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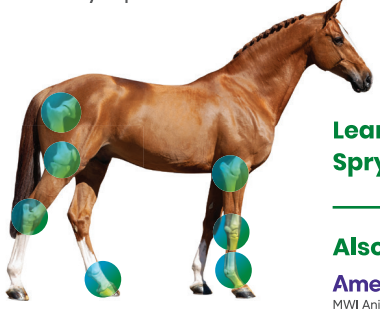

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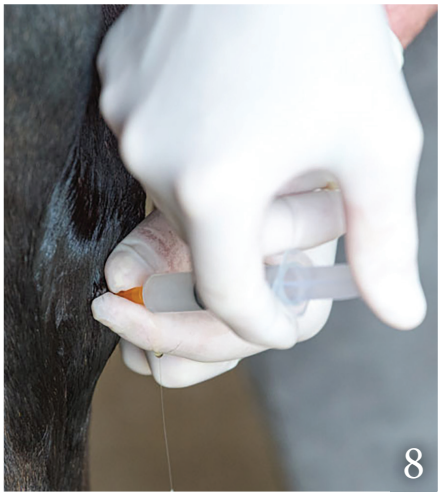

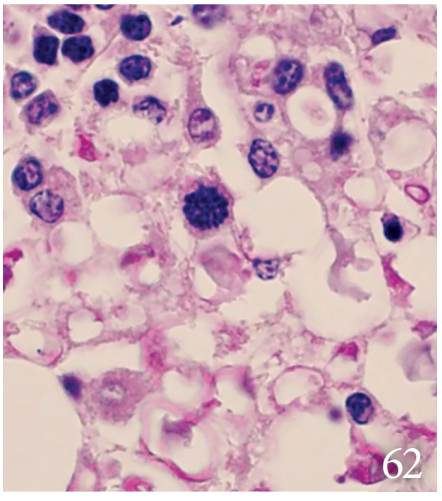

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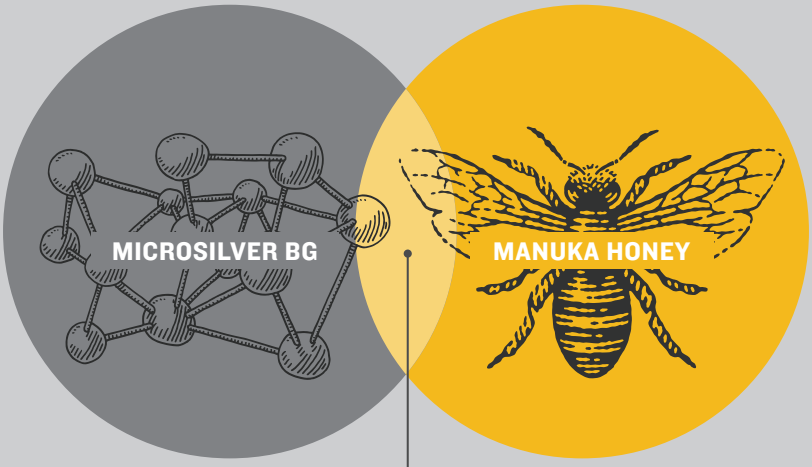

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Progress

Moving forward toward a destination is progress. Just moving isn't progress. Destination is the key word. Equine veterinary practice is making progress. The destination is to create a career in equine veterinary medicine that is attractive to veterinarians and staffs while allowing those people to remain in equine veterinary medicine serving horses and their owners.

The AAEP Commission on Sustainability is a leader in this progress. Amy Grice, VMD, MBA, is writing a column in each *EquiManagement* magazine this year outlining the progress. (Check it out on page 20.) She and the members of the five subcommittees are outlining progress in an article each month on EquiManagement.com. (Search for "AAEP Commission on Veterinary Sustainability.")

The five subcommittees are Compensation, Student, Culture, Internship and Emergency. Overseeing the subcommittees is the Steering Committee, which is made up of the co-chairs of each subcommittee and the AAEP officers. This group will meet in July to coordinate the Commission strategy for the remainder of 2023.

I encourage those of you in practice to read these columns to see what your colleagues are finding out through surveys and discussions. And to look at what they are recommending to help equine veterinary practice progress to the point where more people want to be involved.

Podcast Topics

EquiManagement hosts two podcasts for equine veterinarians, vet students, vet techs and industry professionals. Disease Du Jour focuses on equine health and research. The Business of Practice focuses on the business and human sides of equine veterinary medicine.

Disease Du Jour—brought to you by Merck Animal Health—produced its 100th episode earlier in 2023. It remains a popular podcast, and we are working to cover more unique topics. We have shortened the podcast down to about 30 minutes based on feedback from our listeners. We are taking on topics in smaller bites.

One of the topics that will be published just before this issue is mailed is Artificial Intelligence in Veterinary Medicine. And no, robots aren't going to replace veterinarians. But the speaker from Cornell University has some great insights on how artificial intelligence is and will be able to help vets.

The Business of Practice—brought to you by CareCredit—has some great folks inside and outside equine veterinary practice sharing their insights. Thus far in 2023 we have discussed Supply Chains, Professional Pricing, Non-Compete Clauses (and the very real possibility they will become illegal), Remote Office Staff and Resilience. There are some amazing tips and tidbits that can help you be more profitable and live a better life.

GEES Meeting Coverage

We are thrilled to partner with Boehringer Ingelheim to bring you some key presentation summaries from the 2023 Global Equine Endocrine Symposium (GEES). There was a tremendous amount of game-changing research presented at that meeting from researchers working around the world. Don't miss that article starting on page 22. EM

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1. Marchegiani, A., et al. (2021) The Effectiveness of Fluorescent Light Energy as Adjunct Therapy in Canine Deep Pyoderma: A Randomized Clinical Trial. *Vet Med Int*, 6643416.

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ACHIEVE MORE TOGETHER

By Carly Sisson

EquiManagement uploads new articles to our website daily. Content ranges from horse health and research to business and wellness topics to news items, including infectious disease outbreak alerts and press releases from industry organizations. Here is some recent content that you might have missed.

New Research on NSAIDs

In one of her online articles, Nancy Loving, DVM, presented findings from a recent study about the potentially adverse effects of NSAID use in humans. The study suggested that there are no long-term benefits on joint inflammation from NSAID use. In fact, joint inflammation and cartilage quality were worse in humans who took NSAIDs compared to the controls. These findings might be relevant to equine practitioners who are considering prescribing NSAIDs for patients with osteoarthritis. To read the full article, search "NSAIDs Might Worsen Osteoarthritis in Humans" on EquiManagement.com.

Infectious Disease Series

EquiManagement is excited to begin a new series of articles on common infectious diseases in horses intended to help practitioners better educate their clients on major diseases. These articles will be written by Loving.

You can search for "Equine Herpesvirus (EHV-1) and Equine Herpesvirus Myeloencephalopathy (EHM)" to read more about how these common infections spread and persist within equine populations. You can also search for "Equine Strangles: Management and Prevention" for a comprehensive overview of the disease and hidden reservoirs for *S. equi*. Future disease summaries will include equine infectious anemia, West Nile virus and Eastern equine encephalitis.

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AAEP Commission on Veterinary Sustainability

In addition to updating you on the AAEP Commission's work in every print issue of EquiManagement, we publish detailed articles online about the Commission's important initiatives every month. In a recent article titled "Reaching Equine-Oriented Veterinary Students," Scott Toppin, DVM, DAVBP, went into depth about the Student Subcommittee's mission. He urged established practitioners to have discussions with current vet students that might compel them to consider equine practice. He said that practitioners should emphasize the rewards of equine practice, which include working outside and forming friendships along the way.

Disease Du Jour Podcast: Equine Botulism

In a recent episode of the Disease Du Jour podcast, we talked with Amy Johnson, DVM, DACVIM (Large Animal and Neurology), about the three main types of botulism in horses. The discussion centered around clinical signs, diagnosis, treatment and prevention, as well as geographic risk factors.

Visit the Disease Du Jour page on EquiManagement.com to listen to the podcast and read the accompanying article or tune in on your favorite podcast platform. EM

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By Nancy S. Loving, DVM

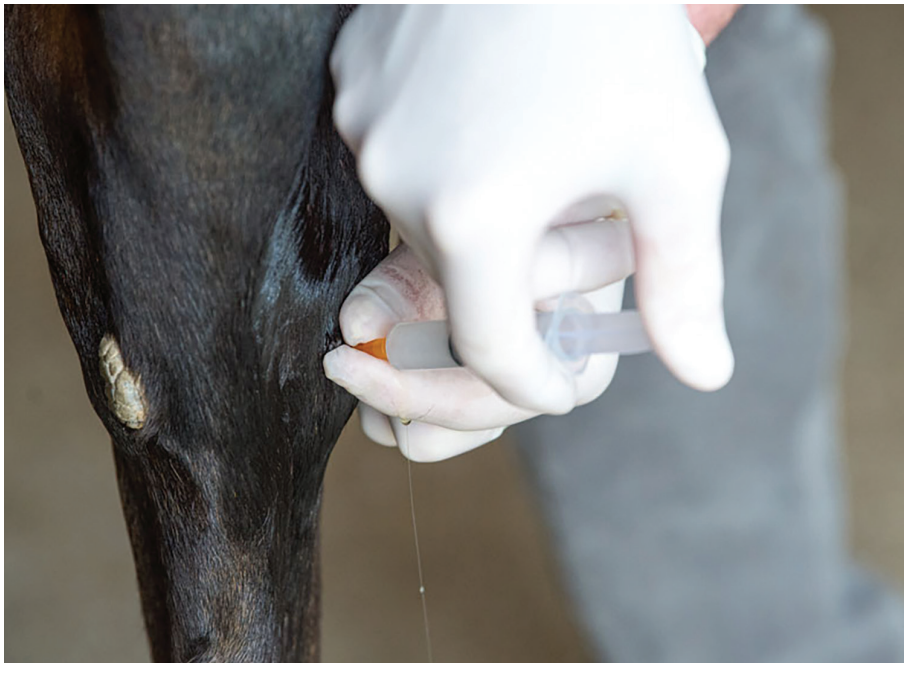
The Use of Mesenchymal Stromal Cells for Sepsis

At the 2022 Equine Regenerative Medicine and Orthobiologics Summit (ERMOS), Laurie Goodrich, DVM, PhD, DACVS, Director of the Orthopedic Research Center at Colorado State University, reported on the value of mesenchymal stromal cells (MSCs) in managing septic arthritis. Many studies have demonstrated that MSCs are immunomodulating, with autologous and allogenic cells having equivalent actions on inflammation and immune modulation. She added that an increased concentration of MSCs has a greater effect on decreasing inflammation.

MSCs also exert antimicrobial actions through the secretion of peptides and paracrine recruitment of immune cells. Activation of MSCs with TLR agonists stimulates antimicrobial peptides. This leads to improved immune responses, such as increased bacterial phagocytosis by neutrophils and decreased lipopolysaccharide expression. Goodrich noted that several different inflammatory activators of MSCs can logarithmically reduce bacterial counts and biofilm formation.

In a study on treating septic arthritis from *Staphylococcus aureus*, TLR-activated MSCs were administered intra-articularly (IA) into the tibiotarsal joint. There were two objectives: a) evaluate if this can improve the clinical outcome, and b) determine if activated MSCs can decrease the bacterial bioburden and inflammatory biomarkers.

Eight healthy horses were used in the study in which *Staphylococcal aureus* was injected into the tibiotarsal joint. Four horses served as controls and were injected IA with vancomycin. The four treated horses were injected IA with vancomycin plus TLR-MSCs. All horses also received intravenous gentamycin and phenylbutazone. The control horses were euthanized on Day 7 and the treated horses on Day 14.



AMY DRAGOO

Intra-articular injection with activated MSCs such as vancomycin is a promising treatment for horses with joint sepsis.

The control horses experienced higher pain scores and non-weight-bearing lameness compared to the treated horses, which were able to walk on the affected leg.

Synovial fluid bacterial counts of the control horses were markedly elevated compared to the absence of bacteria within the MSC-treated synovial fluid.

Synovial fluid of the control horses was cloudy compared to the clearer fluid of the treated horses.

There were also differences in total protein, nucleated cells, glucose and lactate in the synovial fluid, with values from the treated horses much improved over the controls.

Markers of inflammation—IL-6 and IL-18—were elevated in the control horses and not significantly elevated in the treated horses.

Gross pathology of the joints appeared quite different. More cartilage damage and inflammation were visible in the control group compared to the treated group. The control horses had more normal-appearing joint surfaces.

