The Modern Equine Vet

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Using Advanced Imaging to Guide Rehab

Equine Flu Continues to Be Major Concern

Older Horses Might Be at Higher Risk for EqPV-H

Change in Diet May Treat Equine Peripheral Caries

TABLE OF CONTENTS

4 COVER STORY

Advanced Imaging Can Guide Rehab Protocols and Monitor Progress

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SPORTS MEDICINE

Managing Specific Injuries in Competition Horses 10

DENTISTRY

Change in Diet May Treat Equine Peripheral Caries 3

INFECTIOUS DISEASES

EqPV-H Antibodies Detected in Older Austrian Horses without Hepatitis 15

Equine Influenza is Top Infectious Upper Respiratory Disease for Second Straight Year 16

SPONSORED EDITORIAL

Roundtable: Insights on DJD 7

Dental Exams: Help Your Clients Realize Their Importance to Horse Health 9

ADVERTISERS

Shanks Veterinary Equipment 3
Arenus Animal Health/Aletra 5
American Regent Animal Health Sponsored Content 7
Zoetis Sponsored Content 9
Arenus Animal Health/Assure Gold 11
American Regent/BetaVet 13
Arenus Animal Health/Assure Gold 17

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Change in Diet May Treat Equine Peripheral Caries

Recommending a change in diet can help prevent or manage equine peripheral caries, according to a recent study.

Equine peripheral caries can cause significant morbidity and can have considerable welfare implications. Recent research suggests that diets with high water soluble carbohydrate (WSC) content are associated with a higher risk of peripheral caries.

The condition may be treated by removing the cause of the caries, allowing the damaged tooth to erupt out and be replaced by the unaffected tooth under the gingival margin.

This retrospective study aimed to investigate whether the peripheral caries process can be halted if oaten hay is removed from the diet and replaced with a non-cereal hay, which is typically lower in WSC. The researchers switched 42 horses with peripheral caries from oaten hay to a non-cereal hay or straw (meadow hay, Rhodes hay, lucerne hay or barley straw).

Equine peripheral caries can cause significant morbidity and affect the animal's welfare.

They took baseline photographs at the time of the switch and then again at subsequent visits. Identifying information was removed from the images before being randomized, and scored by 6 equine veterinary dentists using a grading system.

At follow-up, 69% of cases were marked as inactive, compared with 47.6% of cases at baseline. Significantly lower grades of peripheral caries were observed in the gingival, middle and occlusive third of the molars at follow-up compared with baseline. Significant improvements were not observed in the premolars.

This was a review of clinical records, not a prospective study. As such, other changes in the diet and management were not recorded, and there was no control group.

The researchers concluded that recommending a change in a horse's diet from oaten hay to a lower WSC hay may be useful as part of long-term management of equine peripheral caries. **MeV**

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For more information:

Jackson K, Kelty E, Tennant M. Retrospective case review investigating the effect of replacing oaten hay with a non-cereal hay on equine peripheral caries in 42 cases. *Equine Vet J.* 2020 Dec. 17 doi: 10.1111/evj.13404.

ADVANCED IMAGING Can Guide Rehab Protocols and Monitor Progress

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The goals of treating musculoskeletal injuries in the sporting horse are to stop the acute inflammation, minimize inflammation after the acute phase, prevent reinjury and help the horse return to work.

Advanced imaging is not just useful in diagnosing an injury, but also in guiding rehab protocols, monitoring and assessing progress and prognosis, as well as determining the likelihood of return to work, explained **Lauren V. Schnabel**, DVM, PhD, DACVS, DACVSMR, associate professor of Equine Orthopedic Surgery and associate director, Comparative Medicine Institute, North Carolina State University.

The rehabilitation protocols must be tailored to each horse, even for "simple" tendon and ligament lesions. "'Simple' is in quotes because nothing is simple. Any injury can become complicated," said Dr. Schnabel, who described simple lesions as soft tissue injuries of the distal limb outside the hoof capsule with overt fiber pattern disruption.

"Your rehab plan really is case specific," she said at the AAEP 2020 Virtual Annual Convention and Trade Show, but offered some pointers in developing a plan.

To monitor the healing and rehabilitation, they frequently rely on Doppler ultrasonography to evaluate for that potential return of vascularity—and depending on where the lesion location—elastography to assess for softening of the tendon or ligament that may proceed any changes in fiber pattern.

Marie Rosenthal, MS

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[1] Nogradi N, Couetil LL, Messick J, Stochelski MA, Burgess JA. Evaluation of an Omega-3 Fatty Acid Containing Feed Supplement in the Management of Horses with Chronic Lower Airway Inflammatory Diseases. J Vet Intern Med 2015; 29:299-306.
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Because of the need for general anesthesia, high-field MRI is used more for diagnosis than monitoring. Quite a bit of manpower and positioning is needed, and how much can be seen frequently depends on the configuration of the horse. Used with permission of the AAEP. First presented at the 2020 AAEP Annual Convention and Trade Show.

