is widely used in the country's Thoroughbred industry; it will likely be available in the United States in the future.



COURTESY DR. FUMIO SATO

Suspensory Injury's Effect on Future Racing Performance

You had high hopes for your Thoroughbred racing prospect until he sustained a suspensory ligament branch injury as a yearling. The question now is, after rehab, should you continue to pursue racing, or should you point him down a different career path? Researchers say the answer depends on the severity of the injury.

Jonathan McLellan, BVMS, MRCVS, and Sarah Plevin, BVMS, MRCVS, of Florida Equine Veterinary Associates, in Ocala, recently hypothesized that youngsters who injure a suspensory ligament branch

are less likely to race to their potential.

Specifically, the team reviewed juvenile insertional suspensory branch injuries (JISBI), which occur at the suspensory ligament's insertion on the proximal sesamoids between ages 1 and 2. Clinical signs include localized heat and swelling, pain on palpation, variable lameness (typically following speed work), a dropped appearance of the fetlock, and fetlock joint effusion (swelling). Veterinarians typically diagnose JISBI using ultrasound.

They reviewed clinic records on 85 juvenile horses presenting over three years with JISBI in one suspensory ligament branch. For controls, they matched each case with its disease-free maternal sibling and compared race starts, earnings, speed figures, and age at first start, finding that:

- Of the injured horses, 56 eventually raced, indicating they were four times less likely to start in a race than controls;
- Sixty-six percent of JISBI cases started a race, compared to 89% of controls;
- Total earnings per start for JISBI cases were less than controls;
- Mild JISBI cases performed similarly to controls by 3 years of age;
- Horses with moderate to severe JISBI performed worse than controls;
- The more severe the initial injury, the higher the re-injury rate, with 37% of the most severe JISBI cases suffering re-injury by the end of their 3-year-old racing seasons, compared to 10% of mild cases and 23% of moderate cases.

Overall, horses with JISBI had fewer starts and less earnings than controls.

However, "although JISBI results in a



ANNE M. EBERHARDT

Veterinarians are asking whether furosemide can alter long-term changes associated with EIPH.

reduced likelihood of starting a race, those horses that make it to race show very few differences in earnings from controls and might live up to their genetic potential."

In conclusion, McLellan said veterinarians should take radiographs and ultrasound images if they suspect suspensory branch injury and always consider the injury's severity when providing a prognosis.

“To not race on furosemide is a competitive disadvantage.”

DR. RICK ARTHUR

Managing Cystic Stifle Lesions

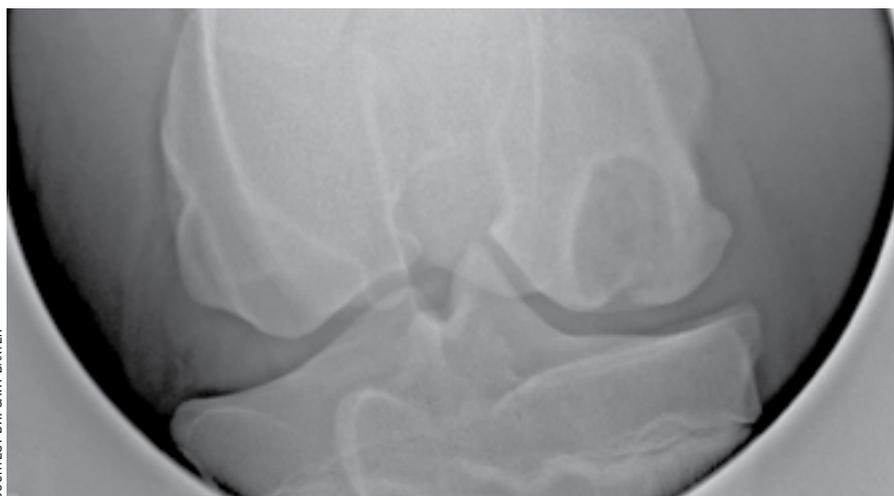
Could something smaller than a pea end a horse's athletic career? If it is a cystic lesion in the stifle (or femoral condylar cyst), it's entirely possible. Fortunately,

specific management approaches can help some horses return to the arena or the track with few, if any, lasting effects.

Wayne McIlwraith, BVSc, PhD, Dipl. ACVS, ACVSMR of the Colorado State University's Equine Orthopaedic Research Center, in Ft. Collins, said there are five different types of cystic lesions that arise in the stifle joint—some defects are dome-shaped, some circular, and in some, there is flattening of the condyle at the end of the femur. Historically, clinical signs tend to recur following treatment when the horse returns to its previous athletic level.

In general, McIlwraith noted that intra-articular (in the joint) corticosteroid injections tend to be unrewarding. Surgeons performing arthrotomy (opening up the joint) with debridement of the cystic lesion have experienced a relatively high success rate, but the procedure is quite invasive. Instead, they often debride the lesion arthroscopically and inject corticosteroids directly into the lesion with success; sometimes they augment this approach by adding a bone graft over the lesion. Another treatment option that shows promise is the placement of a stainless steel lag screw across the condyle through the lesion.

"If the margin of the cyst is stable without collapse, then arthroscopy with intralesional steroids is a good approach," he said. If the cystic edges are unstable or arthroscopic surgery fails to resolve lameness, then he recommends treating with surgical debridement. Success rates for return to soundness following arthroscopic debridement are 64-72%, depending on the size of lesion and horse's age. The best results are seen in horses younger than 3 and in lesions smaller than 15 mm.



COURTESY DR. GARY BAXTER

This 2-year-old suffers from a medial femoral condylar cyst in his stifle.

McIlwraith explained that lack of resolution could be related to tears in the stifle's meniscus or meniscal ligaments; about 9% of horses with stifle cysts have concurrent meniscal lesions. He also said it is possible for a meniscal lesion to develop after surgical debridement—the debrided edges of the cyst might act like a cookie cutter and cause inadvertent meniscus injury. Administering certain types of intralesional steroids (such as methylprednisolone) might be counterproductive and increase bone resorption (basically, the bone would lose tissue or break down); other corticosteroids, such as triamcinolone, provide better outcomes. In horses with cysts in only one stifle, 90% improved in their comfort with triamcinolone injected under arthroscopic guidance, whereas a 67% of horses with cysts in both stifles improved.

The screw technique might help relieve strain on a subchondral bone cyst (located just under the cartilage surface within a joint) and promote formation of trabecular bone (the precursor to hard bone tissue) within the cyst and bone remodeling. McIlwraith said the screw technique has been shown to decrease lameness grades and to improve density of the cystic lesion with new bone growth. The screw can be left in place permanently with no untoward effects on horses in active training.

In summary, McIlwraith said success rates of horses with unilateral cystic lesions treated arthroscopically with intralesional injection of triamcinolone acetonide can reach 90%, and success rates of horses treated with debridement range from 30-70%, depending on the cyst's size and the horse's age. He also said the lag screw technique is an excellent option to use in horses when previous approaches have failed.

Managing EIPH in Racehorses

Racehorses must be healthy and at their peak fitness to be successful. One commonly combated health condition—exercise-induced pulmonary hemorrhage, or EIPH—can be performance-limiting and even deadly for these athletes. As racehorse medication reform has taken center stage in recent years, the racing world has been rife with controversy over whether to allow horses in America to race while medicated to help control the condition, or to implement a medication-free racing policy.

Convention Tweet

Alexandra Beckstett
 @TH_ABeckstett

Tibia stress fractures one of the most common causes of hind limb lameness in young Thoroughbred racehorses.

Rick Arthur, DVM, described the condition's history, what it does to the horse, and how veterinarians currently treat it.

Arthur, of UC Davis, and the equine medical director for the CHRB, said veterinarians originally thought that the bleeding derived from injury to the blood vessel-rich area within the head. But, in 1974, with the advent of a simple fiberoptic scope, it was determined that the bleeding was coming from the blood vessels within the lungs. This discovery modified how veterinarians approach the syndrome's diagnosis and treatment. Veterinarians coined the term "exercise-induced pulmonary hemorrhage" after conducting post-race endoscopic exams at racetracks in the late 1970s, Arthur added.

“Fetlock injuries comprise over half of fatal musculoskeletal injuries among California racehorses.”

DR. ERIN MCKERNEY

Bleeding is apparent in 40-80% of affected horses on a single exam post-race, depending on endoscope length and other factors, and it is evident in 85% or more of horses examined multiple times. But Arthur stressed that the most notable feature is found with microscopic exam of tracheal cells; 100% of samples have signs of EIPH. He said that all racehorses bleed, but some are more seriously affected than others.

Arthur explained that studies in Hong Kong from the mid-1980s demonstrated pronounced pathological cellular structure changes in EIPH horses' lungs,

primarily in the dorsal-caudal (top, back) portions of the lung. Similarly, he said, veterinarians have learned they can identify physiological changes with nuclear scintigraphy and lung function tests in horses with advanced EIPH. Both lung structure and function can change in chronic EIPH cases, he said.

Veterinarians grade bleeders on a 0 to 4 scale (4 being most severe), describing how much of the trachea's circumference is blood-streamed. Arthur said the scale correlates to performance: The more the occlusion, the worse the performance. Episodes occur during racing and training.

Arthur explained that a galloping horse takes up to 130 to 150 breaths per minute, and his heart beats a maximum of 220 to 240 beats per minute. The heart beats so rapidly that its left side (atrium) doesn't have time to fill, causing blood to back up into the lungs. This increased pressure leads to capillaries breaking and blood entering the lungs' interstitial (surrounding the cells) spaces. The body's normal response eventually results in interstitial fibrosis, which compromises racing athletes' long-term potential, he said, by creating areas of less efficient air exchange.