Besides the significant and effective treatment of septic arthritis with TLR-activated MSCs in conjunction with an antibiotic, this combination treatment also eliminated multi-resistant *Staph aureus* in the septic joints.

EHV-1 Proactive Strategies

Although many practitioners routinely vaccinate equine patients against equine rhinopneumonitis (EHV-1), those vaccines don't protect against the neurologic form of equine herpesvirus myeloencephalopathy (EHM). Equine herpesvirus continues to circulate within the horse population.

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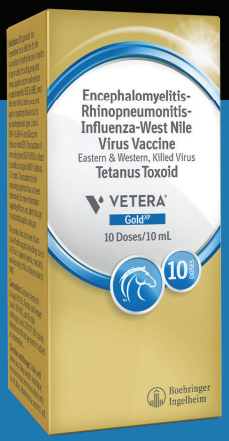

With some equine vaccines, there's loose interpretation about efficacy. Some say blood titers are the predictor of protection. But they are only part of the immune response. Vetera® Gold^{XP} is proven through actual disease challenge.[1,2,3] Millions of doses have been used by veterinarians. That's just what matters.

[1] West Nile Virus Challenge Vaccine Efficacy, BI study number: V9 2009 WNV 12mo DOI

[2] Equine Influenza Challenge, BI study number: 01 V9 6mo DOI OH/03.

[3] Lack of Interference - Influenza Challenge, BI study number: 2012-001 Inf. Data on file at Boehringer Ingelheim.

MIDDELVELD/ISTOCK VIA GETTY IMAGES

EHV-1 spreads through nose-to-nose contact, and proper biosecurity measures are essential to mitigate disease spread.

2022 podcast with an expert panel of internal medicine specialists to discuss EHV-1. The panelists included Steve Reed, DVM, DACVIM; Lori Bidwell, DVM, DACVAA, CVA; and Josie Traub-Dargatz, DVM, MS, DACVIM.

Reed and Bidwell said that EHV-1 is spread through nose-to-nose contact and by grooms, braiders, community water buckets and shared equipment. Bidwell remarked that "EHV-1 can survive 7-30 days on clothing."

Another point of concern is that some horse owners erroneously believe that dexamethasone is a "calming agent" and commonly give this corticosteroid the night before showing. That might occur many times a week. Corticosteroids are known for their immune-depressing effects, making the horse an easier target for infectious disease.

Reed pointed out that EHV-1-affected horses develop an initial fever, then break with respiratory disease. He said that the disease can take a rapid turn and that a horse is identified with "a fever in the morning, becomes neurologic in the afternoon, and is on death's door by midnight." Even a mild fever is concerning (102–103º F). By checking temperatures twice daily, a febrile horse can be isolated quickly to protect others at a facility.

Traub-Dargatz reminded veterinarians that equine herpesvirus is a latent virus that can reactivate. That means a horse can shed virus in nasal secretions despite no sign of disease. She emphasized that it is critical to use good hand hygiene between groups and individual horses by accessing hand washing stations and/or using hand sanitizer. Other recommendations are practical and preventive, especially at show and sport horse venues:

- Avoid direct horse-to-horse contact.
- Avoid congregation of horses at entry gates and in wash areas, and have those areas cleaned frequently.
- Do not allow horses to share water or feed.
- Eliminate extraneous people from the area if they have no role in horse care.
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- Monitor horses at an event venue with twice-daily rectal temperatures, and for 5-7 days upon returning home.
- Pay close attention to horses with the most immediate contact with a sick horse and monitor with twice-daily rectal temperatures.
- Have an action plan to mitigate spread of disease in case of an outbreak. Pre-planning is important to prepare an isolation area and assign appropriate personnel to handle sick or suspect horses. Not only are diagnostic tools important, but biosecurity must also be enhanced to limit disease spread. This is best tailored for each specific event.

In an isolation area, Traub-Dargatz noted that it is very difficult to care for a neurologic horse while also maintaining biosecurity to contain the disease agent.

In the Utah 2011 outbreak, exposed horses dispersed from the venue to 19 states and Canadian provinces. That outbreak taught everyone a number of helpful things, including the importance of contact tracing information.

Horses that developed EHM tended to be involved in a high number of show classes, including at events prior to the Utah event.

One significant finding was that horses supplemented with zinc were at a lower risk than horses not receiving zinc-fortified supplements.

Reed cautioned against stacking too many drugs that aren't necessarily helpful. He said that anticoagulants and anti-viral medications with good bioavailability are important for disease management.

Bidwell discussed her treatment protocol during an active California outbreak: Flunixin twice a day, heparin subQ three times a day, and DMSO intravenous once or twice daily for three days. In addition, horses received valacyclovir (20 grams) 2-3 times a day.

Stress affects all pillars of the immune system, and Bidwell emphasized that diet should be consistent and should include zinc and lysine. She pointed out that at events, horses are often offered hay and grain from different sources.

Horses need restorative sleep, which is significantly disrupted in a show environment. Lighting might be on all night in the barn, especially with braiders who come to prepare a horse for the next day's event. There also might be grooms or riders playing music, adding to general noise in the barn. She stressed the importance of good horsemanship on all levels to give horses the most optimal environment possible at an event. She also urged owners to consider that horses need ample rest and time off for months rather than engaging them in horse shows week after week, year-round.

Traub-Dargatz also discussed transport strategies—a critical element in stress mitigation. She said that it is important to load compatible horses next to each other on a trailer. Some horses irritate others, and that can make for many uncomfortable and stressful hours on the trailer. She said owners also should consider how much care the driver takes when hauling for longer distances. It is best to hire grooms who are adept at handling horses quietly and with patience.

Practitioners are reminded of invaluable resources that help with guidance in the event of a herpesvirus outbreak:

- Equine Disease Communication Center (EDCC) has links to biosecu-

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References: 1. Zimeta® (dipyrone injection) [package insert], Rev. 12/2020. **2.** Morresey PR, et al. Randomized blinded controlled trial of dipyrone as a treatment for pyrexia in horses. *Am J Vet Res.* 2019;80(3):294-299.

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rity resources at https://equinediseasecc.org/biosecurity.

- California Department of Food and Agriculture has developed a biosecurity toolkit in two parts—one for prevention and one for managing disease outbreak—at https://www.cdfa.ca.gov/ahfss/Animal_Health/Equine_Biosecurity.html.
- AAEP Biosecurity Guidelines can be found here: https://aaep.org/sites/default/files/Guidelines/BiosecurityGuidelinesFinal1.pdf.
- USAHA has guidelines for an EHV response plan here: https://www.usaha.org/upload/Publication/Top%20Specific/EHM_Guidance_Document_Revised_Fe.pdf.

Insect Bite Hypersensitivity

Skin allergies in horses are frustrating to owners and vets, and they cause great discomfort to horses. Insect bite hypersensitivity (IBH, aka summer eczema or sweet itch) is a reaction to salivary proteins of *Culicoides* sp. These gnat bites generate a profound pruritic reaction, with horses rubbing their manes, tails and abdomens so extremely as to cause significant skin damage and open wounds. Management is the primary measure of control to date: Remove horses from breeding sites of *Culicoides*; stable horses during prime insect feeding times; and use insect repellents and custom fly sheets. Medications that mitigate the allergic response include corticosteroids and antihistamines.

The allergic response to gnat saliva relies on activation of eosinophils. An effort is underway to develop a therapy is based on antibodies that target equine interleukin-5 (IL-5), which activates and regulates eosinophils. An *in vitro* study has looked into this as a solution to this seasonal disease [Langreder, N.; Schackermann, D.; Meier, D.; et al. Development of an inhibiting antibody against equine interleukin 5 to treat insect bite hypersensitivity of horses. *Research Square* Nov 2022; doi.org/10.21203/rs.3.rs-2234317/v1].

ISTOCK/GETTY IMAGES PLUS

Horses that experience insect bite hypersensitivity might benefit from passive vaccination in the future.

An earlier study of an active vaccine that contained interleukin linked to a virus-like particle (VLP) is reported to generate neutralizing antibodies. Data from that study reported a strong clinical benefit from decreased circulating eosinophils after two years of treatment [Fettelschoss-Gabriel, A.; Fettelschoss, V.; Olomski, F.; et al. Active vaccination against interleukin-5 as long-term treatment for insect-bite hypersensitivity in horses. *Allergy* 2019, vol. 74, pp. 572-582].

Researchers in the current *in vitro* study have concerns of potential unwanted consequences from an active vaccine. They noted that IL-5 is integral to immune responses against internal parasites, viruses and bacteria, and active vaccination has the potential to interfere with protection against invading pathogens. Researchers also noted that active vaccination has the potential to enhance the allergic reaction through greater immune cell recruitment.

To optimize prevention, the researchers propose a more passive vaccination based on neutralizing monoclonal antibodies. The response of immunoglobulin G to the vaccine has a half-life of 21 days, so a horse would need administration multiple times over the course of a season. The researchers suggested that a passive vaccine enables better and more fine-tuned control that can be stopped and started as needed. The goal of the study is to "reduce the allergic reaction by selecting an inhibiting antibody without effector function that prevents the binding of eq-IL5 to its receptor."

The team has isolated a promising therapeutic antibody that fulfills their criteria for inhibition efficacy, stability and specificity without compromising or amplifying the immune system. Further studies will test this on live horses suffering from insect bite hypersensitivity. EM

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By Amy L. Grice, VMD, MBA

Handling Ethical Dilemmas

There are common ethical issues that can arise in equine practice. The AAEP provides an ethics session at each convention plus six annual ethics articles in the *Equine Veterinary Journal*. New ethics materials are being prepared by the Ethics Committee for the AAEP Commission on Sustainability's subcommittees—compensation, internships, students, practice culture and emergency duty.

Issues with ethical ramifications in equine practice include deciding whether to offer a full range of treatment options. This would be despite some of the most advanced treatments not having strong published evidence yet. Another might be making decisions related to animal welfare such as whether it is more humane to euthanize a horse or continue with treatment. You might be facing competing interests between a horse's owner, trainer and rider. Or you might be deciding when to use compounded medications or medical devices.

Unlike humans, who are generally treated with a base level of dignity, views on how animals should be treated vary wildly among different countries as well as within the United States. This can lead to tension between owners and vets.

According to the AVMA, fewer than 15% of horse owners consider their horses to be livestock. Conflicts might manifest during cost discussions because owners might not see the value in the diagnostic or treatment approaches that are being recommended. This supports the importance of presenting a range of options at different price points.

According to Brown University, an ethical framework provides a set of standards for behavior that helps us decide how we ought to act in a range of situations. In 2001, Siobhan Mullen and David Main published a framework for a process that veterinarians can use when faced with ethical dilemmas. It can be divided into four steps:

1. Identification of possible outcomes
2. Establishment of stakeholder interests
3. Formulation of an ethical decision
4. Minimization of the decision's impact

In your identification of possible outcomes, consider all of the realities surrounding the client, patient and caregiving situation. Formulate a list of all possibilities for resolving the patient's health needs. Next, establish the stakeholders' interests or motivations for their positions. The client's interests might be different from those of the trainer, agent or rider. While it is likely that none of them want to harm the horse, perhaps they have limited time and/or money. These limited resources might not be adequate to solve the patient's issue. The owner might want to pass over the responsibility for decision-making to the trainer, agent or rider. Or they might wish to decrease the burden on personal resources through decisions that trample on the veterinarian's values.

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As well as considering the legal or ethical guidelines surrounding animal welfare or professional conduct, you should attend to factors related to legal ownership and liability. Remember that it is likely in no one's self-interest that the animal continues to suffer. So, avoiding that scenario would be the minimum acceptable ethical outcome.

When making ethical decisions, the competing factors are often shades of gray with no right or wrong answers. Because the priority is the patient's well-being and lack of suffering, you must make clients aware that they have choices and a responsibility to act. After offering all the possible options while being compassionate and open-minded, try to arrive at a decision together. Some options suggested by the horse's stakeholders might clearly not be in the patient's best interest, and it is important to state that fact and seek to understand while being the horse's strongest advocate.

Try to help decision-makers feel that you understand their concerns. If they feel that you aren't listening, they are more likely to shut down, ignore your advice or feel badly treated.