General Rehabilitation Plan

Although plans are tailored to each horse and its injury, there are some general points that they often consider, she said.

"Typically, we monitor these horses every 2 to 4 weeks initially during the acute phase, and then every 4 to 8 weeks until they're healed," she said. "Our imaging findings are assessed in combination with a physical and lameness evaluation, and the results of these examinations together guide our decision-making on rehab protocols that aim for an eventual return to full work."

Increasing exercise intensity to the next stage of the rehab plan depends on a favorable lameness exam with improvement in healing and imaging over the previous examination. Because it depends on the progress made, "our exercise instructions are very specific only until the next recheck appointment to guarantee that they come back," she said. "We might need to tweak things."

Always keep in mind the horse's work when intensifying the regimen, Dr. Schnabel suggested. "We want to be careful about what's specific to that horse's discipline, as we go up to the next levels of our rehab intensity," she said.

Foot balance and the need for therapeutic shoeing are assessed for every case to assure the best support for the horse's limbs. "It's just always sort of mind boggling how many of even these high-performance horses will come in with really poor foot balance. So, we want to address that certainly prior to starting a rehab program, to put the horse in the best position to succeed."

All owners and trainers are also counseled on the importance of maintaining overall fitness, even during rest and rehab with mobility and strength-building exercises, as well as core stability exercises. These exercises keep horses in shape during rehab and in a much better position to return to full work.

Dr. Schnabel's team likes to specify an overall expectation for the time to return to full work—provided the lesions heal. They also advise owners and trainers to make sure the horse stays calm, and maintains stall rest with controlled exercise. "For that reason, we often do provide long-term sedatives, such as reserpine or trazodone for these horses," she said, adding that she probably uses more trazodone than reserpine, because there are fewer gastrointestinal side effects and trazodone is fast acting.

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Roundtable: Insights on DJD

American Regent Animal Health, makers of Adequan® i.m. (polysulfated glycosaminoglycan), invited eight equine practitioners to discuss the present and future of degenerative joint disease (DJD) diagnosis and treatment.

This group included **Kent Allen**, DVM, owner of Virginia Equine Imaging and a founder of the International Society of Equine Locomotor Pathology (ISELP); **Robin Dabareiner**, DVM, PhD, DACVS, who worked at Texas A&M for 23 years before working at Waller Equine Hospital in Texas; **Christopher E. Kawcak**, DVM, PhD, DACVS, DACVSMR, ACVS Founding Fellow/MIS, director of Equine Clinical Services at Colorado State University; **Zach Loppnow**, DVM, an associate veterinarian at Anoka Equine Veterinary Services in Minnesota; **Rick Mitchell**, DVM, MRCVS, DACVSMR, president of Fairfield Equine Associates in Connecticut and a founding member of ISELP; **Kyla Ortved**, DVM, PhD, DACVS, DACVSMR, the Jacques Jenny Endowed Term Chair of Orthopedic Surgery, University of Pennsylvania's New Bolton Center; **Kelly Tisher**, DVM, managing partner at Littleton Equine Medical Center in Colorado; and **Gary White**, DVM, owner of Sallisaw Equine Clinic in Oklahoma.

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KEY TAKEAWAYS

- Allen stated that changes veterinarians are seeing in the **frequency of DJD** are "probably due more to us getting better at diagnosis than the animals getting more disease."
- Kawcak said some categories of horses face **increased incidence of DJD**. "I deal with a fair number of young cutting horses ... I do think in those young, hardworking, active athletes with that big push in their 3-year-old year that the incidence has gone up, especially in stifles and hocks."
- Tisher mentioned the **"diagnosis dilemma"** with young horses: "Where does degenerative joint disease become the diagnosis, when you maybe don't have imaging changes but you do have the strong sense of synovitis, capsulitis and [the] need to manage that horse at a young age?"
- Kawcak said the absence of CT and MRI leads to **under-diagnosing DJD**: "I think we're surprised about how many times a relatively normal-looking joint on radiographs will have fairly substantial changes on MRI or CT."
- The group mentioned the importance of **early joint health intervention**. Mitchell asks clients, "What's it going to cost you to replace this horse? Compare that expense to what it would cost to maintain this horse properly."
- Ortved said providing **targeted education** to help clients understand what veterinarians can do to diagnose and treat DJD is important, as is teaching clients what DJD is.
- Group consensus was that while there might be different abilities to pay for diagnoses and treatments among top-level performers, mid-level athletes and backyard/senior horses, veterinarians should "offer the **best alternative first**, [and] if that's not workable, find out what is," White said.
- The group agreed oral joint supplements are an issue. Tisher summarized the sentiment: "If you add up what your feed-through costs [are with supplements], you may be able to do a box of Adequan i.m. as an FDA-approved product for about half the price."
- Loppnow said, "When it comes to recommending things that I think are going to be interventional and helpful for these horses, it really **falls back on the science** for me."
- Dabareiner said, "I think some of those tough old horses just need a little daily bute [phenylbutazone] … [and] I strongly encourage the use of Adequan [i.m.]."