Historically, veterinarians have used furosemide to manage bleeders. Arthur reported it is quite effective in reducing bleeding, particularly in Grade 3 and 4 horses. He pointed out that in addition to experiencing a profound effect on the cardiovascular system, horses can run three to five lengths faster than horses not medicated with furosemide; "to not race on furosemide is a competitive disadvantage." This has caused nearly all trainers to put their racehorses on this medication.

"The question that remains," said Arthur, "is whether or not furosemide can alter long-term pathological changes associated with EIPH."

Considerable research has been done on EIPH over the last 30 years, Arthur concluded, but there is still much to do. 🐾

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LAMENESS

Diagnostics

STEPHANIE L. CHURCH

ALEXANDRA BECKSTETT
 NANCY LOVING, DVM

Diagnosing Lower Limb Lameness in Sport Horses

“The lower limb is the most common site of lameness in ‘English’ sport horses,” noted Rick Mitchell, DVM, MRCVS, of Fairfield Equine, in Newtown, Conn. Sport horse practitioners must be well-versed in how to diagnose injuries in this region, he said, and should take a “more aggressive” approach to diagnosing these horses to try to reduce loss of training and competition time.

He began by listing factors that can influence lameness development:

- Conformational predisposition;
- Repetitive loading;

- A long toe, low heel, and/or broken-back hoof-pastern axis;
- The manner and frequency with which the horse is shod—medial to lateral (side-to-side) balance and break-over (the moment the heels lift off the ground, which can be impacted by how the farrier adjusts the toe) might be

“There should be a thorough and complete exam overall, including a neurologic evaluation, not just an exam of the lame limb.”

DR. RICK MITCHELL

major contributing factors; and

- The footing on which a horse works.

Mitchell noted that the timing of a lameness exam is critical because a horse can improve with a few days of rest after the owner notes an issue. “Such mild lameness issues may be best re-examined after a day or two of exercise,” Mitchell added.

During a lower limb lameness exam, he said he likes to observe the horse in its stall first and then watch it walking out onto different footing. He looks for indications in the stall of discomfort, such as a hole or mound where the horse has created his preferred standing position.

Then Mitchell suggested stepping back to look at the horse’s body symmetry, musculature, and posture. “There should be a thorough and complete exam overall,

including a neurologic evaluation,” he said. “All limbs, the axial skeleton, and musculature should be examined.”

This should include palpation and passive flexion (flexing a joint to check for normal range of motion) and stress flexion (holding a joint in flexion for a minute before watching the horse jog off) tests. With flexion he sees if the horse is intolerant and/or if he is more lame following flexion.

Mitchell said he likes to observe the horse at both the walk and trot, in hand on straight lines, in circles or figure eights, and on a slope. He watches the horse move freely on the longe line over a firm surface, as well, but cautioned against this step in a very lame horse. If the horse is unruly during any of these portions of the exam, he suggested administering a very small dose of the sedative detomidine to help control the horse without providing pain-relieving effects. He recommended watching the horse move under saddle, when possible, as a rider’s weight often makes subtle problems more apparent. This is also a good opportunity to observe the horse at the canter and how he performs his lead changes.

Once the examiner identifies the lame limb, he or she should assess hoof symmetry and configuration carefully. Further work-up includes using other techniques: hoof tester exam, wedge tests to stretch the deep digital flexor tendon (DDFT) or collateral ligaments (which involves placing a “wedge” under the foot and watching for increased resultant lameness associated with the structure in question), diagnostic nerve blocks, and imaging modalities.

Before beginning diagnostic nerve blocks, Mitchell said, “Make sure the horse isn’t warming out of its lameness. Also, be mindful of show schedules and drug rules before using regional anesthesia.”

If the horse shows signs of overt swelling, significant pain on palpation, and/or decreased range of motion, the veterinarian might elect to skip straight to imaging rather than putting a horse through an unnecessary battery of movement tests that could exacerbate a significant problem.

In summary, Mitchell said veterinarians should “take the time to properly diagnose with powers of observation, a thorough exam with limb manipulations and exercise, and use diagnostic tools and imaging techniques to arrive at an accurate diagnosis.”



Convention Tweet

Twin Pines Equine
@TwinPinesEquine

MRI has redefined the term “navicular disease”- it’s more than just bony changes! - Dr. Brendan Furlong.

CT Scans Can Help With Stifle Lameness Diagnosis

Diagnosing problems in the stifle joint is difficult due to its location and complex soft tissue structures. Some veterinarians and researchers have proposed using CT arthrography to image the joint, so Sarah Puchalski, DVM, Dipl. ACVR, associate professor of surgical and radiological sciences at the University of California, Davis, School of Veterinary Medicine, sought to study this technique.

Diagnosing stifle lamenesses typically requires anesthesia and an imaging technique such as radiography, ultrasound, or nuclear scintigraphy. However, none of these methods are without flaw: “Radiographs are insensitive, ultrasound is very useful but limited to certain portions of the body, and scintigraphy can be useful but is also very insensitive,” Puchalski said.

A CT unit uses X rays to produce cross-

section images of the body. Scanning large body parts can be difficult, and a special table design is required to evaluate a horse’s stifle. Lingehoeve Diergeneeskunde, a veterinary clinic in The Netherlands, owns a CT scanner capable of scanning horses’ upper limbs, so Puchalski traveled there to work with Erik Bergman, DVM, Dipl. ECAR, and conduct her research.

In the retrospective study, she evaluated records from 137 lame horses that underwent CT arthrography of 141 stifle joints from 2006 to 2013. The average horse age was 8, average lameness grade was 2.1 (on a 0-5 scale, with 0 being sound and 5 being unable to bear weight), and average lesion number was three per stifle.

On CT, Puchalski said they observed various abnormalities of the bones themselves, the material beneath the cartilage surface, and surrounding ligaments and other soft tissues, with the most frequent finding (in 102 of 141 joints) being abnormalities of the meniscotibial ligaments that attach to pieces of cartilage called menisci that cushion the stifle joint.

Puchalski said the combinations of lesions that horses had was statistically important, and horses with more lesions typically had higher lameness scores. In conclusion, she said CT is an important method for diagnosing stifle lameness. The downside is the limited availability of appropriate CT units.

If a horse with stifle lameness has a neg-



COURTESY VETCTNL/DR. ERIC BERGMAN

Although CT scan is an important method for diagnosing stifle lameness, scanning large body parts on horses can be difficult and requires a special CT table design such as this.

ative or mildly abnormal stifle ultrasound and radiographs, she said, consider that other lesions might be present that these imaging methods do not reveal and, if possible, pursue other diagnostic options.

Diagnosing Distal Limb Lameness: From Hoof Testers to MRI

One of the most telling pieces of technology currently used in lameness examinations, said Brendan Furlong, MRB, MRCVS, of B.W. Furlong & Associates, in Oldwick, N.J., is MRI. He offered insights into the evolution of lameness diagnostics and what MRI has revealed about equine lower limb conditions.

Once a veterinarian localizes a problem to the foot (typically using hoof testers and diagnostic analgesia), imaging is generally the next diagnostic modality pursued. But imaging is not without its problems: Radiographs give only a limited peek at what's going on inside, without providing any information about soft tissue pathology (damage or disease); negative results on nuclear scan don't necessarily rule out significant injury; and ultrasound of the foot is challenging and limited in scope at best, because it is difficult to align the probe in a way that visualizes internal tissues, he said.

On the other hand, researchers have proven MRI is useful for exploring equine hoof problems, and they have used this modality to further their understanding about lower limb pathology.

For instance, beginning in the early 1890s veterinarians recognized navicular disease primarily as a bony disease and didn't take into account related soft-tissue problems. This outlook persisted until the advent of routine MRI use in the horse in the late 1990s. Now, veterinarians see navicular disease as a broader-reaching ailment that includes soft tissue problems and edema within the navicular bone.

Prior to MRI studies, veterinarians did not consider bone bruising a serious pathology. Now they have identified it as a significant cause of lameness, especially in acute cases with increased fluid in the bone due to cellular necrosis (death). Early intervention—which MRI allows—might improve the outcome in horses with bruising and edema in bones across a joint (animals that normally would have a guarded diagnosis).

Other potential lameness sources veterinarians have a better understanding

USING BURSOGRAPHY TO DIAGNOSE PALMAR HEEL PAIN

By now it's no secret that MRI is the gold standard in diagnosing pain in the rear (palmar) portion of horses' feet. However, many owners still choose to pursue less-reliable radiography for their heel-sore horses due to the cost and inconvenience of MRI.

Tracy Turner, DVM, MS, Dipl. ACVS, ACVSMR, of Anoka Equine Veterinary Services, in Elk River, Minn., believes there's a more effective diagnostic option for owners hoping to avoid MRI: navicular bursography.

With navicular bursography, veterinarians inject a contrast material into the horse's navicular bursa (the fluid-filled sac cushioning the navicular bone from the deep digital flexor tendon [DDFT] that slides over it) and then radiograph (X ray) the area.

Practitioners originally used this technique to confirm accurate injection of anesthetics (pain relievers) into the bursa. They soon learned they could also use it to evaluate the navicular region when normal radiographs fail to pinpoint the problem.

Bursography offers owners another effective diagnostic option when MRI is not in the cards

- Cystlike lesions in the flexor surface of the navicular bone;
- Uneven areas in the DDFT with juxtaposing cartilage loss;
- Distal annular ligament (which functions to maintain tendon alignment across joints) injuries;
- Bursa tears;
- Enlargement of the collateral sesamoid ligament that attaches the navicular bone to the proximal (upper) end of the short pastern bone; and
- Shrinking of the proximal joint capsule pouch.

"Navicular bursography is a simple technique that can be used to confirm injection into the navicular bursa and can also give valuable new information regarding pathology in the region of the navicular bone," Turner said. "Changes seen by means of contrast navicular bursography represent stages of pathologic damage and allow a more timely therapeutic intervention, more targeted management, and more accurate prognostication."