Although the final decision might not be the one you would make if you were the horse's owner, if the standard of minimizing suffering and advocating for the horse is met, you can be confident that you have been ethical. EM

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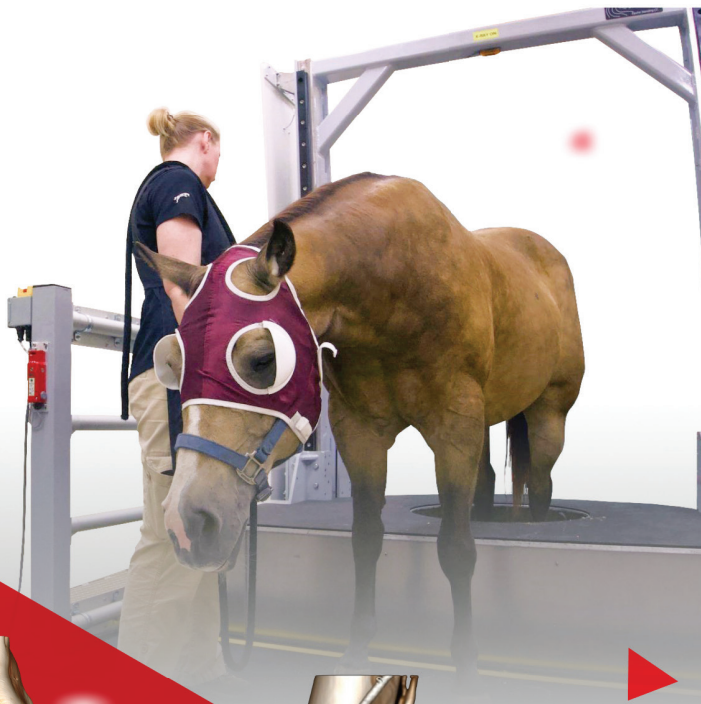

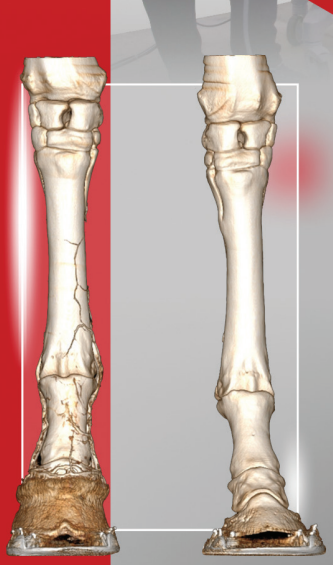

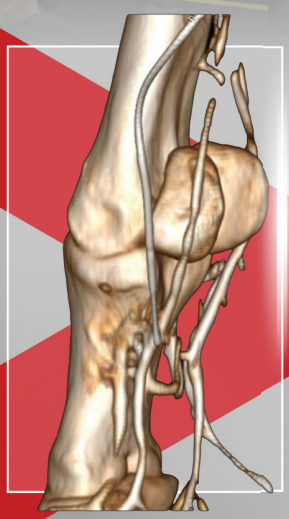

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By Amy L. Grice, VMD, MBA

Finding Joy Every Day

Joy. Happiness. Bliss. Enjoyment. Gladness. Delight. These words describe a feeling that is absolutely necessary for having a meaningful life. As many of us careen through our busy days knocking out task after task, it is important to pause for the small moments of joy.

PEOPLEIMAGES/ISTOCK VIA GETTY IMAGES

The emphasis is on finding those small moments frequently because the really big moments might only come occasionally—the birth of a baby, a wedding, a new home (or a new horse), a fabulous vacation. If we wait for the momentous experiences of joy, we're passing up a lot of smaller moments that can really add up. These snippets of gladness are there, if only we are tuned in enough to notice them. But if we become aware, soon we will start to seek them out.

Consider a breezy but blue-skied February day with 25 mares in heat to check, all inside the concrete block barn that's hovering around 10 degrees. At the midpoint, you excuse yourself for a moment, step outside the south end of the barn where the sun is brightly shining and the wind is blocked. You close your eyes and feel the warmth of the sun's rays on your face. And it feels so good. It is utterly quiet, and you suddenly feel glad to be alive. After about a minute, you open your eyes and return to your work.

It's the end of a long, busy day in May, and you're stinky and wet with amniotic fluid from the dystocia you've just attended. The mare is lying exhausted in lateral recumbency while the foal is sternal at her rear. As you start to gather your straps and lube, the filly makes a tentative little whinny, and the mare rolls up sternal and makes that deep-chested whicker of welcome. As you watch, the mare rights herself and attentively begins to lick the foal. You stop, watching with delight as the right stuff happens, glad that your efforts were successful.

You have just finished an emergency call for a badly choked horse that was discovered by its early-rising owner at 4:00 a.m. After scrubbing your bucket and tube, you pack up and head out, feeling tired and not in the least ready to start your scheduled day in a few hours. As you crest the highest hill on your journey back, you see the most incredible pink sunrise spread out before you. It is awesome! You pull over and watch until the sun makes its appearance. Suddenly you feel a little grateful for the timing of that emergency call and decide to stop at the bakery and bring chocolate croissants to the entire team at the office.

Being observant and open to the smallest opportunities for gratitude will bring joy every day into your life. That fabulous smell of a horse's fluffy winter coat. The sound of peaceful munching of hay in the late-night stable. The squeak of your boots on very cold snow. The freshly fallen powder that glitters like diamonds. Seeing the Milky Way or a shooting star overhead as you leave a late-night call. The smell of warm rain on a summer night. Helping a turtle across the road. The bald eagle perched above the river. When the surgical colic horse in the recovery stall stands on his first attempt.

Keep looking, listening and feeling. That's the key. EM

Editor's note: Taking care of yourself and your staff is critical to staying mentally and physically healthy in practice. Check out Dr. Amy Grice's new series of articles titled Vet Wellness Briefs in each magazine and montly online to give you tips on veterinarian wellness. Brought to you by Zoetis.

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1. American Association of Equine Practitioners. AAEP Parasite Control Guidelines. https://aaep.org/guidelines/parasite-control-guidelines. Accessed August 2022.

zoetis

By Amy L. Grice, VMD, MBA

AAEP Commission: Subcommittees Get to Work

The five subcommittees of the AAEP Commission on Equine Veterinary Sustainability have been hard at work gathering data, creating educational materials and building tools for members. They are fleshing out the structure of a new model of practice that can meet the needs of all equine practitioners and ensure the continued care of our nation's horses.

The **Compensation Subcommittee** met in person in March and developed information to share with members from a survey performed by Comer Research Consultants. The survey was emailed to 6,564 active members of the AAEP in September 2022. The 1,378 respondents yielded a excellent response rate of 21%. Determining recent graduate compensation was one of the most important goals. Salaries were determined by asking respondents for their 2021 annual taxable income from veterinary work as reported on their federal W-2 statement. This was chosen in order to simplify the reporting of the many different forms of compensation within the industry. The 2021 respondents were still students for the first six months, and nearly three-quarters of 2020 respondents were interns for the first six months. Therefore, data from these cohorts were removed, as they did not have a full year as an associate. For those graduating between 2016-2019, the average compensation was $88,973 for 2021.

The **Student Subcommittee** will have an in-person meeting in June, where the subcommittee members and a cross-section of equine-oriented veterinary students will convene to determine the best steps to spread awareness about the many positive aspects of equine practice. The subcommittee is also creating a Speakers Bureau for SCAAEP groups to use. It also has contracted with Comer Research Consultants to survey vet students, particularly those who have turned away from a career in equine medicine, in order to determine the most important reasons for their choices.

MINERVA STUDIO/ISTOCK VIA GETTY

The **Culture Subcommittee** had a productive in-person meeting in mid-March, when they collaborated to build a rubric based on seven pillars of a healthy practice culture. The seven pillars include 1) safety—physical, psychological and mental; 2) security—which flows from comprehensive benefits, parental leave and leaders modeling a balanced life; 3) connection and community—which includes relationships with colleagues, involvement in organized veterinary medicine and networking opportunities; 4) mattering at work—requiring involvement in decision making, recognition, and alignment of mission, vision and values; 5) professional and personal life—dealing with finding integration and balance, having autonomy over schedule and setting boundaries; 6) communication—both within the team and with clients; and 7) opportunities for growth—including mentorship, onboarding, reviews, engagement measures and effective feedback. The group is now creating resources for each pillar.

The **Internship Subcommittee** has completed a series of documents aimed at helping students choose externships and internships that are right for their goals, as well as materials to help mentors assess interns' progress and build internship programs that consistently attract new vets. They have had several well-attended roundtables and are revamping the AAEP Avenues materials.

The **Emergency Subcommittee** met in-person in May to discuss the multiple models for providing emergency coverage and to begin developing actionable tools for AAEP members. The group hopes to have a vigorous discussion on client strategies to decrease practitioner burnout at their AAEP Member Roundtable on April 26. They are also exploring telehealth companies that provide triage, as well as state license reciprocity to aid relief veterinarians in broadening their scope.

Overseeing the various subcommittees is the **Steering Committee**, which is made up of the co-chairs of each subcommittee and the AAEP officers. This group will meet in person in July to coordinate the Commission strategy for the remainder of 2023.

The dedicated Commission volunteers, assisted by the AAEP staff, are working with great enthusiasm and dedication on this effort.

The winds of change are blowing! EM

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Endocrine issues—including PPID—are not limited to old horses with shaggy hair coats.

Key Takeaways from the 5th GEES

The Global Equine Endocrine Symposium (GEES) highlighted new research that continues to broaden the understanding, diagnosis and treatment of these diseases and management of client horses.

By Kimberly S. Brown

Focal points of the 5th Global Equine Endocrine Symposium (GEES) held in January 2023 in Bern, Switzerland, were diagnosis of endocrine diseases, treatment and monitoring of pituitary pars intermedia dysfunction (PPID) in the daily routine, and management of horses with obesity and EMS.

In this article, we will highlight some key takeaways from the 37 presentations and multiple discussions. The main objectives of the Symposium were to review relevant science, including some research that had not been published at the time of the meeting.

Key discussions at the GEES meeting centered around equine metabolic syndrome (EMS), PPID, ACTH (adrenocorticotropic hormone, which is released from the pituitary gland), thyrotropin-releasing hormone stimulation test (TRH is a hormone synthesized in the hypothalamus that stimulates secretion of thyroid-stimulating hormone—TSH—by the anterior lobe of the pituitary gland), leptin (a hormone expected to be increased in EMS horses), and insulin (insulin levels are used to determine if a horse is considered insulin

(Editor's note: The GEES meeting was hosted by Boehringer Ingelheim, Inc., which sponsored this coverage of the presentations.)

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[1]Prascend® (pergolide tablets) [Freedom of Information Summary], St. Joseph, MO; Boehringer Ingelheim Inc.; 2011.

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dysregulated and at a higher risk of laminitis, such as in horses with EMS and approximately 30-47% of PPID horses).

Diagnosis of Endocrine Disorders

According to the AAEP, the most common endocrine disorders dealt with today by equine practitioners and owners are pituitary pars intermedia dysfunction (PPID or equine Cushing's disease) and equine metabolic syndrome (EMS).

It's fairly simple to find the horse that has hirsutism (long, non-shedding haircoat) or hypertricosis often associated with PPID. *(Editor's note: Hypertricosis is considered the more correct term for acquired increase in hair length and lack of shedding that often occurs when horses have disease of the pars intermedia.)*

It can become more difficult when signalment of endocrine disease is less obvious or specific. Aside from failure to shed properly and a long, curly hair coat, horses with PPID can have increased water intake and urination (polyuria/polydipsia or PU/PD), laminitis (often recurring), hoof abscesses, lethargy, chronic infections, excessive or inappropriate sweating, loss of muscle mass, pot-bellied appearance and reproductive issues.

Equine metabolic syndrome can have some similar clinical signs in horses as PPID, including laminitis. EMS-affected horses usually also have insulin resistance (IR) and excess fat deposits, especially a cresty neck and fat pads at the tailhead.

There were multiple presentations at the GEES meeting that discussed diagnosis of endocrine diseases. Those discussions centered around ACTH/TRH and insulin (oral sugar) testing.

One presentation discussed PPID and insulin dysregulation (ID) in horse breeds classified by genetic clade (***Prevalence of Pituitary Pars Intermedia Dysfunction and Insulin Dysregulation in Horse Breeds Classified by Genetic Clade***, authored by Rachel Lemcke, MS, of Amwell Data Services LLC, in New Jersey; Steve Grubbs, DVM, PhD, DACVIM; and Kelly Graber of Boehringer Ingelheim Animal Health USA).

This retrospective analysis was performed on veterinarian-provided data from a 2016-2020 study in the United States on 6,266 ponies and horses with suspected endocrine disorders (primarily PPID). This study did not include Quarter Horses or Paints due to the high risk of breed misclassification. The enrolled horses were separated by

breed into 13 clades, which is a branch of a genetic cladogram that includes a single common ancestor and all of that individual's descendants. Several clades included closely related breeds. Frequency of endocrine-associated clinical signs were also compared among endocrine classifications and clades.