(For an extended report of this meeting please visit EquiManagement.com/arah)

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High-field MRI is commonly used to diagnose injuries localized to the carpus, tarsus or proximal suspensory region because of the need for general anesthesia to avoid excessive movement. Image courtesy of the AAEP, presented at the 2020 Virtual Annual Convention and Trade Show.

STEP 1: Walking

Following strict stall rest, the plan usually starts with controlled daily hand walking, gradually increasing the time building up to about 40 minutes by the end of an 8-week period.

She said that the exercise should be done under saddle rather than in hand when appropriate for the horse. "Most of our disasters during rehab happen while people are in-hand walking or hand grazing the horse out in the open. The horse gets away and gallops around for a few minutes or it's just completely wild and slips, etc.

"So, we seem to do much better with these horses walking under tack than we do with hand walking," Dr. Schnabel said. "If they have to be hand walked or are unsafe to ride for whatever reason, then we certainly recommend doing that walking within an enclosed paddock or ring in case the horse gets loose."

STEP 2: Trotting

If there is improvement and no increase in lesion severity at that 8-week recheck, they introduce very short, straight, trot sets with walking in between, gradually increasing to 30–35 minutes of trot work with walk breaks by week 16.

"We also gradually introduced ground poles or cavallettis during that trotting period to improve strength and proprioception and just to keep the horse's brain engaged in its work," she said.

"It's certainly been our experience that trot work is often required to provide the proper biomechanical stimulus to the tendon or ligament for healing," Dr. Schnabel said.

So after 8 weeks of trotting, they look for definitive improvement in both the fiber pattern and regression of vasculature on Doppler ultrasonography before increasing work intensity or starting canter work.

"At this stage, persistent hypervascularity—even with return to normal fiber pattern on gray scale—is really worrisome to us for the horse's prognosis and particularly to increase the work without possible further injuries," she warned. "If they've gone through their 8 weeks of trotting and they're still persistently hypervascular, we're going to be worried that they're not ready to go on further, and we're going to back things down."

During the reevaluation, make sure that owners and trainers are compliant with the plan, but remember adding or stopping some modality might also be warranted.

STEP 3: Canter

The preference is for the horse to canter under saddle for about 4 weeks prior to any turnout in a sizeable paddock. She wants to see the animal as fit as possible and cantering under saddle before they have free reign around a pasture.

"After that point, the increase in work intensity is very disciplined and horse-specific but once a horse has returned to full work, it's common for us to reassess the old injury site approximately every 3 to 6 months or sooner—depending on the horse—to monitor for subtle signs of re-injury and adjust work level or rehab accordingly," she said.

Adjuncts

There are many options for enhancing these rehabilitation exercises, including the underwater treadmill, saltwater spa, vibration plates, laser shockwave, therapeutic ultrasound and stem cells that can be used depending on the case and the owner's desire and financial ability. **MeV**

See how Dr. Schnabel manages specific conditions on page 10.

Dental Exams: Help Your Clients Realize Their Importance to Horse Health

As a veterinarian you can tell a lot from these regular checks

By Jeff A. Hall, DVM, Senior Veterinarian, Equine Technical Services, Zoetis

A 2019 equine dental study, published in the *Journal of Equine Veterinary Science*, revealed there is an established link between common horse behavior problems and abscessed cheek teeth. Periapical infections in cheek teeth are common in horses[1] and will usually induce pain that horses then exhibit in their behavior.

Despite this established connection between dental pain and behavior problems, many horse owners are unaware of the impact dental challenges can have on their horse's health and performance. A 2020 equine dental wellness survey conducted by Zoetis revealed that out of nearly 4,000 horse owners from across the U.S., 73% indicated their horse was showing at least 1 behavior associated with dental pain.[2] Yet 22% of respondents indicated their horse hasn't had a dental exam in at least 12 months.[2]

I find that horse owners sometimes hesitate to schedule annual dental exams because they are unsure about what goes into an exam and what their horse will experience. Veterinarians have an opportunity to educate horse owners about the importance of dental exams, and the impact dental challenges can have on their horse's well-being and behavior.