He concluded that bursography offers veterinarians and owners another effective diagnostic option for palmar foot pain when MRI is not in the cards.

"By adding dye, you get 60% more information on the X ray," said Turner. He said his most frequent finding is cartilage thinning or erosion—a common navicular disease pathology. Other radiographic changes include:

of, thanks to MRI, are distal border fragments of the navicular bone and sidebone, Furlong said.

MRI is also an excellent modality for diagnosing injury to the collateral ligaments around the coffin joint and of deep digital flexor tendon lesions at the insertion on the coffin bone, Furlong said. If collateral ligament injury is identified early on, he explained, it has a much better prognosis for recovery, provided the lesion isn't

associated with the bony insertion and bone remodeling.

Furlong concluded that MRI allows the veterinarian to see all of a horse's pathologies, which allows for practical decisions. He said it can be expensive to incorporate MRI into a practice, but it enables accurate diagnoses that are tremendously beneficial to horses and clients.

Diagnosing Knee and Upper Cannon Bone Injuries

Kit Miller, DVM, FEI-accredited veterinarian and founder of Miller and Associates, in Brewster, N.Y., described how ambulatory veterinarians can identify knee and upper cannon bone injuries using routine imaging modalities.

He urged practitioners to use diagnostic anesthesia to rule out problems in the distal (lower) limb. Following sequential

“Injury within the proximal superficial flexor tendon is especially common in older campaigners.”

DR. RICK MITCHELL

anesthesia, working from the bottom of the limb upward, if the veterinarian does not localize the horse's lameness to the lower limb Miller suggested using a lateral palmar nerve block to isolate the source of lameness to the carpal (knee) area.

He listed some characteristics of injuries within the carpal sheath (which surrounds the superficial and deep digital flexor tendons in the back of the knee, extending several inches above and below the knee joint) and the proximal (upper) cannon bone area:

- Bony lesions might impinge upon the carpal sheath and irritate the DDFT;
- Not all lesions are centrally located, so imaging should also include medial and lateral (both sides) views, not just the midline; and
- Carpal sheath effusion (swelling) might not always be discernible with palpation, but it might be apparent on ultrasound.

Miller said other imaging modalities besides radiography and ultrasound, including CT scan, MRI, nuclear scintigraphy, or tenoscopy (which requires a surgical approach with a fiberoptic camera), can help veterinarians identify persistent or recurrent problems that are difficult to diagnose. He recommended taking serial images to compare changes over time.

Speaking to specific carpal and proximal cannon lamenesses, Miller noted that a horse with proximal suspensory desmitis (inflammation of the upper suspensory ligament) often places the affected limb a bit more to the outside of his body. Commonly, the lameness worsens in the days following the initial injury. Miller urged veterinarians to rapidly identify these injuries, ideally within 10 days, to improve horses' chances of recovering successfully.

"Injury within the proximal superficial digital flexor tendon is especially common in older campaigners," Miller said. Initially, an affected horse might show intermittent lameness that worsens under tack until he warms up. Miller said most horses are not sensitive on palpation, and the horse may or may not become more lame with carpal flexion. "This kind of injury tends to be progressive and degenerative," he said.

Effusion in the carpal sheath is rarely a primary problem, said Miller, and it usually relates to an underlying issue, either bony or soft tissue. Because of its anatomical proximity, veterinarians often assume this could be linked to a superficial digital flexor tendon injury, but that might not be

the case. He also described instances of soft tissue/tendon injury within the carpal canal (the depression running down the back of the knee) that were not accompanied by effusion.

Miller stressed that a solid working knowledge of carpal and proximal cannon bone region anatomy, coupled with thorough and methodical nerve blocks and imaging techniques, can help a practitioner make an accurate diagnosis. 🐾

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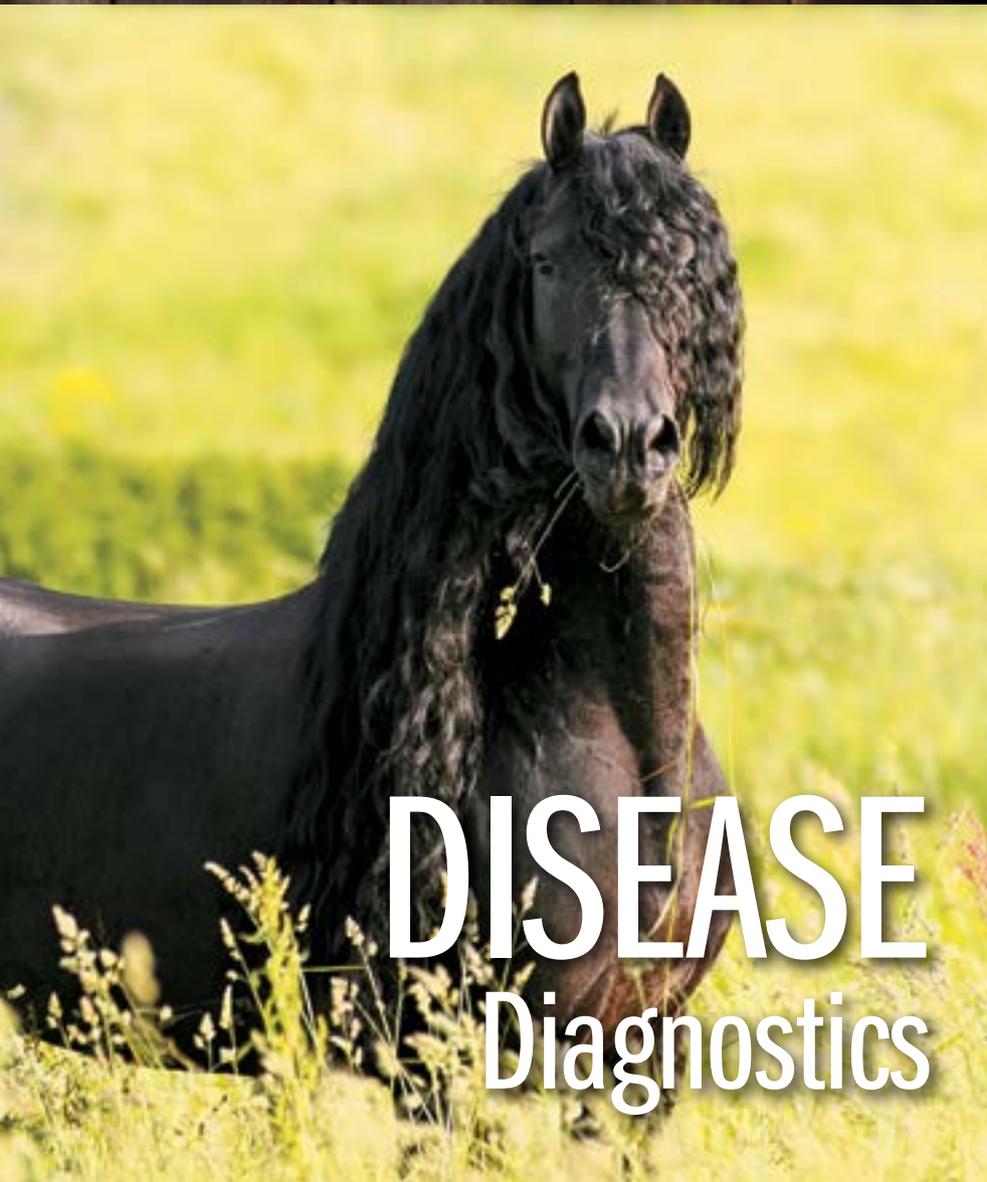
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ALEXANDRA BECKSTETT
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Friesians' Blood Work Differs from Other Breeds

When it comes down to the blood coursing their veins, a horse is a horse, right? Not necessarily, say researchers who compared Friesians' complete blood count and chemistry values to general horse population reference intervals for adult horses, revealing that veterinarians caring for the 10,000-12,000 Friesians in North America should interpret a few test results differently than they would in the average adult horse.

Katherine Fox, DVM, head of research at The Fenway Foundation for Friesian Horses, in Hortonville, Wisc., worked with researchers at the University of Wisconsin's School of Veterinary Medicine, in

Madison, and with IDEXX Laboratories, in Columbus, Ohio, to determine these reference intervals (RI) for Friesians.

Fox said that while a lot of research is available on the "Big Four" problems in Friesians—megaesophagus (chronic dilation of the esophagus), aortic rupture, dwarfism, and hydrocephalus (fluid on the brain)—there hasn't been information

“Friesian breed-specific reference intervals provide a more accurate means for veterinarians to evaluate and treat Friesian horses under their care.”

DR. KATHERINE FOX

available on basic differences between this breed and other full-sized horse breeds. Recently, Friesian owners contacted The Fenway Foundation with a desire to understand “more subtle concerns” that could be evident on blood work. Few studies exist on breed-specific reference intervals across the equine species.

“Knowledge of how Friesian horses are alike and different (as compared to other breeds), with respect to their blood values, will allow for more accurate diagnosis, treatment, and more reliable response to therapy,” she said.

The research team sent out a questionnaire to Friesian owners in the United States and Canada, and 127 horses met the study criteria. The scientists included both males and females, recognizing there can be differences among them, and they assessed animals from ages 3 to 18 (though the vast majority of the animals were 6- to 10-year-olds), since young horses can have different blood values than adults. All horses resided in North America, and they had no disease 30 days prior, the day of, or 30 days following the blood collection.

IDEXX laboratories ran the samples, analyzing them within 24 hours to minimize changes that can occur *in vitro* (outside the horse's body). They processed every sample the same way and determined that many of the values, from red blood cells and leukocytes to electrolytes and enzymes, fit well within RIs that IDEXX established for the general horse population.