The research showed that both the highest rates of PPID (61.52%) and ID (72.22%) occurred in Clade 3, which included Miniature Horses, Shetland ponies and dwarf ponies.

The lowest rate of PPID (21.70%) was found in Clade 2 (Lusitano and Andalusian). Clade 7 (Percheron and Belgian Draft) had the lowest rate of ID (24.84%).

In addition, endocrine disorders were identified in over half the horses 10 years old and younger in the majority of clades, highlighting the need for endocrine testing in younger horses.

Decreased athletic performance was not statistically associated with any endocrine classification or combination evaluated, although it was less prevalent in Clade 2 than in Clade 6 (Clydesdale and Shire).

Laminitis, however, was statistically associated with horses that had both PPID and ID, as well as those with ID only. Clades 1 (Peruvian Paso and Paso Fino) and 3 had statistically higher rates of laminitis than several other clades.

Horses in this data set were more likely to have both PPID and ID rather than only PPID. In fact, horses were more likely to have only ID or no identified endocrine disorder than only have PPID. It is important to note that the majority of these horses and ponies were not tested using dynamic testing, suggesting these frequencies of endocrine disorders might be underestimated.

This research highlights the continued need for equine practitioners to evaluate younger and older horses and ponies with clinical signs for endocrine disorders, preferably using dynamic testing

KIMBERLY S. BROWN

Researchers and veterinarians were invited from around the world to present at the 2023 GEES meeting on the latest equine endocrine-related studies.

(which is more sensitive than static testing). Testing for only PPID or ID might lead to an oversimplification of the endocrine dynamic within patients, inadvertently allowing undiagnosed endocrine comorbidities to cause further clinical signs and negatively impact patient health.

This work can also help inform veterinarians of likelihoods of endocrine disorders within a variety of specific horse and pony breeds.

That same group also reported on ***Exploring Endocrine Disorders within Warmblood Breeds: Frequency of PPID and ID***. This study used the same group of horses as above, but they compared rates of endocrine disorders among nine Warmblood breeds. A second comparison was performed examining the frequency of endocrine-associated clinical signs in three specific Warmblood breeds (Dutch Warmblood, Hanoverian and Oldenburg) versus non-breed-specific Warmbloods.

The study results showed that endocrine disorders were identified in 55-85% of specific Warmblood breeds versus 69% of non-breed-specific. There was not a significant difference in endocrine disorder prevalence among any Warmblood breed evaluated.

Of the three Warmblood breeds compared to non-breed-specific Warmbloods, regional adiposity was the only endocrine-associated clinical sign statistically different among the comparisons. Oldenburgs had a lower rate of regional adiposity regardless of endocrine classification versus non-breed-specific Warmbloods.

Among all Warmblood breeds evaluated, regional adiposity rates were highest in Warmbloods with PPID and ID versus those with PPID alone. Rates of decreased athletic performance and laminitis were not statistically associated with any endocrine classification.

Therefore, veterinarians who work with Warmbloods should be on the lookout for PPID and/or ID in their patients and utilize dynamic testing methods. The researchers noted that, "Hair coat changes were statistically associated with horses with PPID as well as those without endocrine disorders, suggest-

SHELLEY PAULSON

It's fairly simple to find the horse with the shaggy hair coat, but there are many horses with endocrine issues that require veterinary involvement to determine the cause of issues such as muscle atrophy and regional adiposity.

ing many horses in this study may have undiagnosed PPID. Rates of regional adiposity were lowest in PPID-only horses, further highlighting the need for dynamic testing."

A study titled ***Muscle Atrophy Scores in a Population of Aged Horses and Ponies With and Without PPID*** was reported on by Pat Harris MA, PhD, DipECVCN, VetMB, MRCVS. She is head of the Equine Studies Group at Waltham Petcare Science Institute in the United Kingdom and Director of Science for Mars Horsecare.

Harris shared, as background information, some recent survey results from more than 2,000 owners of senior horses in the USA. The survey had been carried out in collaboration with the Gluck Equine Research Center in Kentucky. The owners had reported that nearly 20% of their older horses had low muscle mass. While age was a major contributor, PPID was also an important risk factor. She also introduced the new Muscle Atrophy Scoring system (MASS) that had recently been developed for use in horses by the Gluck Equine Research Center in collaboration with Waltham (Herbst et al 2022). She explained that this required users to first determine for each of the assessment areas whether the lean MASS or the adipose MASS scoring chart should be used in order to minimize any confusion between adipose tissue and muscle.

Harris went on to describe in more detail the study undertaken in collaboration with Melbourne University, together with the Queensland University of Technology and Boehringer Ingelheim. This evaluated, in Australia, the utility of the new MASS in a group of 31 animals (18 ponies and 13 horses more than 15 years old) with and without PPID. A PPID-positive diagnosis was established in 12 animals based on clinical signs, baseline ACTH and a TRH stimulation test.

All animals were assessed and body condition (BCS: 1-9), cresty neck (CNS: 0-5) as well as MASS (4-1: using lean or adipose charts as appropriate) scores were obtained.

Overall, the PPID animals had significantly more muscle atrophy than the non-PPID animals. The majority of the non-PPID animals showed no signs of muscle atrophy. Seven of the PPID animals had a MASS of 7 or more. Only one non-PPID animal had such a value (a 32-year-old mare with marked atrophy and chronic weight loss). These differences in MASS were found despite there being no overall difference in BCS or CNS between the two groups.

In her conclusions, Harris stated: "The results confirm that muscle atrophy is a common feature of PPID; and that the scoring system developed in horses is also applicable to ponies, including Shetland/Miniature ponies. The majority of non-PPID animals (of a similar age to the PPID group) showed no evidence of muscle atrophy, indicating that old age per se is not automatically associated with muscle loss in healthy animals. As the PPID animals had similar BCS and CNS to the non-PPID cohort, there appears to be no loss of adiposity due to this condition (assuming they are other-

wise healthy). Rather, PPID appears to be associated with a specific loss of muscle tissue. These findings warrant further investigation and may have important implications for optimizing the nutrition of horses and ponies with PPID."

She emphasized that the MASS therefore could be an important muscle atrophy monitoring tool for owners and veterinarians, although she recommended concentrating just on the neck, back and hindquarter regions.

Veterinarians examining older horses and ponies should pay specific attention to monitoring muscle atrophy, especially in animals with, or suspected of having, PPID. [For more information on the MASS scoring system see Herbst, A.C.; Johnson, M.G.; Gammons, H.; Reedy, S.E.; Urschel, K.L.; Harris, P.A.; and Adams, A.A. 2022 Development and evaluation of a muscle atrophy scoring system (MASS) for horses. *JEVS*, p.103771.]

New and Possible Treatments

There were several exciting presentations that offered initial research on medicines used to treat insulin dysregulation in horses. The specific drugs that were researched were velagliflozin (researched for horses) and canagliflozin (Invokana for humans).

Velagliflozin and canagliflozin are both sodium-glucose co-transport 2 (SGLT2) inhibitors that reduce renal glucose reabsorption, promote glucosuria, and consequently, decrease blood glucose and insulin concentrations.

In horses, Velagliflozin has been researched to counteract the effects of insulin dysregulation, including the development of laminitis. The study presented at the GEES meeting was ***The sodium-glucose cotransporter-2 inhibitor velagliflozin decreases basal plasma insulin concentrations in horses with moderate-severe insulin dysregulation*** and was presented by Kristen Thane, DVM, DACVIM (Large Animal), of Tufts. She noted that velagliflozin decreased plasma insulin concentrations in horses with moderate/severe hyperinsulinemia. She said that serum triglyceride concentrations increased in all horses treated with velagliflozin. This hypertriglyceridemia typically improved gradually during the 40-week trial. However, development of marked hypertriglyceridemia was observed in some horses after starting treatment with velagliflozin. Therefore, serum triglycerides should be monitored when initiating therapy with an SGLT2 inhibitor. No laminitis developed while horses were receiving velagliflozin treatment.

Canagliflozin in previous research showed it had the ability to lower insulin levels in horses, reverse or reduce fat pads and eliminate laminitis pain in horses with refractory hyperinsulinemia and laminitis (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9473365/#:~:text=Once%20daily%20administration%20of%20the,with%20refractory%20hyperinsulinemia%20and%20laminitis).

At the GEES meeting, Drs. Sanna Lindase and Johan Brojer of the Department of Clinical Sciences, Swedish University of Agricultural Sciences, each presented on studies looking at canagliflozin.

Lindase noted that short-term treatment with canagliflozin decreased excessive hyperinsulinemia 65% compared to placebo, but there were no differences between the study doses (0.6 vs 1.2 mg/kg). The horses treated with canagliflozin decreased in body weight and had higher serum triglyceride concentrations. She could not find a correlation between decrease in body weight and increase in triglyceride concentrations.

Brojer studied how canagliflozin affected the beta-cells in the pancreas compared to placebo. The striking finding was that canagliflozin changed the function of the beta-cells. He concluded that the marked decrease in insulin response seen in insulin dysregulated horses treated with canagliflozin is caused by lower blood glucose concentrations since glucose is lost by urine, but more importantly, because the beta-cells produce less insulin in response to increases in blood glucose concentrations.

The study ***Factors influencing owner decision-making regarding the management and treatment of pituitary pars intermedia dysfunction*** was presented by Jo L. Ireland, BVMS, PhD, Cert AVP(EM), FHEA, FRCVS, of the University of Liverpool's School of Veterinary Science. This study investigated owner understanding of PPID and treatment. What the study found was that:

- Where horses were not exhibiting typical signs of PPID, the disease became "abstract and difficult to comprehend."
- Owners with horses that had concurrent health issues such as EMS and PPID found it difficult to differentiate between the diseases.
- Owners believed they knew their horses best.
- Balancing management and treatment was complex, i.e., for weight management horses need to be kept off grass but if they had arthritis then movement was needed.
- Owners wanted horses to have time to be out with other horses.
- The vet-owner relationship was important in the care of the horse.
- Small improvements in veterinary-to-owner communication could have a large impact on treatment compliance.
- Cost of treatment was not the main consideration, but it was a concern.
- Health and happiness go hand-in-hand, and owners think horses can't have one without the other.
- The perceived risk of laminitis was troubling to owners.

The study ***Long-Term Response of***

One study looked at long-term response to pergolide by equids with PPID.

Equids with Pituitary Pars Intermedia Dysfunction to Treatment with Pergolide was presented by Hal Schott, DVM, DACVIM, of Michigan State University. He said PPID is being increasingly recognized and treated. However, there is limited data on long-term response to treatment with pergolide. This study determined that long-term treatment of equids with PPID produced clinical improvement in nearly all affected animals. Horses might not need progressively increasing drug doses. Endocrine test results can improve in PPID horses treated with pergolide over a prolonged period of time. Treatment with pergolide improves the quality of life but does not prolong life.

Schott said that overall, there is high client satisfaction with extended use of Prascend® (pergolide tablets). He said most owners are willing to spend $1,000 annually to treat horses, but that willingness drops off at $1,500 per year.

Management of Obesity and EMS

Alfredo Sanchez-Londoño, DVM, MS, DACVIM (Large Animal), of Auburn University, created a web-based ***Survey of knowledge of Equine Endocrine Diseases by Farriers/Hoof Professionals***. The survey was distributed world-wide through farrier associations, farrier magazines and social media. Of the 179 participants who completed the survey, 141 were familiar with the term PPID and all of those had heard of equine Cushing's disease.

A total of 167 were familiar with the term EMS, and all respondents were familiar with the term "easy keeper." Since foot maintenance is critical in managing horses affected with PPID or EMS, farriers were asked about owner compliance with those issues. It was considered "good" for 72 respondents and "average" compliance by 57.

The foot care professionals said emphasis needs to be on prevention of EMS. Many recommended boots in the acute phase of laminitis. There needs to be more basic information available for horse owners. Owner compliance is good initially, "but then they go backward." He said more vets should be working together with farriers, and that veterinarians should talk with horse owners about diet and nutrition of their horses.

The same researcher conducted a ***Survey of Knowledge of Equine Endocrine Diseases by Horse Owners***. A total of 1,972 respondents completed the survey, the vast majority of which were based in the United States. Of that total, 1,286 participants were familiar with the term PPID, 679 were not and 7 did not respond. From the 1,972 participants, 955 had heard about the diseases but had not had a horse diagnosed with them, 511 had a horse diagnosed with PPID, 251 had a horse diagnosed with both EMS and PPID, and 202 had a horse diagnosed with EMS.

Sanchez-Londono said owners want earlier diagnoses of these diseases. They also want other treatments/management strategies for affected horses. There is need for more information about these diseases in donkeys, plus education on nutritional management in all equids. In "other" responses on this survey, there were write-in comments from about 250 owners who felt their veterinarians needed to be more "up-to-date" on information about these diseases.