HELP CLIENTS KNOW WHAT TO EXPECT DURING DENTAL EXAMS

Take the time to follow up with clients who haven't brought their horse in for a dental exam. Reassure clients that dental exams are safe, routine procedures for their horse by helping them know what to expect. This includes how long the exam will last and what you're looking for as you examine their horse. As part of this conversation, explain that in order to complete a thorough visualization and palpation of the mouth and teeth, the horse must be sedated. Sedation helps ensure compassionate care for the horse and precise control for the veterinarian performing the procedure.

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REFERENCES
1 Pehkonen J, Karma L, Raekallio M. Behavioral Signs Associated With Equine Periapical Infection in Cheek Teeth. *Journal of Equine Veterinary Science*. 2019;77:144-150.
2 Zoetis Equine Dental Risk-Assessment Survey Results. Zoetis U.S. Market Research. May 30, 2020
3 Data on file, 2020 Equine Pain & Sedation Market Research Study. Aug. 10, 2020

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Managing Specific Injuries

Marie Rosenthal, MS

Digital flexor tendon sheath (DFTS) injuries can be challenging in every step of management, according to **Lauren Schnabel**, DVM, PhD, DACVS, DACVSMR. Therefore, multiple imaging modalities and tenoscopy are best for characterizing the DFTS pathology.

"This is a really tricky area," she said because the lesions are at risk for adhesion formation, which can cause restriction or palmar/plantar ligament constriction—painful problems that can limit performance.

Dr. Schnabel can rely on standard computed tomography (CT), contrast tenography with radiography or CT, saline distension of the DFTS using ultrasonography or magnetic resonance imaging (MRI) and dynamic ultrasonography to guide management.

To limit adhesions and constrictions, they recommend passive and active range-of-motion exercises. Passive range of motion involves taking the horse's limb and flexing and extending it through the full range of motion. Active range-of-motion exercises involves putting the horse through its paces using ground poles, cavallettis, or in the water treadmill. Massage also may help prevent the development of adhesions.

Suspensory Branch Pathology

Another challenging condition to diagnose or confirm is suspensory branch pathology. A complete radiographic examination of the fetlock region is recommended. "We want to determine the extent of the osseous changes of both the proximal sesamoid bones, fetlock joint and potentially the splint bones. These changes can really affect our prognosis as well as our rehab timeline and treatment options," she said.

One reason these are challenging is that abnormalities can appear on ultrasonography that are not linked to clinical lameness. Doppler, which clearly shows increasing levels of hyper vascularity, helps sort through the noise and increases the veterinarian's clinical judgment to make that call.

"Pain on palpation, positive flexion test, where the horse blocks are all really critical things, and then Doppler can be really helpful on top of that," she said.

Typical abnormalities of branches are changes in shape, enlargement, diffuse or discrete fiber pattern, abnormalities and margin irregularities. Additional abnormalities that affect prognosis and rehab plans are insertional fiber changes at the attachment of the sesamoid bone.

"So variations in these branch lesions really do affect the rehab protocols and modalities that are instituted," she said. For example, changes affecting the osseous structure are more likely to be treated with bisphosphonates and shockwave therapy. "That's where I think I see the most benefit from shockwave therapy."

Therapeutic ultrasonography and massages are often prescribed for perligamentous fibrosis.

All horses with suspensory branch pathology are also prescribed range-of-motion exercises. These are especially important in horses with concurrent arthrosis of the fetlock.

"If we have these osseous components, we want to follow them with radiographic examinationa as well, and also potentially nuclear scintigraphy if we're trying to identify further bone progression," Dr. Schnabel said.

Forelimb proximal suspensory injuries are most commonly diagnosed with the ultrasonography looking for enlargement and fiber pattern abnormalities, but they can be difficult to find. The normal architecture of this ligament contains fat and muscle, which can

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look like a fiber pattern. Enhanced ultrasonography can help, as can a non-weight-bearing examination or angle-contrast ultrasonography. "These help us distinguish between fiber pattern abnormalities from normal fibers and fat and muscle fibers."

Both radiography and nuclear scintigraphy are helpful in seeing resorption changes, evolusion fragment or stress fractures. "We're going to start with radiographs to follow these, but certainly a bone scan can be really critical to monitor these stress fractures in particular, [to determine] when the horse is okay to go back to work," she said.

The capacity for healing cartilage damaged by injury or osteoarthritis is poor, so the aim is to limit progression and restore as much as possible the joint environment.

Although radiography is important for splint bone fractures, MRI also can be very useful in cases that are not responding to treatment, or in cases of re-injury.

Hind Limb Proximal Suspensory Injuries

"Another difficult diagnosis is hind limb proximal suspensory injuries because subtle lesions can be difficult to find on gray-scale ultrasonography, and Doppler and elastography are not particularly useful either" she said. Moderate to severe lesions can have additional pathology that is not always visible on ultrasonography.