But a few of the values were different. Among them was glucose: Fox said she found that “21 of the horses had a glucose value that was lower than the general horse population. This may have been the result of a longer time between the blood draw and centrifugation of the blood, or it may be the Friesian horse itself.

“In summary, we found 11 hemotologic and 19 biochemical general horse reference interval values that were acceptable for use with adult Friesian horses,” she said. “There were three hemotologic and two biochemical values for which Friesian-specific RI values should be used.” These included hemoglobin, red blood cell count, hematocrit, glucose, and lactate dehydrogenase.

Fox explained that “use of these values will help to prevent overdiagnosis of conditions such as anemia, hypoglycemia, and muscle or liver injury, thus eliminating unnecessary diagnostics and treatment.

It will also help to alleviate the confusion that occurs when a Friesian horse fails to respond to therapy.

“Friesian breed-specific reference intervals provide a more accurate means for veterinarians to evaluate and treat Friesian horses under their care,” Fox said. “Correct interpretation of the blood results that are seen ‘on paper’ and understanding what is truly happening within that Friesian horse will allow all of us, owners and veterinarians, to move forward with confidence that we are all doing our best to keep these wonderful Friesian horses healthy and happy.”

Can Imaging Mesenteric Lymph Nodes Save Horses’ Lives?

Lymphadenopathy (enlarged lymph nodes) is a common finding upon post-mortem examination of horses with infectious, inflammatory, or cancerous disease, so Betsy Vaughan, DVM, assistant clinical professor of Large Animal Ultrasound at the University of California (UC), Davis, School of Veterinary Medicine, set out to determine if this condition could be identified on ultrasound. This might help veterinarians reach a conclusive diagnosis and implement treatment before horses must be euthanized.

“Mesenteric lymph nodes are not often visualized by ultrasound because of their location deep within the horse’s abdomen,” Vaughan said. “The cecal mesentery (connective tissue attached to the cecum, part of the large intestine), however, is located adjacent to the body wall in the right flank region and can be readily visualized with ultrasound in most horses,” so she proposed that using ultrasound to evaluate this structure might reveal signs of lymphadenopathy and direct further diagnostic testing.

In Vaughan’s retrospective study she reviewed the records of horses presenting to UC Davis from 1999 to 2007 for a complete abdominal ultrasound. She included horses that had multiple cecal lymph nodes visible within the mesentery adjacent to the cecal artery and vein.

Vaughan identified 42 horses, aged 3 months to 26 years, with cecal lymphadenopathy. These horses had presented with signs of weight loss, fever, anorexia, lethargy, colic, and diarrhea, and she categorized them according to whether they were diagnosed with neoplasia (tumors, 14), inflammation (16), or infectious disease (12).



Convention Tweet

Stephanie L. Church
 @TH_StephLChurch

Hunter: Facial sinus provides sampling site for serial monitoring of critically ill horses, doesn’t require jugular vein use.

On ultrasound, Vaughan said the lymph nodes appeared oval to round in shape, variably sized, and were often too numerous to count.

Based on the study results, Vaughan determined that veterinarians can easily image the cecal mesentery from the right side of the horse to garner information that could lead to a lymphadenopathy diagnosis. She suggested they evaluate this structure as part of a complete abdominal ultrasound examination.

“Finding enlarged lymph nodes in this area suggests that something significant is affecting the horse’s abdomen,” she said. If veterinarians know to look for concurrent ultrasound abnormalities, they might diagnose abdominal issues better and earlier, possibly saving more horses’ lives.

Blood-Contaminated Joint Fluid Samples Might Still be Useful

To determine whether a horse’s joint is infected—which can be a serious side effect

of joint injections or lower limb wounds—veterinarians analyze synovial (joint) fluid samples. Collecting synovial fluid can be a tricky procedure, however, that frequently results in a blood-contaminated sample. Historically, veterinarians been unable to provide definitive diagnoses of infection based on these samples, tossing them and starting over, but now researchers believe useful information can still be garnered from blood-tinged specimens.

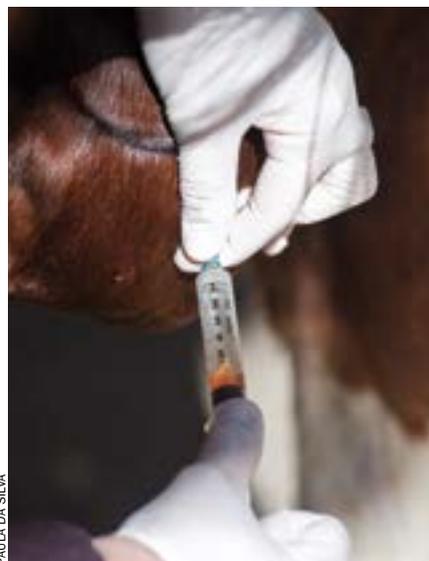
When veterinarians assess synovial fluid for signs of infection, they look for elevated total protein (TP) concentrations and white blood cell (WBC) counts. James Carmalt, MA, VetMB, MVetSc, FRCVS, Dipl. ABVP, ACVS, professor of equine surgery at the University of Saskatchewan’s Western College of Veterinary Medicine, in Saskatoon, and colleagues conducted a two-part study to produce a mathematical model that would allow veterinarians to approximate TP and WBC from contaminated samples.

First they took venous blood and synovial fluid samples from 10 horses. The researchers then contaminated the horses’ normal synovial fluid with each animals’ own blood (usually from the jugular vein) in 10% increments from 0 to 50%. Using measurements from each sample, Carmalt and his colleagues generated an equation that accounted for the change in TP concentration and WBC counts based on the level of blood contamination.

In the second part of the study, the team tested their results by using contaminated samples from five additional horses. A blinded researcher used their formula to predict what the TP and WBC values would have been if the samples had not been contaminated.

Carmalt said he and the team confirmed that veterinarians can use the method to calculate TP concentration and WBC counts from blood-contaminated synovial fluid samples.

“However, diagnosing a potential septic arthritis is still challenging when results are above normal but are not above the published cutoff values (which indicates a positive result) for septic arthritis,” he said. “We believe that in these circumstances, use of other diagnostic tools, including cytology (the microscopic examination of cells) as well as the clinical picture and clinician experience, cannot be overrated” in confirming arthritis caused by infection.



PAULA DA SILVA

Veterinarians test synovial fluid for signs of infection, or septic arthritis.

Coffin Bone Loss, Remodeling Associated with Laminitis

Laminitis is a devastating hoof disease in which the interlocking leaflike tissues called laminae anchoring the distal phalanx (DP, or coffin bone) within the hoof become inflamed and fail to support the bone. Recently, scientists discovered that osteolysis (dissolving of bone) of the DP is an early sign of laminitis development. To identify and characterize this process better, University of Pennsylvania School of Veterinary Medicine (Penn Vet) researchers evaluated DP disease using micro-computed tomography (microCT).

Julie Engiles, VMD, Dipl. ACVP, assistant professor of pathology at Penn Vet's New Bolton Center (NBC), and colleagues assessed parasagittal (vertical) bone slices from 36 feet collected in a database established by Hannah Galantino-Homer, VMD, PhD, senior laminitis research investigator at NBC, from 15 horses with and without clinical signs or history of laminitis. They evaluated the feet for bone loss using microCT, which can provide detailed information about subtle changes in bone microarchitecture. Engiles said her team's microCT scans provided quantitative measurements indicating bone volume, bone density, and bone mineral density, among others, which they correlated with laminitis severity based on radiographic, gross (visible), and histopathologic (microscopic) changes identified within an adjacent parasagittal slice from each foot.

So how exactly is bone dissolution in the distal phalanx involved with laminitis?

"The inner hoof wall and DP are directly connected via blood vessels that arise within the deep cavities of the bone and extend through bony conduits to supply the overlying soft tissues, including the laminae," Engiles explained. "With chronic laminitis comes dramatic changes to the DP bone architecture that can be seen on an X ray as marginal remodeling and fractures, which were previously attributed to altered biomechanical forces due to laminitis-associated structural changes in the hoof wall. However, in this study, we have identified micro-architectural changes in the bone that occur in the very early stages of the laminitis. These changes reflect an imbalance in bone resorption versus bone formation cycles that can occur from stimuli such as inflammation, alterations in blood flow, or metabolic changes, as well as altered biomechanical forces."

USING BLOOD PROTEIN LEVELS TO DIAGNOSE SURGICAL VS. NONSURGICAL COLIC

Colic in horses can range from a benign bellyache to a life-threatening condition requiring emergency surgery. And while in most cases veterinarians identify severe colic cases relatively easily, they might have a more difficult time deciding if such cases require surgery or if they can be managed medically.

There might be hope, however, for veterinarians that must make this decision for colic cases with infectious causes. Danish researchers recently evaluated whether practitioners could use certain blood protein levels to distinguish surgical from nonsurgical colic cases.

SAA concentrations might help veterinarians determine which horses need colic surgery

The team looked at levels of three proteins—serum amyloid A, haptoglobin, and fibrinogen—as diagnostic markers for these infectious nonsurgical vs. surgical colics. Tina Holberg Pihl, DVM, PhD, assistant professor

of medicine and surgery at the University of Copenhagen's Department of Large Animal Sciences, noted these proteins are the most important "acute phase proteins" in the horse, levels of which rise when the horse fights inflammation.

The researchers studied these levels separately as well as in conjunction with analyzing common blood and peritoneal fluid (that which surrounds and lubricates the abdominal organs) factors such as white cell count, packed cell volume, total protein, and lactate to see if including these proteins could improve diagnostic accuracy. In doing so they examined records from 148 cases of severe colic.