Take-Home Message

There is a lot that is and is not known about endocrine diseases in equids. More research is being conducted, but it is hard for busy veterinarians, farriers and owners to get that new information and put it to use.

Veterinarians should be in the forefront of educating themselves, their lay colleagues and their clients about updates in diagnosing, treating and long-term care and management of equids that have endocrine disease.

For more information from the 2023 GEES meeting, search for this article on EquiManagement.com and download the *Proceedings from the 5th Global Equine Endocrine Symposium*. EM

AMY DRAGOO

EHV quarantines can have large economic impacts on the industry.

Herpesviruses and Horse Owners

Help your clients understand the facts about equine herpesvirus and be prepared, not petrified.

By Stacey Oke, DVM, MSc

Equine herpesvirus is all over the news, and it usually isn't good news. Outbreaks. Neurologic disease. Deaths. If we simply look at those reports, it's easy to get the impression that herpesvirus infections only cause those problems. Not surprisingly, our clients see that news and are worried, too.

Even if you stick to science, the word around equine herpesviruses is harsh: "Equine herpesvirus-1 is one of the most important and prevalent viral pathogens of horses and a major threat to the equine industry throughout most of the world" (Oladunni, et al., 2019), and "Equine herpesvirus 1 (EHV-1) is the most significant equine herpesvirus in terms of equine health and economic impact to the equine industries worldwide" (https://equine.ca.uky.edu/content/equine-herpesvirus-1-revisited-significance-and-control-strategies).

While those statements are true, there are a lot of other facts that should be relayed to horse owners to paint a realistic picture of what EVH "looks" like clinically (i.e., county-wide quarantines don't happen every day). Thus, the goal of this article is to relay some relevant information about equine herpesvirus that isn't all doom and gloom, including data on the "other" EHVs—EVH-2 and EHV-5. We'll also cover some tips and tricks that veterinarians can follow when testing and treating affected horses.

Fact: EHV-1 Isn't the Only One

There are nine different equine herpesviruses, but horses are the natural host to only five of those—equine herpesviruses 1 through 5. Those five viruses are divided into two groups: alphaherpesviruses and gammaherpesviruses. EHV-1, -3 and -4 are alphaherpesviruses while EHV-2 and -5 are gammaherpesviruses.

According to Marie Luisa Marenzoni, DVM, MS, PhD, DECVM, from the Department of Veterinary Medicine, University of Perugia, Italy, it does matter what group a herpesvirus hails from.

"The alpha- and gammaherpesviruses belong to different viral families," she noted. "They have different replication cycles and a different relationship with

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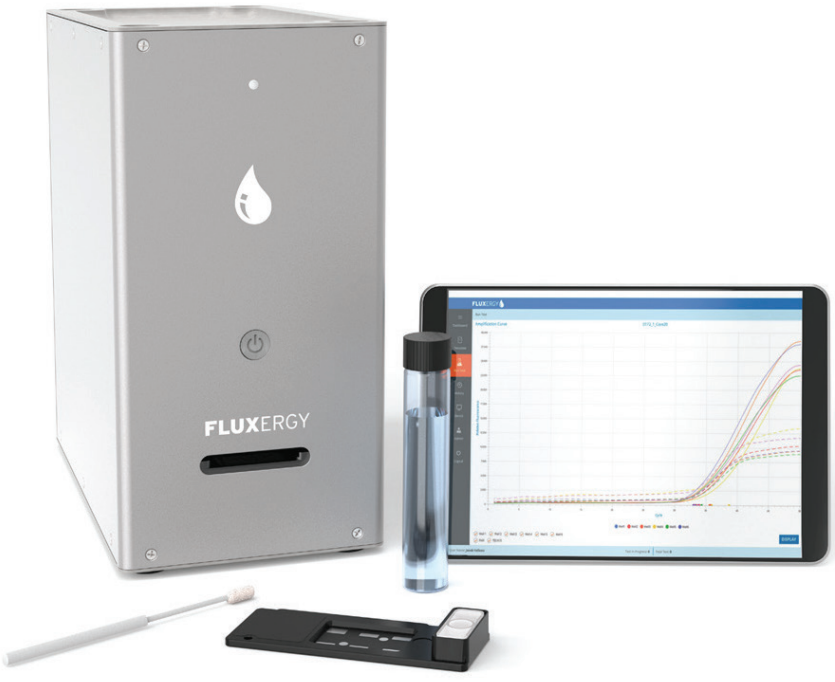

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Fluxergy provided RUO EHV-1 PCR test kits to the **Desert International Horse Park** in a pilot program to allow for 1 hour on-site screening of febrile horses. This organization established and executed the biosecurity protocols with Fluxergy's technical support. The Fluxergy platform is not only used on show grounds, but also validated by leading university veterinary teaching hospitals and equine referral hospitals.

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"The decision to establish a lab on-site was made easy given the technology and support we received from Fluxergy. Most importantly, it gave us an important new tool for our biosecurity program and greatly enhanced our ability to assess the risk created by a horse with a fever. Identifying potential sick horses is the most important priority in preventing another outbreak, and with Fluxergy's technology, we are better prepared."

Steve Hankin, CEO
at Desert International Horse Park

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Both neuropathic and non-neuropathic strains of EHV-1 can cause EHM, which can cause horses to become acutely and severely neurologic and recumbent.

the host cells. The alphaherpesviruses, for example, more frequently have a lytic phase while the gammaherpesviruses are more cell-associated and cause less cellular damage. This results in different clinical signs and severity of infection."

This explains why—clinically speaking—the respiratory forms of EHV-1 and -4 are generally indistinguishable and why EHV-2 and -5 are not often considered common causes of rhinopneumonitis.

Fact: Not All Upper Respiratory Infections are EHV

This was demonstrated in a voluntary biosurveillance study. In the study, 261 equine practices collected samples from horses with acute onset of fever and/or respiratory signs such as nasal discharge and coughing (Jaramillo-Morales, et al. 2023). Nasal swabs were collected, and DNA was purified by a laboratory. The purified nucleic acids were tested for *Streptococcus equi*, equine influenza virus, EHV-1, EHV-4, and equine rhinitis A and B viruses. In total, 9,409 horse with acute onset respiratory disease were tested.

EHV-4 was found in 10.5% of the horses, and EHV-1 in only 1.6%.

"The prevalence of EHV-1 and -4 in that study was about what we expected considering the severity of the disease of the horses included in the study," relayed one of the study authors, Camilo Jaramillo-Morales, DVM, MS, a large animal internal medicine resident and a DACVIM candidate at UC Davis' Veterinary Medical Teaching Hospital.

Equine Herpesvirus	Clinical Syndrome
1	Rhinopneumonitis Abortion EHV-1 myeloencephalopathy (EHM) Neonatal disease
2	Pharyngitis
3	Coital exanthema (a venereal disease)
4	Rhinopneumonitis
5	Equine multinodular pulmonary fibrosis (EMPF)

Fact: Many Horses Routinely Test Positive for Gammaherpesviruses

In a survey of 162 healthy horses attending a show in California, qPCR samples of nasal secretions were positive for EHV-2 in 39.9% of horses and positive for EHV-5 in 36.4% of horses. Notably, EHV-1 and -4 samples were negative in all horses (Pusterla, et al. 2022).

The fact that EHV-1 and -4 were not detected in any horses was not particularly surprising in this case. This study was conducted after a multicounty equine herpesvirus outbreak, and the horses swabbed in this study had all been quarantined for a minimum of 28 days before participating in the show where the study was conducted. All horses were healthy at the time of arrival to this show and remained healthy throughout the multi-day event.

Further, the fact that EHV-2 and -5 were detected was also not surprising. The research noted, "These gammaherpesviruses are considered commensals as they are found in healthy horses as well as horses with respiratory tract infections."

Fact: Gammaherpesviruses Might Not Cause Disease

Gammaherpesviruses are believed to have co-evolved with horses for millions of years. Because infections occur in both the absence of clinical signs as well as with a variety of clinical signs, it is difficult to determine if these viruses actually cause a specific disease (like EHV-1 causes EHM).

As mentioned above, gammaherpesviruses remain latent in infected horses

just like the alphaherpesviruses.

The prevalence of EHV-2 and -5 is reported anywhere from fewer than 10% to 100% in various studies.

"But it should be noted that it is not clear whether the viruses are simply present when clinical signs do occur, as commensals, or whether they cause these clinical signs," noted Marenzoni.

More About Equine Herpesvirus Type 2

As with all the EHVs, foals become infected early in life, usually around 2-4 months of age when maternal antibodies decline. The prevalence of infection in foals is high—almost 100%—and infected foals become latently infected for life. Foals shed high levels of EHV-2, and their rate of infection begins to decline around nine months of age.

EHV-2 infection causes pharyngitis in foals, either with or without lymphadenopathy as well as rhinitis and pyrexia. Continued shedding of EHV-2 into the nasopharynx can lead to chronic pharyngitis. Severe respiratory disease outbreaks have been reported in horses worldwide; foals are most affected.

In older horses, EHV-2 infection is not clearly associated with any one clinical presentation. However, "poor performance syndrome" in racehorses has been suggested as an EHV-2-related disease.

Horses with this syndrome have malaise, mild respiratory disease (cough), lymphadenopathy, pharyngitis, anorexia and low-grade fever that is not responsive to antibiotics.

According to Marenzoni, EHV-2 infections are frequently diagnosed in conjunction with other viral or bacterial infections. Some experts believe that EHV-2 "opens the door" for those other infections, such as *Rhodococcus equi*.

Testing for and Treating EHV-2

Just like some tests cannot differentiate between EHV-1 and -4, serology cannot distinguish between EHV-2 and -5. The best tests for EHV-2 are PCRs from nasal swabs for horses with respiratory signs or seroneutralization in paired sera samples.

Symptomatic care for treatment is all that is typically warranted. As Marenzoni pointed out, "It is not clear if the EHV-2 virus is even the cause" of the clinical signs.

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Nasal discharge can be a clinical sign of EHV, but it can also be a sign of other diseases, such as strangles, influenza, and equine rhinitis A and B viruses.

More About Equine Herpesvirus Type 5

EHV-5—like EHV-2—is frequently detected in normal, healthy horses. A number of clinical conditions have been "blamed" on EHV-5. Examples include poor performance syndrome (identified above with EHV-2), dermatitis (similar to herpes-associated erythema multiforme in humans), abortion, systemic granulomatous disease, and hematologic disorders that are characterized by pancytopenia and chronic T-cell leukemia or lymphoma.

In 2007, researchers suggested that equine multinodular pulmonary fibrosis (EMPF) resulted from EHV-5 infection. Affected horses have marked interstitial fibrosis and the airways contain neutrophils as well as macrophages. Some of those macrophages were found to contain EHV-5 DNA.

More recent studies reported that experimentally infecting horses with EHV-5 resulted in EMPF in three of six horses. Thus, it is possible that EHV-5 can cause disease in horses. Which means it is not the nonpathogenic virus it has always been believed to be. It is possible that only certain strains of EHV-5 cause EMPF (Marenzoni, et al. 2015).

"EHV-5 has consistently been identified in all cases of EMPF. However, it is still not possible to unequivocally state that EHV-5 causes EMPF or if the environment of the lung caused by EMPF results in increased EHV-5 loads," explained Marenzoni.

"Further, there is no evidence of natural transmission of EMPF," she added

In other words, the pathogenetic mechanism of EHV-5 is not known.

Horses with EMPF have a history of weight loss, poor condition, exer-

cise intolerance and inappetence. The respiratory signs are severe, associated with tachypnea and dyspnea, and can be mistaken for severe equine asthma.

Testing and Treatment of EHV-5

"To diagnose EHV-5 infection in horses without EMPF, the methods are the same of the other EHVs: PCR and serology," said Marezoni. "To diagnose EMPF, a pulmonary biopsy must be performed to characterize the lesions. PCR to detect EHV-5 can be performed on the lung biopsies or using bronchoalveolar lavage fluid."

Treatment for EMPF is—like all EHVs—symptomatic. It might involve hydration, moving the horse to a well-ventilated area, corticosteroids to decrease pulmonary inflammation, non-steroidal anti-inflammatory drugs for pain and fever control, and potentially antivirals.

Acyclovir and valaciclovir reportedly have beneficial effects in some cases. However, because the etiology of EMPF is still speculative, whether the antivirals were actually of benefit remains unclear.

Despite aggressive and prolonged treatment (six weeks), the prognosis for EMPF is generally considered poor, although some horses with mild signs of disease do recover.