High-field MRI is generally thought of as the gold standard for making a diagnosis and assessing prognosis because the entire suspensory ligament can be visualized. "We are looking for other tarsal pathology and then we can assess the entire suspensory ligament," Schnabel said.

Adhesions of the suspensory ligament to the surrounding bone or soft tissue; failure to respond to neurectomy; and advanced bone changes that can be visualized on MRI, ultrasonography, and sometimes radiographs are among the problems that warrant a frank discussion with the owner about realistic expectations for the horse, she said.

Soft tissue injuries within the hoof capsule are best detected using high-field or low-field standing MRI for diagnosis, and low-field MRI for re-evaluation and monitoring these injuries. "We just didn't even know as much before we were able to MRI these horses. So what we used to think of as navicular disease, now we know that this is a very complex syndrome with so many structures that we've really only been able to see based on MRI," she said.

MRI also is used to monitor the collateral ligaments of the distal interphalangeal joint, deep digital flexor tendon and the navicular apparatus. "As we've advanced with our ultrasound abilities, it's also more commonplace to be able to detect and monitor these injuries within the hoof capsule using ultrasound, and I would say more-so following the MRI.

"It's tricky to kind of see these right off the bat with ultrasound," she said.

These injuries require a prolonged rehab period compared with many other injuries, and they also have a high likelihood of re-injury. Rehab can include shockwave and laser and stem cell therapies.

Bone Injuries

MRI is frequently used to monitor bone injuries, particularly in sporting horses, and this has led to an increased awareness of bone marrow edema, sclerosis and ethesiopathy among other bone abnormalities, she said. The clinical relevance of these can be difficult to determine, but a combination of MRI, diagnostic analgesia and nuclear scintigraphy can help sort through them.

For lesions that are considered a primary cause of lameness, nuclear scintigraphy can also be very useful for monitoring bone pathology.

High-field MRI, and arthroscopy if indicated, is the gold standard for monitoring cartilage injuries and osteoarthritis. The capacity for healing cartilage is poor, so the aim is to limit progression and restore the joint environment as much as possible.

"It is really critical to determine the extent of associated subchondral bone injury both for prognosis and rehab timeline because if there is damage to the subchondral bone, that will substantially reduce prognosis and rehab time," she said.

"For all cases, rehabilitation is focused on preserving joint range of motion, encouraging mobility," she said, "through range-of-motion exercises, the underwater treadmill and treatment during an acute or inflammatory episode. Stall rest, thermal therapy, and then pulsed electromagnetic therapy are helpful.

"And then once the inflammation and pain have subsided, consistent exercise is often highly encouraged. In our opinion, many cases of osteoarthritis are best managed with open access to turn out," Dr. Schnabel said. **MeV**

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References: 1. Trotter GW. Intra-articular corticosteroids. In: McIlwraith CW, Trotter GW, eds. *Joint Disease in the Horse.* Philadelphia: W.B. Saunders; 1996; 237-256.

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INJECTABLE SUSPENSION

BRIEF SUMMARY OF PRESCRIBING INFORMATION
(Betamethasone Sodium Phosphate and Betamethasone Acetate Injectable Suspension) 6 mg betamethasone per mL
For Intra-Articular (I.A.) Use in Horses

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

INDICATION: BetaVet® is indicated for the control of pain and inflammation associated with osteoarthritis in horses.

DOSAGE AND ADMINISTRATION: Shake well immediately before use.

CONTRAINDICATIONS: BetaVet® is contraindicated in horses with hypersensitivity to betamethasone. Intra-articular injection of corticosteroids for local effect is contraindicated in the presence of septic arthritis.

WARNINGS: Do not use in horses intended for human consumption.
Clinical and experimental data have demonstrated that corticosteroids administered orally or parenterally to animals may induce the first stage of parturition when administered during the last trimester of pregnancy and may precipitate premature parturition followed by dystocia, fetal death, retained placenta, and metritis. Additionally, corticosteroids administered to dogs, rabbits and rodents during pregnancy have resulted in cleft palate in offspring. Corticosteroids administered to dogs during pregnancy have also resulted in other congenital anomalies including deformed forelegs, phocomelia and anasarca. Therefore, before use of corticosteroids in pregnant animals, the possible benefits to the pregnant animal should be weighed against potential hazards to its developing embryo or fetus. **Human Warnings:** Not for use in humans. For use in animals only. Keep this and all medications out of the reach of children. Consult a physician in the case of accidental human exposure.