Pihl said the researchers found serum amyloid A (SAA) was the best marker for differentiating between infectious nonsurgical and surgical colic, noting that "High SAA and fibrinogen concentrations in serum will increase the likelihood that a horse with severe colic has a primary inflammatory disease requiring medical therapy and not a disease requiring surgery." Other markers, including haptoglobin, were not found to improve the predictive value of the model.

She noted that the white blood cell count that veterinarians traditionally use to try to distinguish infectious gastrointestinal disease from surgical colic did not perform as well as predictors of inflammatory disease in this study. Lactate, another blood and peritoneal fluid marker veterinarians use to evaluate colic, also was not useful for distinguishing surgical from nonsurgical candidates.

In conclusion, Pihl said SAA concentrations might help veterinarians determine which horses need surgery and help them evaluate response to treatment in nonsurgical infectious colics.

In this study, Engiles said, she and her team determined that DP bone loss did correlate to early and chronic stages of laminitis pathology. She said they observed these bony changes in both performance and nonperformance animals, as well as in acute to subacute (not yet chronic) stages of disease.

"In addition, preliminary microscopic evaluation of the laminitic equine DP shows early activation of medullary spaces (marrow-filled cavities and cellular intervals between the mineralized bone struts) with increases in inflammatory cells, bone demolition, and vascular changes with edema (fluid swelling) that corresponds to the bone loss seen on microCT," Engiles said. "This supports our hypothesis that

the DP is a dynamic structure influenced by many altered states."

Although there is not yet a direct practical application for this early investigative research, Engiles said their study does introduce a novel component of laminitis pathology, highlighting the complexity of both the equine foot's architecture and the disease itself.

"Given the direct anatomic connection between the DP and hoof laminae, the dramatic and early association between laminitis and DP bone pathology, and the potential for activated bone to induce pain, clinicians should consider the potential influence of the distal phalanx on laminitis progression, lameness, or response to therapy," Engiles said. 🐾



BROODMARE Health

ALEXANDRA BECKSTETT
 CHRISTY CORP-MINAMIJI, DVM

Can a Human Procedure Prevent Pregnancy Loss in Mares?

Researchers have successfully taken a page from human medicine to treat one common cause of pregnancy loss in mares: cervical incompetence. Recently, Stefania Bucca, DVM, of the Qatar Racing and Equestrian Club, in Doha, evaluated the efficacy of applying a cervical cerclage suture to affected mares.

An incompetent cervix does not relax and open properly during estrus or form a tight seal and close properly during diestrus (when the mare is not in heat). During pregnancy, this failure to close exposes the uterine environment to physical, chemical, or biological challenges and predisposes the mare to developing ascending placentitis (inflammation that can cause late-term abortion), said Bucca.

Current standard treatment involves administering an antimicrobial, a non-steroidal anti-inflammatory, and altrenogest (a progesterone hormone product

used to support pregnancy) for a week's duration at monthly intervals until the foal's birth. "The shortcoming of this treatment is that mares may still have a preterm delivery or fetal loss with histopathological (microscopic) evidence of ascending placentitis despite treatment," she said.

In women, cervical incompetence can result in preterm birth and late-term abortions, similar to that seen in mares. Human doctors treat this condition by administering progesterone, but they also might perform a cervical cerclage—essentially, stitching up the cervix opening early in pregnancy and removing the sutures near the end of gestation. So Bucca set out to determine how effective and applicable this technique might be for mares.

In her study, she performed six cerclage procedures on four pregnant mares with known cervical incompetence. Two mares underwent the procedure during two pregnancies. She treated each mare with an antimicrobial (to deter infection) and altrenogest for five to seven days after the cerclage and monitored cervical parameters via ultrasound every three to four

weeks. She removed sutures on the mares' estimated due dates or right before foaling.

"All mares delivered live foals that survived to at least 1 year of age," she said. Regular exams after sutures were placed did not reveal abnormalities, and she did not see any potential complications during post-foaling inspections and examinations at foal heat.

In conclusion, Bucca suggested performing a cervical cerclage in mares with cervical incompetence that do not respond to altrenogest supplementation. "Although no complications have been reported in association with cervical cerclage, close supervision of treated mares for signs of impending parturition (birth) is of critical importance to prevent cervical damage in the case of untimely delivery with the suture still in place," she said.

Using Donor Mares As Their Own Embryo Recipients

With the advanced reproductive techniques available today, breeders can help even stallions with poor-quality or limited sperm produce offspring. One method is

called intracytoplasmic sperm injection (ICSI)—a form of *in vitro* (in the lab) fertilization in which a single sperm is injected directly into an egg. However, this procedure comes with a high price tag because it typically requires two mares: one to donate the oocytes (eggs) and one (called a recipient mare) to carry the embryo to term. A Colorado State University research team recently set out to determine whether they could establish a viable pregnancy by implanting the ICSI-produced embryo back into the oocyte donor mare.

Elaine M. Carnevale, MS, DVM, PhD, associate professor at CSU's Animal Reproduction and Biotechnology Laboratory, in Fort Collins, presented the team's findings. She explained that owners use separate donor and recipient mares when the donor mare has reproductive tract problems or if they desire more than one foal from the donor mare in a season. Under some conditions, however, such as when ICSI is being performed because of a stallion's limited or poor semen, it might be advantageous to use the same mare as both egg donor and embryo recipient. The challenge lies in timing the development of the embryo in the lab with the mare's reproductive cycle.

The team collected 12 oocytes from nine mares and fertilized them using ICSI. Carnevale said eight embryos developed to the blastocyst stage (which takes about six to seven days) before transfer back into each donor mare's uterus. Five pregnancies resulted from these embryos.

Because the researchers' goal was to establish whether embryo transfer back to the donor mare could be successful, they did not allow the mares in the study



With cervical cerclage, the veterinarian stitches up the cervix early in pregnancy and removes the sutures near the end of gestation.

Convention Tweet

Ernie Martinez DVM
@emartinezdvm

Good Repro Rounds - heavy hitters of repro all have same problems - trouble detecting early placentitis, looking for new markers.

to carry to term. However, says Carnevale, "We used similar procedures for clinical mares in the 2013 breeding season . . . The client mares will foal in 2014."

She said that based on the study results, "Allowing the oocyte donor mare to carry her own pregnancy to term will make ICSI more affordable to many mare owners that want a pregnancy from a stallion with very limited semen."

Handling Hydrops Conditions in Pregnant Mares

A broodmare's belly undoubtedly grows as her fetus matures, but any rapid or unexpected expansion—particularly during the last trimester—is cause for concern. She might be suffering from one of two life-threatening conditions: hydrops allantois or hydrops amnion, characterized by excessive accumulations of allantoic or amniotic fluid in the uterus, respectively.

Fortunately these conditions are extremely uncommon; however, an incorrect diagnosis can quickly mean death for both the mare and her unborn foal. If detected early, veterinarians can manage these cases, so Nathan Slovis, DVM, Dipl. ACVIM, CHT, of Hagyard Equine Medical Institute, in Lexington, Ky., described how to diagnose and treat them as well as educate owners about what to expect.

Veterinarians don't know what causes hydrops conditions. But Slovis said they recognize that if they go undetected or untreated, abdominal wall hernias, prepubic tendon rupture, and cardiovascular shock can result.

"The condition is often detected by the horse owner as a sudden onset (over a period of a few weeks) of abdominal enlargement, ventral edema (fluid accumulation in the abdomen), colic, lethargy, anorexia, tachycardia (rapid heartbeat), and dyspnea (difficulty breathing due to pressure on the abdomen)," he said. Misdiagnoses include

twins and other causes of colic or edema.

To make a definitive diagnosis, Slovis said the veterinarian should perform a transrectal examination of the reproductive tract, which will reveal a large, fluid-filled uterus, and transabdominal ultrasound to detect abnormally abundant fetal fluids (110-230 L of allantoic fluid, compared to the normal 8-18 L).

Upon diagnosis, Slovis said veterinarians should discuss with owners the risks and prognoses for both the mare and fetus and establish whether they want to try to save either the mare or her unborn foal. If it is early in gestation, they might suggest terminating the pregnancy. Those cases diagnosed later in gestation typically require controlled drainage of the fluid—a one- to three-hour procedure that usually leads to pregnancy termination, he noted.

"Mares that present during the last two to four weeks of pregnancy may be managed by conservative therapy (an abdominal wrap for support, weekly veterinary evaluation, and having veterinary staff available for correction of dystocia and hypotensive shock) or partial drainage," he said. "The aim of partial drainage is to maintain pregnancy for as long as possible for additional fetal maturation to occur."

In the more than 30 hydrops cases Slovis and his colleagues have treated over the past decade, he said nearly all of the mares recovered well and were discharged from the clinic. None of the foals, however, survived. Common side effects Slovis said he's seen post-treatment include retained fetal membranes and dystocia.

Slovis concluded that early detection, management, and client education about hydrops conditions are key to a successful outcome. The drainage procedure is relatively easy and, although ideally performed in a hospital, the veterinarian can complete it in the field if necessary. Affected mares can be bred back without reoccurrences, but there is some indication that the condition is hereditary, so Slovis suggested breeding back to a different stallion. 🐾

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STALLION Health

ALEXANDRA BECKSTETT
CHRISTY CORP-MINAMIJI, DVM

How to Select and Prepare a Stimulus Mount

Sometimes even the most eager stallion requires a little motivation when it's time to collect semen for artificial insemination. Most breeding facilities employ the help of a live "stimulus" mare to put him in the mood. But not just any mare will do for all stallions.

Kristina Janson Whitesell, DVM, a resident in reproduction and research fellow in the Havemeyer Equine Behavior Program at the University of Pennsylvania's New Bolton Center, in Kennett Square, described the ideal stimulus mare candidate and how to prepare her for the job.