Not-So-Fun Fact: Herpesvirus Outbreaks Have Massive Economic Effects

Herpesviruses are associated with both direct (i.e., medical) and indirect cost. For example, sick horses (e.g., with upper respiratory tract infections) lose training days and incur costs for diagnostics and treatment. Third-trimester "abortion storms" related to EHV result in the loss of foals and an entire breeding season. EHM grinds various sectors of the equine industry to a halt due to extensive movement restrictions. Those are all associated with massive expenses and costs to the industry.

Canceling events due to outbreaks and quarantines has serious repercussions. Researchers in Texas and Louisiana, for example, collaborated during COVID and reported that Houston, Texas, lost approximately $277 million after the cancellation of the Houston Livestock Show & Rodeo. Similarly, Denver, Colorado, lost $120 million due to the cancellation of the National Western Stock Show (Huseman, et al. 2021).

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The prevalence of EHV-2 infection in foals is nearly 100%; then foals become latently infected for life.

"The top five business sectors supported by the horse industry are support activities for agriculture and forestry, hotels and motels, commercial sports, real estate and wholesale trade," the study authors wrote. "Horse shows provide a significant economic boost to local, region and state economies."

An open letter to the horse industry published by the American Horse Council (https://horsecouncil.org/press-releases/an-open-letter-to-the-horse-industry/) noted that, "The horse community is always just one step from a calamity and that calamity is a disease outbreak of such proportion as to widely imperil the health of our horses and threaten the economic viability of our industry. The ever-present risk is due to the equine industry's reliance on the timely movement of healthy horses for sales, breeding, racing, showing, work and recreation. In this environment, an infectious disease outbreak can result in federal or state restrictions on horse movement to stop the spread of the disease ... disease outbreaks have cost the industry millions of dollars for the care of horses, implementation of biosecurity, and lost revenue in the form of canceled or restricted commercial equine activities."

Practitioners: Be Cognizant of Reporting Rules in Your State

According to Angela Pelzel-McCluskey, DVM, MS, a USDA-APHIS Equine Epidemiologist located in Fort Collins, Colorado, EHV is a reportable disease in most states.

"But here's the catch with state reportability: It's listed as a reportable disease in several different ways depending on the state," said Pelzel-McCluskey. "Some states have any EHV-1 detection listed as reportable; some states have only confirmed EHM cases listed as reportable. And there is a final category of states in which any equine neurologic presentation is reportable regardless of cause, which eventually catches EHV-1 if that ends up being the cause."

Veterinarians need to visit their state veterinarian's or department of agriculture's website to see exactly what facet of EHV is reportable in their state. It is important for veterinarians to know the reportable disease list in the state (or states) in which they practice.

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Virus isolation is ideal for EHV diagnosis, but qPCR is the most common test.

In addition, Pelzel-McCluskey said that just because it is reportable in a state doesn't necessarily mean it is actionable.

"At the federal level, it's only classified as a monitored disease, meaning we know it's an endemic disease for which we have cases every year," she explained. "We do not catalog any more specifics than that with the international World Organization of Animal Health."

Marenzoni explaind that, "The reason that EHV-1 is notifiable is to prevent its spread, similar to COVID. This should be seen as a measure to prevent other cases rather than a form of oppression. The sooner I notice it, the fewer cases I will have."

Fact: Horses Are Infected for Life but Are Not Immune to Disease

Foals become primarily infected with EHV via the respiratory route after exposure to droplets of nasal secretions or contact with fomites containing the infective virus. This is true for all types of EHV and occurs within the first weeks to months of age, particularly 2 to 4 months of age when maternal antibodies begin to dwindle. After the primary infection, which is typically self-limiting or even asymptomatic, herpesviruses have leukocyte-associated viremia resulting in the spread of the virus to peripheral tissues. This is how the viruses establish themselves within the foal's body as a latent infection that can be reactivated to cause clinical disease and viral shedding during periods of stress. This viremic spread also explains how the virus causes abortion and neurologic disease.

A common feature of all herpesviruses is their ability to lie dormant and resurge at any point in a horse's life, putting other horses at risk of infection (especially naïve animals). These latently infected horses, however, are not immune to reinfection. Even a horse with a latent infection can become reinfected at any point in its life, developing clinical signs of disease or having an asymptomatic infection but still shedding the virus to other horses.

Latent infections, unlike active or subclinical infections, cannot be detected in horses.

"The virus in the latent phase is found in areas of the body that are not easily accessible for sampling, such as the trigeminal ganglia or a few circulating lymphocytes," noted Marenzoni.

Additionally, according to the AAEP vaccination guidelines, existence of this carrier state seriously compromises efforts to control EHV-related diseases. It also explains why outbreaks of EHV-1 or EHV-4 can occur in closed populations of horses.

Fact: Testing is Needed for Respiratory Diseases

Many pathogens cause clinical signs such as fever (which can be biphasic and potentially missed), lethargy, nasal discharge, anorexia and potentially lymphadenopathy. Therefore, clinicians should recommend testing to identify the cause of any respiratory disease.

Although virus isolation is the gold standard for diagnosing EHV-1 and -4, qualitative polymerase chain reaction (qPCR) is typically the go-to test. Experts recommend choosing a test that detects the glycoprotein B gene (check with your laboratory for the best test to order). The qPCR test can be performed on nasal or nasopharyngeal swabs as well as blood samples. Veterinarians can send the swabs in plain, red-top tubes.

"We test for EHV-1 either by nasal swab PCR or blood PCR to monitor patients that we know are clinically affected and to determine how long to prescribe antivirals for. As mentioned above, serology in latent cases is not helpful," advised Jaramillo-Morales.

When paired sera samples are measured via a viral neutralization test, a horse is considered positive with a fourfold or greater increase in antibody titer levels measured 14-21 days apart. Do not vaccinate horses between the two samples. The traditional serum neutralization test cannot differentiate between EHV-1 and -4; however, a commercial test kit used in practice can and claims to be accurate in detecting both viruses.

(Author's note—An important point for practitioners is that if a horse presents with a high fever but tests negative for EHV-1 and -4, and other causes of the fever have been ruled out, re-testing horses via PCR using blood or nasal swabs in 24-72 hours is indicated. Quarantine all horses until all test results are reported.)

Fact: Neuropathogenic EHV-1 Isn't the Only Cause of EHM

While there is a specific form of EHV-1 called the "neuropathic" strain (i.e., G2254/D752), even the "non-neuropathic strain" (A2254/N752) can cause EHM (Bryant, et al. 2018). Some EHV-1 strains lacking either of these genotypes can cause EHM. For example, Thieulent, et al. (2022) reported a C2254/H752 strain of EHV-1 that caused EHM. This means that any horse with EHV-1

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infection should be carefully monitored for signs of neurologic disease.

The only definitive test for EHM is histological and immunohistological examination of central nervous system tissues postmortem.

"In clinical practice, however, nasal and blood PCR will diagnose EHM, the same as rhinopneumonitis," said Jaramillo-Morales.

Treating EHM

In terms of treatment, Jaramillo-Morales noted that, "If we aggressively treat horses at the beginning of the disease, then we can prevent pathological decubitus of the patient and avoid multiple associated complications. We are currently using ganciclovir intravenously followed by valacyclovir orally. We have had very good outcomes with this approach."

No antiviral is currently marketed specifically for equine herpesviruses. However, antivirals are often used with apparent success.

In the study by Thieulent, et al. (2022), valganciclovir (6.5 mg/kg) was prescribed orally to four horses experimentally infected with the C2254/H752 strain of EHV-1. Valganciclovir administered three times the first day and then twice daily for 13 days resulted in:

- reduced clinical signs of disease;
- decreased infectious virus shedding;
- decreased viremia; and
- no adverse reactions.

Facts: Vaccines Alone Won't Prevent Disease

Marenzoni, et al. published a meta-analysis of EHV-1 vaccines in 2022 showing that "vaccination generally results in a slight improvement in clinical and virological outcomes, although not to a significant extent."

However, Marenzoni also noted that "Vaccination must be considered one of many useful tools for infection control for EHV-1 and -4. But being a vaccine with limited efficacy, it must be accompanied by the application of biosecurity standards, including quarantine, early diagnosis, movement control, and creating small, stable groups of animals."

Thus, it's important for veterinarians to ensure that their clients understand that appropriate biosecurity is key to preventing and managing disease and outbreaks in addition to vaccination. In an outbreak situation of respiratory disease or EHM, the goals are to achieve an early diagnosis, prevent further spread of disease and manage the clinical cases.

For example, segregate pregnant mares from all other horses in broodmare operations. Further subdivide the pregnant broodmares into small, physically separate groups for the duration of their pregnancies. Isolate all mares returning to the farm for a minimum of three weeks. In the face of abortion, remove the remaining pregnant broodmares immediately because aborted fetal tissues and placentas can contain very high levels of infective virus.

THINKSTOCK

EHM often results in widespread movement restrictions, which can grind sectors of the industry to a halt.

Final Facts: Vaccines

There are no vaccines for EHV-2 and EHV-5, and there is no evidence that current vaccines can prevent naturally occurring cases of EHM.

To derive the maximum benefit of vaccines, veterinarians are encouraged to follow the AAEP Vaccination Guidelines for EHV.

(Author's note—An important point for practitioners is to be prepared for an EHV-1 outbreak by having the requisite supplies available. Contact your laboratory of choice and ensure you know what samples to collect and what type of container/media is required to transport those samples.)

Take-Home Message

According to the available biosurveillance data reported herein, EHVs aren't the most common cause of respiratory disease in sick horses. That said, it should always be on the list, and any horse with a temperature or runny nose should be treated as infectious and potentially shedding virus until proven otherwise.

Vaccination and appropriate biosecurity protocols will help minimize the spread of disease when herpesvirus is involved. All horses that test positive for EHV-1 should be monitored closely for neurologic signs.

Outbreaks do occur, and despite being relatively uncommon, appear to be increasing in frequency. These outbreaks have massive economic impacts on the industry, both in direct and indirect costs.

EHV-2 and -5 are far more benign, and they are often considered commensals, meaning their presence does not necessarily mean causation.

Open communication between veterinarians and owners will quell owner fears related to EHVs. EM

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Vetscan Imagyst Allows Vets 24/7 Access to Clinical Pathologists

Platform provides quick results, plus AI for fecal egg counts.

KIMBERLY S. BROWN

Vetscan Imagyst, a new multispecies diagnostic platform from Zoetis, allows veterinarians to submit digital cytology for evaluation by board-certified clinical pathologists 24/7, with turnaround of two hours or less.

Practitioners and veterinary technicians at Rhinebeck Equine, an independently owned practice in New York's Hudson River Valley, have been using the digital cytology tool and are early experience testers of the equine fecal egg count (FEC) system. We spoke with this team to find out how they are using Vetscan Imagyst.

What Is Vetscan Imagyst?

Vetscan Imagyst permits pathologists to remotely examine cytology slides and uses artificial intelligence (AI) to evaluate fecal samples. For cytology a veterinary practice can create slides from any specimen and send images to pathologists, who return reports within two hours. A traditional cytological evaluation can take 24 hours or more from time of submission. Small animal FECs are currently available, with AI equine fecal egg counts coming online in spring 2023.

Why Use Vetscan Imagyst?

Laura H. Javsicas, VMD, Dipl. ACVIM, an internist at Rhinebeck, said she had been looking for a "tele-cytology" solution for clients. Rhinebeck purchased Vetscan Imagyst in January 2022. Janine Baker, LVT, a licensed vet tech and lab manager at the clinic, said once she understood the steps of operation for the new equipment, she taught the other techs, and they use the equipment 24/7/365.

There are many ways vets can use Vetscan Imagyst cytology services: peritoneal fluid, joint fluid, or fine-needle aspirate assessments, for instance. The platform can also help answer time-sensitive questions such as, "Does the horse need surgery?" or "Should we lavage the joint with arthroscopy with the horse under anesthesia or can we just flush?"

How Vetscan Imagyst Works

The Vetscan Imagyst digital whole slide scanner does not take up much room, though you need a small prep space. The equipment is integrated with your practice management software, and you need high-speed internet for best results.

Vets or techs prepare cytology samples based on detailed instructions before inserting slides into the Vetscan Imagyst scanner. A tech reviews the resulting images, with areas selected for pathologist review, then submits the images via an online form to the pathologists on duty.

Platform Adds Practice Value

Javsicas said her practice runs labs for referring veterinarians.

"This is another tool in our diagnostic toolbelt," said Baker. "And we're becoming more willing to reach for it because of the speed. If you know you [traditionally] have to wait 24 hours or more for a cytology, you might not do it."