PRECAUTIONS: Corticosteroids, including BetaVet®, administered intra-articularly are systemically absorbed. Do not use in horses with acute infections. Acute moderate to severe exacerbation of pain, further loss of joint motion, fever, or malaise within several days following intra-articular injection may indicate a septic process. Because of the anti-inflammatory action of corticosteroids, signs of infection in the treated joint may be masked. Appropriate examination of joint fluid is necessary to exclude a septic process. If a bacterial infection is present, appropriate antibacterial therapy should be instituted immediately. Additional doses of corticosteroids should not be administered until joint sepsis has been definitively ruled out. Due to the potential for exacerbation of clinical signs of laminitis, glucocorticoids should be used with caution in horses with a history of laminitis, or horses otherwise at a higher risk for laminitis. Use with caution in horses with chronic nephritis, equine pituitary pars intermedia dysfunction (PPID), and congestive heart failure. Concurrent use of other anti-inflammatory drugs, such as NSAIDs or other corticosteroids, should be approached with caution. Due to the potential for systemic exposure, concomitant use of NSAIDs and corticosteroids may increase the risk of gastrointestinal, renal, and other toxicity. Consider appropriate wash out times prior to administering additional NSAIDs or corticosteroids.

ADVERSE REACTIONS: Adverse reactions reported during a field study of 239 horses of various breeds which had been administered either BetaVet® (n=119) or a saline control (n=120) were: acute joint effusion and/or local injection site swelling (within 2 days of injection), 15% BetaVet® and 13% saline control; increased lameness (within the first 5 days), 6.7% BetaVet® and 8.3% saline control; loose stool, 5.9% BetaVet® and 8.3% saline control; increased heat in joint, 2.5% BetaVet® and 5% saline control; depression, 5.9% BetaVet® and 1.6% saline control; agitation/anxiety, 4.2% BetaVet® and 2.5% saline control; delayed swelling of treated joint (5 or more days after injection), 2.5% BetaVet® and 3.3% saline control; inappetance, 3.4% BetaVet® and 2.5% saline control; dry stool, 1.7% BetaVet® and 0% saline control; excessive sweating, 0.8% BetaVet® and 0% saline control; acute non-weight bearing lameness, 0.8% BetaVet®and 0% saline control; and laminitis, 0.8% BetaVet® and 0% saline control.

CLINICAL PHARMACOLOGY: Betamethasone is a potent glucocorticoid steroid with anti-inflammatory and immunosuppressive properties. Depending upon their physico-chemical properties, drugs administered intra-articularly may enter the general circulation because the synovial joint cavity is in direct equilibrium with the surrounding blood supply. After the intra-articular administration of 9 mg BetaVet® in horses, there were quantifiable concentrations of betamethasone (above 1.0 ng/mL) in the plasma.

EFFECTIVENESS: A negative control, randomized, masked field study provided data to evaluate the effectiveness of BetaVet® administered at 1.5 mL (9 mg betamethasone) once intra-articularly for the control of pain and inflammation associated with osteoarthritis in horses. Clinical success was defined as improvement in one lameness grade according to the AAEP lameness scoring system on Day 5 following treatment. The success rate for horses in the BetaVet® group was statistically significantly different (p=0.0061) than that in the saline group, with success rates of 75.73% and 52.52%, respectively (back-transformed from the logistic regression).

ANIMAL SAFETY: A 3-week target animal safety (TAS) study was conducted to evaluate the safety of BetaVet® in mature, healthy horses. Treatment groups included a control (isotonic saline at a volume equivalent to the 4x group); 1X (0.0225 mg betamethasone per pound bodyweight; BetaVet®); 2X (0.045 mg betamethasone per pound bodyweight; BetaVet®) and 4X (0.09 mg betamethasone per pound bodyweight; BetaVet®). Treatments were administered by intra-articular injection into the left middle carpal joint once every 5-days for 3 treatments. Injection site reactions were the most common observations in all treatment groups. Injection site reactions were observed within 1 hour of dosing and included swelling at the injection site, lameness/stiffness of the left front limb, and flexing the left front knee at rest. The injection site reactions ranged from slight swelling (in many horses on multiple days in all treatment groups) to excessive fluid with swelling, pain, and lameness (4x group only). Injection site reactions were observed most commonly on treatment days, and generally decreased in number and severity over subsequent days. The incidence of injection site reactions increased after the second and third injection (number of abnormalities noted on day 10 > day 5 > day 0). In the BetaVet® treated groups the number and severity of the injection site reactions were dose dependent. The 4X BetaVet® group had the highest overall incidence of and severity of injection site reactions, which included heat, swelling, pain, bleeding, and holding the limb up at rest. The control group and 4X group (which received similar injection volumes) had a similar incidence of injection site reactions; however, the severity of reactions was greater in the 4X group. Absolute neutrophils were statistically significantly higher in the BetaVet® treated groups as compared to the control group. Trends toward a decrease in lymphocytes and eosinophils, and an increase in monocytes were identified in the BetaVet® treated groups after the initial dose of BetaVet®. Individual animal values for white blood cells generally remained within the reference range. BetaVet® treated horses also had a trend toward increased blood glucose after the initial dose. Some individual animals showed mild increases in blood glucose above the reference range.