"A stimulus/mount mare that is an easy keeper, sound, and reliably attractive and receptive to most stallions, as well as comfortable with her work and easy to handle, is invaluable to a breeding facility," said Whitesell.

"A cycling mare in natural estrus close to ovulation is typically the most stimulating to stallions," she added. And on farms with large herds of mares from which to select on any given day, a naturally cycling mare is often a good choice. But

for many facilities the choice is to prepare one or more ovariectomized (with ovaries removed) mares that can be used year-round as stimulus/mount mares for semen collection.

To determine whether a mare will be reliably stimulating, receptive, and safe for the job at hand, Whitesell and her colleagues run each candidate through a detailed evaluation process. They consider mares that are sound, healthy, not too old, have a good temperament, and demonstrate estrus. If a mare meets these criteria, Whitesell then uses a behavior evaluation checklist to assess the horse's comfort and compliance with the collection process, her response to different stallions, and the different stallions' responses to her.

“A stimulus mare that is an easy keeper, sound, and reliably attractive and receptive to most stallions ... is invaluable to a breeding facility.”

DR. KRISTINA JANSON WHITESELL

Ideal stimulus mares should exhibit:

- Tolerance and comfort with application of a twitch, breeding cape, hobbles, breeding boots, and tail wrap;
- Receptive responses to stallions with and without a twitch;
- Ease and comfort loading and standing for long periods in stocks, as well as unloading from them;
- An absence of nonreceptive responses such as striking, squealing, biting, kicking, rearing, moving away, etc.; and
- Tolerance of being mounted.

When evaluating the mare's response, Whitesell said they present stallions of various ages, experience, breeds, and temperaments and note specific potential problems the mare exhibits, such as leaning into the stallion or pushing against the dummy.

Once Whitesell's clinic selects a mare, they perform an ovariectomy followed by estrogen treatment to induce and maintain estrus.

In conclusion, Whitesell said, "organized and systematic behavior evaluation specific to your clinic's protocols before selection will reveal undesirable behaviors that may prove unsafe in the semen collection environment or may complicate or prevent successful semen collection."

 **Convention Tweet**

Alexandra Beckstett
@TH_ABeckstett

Dr. Pearson: Hemospermia (blood in semen) diagnosed @ height of breeding season requires rest, hurts breeding programs.

A stimulus mare that's carefully selected and prepared can offer many years of service and become an integral member of a reproductive service team, Whitesell said.

Causes and Treatment Options for Hemospermia

Does your breeding stallion have a tinge of blood in his semen after a routine collection for artificial insemination? Or do you notice lesions on his genitalia during pre- or post-breeding washing? These are telltale signs of hemospermia—literally, blood in the semen—a condition that is detrimental to not only fertility but also stallion welfare and industry economics.

Lisa Pearson, DVM, MS, Dipl. ACT, theriogenologist at Washington State University's College of Veterinary Medicine, reviewed the common causes and treatment options for stallions with this condition.

Veterinarians typically diagnose hemospermia at the height of breeding season, when live cover or collection schedules are at their busiest.

"One of the mainstays of treatment for all cases is sexual rest, which has severe economic consequences on the stallion's

reproductive performance," Pearson said.

Causes of this condition vary, and Pearson discussed several of them during her presentation.

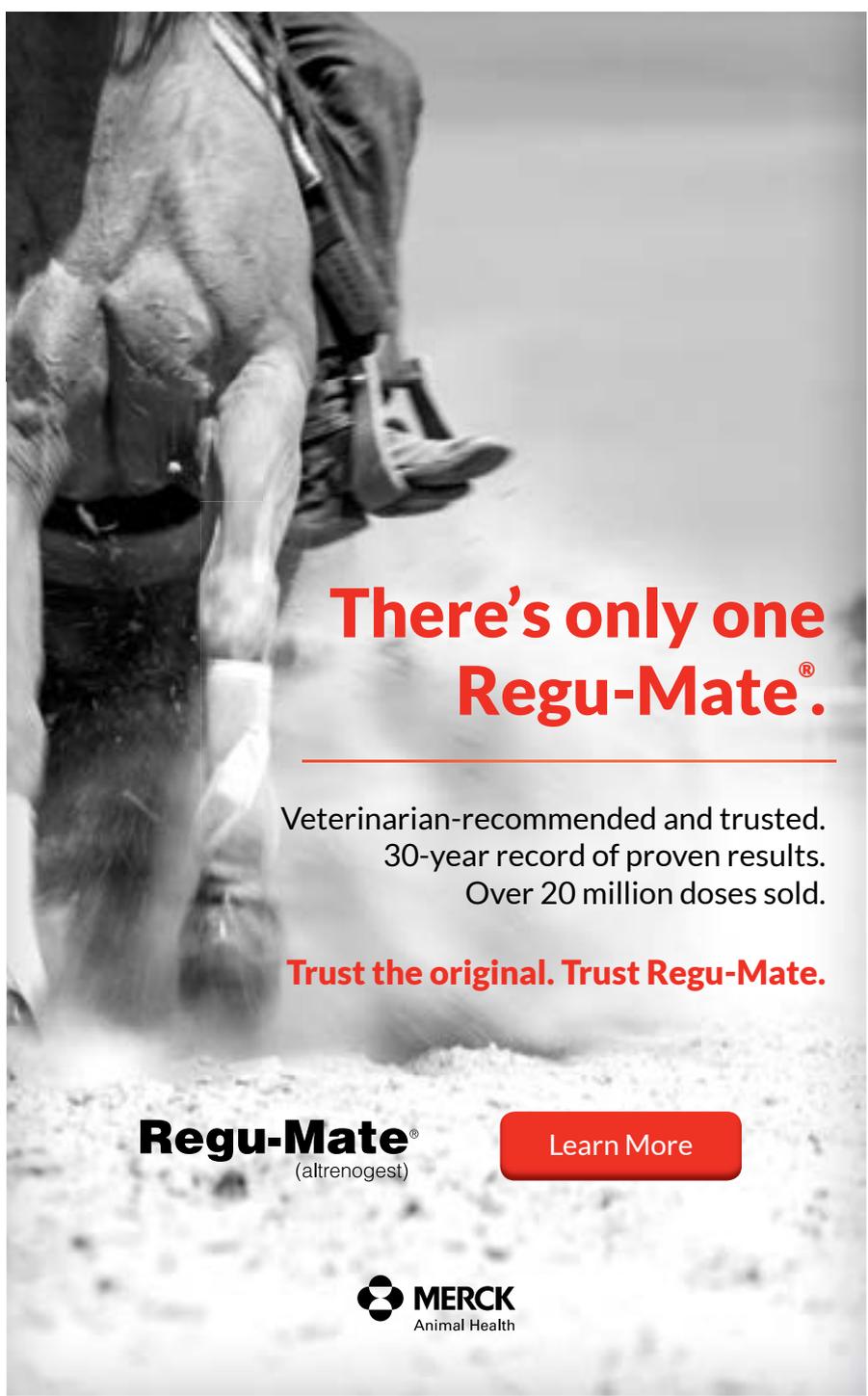
Squamous Cell Carcinomas (SCC) are one of the most serious and potentially life-threatening causes of hemospermia. These cancerous tumors can develop on a horse's penis and bleed due to irritation or ulceration during erection.

"SCC is commonly identified in horses

with unpigmented genitalia but can occur in any breed or color," she said. "Appaloosa and American Paint Horses are significantly more affected than other breeds."

She said most penile SCC is associated with equine papillomavirus-2, and that the lesions are varied, slow-growing, locally invasive, and metastasize (invade and spread to other parts of the body) late in the course of disease.

"Small lesions may be treated with



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One cause of hemospermia is damage to the urethral process, as seen here.

chemotherapy (using intralesional cisplatin, topical 5-fluorouracil, or oral cyclo-oxygenase [type of enzyme] inhibitors), cryotherapy (cold therapy), or laser excision," Pearson said. "Large lesions may require surgical resection or a phallectomy (partial or complete surgical removal of the penis)."

Researchers have shown varying levels of success using all these techniques; unfortunately, Pearson said, SCC has a high recurrence rate (up to 44%) regardless of the treatment method.

Urethral Rents, tears to this conduit for urine and semen, can occur in stallions of any age or breed—although Quarter Horses are overrepresented, Pearson said. Hemospermia occurs when a rent hemorrhages during erection.

"In some stallions, adequate sexual rest results in complete resolution of hemospermia and rent healing," Pearson said.

Additional treatment options include subischial urethrostomy (a surgical procedure that creates an opening in the urethra) and laser coagulation (a type of laser surgery to seal or destroy blood vessels), but she noted these have only been tried in a few animals.

Penile Habronemiasis, also known as summer sores, is uncommon in the United States due to widespread anthelmintic (dewormer) use that kills the causative *Habronema* spp larvae that flies deposit in open wounds. Veterinarians should suspect horses with this condition also have a large stomach worm population, Pearson said.

"Hemospermia results from collection from affected horses, with hemorrhage originating from inflamed or ulcerated areas of the glans penis," she explained.

Treatment includes avermectin anthelmintic administration, followed by corticosteroids to reduce immune reaction. Pearson said proper parasite control programs, including deworming, manure management, and fly control, can help prevent penile habronemiasis.

Equine Herpesvirus-3 (EHV-3) infection "can lead to pustules and ulceration of the penile surface, which can result in hemospermia on erection and service of an artificial vagina or mare," Pearson said.

As with other causes of hemospermia, EHV-3 cases require sexual rest—to not only help the stallion's painful lesions heal but also prevent him from spreading the highly contagious infection.