She added that "owners happily pay for the time and expertise." Plus, the technology empowers techs with new skills.

Fecal Egg Count Ability

Traditionally, FEC results are read in-house by techs—which can be time-consuming and depend on knowledge and experience. Using AI, the Vetscan Imagyst eliminates human error.

COURTESY ZOETIS

Vetscan Imagyst offers cytology evaluations from clinical pathologists 24/7, with turnaround within two hours.

Most other automated FEC options cannot differentiate parasite eggs and require many supplies. "We see a lot of foals, so we need to differentiate between ascarids versus strongyles," said Javsicas.

She said Rhinebeck has worked with Zoetis to fine-tune FEC resources, including a clean and client-friendly report, with images of the parasite eggs counted. Zoetis stresses that Vetscan Imagyst AI can improve FEC accuracy and speed of results and improve overall efficiency.

"Every veterinarian knows the importance of easy and rapid access to specialists when diagnosing and treating our patients," said Richard E. Goldstein, DVM, Dipl. ACVIM (SAIM), ECVIM-CA, vice president and chief medical officer of Global Diagnostics at Zoetis. "With the new digital cytology solution available from Vetscan Imagyst, we are virtually placing a board-certified clinical pathologist right 'down the hall' from every veterinarian."

JACKF/ISTOCK VIA GETTY IMAGES

There are alternatives to providing 24/7/365 care, including emergency co-ops.

New Ways to Approach Emergency Coverage

New avenues for veterinarians to care for equine emergencies are becoming more common in the industry.

By Amy L. Grice, VMD, MBA

General equine practice has always required round-the-clock emergency coverage. A 2012 AAEP survey of horse owners and trainers revealed that the availability of emergency care 24/7/365 at the horse's residence was one of the top three criteria for an owner's choice of a vet. Recent studies exploring the low retention and acquisition rates of equine vets have revealed emergency duty as a strong negative factor.

In the United States, more than 50% of equine practices have two full-time equivalent (FTE) veterinarians or fewer. The number of solo practitioners, as measured by AAEP membership demographics, is consistently about 35-40%. The demands of emergency coverage born by a single individual or two individuals might lead to burnout.

The Emergency Problem

According to Amanda McCleery, DVM, in her presentation at the 2021 AAEP Convention, "with the majority of current equine veterinarians being female, the current working conditions required of equine practitioners may simply be untenable for many professionals who are disproportionally burdened by more hours of household work and child care."

Even in larger practices where the on-call responsibilities are shared among many practitioners, the larger number of clients means that each emergency shift will likely be very busy. The current paradigm in equine practice is for the doctors who are on emergency call to have a regularly scheduled workday before and after their night on duty. When a veterinarian is seeing emergencies all through a weekend, they might work 12 days straight without a break.

Alternatives for Providing Coverage

Alternative models for providing emergency coverage include emergency service cooperatives, referral hospitals with emergency departments, restricting emergency service only to clients, restricting emergency service to those who

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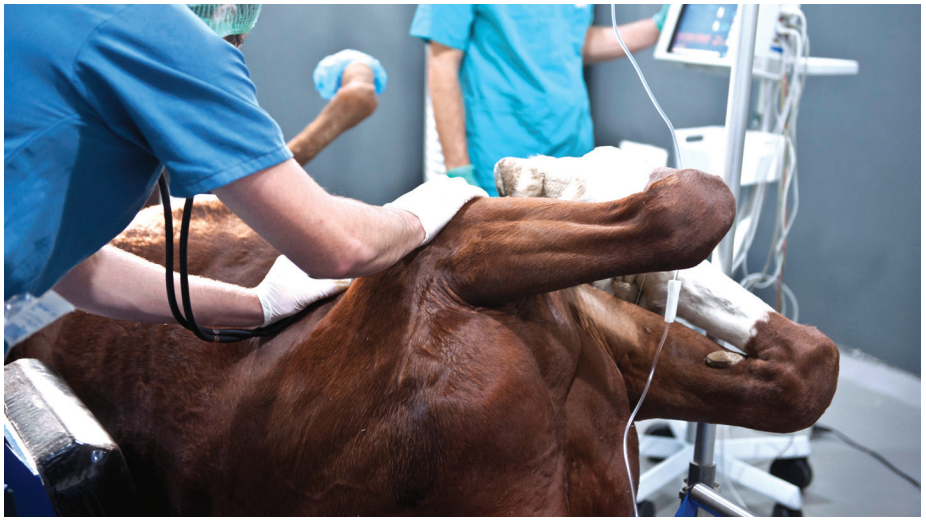

BARANOZDEMIR/ISTOCK VIA GETTY

Some practices only offer emergency services to patients who can haul in.

will haul a horse to the practice facility, emergency-only equine practices, and use of relief veterinarians.

Emergency cooperatives are becoming more common in areas where there are multiple small practices that are cooperative rather than competitive. Co-ops alleviate the demand of providing round-the-clock emergency care, which can be difficult for parents of small children.

Why or Why Not?

In 2020, a working group of the AAEP Wellness Committee created an Emergency Coverage Survey, which had a little more than 800 respondents. At that time, only 8% of those polled utilized a cooperative model for emergency coverage. There were numerous reasons given for not utilizing such a group to reduce the burden of emergency duty. They included:

- Not enough local practitioners to form a group;
- Treatment of other species would be required;
- Being such a large practice that the burden was already distributed among many doctors;
- Concern over the level of care or diagnostic skill provided by local colleagues;
- Concern they would need to cover too large of a geographic region;
- Concern over loss of clients to other practices;
- Concern over loss of needed revenue;
- Concern about other practices' fees—too high or too low;
- Fear that their clients would be angry.

Be Transparent with Clients

If you are joining or forming a cooperative, have a seminar to introduce all of the vets to the clients being served.

Many equine practitioners are restricting emergency services to current clients that utilize the practice's well care services for their horses. By confining care for emergencies to horses that have good preventative care, the number of urgent visits can be reduced.

Emergency-Only Practices

An increasing number of practices have fewer doctors on staff. These practices are either no longer offering emergency services or are limiting them to clients who can transport their animals to the practice's facility. Others

provide urgent ambulatory service until late evening, then refer all cases to a regional referral hospital or veterinary school. Some states mandate that each practice must make a provision for emergency care of patients, but this can usually be a referral to another practice.

To address the burden of emergency care, the companion animal sector has created a model of specialty emergency hospitals. In recent years more emergency-only practices are emerging in areas with robust equine populations.

Some of these practices are supported by subscriptions for emergency coverage from local practices, with those fees covering some of the expenses of the business. Other emergency-only firms rely on busy nights and weekends of emergency care that is priced robustly to support the practice. In that instance, local practices direct clients to call the emergency practice for after-hours care.

Some equine referral hospitals employ emergency-only clinicians and have a separate emergency division. Some relief veterinarians in the equine field regularly provide coverage for small practices to allow those doctors some downtime. A variety of options are developing in response to increased need.

Take-Home Message

Although emergency care for horses will always be needed—and greatly appreciated by their owners—new solutions to the burdens of this care are being implemented every year. EM

(Editor's note: For a longer version of this article search EquiManagement.com for "New Ways to Approach Emergency Care.")

DEBUNKING DJD MYTHS:

THE PRACTICAL TRUTH ABOUT EFFECTIVE DJD MANAGEMENT

This 2022 AAEP Convention Sunrise Session was brought to you by American Regent Animal Health and featured Drs. Jackie Christakos and Kelly Tisher.

By Kimberly S. Brown

Jackie Christakos, DVM, and Kelly Tisher, DVM, of Littleton Equine Medical Center in Colorado, gave a presentation about degenerative joint disease (DJD) on behalf of American Regent Animal Health (makers of Adequan) during a Sunrise Session at the 2022 AAEP Convention. Tisher became a partner of Littleton Equine at the start of 2000. Christakos has been full-time with Littleton Equine since 2013. Both started at Littleton with internships shortly after vet school.

In opening the presentation on Debunking DJD Myths, Christakos said "lameness is grayer than Kelly's hair!"

The vets then discussed some basics of DJD. Tisher advised that the earlier in the disease process is better when it comes to intervention and treatment.

Christakos said one myth about diagnosis of DJD is that a specific diagnosis isn't that important. "If you haven't touched the horse, you haven't examined it," she stressed.

The practitioners encouraged veterinarians to develop a routine to examine horses for lameness. Tisher said that will help you determine if you have a performance issue verses a lameness issue.

Tisher noted that in 2021 the practice did 2,500 lameness exams. Christakos and Tisher encouraged the use of various imaging modalities to help get to the cause of lameness.

DJD TREATMENT OPTIONS

Christakos said there are different ways to treat DJD. Symptom-modifying treatments include NSAIDS and corticosteroids. Disease-modifying treatments include produc such as Adequan and orthobiologics.

She said veterinarians should not forget about rest and "controlled rest" for acute injuries. "And don't forget about the basics, like therapeuti shoeing."

Tisher noted that dealing with young versus older horses can mean a different approach to treatment.

Another myth they discussed is that FDA approval isn't important.

Tisher said the veterinarians at Littleton Equine "decided to stick to products that are FDA approved." Christakos added that "if you are worried about cartilage, Adequan I.M. is easy for owners. I like injectable medications that have science behind them. Our practice won't write scripts if it is not an FDA-approved product."

Other myths that they addressed:

Myth: Clients say once I start injecting my horse's joints, I will have to keep injecting.

Christakos said, "We aren't 'fixing' arthritis. But assuming if you treat once for an issue you have to treat again is wrong."

Myth: Steroids are bad for horse joints.

Christakos cited research by Colorado State University's Dr. David Frisbie where the abstract said, "The clinical use of IA administered triamcinolone acetonide (TA) in horses may be therapeutically beneficial in selected cases of osteochondral fragmentation and osteoarthritis." (Find the abstract at https://pubmed.ncbi.nlm.nih.gov/9306060/.)

Tisher added that he uses the steroid that is "most happy" to the cartilage.

Christakos added that, "I don't think I can make a normal joint a 'super joint' by injecting it." And Tisher added to be cautious of using steroids in horses with PPID.

Myth: If there is not substantial radiographic changes the joint doesn't require treatment.

Both veterinarians said this isn't true. Tisher added that using Adequan according to the instructions is important. "I try to do the seven-dose series twice a year or more" for performance horses that need it, Tisher said. While some veterinarians are using Adequan with a loading dose, then using a dose once a month, Tisher recommended that they save that money and give the series twice a year instead.

(Editor's note: The speakers donated their presenter stipends to The Foundation for the Horse.)

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1 Data on file.

2 Adequan® i.m. Package Insert, Rev 1/19.

3 Burba DJ, Collier MA, DeBault LE, Hanson-Painton O, Thompson HC, Holder CL: In vivo kinetic study on uptake and distribution of intramuscular tritium-labeled polysulfated glycosaminoglycan in equine body fluid compartments and articular cartilage in an osteochondral defect model. *J Equine Vet Sci* 1993; 13: 696-703.

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PP-AI-US-0629 (v2.0) 05/2022

The black-legged tick (*Ixodes scapularis*) can transmit the pathogens that cause Lyme disease and *Anaplasma phagocytophilia*.

ERIKKARITS/ISTOCK VIA GETTY IMAGES

Help Clients Temper Tick Terror and Lyme Lunacy

Here are tips for turning your clients into "tick whisperers" and minimizing tick-borne illness in their horses.

By Stacey Oke, DVM, MSc

In certain regions of the United States, ticks have become a problem akin to vermin in large cities. The expansion of humans and horses into tick habitats and vice versa means that ticks are being encountered more frequently and tick bites are relatively common.

In turn, tick-borne diseases, such as Lyme disease, are on the rise. And that makes many owners hyperaware of the tick population problem.

"Equine veterinarians should work with their clients to teach them about ticks in their regions, including identification and how to prevent tick bites to best protect horses from tick-borne pathogens," advised Erika Machtinger, PhD, CWB (certified wildlife biologist). She is an assistant professor in the Department of Entomology at Pennsylvania State University.

Only a Few Bad Apples

Of the many types of ticks living in the fields and forests on and around farms, only a small handful of ticks pose problems for horses and their owners. Instead, most ticks are specialized to a single host—and most of the time that host isn't a human or a horse.