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To report an adverse event please contact American Regent Animal Health at (800) 734-9236 or email pv@americanregent.com.

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EqPV-H Antibodies Detected More in Older Horses and Condition Was Not Associated with Hepatitis

Researchers testing sera found that equine parvovirus-hepatitis (EqPV-H) antibodies and DNA were frequently detected in older Austrian horses that did not have an associated hepatitis.

The discovery of this condition was relatively recent, so veterinary understanding is in its infancy. Any information regarding prevalence, geographical distribution, genetic diversity, pathogenesis and risk factors enhances understanding of this potentially fatal infection, the researchers said.

In this cross-sectional study, the researchers use polymerase chain reaction (PCR) to analyze sera from 259 healthy horses and 13 healthy donkeys for the presence of EqPV-H antibodies and EqPV-H DNA. Associations between infection status, sex, age and concurrent equine hepacivirus (EqHV) infection were described.

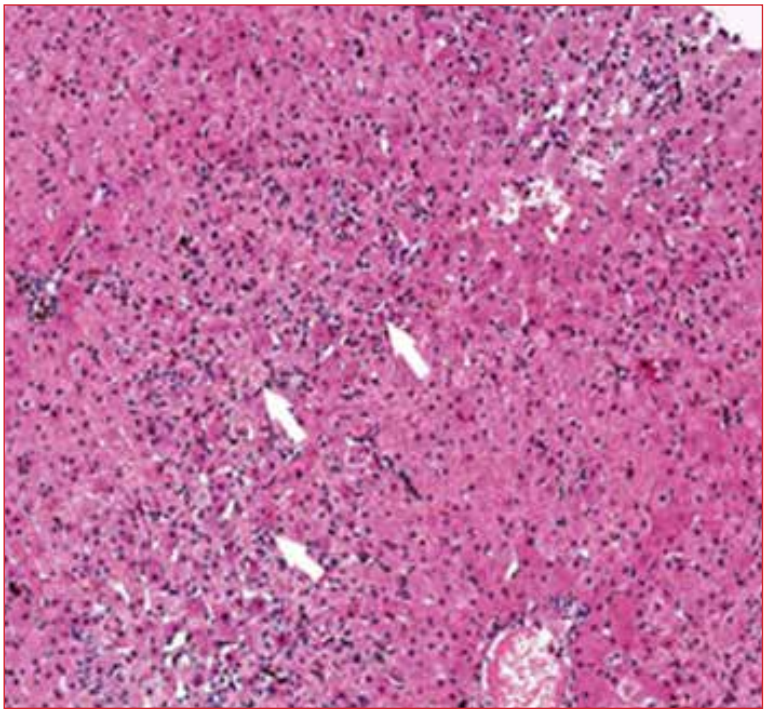
EqPV-H usually is associated with equine serum hepatitis, so they also measured glutamate dehydrogenase (GLDH), gamma-glutamyl transferase (GGT), bile acids and albumin concentrations and compared the results between horses with active infection and PCR-negative horses. Phylogenetic analysis of the EqPV-H variants was performed.

In horses, EqPV-H seroprevalence was 30% and DNA prevalence was 8.9%. One horse was co-infected with equine hepacivirus. There was no evidence of EqPV-H in donkeys. Horses older than 16 years of age were 8 times more likely to have active EqPV-H infection compared with horses that were 1 to 8 years old (P=0.002; OR=8.19; 95% CI=1.79 to 37.50), and were 3 times as likely to have active EqPV-H infection compared with horses 9 to 15 years of age (P=0.03; OR=2.96; 95% CI=1.08 to 8.17).

GLDH, GGT, bile acids and albumin concentrations were not significantly different between horses with active infection and those without.

"Our findings have identified a significantly higher chance of active EqPV-H infection in 16–to 31-year-old horses, compared with 1-to-8-year-old horses, as well as 9-to15-year-old horses," the researchers wrote. "With every increase of 1 year in age, the risk of active EqPV-H infection is 1.1 times higher. The risk becomes increasingly greater with increasing age, culminating in the highest risk in horses of advanced age."

The EqPV-H variants identified in this Austrian population of horses showed high similarity to sequences worldwide, they said. **MeV**



Liver biopsy sample from a horse with EqPV-H. Individual and small clusters of lymphocytes are scattered about the parenchyma (arrows), indicative of lymphocytic lobular hepatitis.