RESEARCHERS TRACK DECLINES IN STALLION FERTILITY

In most circumstances, a breeding stallion is only as good as his ability to produce offspring. Eventually, even the most genetically superior stallions begin to experience declines in fertility with age. If veterinarians and stud managers were able to track this decline in testicular function, they might be able to adjust their breeding calendars accordingly and manage the stallion to maximize the number of foals he can produce. Fortunately for these individuals, Texas A&M University researchers are defining optimal ways to do exactly this.

Terry L. Blanchard, DVM, MS, Dipl. ACT, professor of theriogenology in the school's Department of Large Animal Clinical Sciences, presented work he and colleagues performed tracking the testicular dysfunction of three aging Thoroughbred stallions.

Fertility changes in aging stallions follow a progressive pattern of deterioration

In their study, the team performed yearly breeding soundness examinations on each stallion over the last several years of the animals' breeding careers. Blanchard said they found that sperm output diminished early in the course of declining testicular function

and was followed by decreases in testicular size. However, he added, the early decreased sperm output didn't drastically reduce pregnancy rates. Later in the testicular decline, sperm DNA and hormone concentrations began to deteriorate.

They found that fertility changes follow "a progressive pattern of deterioration," Blanchard said. The team recommended conducting regular breeding soundness examinations in older stallions to track and detect early changes that might indicate the beginnings of reproductive decline. If veterinarians and stud managers know a stallion's fertility is waning, they can use techniques such as breeding closer to ovulation, reinforcement breeding, multiple matings per heat cycle, and breeding less frequently to maximize the number of foals he can produce.

Seminal Vesiculitis (inflammation of the seminal vesicles—the structures that produce semen) is an important and probably underreported hemospermia-causing condition, Pearson said. "Treatment options include systemic antibiotics and anti-inflammatories as well as endoscopic-assisted lavage (flushing) of the seminal vesicles."

“Practitioners who work with breeding stallions should educate stallion owners on the importance of routine breeding soundness examinations.”

DR. LISA PEARSON

Studies on affected animals' prognosis and recovery, however, are limited. "In some cases, resolution is possible," Pearson said. "In others, the reproductive management of the stallion is altered to reduce risk of transmission of pathogenic

bacteria to mares and improve pregnancy rates."

Penile Injuries can also be linked to hemospermia, including damage to the urethral process from the mare's tail hairs during live-cover, as well as lacerations, swellings, or hematomas from kicks.

"Sexual rest is indicated until the lesion is healed because hemorrhage may recur with subsequent mating or artificial vagina use," Pearson said.

"Practitioners who work with breeding stallions should educate stallion owners on the importance of routine breeding soundness examinations at the beginning of each breeding season and routine collection and semen cryopreservation of healthy stallions," Pearson concluded. "These practices will help to identify any pathology early, which can result in higher treatment success and survival rates, especially for SCC, and allow for frozen semen to be available for breeding if the horse requires sexual rest, thus preventing the loss of a foal crop."

She also emphasized the importance of referring affected horses to specialty centers if veterinarians are unable to treat them on the farm. 🐾

MICHELLE N. ANDERSON
 ERICA LARSON

How Effective is Cribbing Surgery?

Cribbing isn't just annoying for owners and destructive to property. It can also negatively impact your horse's health (via weight loss, tooth wear, colic, etc.) and is notoriously difficult to control. But there's a glimmer of hope for owners with cribbers: Researchers found that a surgical procedure intended to control cribbing is very effective.

Daniel J. Burba, DVM, Dipl. ACVS, professor of veterinary surgery at Louisiana State University's School of Veterinary Medicine, and author on the study, said that about 4-5% of the horse population cribs. While various surgical and nonsurgical treatment options are available, he said their success rates for effectively controlling cribbing vary.

Veterinarians aren't sure exactly how surgery quells the act of cribbing. "I believe it alleviates the ability of the horse to retract its throat (larynx) during the act, thus the horse does not get satisfaction," Burba said. "The reason I believe this is because the horse can still place his upper incisors on a horizontal surface after surgery, but when they try to crib, they are unable to adequately retract the larynx, (and) thus become 'discouraged' and no longer try."

Burba and colleagues have modified the existing Forssell's surgical procedure (which involves transecting the horse's "strap muscles"—the paired muscles under the throat) and now use a laser approach to transect the appropriate nerves and muscles, called the laser-assisted revised modified Forssell's procedure (LARMF).

To determine the most recent procedure's success rates, Burba and colleagues performed a retrospective study in which they examined 119 case files from 1994 to 2012. They reviewed horses' signalment (i.e., age, breed, sex, and other descriptors), how long they'd been cribbing, postoperative complications, and the outcome (they deemed cases successful if the horses stopped cribbing for a year or more).

Key findings from the study included:

- Forty-six mares and 73 male horses underwent surgery during the study;
- Quarter Horses, Thoroughbreds, and Warmbloods were the most common breeds presented for surgery, and most of the horses participated in cutting;
- The team collected follow-up informa-



Researchers found one procedure to correct cribbing was very effective.

PAULA DA SILVA

SURGERY

tion on 90 of the 119 cases. Of those, 76 (84.4%) stopped cribbing for at least one year following the procedure;

- For the 14 horses that resumed cribbing within one year, all the owners reported cribbing frequency had decreased;
- The procedure yielded lower success rates when horses had been cribbing for more than three years prior to surgery;
- Twenty horses developed complications, including incisional infection, prolonged incisional drainage, hematoma (a blood pocket), seroma (a tumorlike collection of serum), and dehiscence (wound reopening). Burba noted that the latter three complications were mostly reported in early cases and weren't seen as much in more recent cases;
- Horses that developed postoperative

complications were more likely to have an unsuccessful outcome; and

- The owners of five horses reported worsened athletic performance after surgery.
- Overall, Burba said the procedure's 84.4% success rate was better than those reported for other treatment options. "The LARMF is a very effective surgical treatment of cribbing in horses," he said.

Best Practices for 20 Minutes of Equine Field Anesthesia Explained

Every week, about half of all equine veterinarians anesthetize horses for procedures that take no more than 20 minutes to perform. Because these horses are under for only a short period of time, veterinarians commonly carry out such procedures in the field rather than in a hospital or clinic setting, said John Hubbell, DVM, Dipl. ACVAA, of The Ohio State University School of Veterinary Medicine.

Anytime veterinarians put horses under anesthesia, there's risk involved, said Hubbell. To minimize or identify this risk prior to surgery, he said veterinarians should complete blood work, collect a full patient history, and perform and record a physical exam prior to anesthesia induction. "Pre-anesthetic blood work does not need to be

“ I believe (surgery) alleviates the ability of the horse to retract its throat during the act of cribbing. ”

DR. DANIEL J. BURBA

extensive for short procedures," he said.

Veterinarians should also secure complete written owner or agent permission prior to anesthesia, Hubbell advised. Additionally, he recommended that all field veterinarians have oxygen on their trucks for emergency ventilation and use intravenous catheterization to ease drug administration and reduce injection-related manipulation and stimulation.

He further stressed that during procedures veterinarians should observe and record the anesthetic drugs they administer and their effects, as well as the horse's minimum heart rate and respiratory rate at five- to 10-minute intervals.

Hubble said more than 90% of equine veterinarians use ketamine (a common anesthetic) as the primary drug for short-term anesthesia, sometimes in combination with xylazine (another common sedative). While the latter technique has been proven to be safe for use in horses, Hubbell noted researchers found some problems practitioners should be aware of, including inadequate sedation and/or muscle relaxation during recumbency.

Two additional sedative drugs approved for use in U.S. horses include detomidine and romifidine, he said. Either can be substituted for xylazine for sedation prior to induction of anesthesia, he said.

Another risky period is during post-anesthesia recovery, when horses can struggle to stand. This struggle is the most common cause of injury to horses undergoing anesthesia, Hubbell said.

"Good footing is necessary for horses during recovery," he said. "Grass turf or most sand arenas work." A minimum 4-by-4-meter (a little over 13-by-13 feet) area free of obstructions is also necessary for a safe recovery, he added.

The horse should wear a halter and lead rope so an experienced handler can control the animal once it stands. "Position the horse in lateral recumbency (lying on



There is always a risk of complications developing in horses under general anesthesia as well as in recovery.

ANNIE M. EBERHARDT

his side)," Hubbell recommended. "Most horses will roll to sternal recumbency (lying on their sternum, or chest) within 45 minutes and stand shortly after."

In most instances it is better to wait for the horse to decide to stand rather than attempt to rush him to his feet, he said.

Short-term anesthesia for procedures lasting fewer than 20 minutes is common field work. An experienced veterinarian who takes precautions prior to, during, and after anesthesia can reduce the likelihood of complications and even death.

GI Complications Associated with Elective General Anesthesia

Brad Nelson, DVM, MS, a PhD candidate at Colorado State University's (CSU) College of Veterinary Medicine, presented a study in which he evaluated the risk factors associated with gastrointestinal (GI) dysfunction in horses undergoing elective procedures under general anesthesia.

Post-anesthetic colic (PAC) is well-recognized; occurs in 3-6% of horses; and can develop after a variety of procedures in which veterinarians employ general anesthesia, including surgery, CT, and MRI. Nelson said elective surgeries are known to have complications. Better characterizing what complications occur and how frequently could help decrease the complication rate and also help veterinarians educate clients better on risks associated with surgical and anesthetic procedures.

Nelson and colleagues performed a retrospective study to evaluate how many horses developed PAC or reduced fecal output requiring treatment, and to identify potential risk factors for GI dysfunction.

The team evaluated 389 healthy adult horses of varying breeds undergoing 416 procedures requiring general anesthesia over a three-year period at CSU.