Source: Emerg Infect Dis. 2018:24(2).

For more information:

Badenhorst M, de Heus P, Auer A, et al. Active equine parvovirus-hepatitis infection is most frequently detected in Austrian horses of advanced age. *Equine Vet J* 2021 Mar 11 doi: 10.1111/evj.13444.

https://beva.onlinelibrary.wiley.com/doi/10.1111/evj.13444

Divers TJ, Tennant BC, Kumar A, et al. New parvovirus associated with serum hepatitis in horses after inoculation of common biological *Product Emerg Infect Dis*. 2018:24(2)

https://wwwnc.cdc.gov/eid/article/24/2/17-1031_article

Equine Influenza Is Top Infectious Upper Respiratory Disease for Second Straight Year

For the second year in a row, equine influenza virus (EIV) cases have surpassed all other equine infectious upper respiratory diseases, according to a report from the Equine Respiratory Biosurveillance Program, which is an ongoing national surveillance study managed by the University of California, Davis Equine Infectious Disease Research Laboratory and Merck Animal Health.

Cases started trending upward in 2008, according to surveillance data.

Ongoing sequencing of real-world influenza isolates infecting U.S. horses demonstrates significant antigenic differences in field isolates, according to data presented at the 2019 AAEP convention.

These mutations could affect the efficacy of some influenza vaccinations against current circulating strains of equine influenza. Studies reveal only the Florida '13 vaccine strain aligns well with current field strains causing infection.

"The scientific standards for influenza disease management include continuously monitoring the virus for changes and responding with updated vaccine strains to keep up with virus variants causing clinical disease," said **Duane Chappell**, DVM, Equine Veterinary Professional Services, Merck Animal Health.

"For the past 13 years, active respiratory disease surveillance has enabled us to not only track significant antigenic drift and—with it—new influenza threats to our horses, but also isolate a relevant new vaccine strains to help improve protection against current circulating strains infecting horses. Importantly, we've continued to evaluate whether commercially available vaccine strains, including our own, are providing adequate protection against circulating field strains of influenza."

Hemagglutinin

Different strains of EIV are compared by sequencing the hemagglutinin (HA) gene, which contains the receptor-binding sites that enable the influenza virus to attach to host cells. Vaccination produces antibodies that bind to the HA, inhibiting this attachment. If antigenic drift decreases binding of vaccine antibodies with the HA glycoprotein at these key sites, it may reduce protection.

"While genetic analysis compares various strains and determines their homology, the number of single amino acid changes is not what's relevant," explains **Kyuyoung Lee**, DVM, MPVM, PhD, UC Davis. "Instead, the important focus is the position of the amino acid changes as they pertain to immunodominant sites, which is determined through sequencing."

Dr. Lee has conducted research evaluating whether U.S. influenza vaccine failure rates were a result of antigenic drift or the introduction of foreign strains. "Antigenic drift of EIV in the United States is the likely reason for vaccine failure and vaccine strains should be updated," he concluded.

To further evaluate these findings, Merck Animal Health conducted a wide-ranging sequencing study comparing commercially available inactivated influenza vaccine strains to 54 positive equine influenza samples isolated through the Equine Respiratory Biosurveillance Program. Case samples from influenza outbreaks in 20 U.S. states were collected between February 2013 and July 2020 from horses ranging in age from 6 months to 17 years.

Variations Found

The results revealed variation among vaccines. Investigators found:

- Amino acid sequencing revealed that all 54 positive samples were identical at 8 key sites of the HA glycoprotein;
- Only the Florida '13 vaccine strain had 100% alignment with all 8 of these key sites;
- The Ohio '03 vaccine strain was similar at 2 key sites with the 54 positive samples;
- Kentucky '97 shared no key site similarity with the 54 positive samples.

With data clearly indicating that equine flu season ranges from December through April, veterinarians may benefit from critically evaluating the optimal time to administer biannual EIV vaccines. Giving the EIV vaccine even 1 or 2 months earlier in the year could make a significant difference. Additionally, data indicate many horses are undervaccinated, receiving just one EIV vaccination per year (or fewer), which further complicates efforts to contain this highly infectious virus.

"With EIV on the rise, reconsidering timing is another aspect of evolving our vaccination practices along with the virus," Dr. Chappell said.

The Prestige (Merck) line of influenza-containing vaccines includes Florida '13 of the clade 1 family and Richmond '07 of the clade 2 family, meeting current World Organization for Animal Health (OIE) and AAEP guidelines for clade 1 and clade 2 strains.

The Equine Respiratory Biosurveillance Program comprises one of the largest collections of equine influenza isolates in the United States. **MeV**

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