Nelson said they found that GI dysfunction occurred in 36 of the 416 procedures (about 8.7% of cases). All but one of the horses that developed complications survived discharge, Nelson said. The surviving horses were treated for an average of 21.7 hours. The team identified the following risk factors for PAC:

- **Breed** 33% of Arabians developed GI dysfunction;
- **Arterial lactate levels** Horses with increased lactate levels (which might indicate low oxygen levels during anesthesia) were more likely to develop GI dysfunction;
- **Positioning** Horses placed on their right side were significantly more likely to develop GI dysfunction, but Nelson noted that this is not likely clinically relevant;
- **Post-anesthetic temperature** Horses with a lower rectal temperature after recovery were more likely to develop GI dysfunction; and
- **Time to first passage of feces** Horses with a prolonged time to the first passage of feces after anesthesia were more likely to develop GI dysfunction.

Nelson said some of the study's limitations were that the anesthetic procedures weren't standardized—different attending clinicians have different protocols—and cases were only monitored for 24 hours, meaning some could have been missed.

So should owners avoid putting their horses through procedures requiring general anesthesia? Not necessarily, Nelson said.

"The results of this study should not make horse owners more or less wary of putting their horse under anesthesia, but more informed on potential complications that can occur," he explained. "Although it was very rare for a horse to not survive the anesthetic event, there is always risk of a complication, as no procedure is without risk. Luckily, the GI dysfunction that developed following anesthesia was mostly mild in this population of horses and resolved quickly with prompt medical therapy.

"This study is helpful in educating clients about risks that can occur when their horse has general anesthesia and can guide the veterinarian treating the horse for values to examine in those horses that are at higher risk or develop a complication," he concluded. 🐾



Convention Tweet

Michelle N. Anderson
 @TH_MNAnderson

It's not unusual for a horse to only breathe 2x per minute while under nesthesia.-Dr. Hubbell

RESEARCH SHORTS

Gene Therapy and Stem Cells' Effects on Osteoarthritis

Ashlee Watts, DVM, PhD, Dipl. ACVS (Texas A&M), and colleagues tested a combination of dual-axis gene therapy and mesenchymal stem cells (MSCs) injected intrarticularly (directly into the joint) for treating early-stage equine osteoarthritis (OA). In their research model, she said the combination of MSCs and gene therapy reduced OA progression. However, Watts noted that this treatment protocol still needs to undergo further testing before it is available for use in clinical practice: "It is possible that the stem cells themselves had a major treatment effect and it was not the addition of gene therapy that led to the improvements seen." Read more at TheHorse.com/33350.

Researchers Study Coronavirus Outbreaks in Adult Horses

In their study of equine coronavirus (ECoV) in mature horses, Nicola Pusterla, DVM, PhD, Dipl. ACVIM (University of California, Davis), and colleagues evaluated the clinical and laboratory results from horses involved in eight recent outbreaks in the United States. Pusterla said this generally self-limiting disease has high morbidity and low mortality. Horses can remain infectious for up to two weeks; however, the virus can only be detected in feces for up to nine days. Fecal PCR appears to be an effective and accurate diagnostic test. Find out more at TheHorse.com/33351.

Managing Eosinophilic Keratoconjunctivitis

Equine eosinophilic keratitis (EK) occurs when eosinophils (a type of white blood cell that responds to allergic and/or parasitic stimuli) invade a horse's cornea. Chelsey Miller, DVM (Iron Will Mobile Veterinary Service), reviewed this painful disease which is characterized by conjunctivitis, corneal ulceration or edema (fluid swelling), mucoid discharge, white corneal plaques, and superficial stromal, perilimbal yellow infiltrate. She said treatment involves administering topical antifungal and antimicrobial medications in addition to a topical mydriatic (a drug that dilates the pupil). While some horses recover well, many horses relapse. Learn more at TheHorse.com/33342.



COURTESY DR. CHELSEY MILLER

Assessing Proximal Metatarsal Lameness in Sport Horses

Michael Schramme, DrMedVet, CertEO, PhD, Dipl. ECVS, ACVS (Campus Veterinaire de l'Universite de Lyon), described how he gets to the bottom of diagnostically elusive injuries to the top of the rear cannon bone—called proximal suspensory disease. He said to watch for specific clinical signs of the injury; perform the "strangulation test" in which the veterinarian places his or her fingers across the back surface of the tendons and squeezes; and use a Lameness Locator to help identify gait abnormalities. Once the area of concern is identified through a clinical exam and diagnostic anesthesia, Schramme said MRI is one of the best imaging techniques for assessing the proximal suspensory ligament. Learn more at TheHorse.com/33352.

An Alternative Approach to Palmar Digital Nerve Blocks

Marvin Beeman, DVM (Littleton Equine Medical Center), evaluated placing palmar digital nerve (PDN) blocks lower than normal to diagnose equine foot pain, on the midline between the bulbs of the heel. He concluded that this method can more accurately block areas of the lower limb with less chance of anesthetic diffusing higher up into the pastern or fetlock region. Find out more at TheHorse.com/33353.

Meperidine for Foot Pain Control

To test this opioid drug's efficacy, Jonathan H. Foreman, DVM, MS, Dipl. ACVIM (University of Illinois), and colleagues induced reversible lameness in eight healthy Thoroughbreds before administering intramuscular meperidine. Because it doesn't put the horse at risk for the negative side effects associated with non-steroidal anti-inflammatory drugs, "meperidine may provide a suitable non-steroidal alternative, but it would need to be administered more frequently," he said. Visit TheHorse.com/33354 for more information.

National Equine Health Plan Progress

Recent infectious disease outbreaks spurred the American House Council and USDA to create a National Equine Health Plan. Once operational, the plan is designed to aid authorities in equine disease surveillance and to make recommendations about implementing biosecurity measures, said Nat White, DVM, MS, Dipl. ACVS (Marion duPont Scott Equine Medical Center). Learn more at TheHorse.com/33110.

Stricter Medication Restrictions

In the face of new racing medication rules, veterinarians are revisiting treatment approaches for injured animals on layup. The current, newly drafted recommendation is to prohibit intra-articular corticosteroid injections within seven days preceding a race, along with imposing a 72-hour withdrawal time (meaning a horse cannot receive medication within the 72 hours prior to a race) on systemic administration of dexamethasone and other short-acting corticosteroids. Rather than placing these new regulations into immediate effect, there will be a grace period over the next year to allow "time for veterinarians to adjust their practices and for trainers to adjust training strategies." Find out more at TheHorse.com/33355.

Nerve Blocks for Suspensory Ligament Diagnosis

A University of Georgia College of Veterinary Medicine research team recently took a closer look at the diffusion patterns resulting from two nerve block injection techniques and the accompanying risk of unintentionally invading synovial structures. The team concluded that a low-volume (2 mL) injection with the needle placed perpendicular to the skin is likely a superior option to a high-volume (8 mL) injection for blocking the deep branch of the lateral plantar nerve because it produces less proximal (upward) diffusion and, thus, has less potential to block unintended areas. Learn more at TheHorse.com/33356.

LOOKING FORWARD



New President Dr. Jeff Blea's View for 2014

The year 2014 is well under way, and the American Association of Equine Practitioners (AAEP) is in full stride continuing to serve as the leading voice for equine health and welfare.

The AAEP continues to focus on continuing education for our members as one of our primary objectives. Our association stages the largest equine veterinary conference in the world, as well as a number of smaller conferences, and produces several print and digital publications that are key resources for the equine veterinary community. As such, AAEP member veterinarians are up-to-date on the latest medical issues, advancements, and procedures affecting horses and, therefore, bring an unsurpassed level of expertise to the horse owner's team of care providers. Education of our members and our clients serves to provide better care and quality of life for our patients and also allows us to continually adapt to challenges within the equine industry.

A few of the challenges facing the AAEP, its members, and our clients in 2014 include legislative actions affecting equine welfare and veterinary practice, uniform medication reform in horse racing, and evolving veterinary business models. "Scope of practice" issues are perhaps one of the biggest challenges currently facing the equine industry, and these will have a tremendous impact on

veterinary practice, horses, and owners in the future.

Some examples of scope of practice issues that we are currently facing in several states include farriers taking radiographs and providing a diagnosis and treatment, lay dental care providers performing complicated tooth reductions or extractions without training or proper anesthesia, and pharmacies providing medications to horse owners without a legal prescription and void of a valid veterinarian-client-patient relationship. Many of these practices are illegal, and they may potentially put the health of the horse in danger, as there is no oversight or accountability.

In the current environment, equine practitioners are modifying the way they do business. Factors such as a declining economy, accessibility of information over the Internet, and competition from paraprofessionals continue to impact equine veterinary practice. Horse owners are more cost-conscious these days, and they expect value for the services that are provided. It is incumbent upon the veterinarian to establish a good relationship with the owner. It is critical for the veterinarian to intimately

understand the owner's business model or what role the horse serves in that owner's life in order to be a vital member of the horse's health care team.

Online availability of information on equine medical conditions will escalate in the future, and the practitioner must be able to adapt and prove the value of their expertise to horse owners. As veterinarians, we are uniquely trained, qualified, and licensed to provide services and perform procedures to ensure the health of the horse. It is the veterinarian's responsibility to prevent, diagnose, and properly treat various conditions to ensure the patient's well-being. Often, owners will seek a paraprofessional's services or attempt to care for a problem after reading information over the Internet. Other times an owner will obtain medications online to reduce costs. In the end, these practices can potentially negatively affect the health and condition of the horse.

Communication between owner and veterinarian is paramount to ensuring the health and welfare of each and every horse. It is a two-way street: The veterinarian must understand and respect the needs of the owner, and the owner must understand that the veterinarian should—and desires to be—an integral part of the horse's health care team. 🐾

Jeff Blea, DVM, is a racetrack practitioner and a partner in VonBluecher, Blea, Hunkin Inc., Equine Medicine and Surgery, in Sierra Madre, Calif.