According to Machtinger, tick species found on horses vary depending on geographic location. Species identifica-

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As with all drugs, side effects may occur. In field studies and post-approval experience the most common side effects reported were signs of discomfort, nervousness, and colic. Other signs reported were: renal insufficiency/failure, anorexia, lethargy, hypercalcemia, behavioral disorders, hyperkalemia, hyperactivity, recumbency, hyperthermia, injection site reactions, muscle tremor, urticaria, hyperglycemia, and fracture. **In some cases, death has been reported as an outcome of these adverse events.** The safe use of OSPHOS has not been evaluated in horses less than 4 years of age or breeding horses. OSPHOS should not be used in pregnant or lactating mares, or mares intended for breeding. NSAIDs should not be used concurrently with OSPHOS. **Concurrent use of NSAIDs with OSPHOS may increase the risk of renal toxicity and acute renal failure.** Use of OSPHOS in patients with conditions affecting renal function or mineral or electrolyte homeostasis is not recommended. Refer to the prescribing information for complete details or visit www.dechra-us.com.

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

* Freedom of Information Summary, Original New Animal Drug Application, approved by FDA under NADA # 141-427, for OSPHOS. April 28, 2014.

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INDICATION: For the control of clinical signs associated with navicular syndrome in horses.

CONTRAINDICATIONS: Horses with hypersensitivity to clodronate disodium should not receive OSPHOS. Do not use in horses with impaired renal function or with a history of renal disease.

WARNINGS: Do not use in horses intended for human consumption.

HUMAN WARNINGS: Not for human use. Keep this and all drugs out of the reach of children. Consult a physician in case of accidental human exposure.

PRECAUTIONS: OSPHOS has been associated with renal toxicity. Concurrent administration of other potentially nephrotoxic drugs should be approached with caution and renal function should be monitored. Use of bisphosphonates in patients with conditions or diseases affecting renal function is not recommended. Horses should be well-hydrated prior to and after the administration of OSPHOS due to the potential for adverse renal events. Water intake and urine output should be monitored for 3-5 days post-treatment and any changes from baseline should elicit further evaluation. As a class, bisphosphonates may be associated with gastrointestinal and renal toxicity. Sensitivity to drug associated adverse reactions varies with the individual patient. Renal and gastrointestinal adverse reactions may be associated with plasma concentrations of the drug. Bisphosphonates are excreted by the kidney; therefore, conditions causing renal impairment may increase plasma bisphosphonate concentrations resulting in an increased risk for adverse reactions. Concurrent administration of other potentially nephrotoxic drugs should be approached with caution and renal function should be monitored. Use of bisphosphonates in patients with conditions or diseases affecting renal function is not recommended. Administration of bisphosphonates has been associated with abdominal pain (colic), discomfort, and agitation in horses. Clinical signs usually occur shortly after drug administration and may be associated with alterations in intestinal motility. In horses treated with OSPHOS these clinical signs usually began within 2 hours of treatment. Horses should be monitored for at least 2 hours following administration of OSPHOS.

Bisphosphonates affect plasma concentrations of some minerals and electrolytes such as calcium, magnesium and potassium, immediately post-treatment, with effects lasting up to several hours. Caution should be used when administering bisphosphonates to horses with conditions affecting mineral or electrolyte homeostasis (e.g. hyperkalemic periodic paralysis, hypocalcemia, etc.).
The safe use of OSPHOS has not been evaluated in horses less than 4 years of age. The effect of bisphosphonates on the skeleton of growing horses has not been studied; however, bisphosphonates inhibit osteoclast activity which impacts bone turnover and may affect bone growth.

Bisphosphonates should not be used in pregnant or lactating mares, or mares intended for breeding. The safe use of OSPHOS has not been evaluated in breeding horses or pregnant or lactating mares. Bisphosphonates are incorporated into the bone matrix, from where they are gradually released over periods of months to years. The extent of bisphosphonate incorporation into adult bone, and hence, the amount available for release back into the systemic circulation, is directly related to the total dose and duration of bisphosphonate use. Bisphosphonates have been shown to cause fetal developmental abnormalities in laboratory animals. The uptake of bisphosphonates into fetal bone may be greater than into maternal bone creating a possible risk for skeletal or other abnormalities in the fetus. Many drugs, including bisphosphonates, may be excreted in milk and may be absorbed by nursing animals.

Increased bone fragility has been observed in animals treated with bisphosphonates at high doses or for long periods of time. Bisphosphonates inhibit bone resorption and decrease bone turnover which may lead to an inability to repair micro damage within the bone. In humans, atypical femur fractures have been reported in patients on long term bisphosphonate therapy; however, a causal relationship has not been established.

ADVERSE REACTIONS: The most common adverse reactions reported in the field study were clinical signs of discomfort or nervousness, colic and/or pawing. Other signs reported were lip licking, yawning, head shaking, injection site swelling, and hives/pruritus.

POST-APPROVAL EXPERIENCE (December 2018): The following adverse events are based on post-approval adverse drug experience reporting. Not all adverse events are reported to FDA/CVM. It is not always possible to reliably estimate the adverse event frequency or establish a causal relationship to product exposure using these data.

The following adverse events are listed in decreasing order of reporting frequency: renal failure, polyuria, polydipsia, abdominal pain, anorexia, lethargy, hypercalcemia, behavioral disorder, discomfort, hyperkalemia, hyperactivity, recumbency, hyperthermia, injection site reactions, muscle tremor, urticaria, hyperglycemia, and fracture. In some cases, death has been reported as an outcome of the adverse events listed above.

INFORMATION FOR HORSE OWNERS: Owners should be advised to:

- NOT administer NSAIDs.
- Ensure horses have access to adequate water before and after administration of OSPHOS.
- Observe their horse for at least 2 hours post-treatment for signs of colic, agitation, and/or abnormal behavior.
- If a horse appears uncomfortable, nervous, or experiences cramping post-treatment, hand walk the horse for 15 minutes. If signs do not resolve contact the veterinarian.
- Monitor water intake and urine output for 3-5 days post-treatment.
- Contact their veterinarian if the horse displays abnormal clinical signs such as changes in drinking and urination, appetite, and attitude.

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IVAN LAS HERAS/ISTOCK VIA GETTY

Veterinarians should encourage horse owners to wear gloves when removing ticks from their horses to prevent the spread of disease.

tion matters because each tick species is associated with different risks of tick-borne diseases or conditions. Machtinger encourages veterinarians to focus client education on the ticks specific to their regions. Practitioners can also help clients understand that not all ticks are found in all areas.

One of the most important ticks in the U.S. is the blacklegged tick, capable of transmitting the pathogens that cause Lyme disease as well as *Anaplasma phagocytophila*.

"In addition, equine piroplasmosis can be transmitted by at least 33 species of ticks in six genera, most often Dermacentor, Rhipicephalus and Hylaomma," Machtinger said.

Even if ticks don't have a high chance of transmitting disease, their presence is still an annoyance, and the bites can be painful.

Tick Bite Prevention: The "Suite" Smell of Success

Social media, word of mouth and a desire to avoid chemicals on horses have some owners reaching for those all-natural herbal tick repellents. While most of the products are about as effective as throwing water on a drowning fly, they can potentially play a role in a balanced tick-prevention plan.

"Owners need to be made aware of the suite of strategies they can use to reduce a horse's risk of tick-borne pathogens," noted Machtinger.

Reducing host and horse interactions. "Clean up places where rodents like to hide because rodents are hosts for many juvenile stages of important ticks," advised Machtinger.

In addition, she recommended keeping grass short in the pastures where horses graze and creating a nine-foot "buffer" between horse pastures and surrounding forests/grasses. This strategy involves removing logs, sticks, grass and brush between the fence and the surrounding tick habitats.

Chemical treatment of tick habitats. Machtinger said that owners can spray pyrethroids on their own, but for large properties/areas it will be a process. Thus, many owners hire companies to perform this service, usually in

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Tick Tidbits

Here are some "tick tidbits" that you can share with clients:

- Ticks go through three active life stages: larvae, nymphs and adults. Larvae are not seen on horses and do not transmit disease.
- Ticks live for about two years.
- Adult ticks are eight-legged animals with two body regions—a small head and a larger body.
- Tick identification is typically performed on adult ticks.
- Adult ticks are seen on horses in early spring and in the fall, not typically in the middle of the summer.

For more information on tick sprays, visit https://www.spray-safeplaysafe.org/.

For additional details on ticks, refer to the book *Pests and Parasites of Horses* written by veterinary entomologists and an equine practitioner. —*Stacey Oke, DVM, MSc*

MGSTUDYO/E+ VIA GETTY IMAGES

Tick control includes on-horse management—chemical barriers to repel ticks or chemicals that kill ticks once they bite—and premises management.

the spring and fall in the midwest and northeast when adult ticks typically feed on horses. The timing of those sprays could be different based on your location in the United States and the life cycle of the local ticks.

"Pyrethroids are toxic to nontarget animals, so the sprays should be directed to target areas where the ticks are. These products are incompatible with aquatic wildlife, so do not spray in areas near ponds, streams or other bodies of water," Machtinger warned.

If these warnings send owners rushing for the "natural" products (such as essential oils), they should be made aware that even "natural" products can be toxic to nontarget animals, require frequent application because they wash away easily, and have limited efficacy data supporting their use.

"If owners still choose to use natural or herbal products instead of pyrethroids, they should be prepared to spray at least every two weeks," said Machtinger.

On-horse prevention. "This is by far the most important component of a tick-control program that owners can use," advised Machtinger.

The four on-horse options include the following:

- Commercial spot-on repellents help reduce, but do not eliminate, the number of ticks that attach. Encourage owners to follow the manufacturer's directions when using.
- Tick-repelling sprays contain permethrin as the main ingredient, usually in a low concentration, about 0.9%. "In one of our recent studies, we found that 5-10% permethrin effectively repels ticks for 24 hours, but similar efficacy was not appreciated at lower concentrations," said Machtinger.

That said, actively deter your clients from purchasing the concentrated 10% permethrin!

"The 10% product is commercially available but not licensed for horses despite the fact that some have a picture of a horse on them! Concentrated products can cause a lot of damage to the horse's skin," shared Machtinger.

If owners choose to use repellent sprays, encourage them to use a microfiber mitt or brush to apply the products daily.

"Repellents might be useful in the short-term, so it would be worth coating your horse with repellent before riding in tick-risky areas like the woods or tall grasses," said Machtinger. And keep in mind that herbal sprays have not been tested against ticks.

- Fipronil is another topical (spot-on) product, but it is not a repellent like the spot-ons mentioned in the first bullet point above. It is important that owners are aware that with fipronil,

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- Brittle hooves, chronic cracks, and lost shoes are a reoccurring problem.
- Dry, flaky hair coat and brittle mane and tail are present.
- Hoof regrowth is desired after hoof injury, surgery, or laminitis.
- Hoof problems such as thrush and white line disease are an ongoing challenge.
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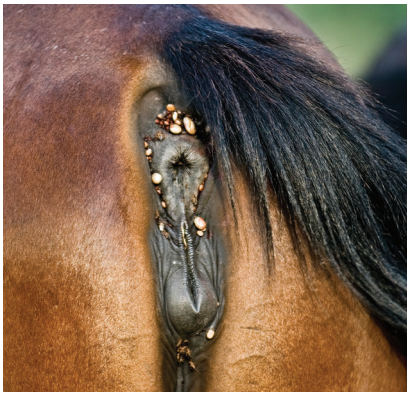


Ticks often hide under the tail, mane and belly, as well as in the eyes, ears and between the legs.

ticks need to bite in order to die. Owners should consult with a veterinarian prior to using this product because it is not labeled for use on horses.

- Treated "clothing" such as fly masks, sheets and boots can be purchased that have pyrethroids impregnated into the fabric. This is the same class of chemical described above that is sprayed on the ground in tick-infested habitats. "These products have been tested on humans and are highly recommended for everyone going outside, but they have not yet been tested on horses to determine their effectiveness," shared Machtinger.

Tick checks. Veterinarians might wish to spend a few moments demonstrating how to conduct a daily tick check on client horses. Key factors to relay are that the tick checks will be more fruitful if conducted on a clean horse. Advise owners to wear gloves to protect themselves during the process. Use a systematic approach each time, being sure to check the ears, eyes, between the legs, and under the mane, tail and belly.

"In reality, ticks can be anywhere on the horse, and the unfed adult ticks are small," said Machtinger. "It should take about five minutes for each side of the horse."

Ticks can be removed using a commercial tick picker or a pair of tweezers. Grasp the tick as close to the horse's skin as possible to avoid possible pathogen transfer when squeezing.

Vaccination. Although there are no vaccines for Lyme disease (*Borrelia burgdorferi*), equine veterinarians can use the canine vaccine in horses.

"We use the Recombitek vaccine most frequently, with the initial series consisting of vaccination at 0, 30 and 90 days and then every six months," said Laura H. Javsicas, VMD, DACVIM, of Rhinebeck Equine in New York. "We see very few, if any, side effects to the vaccine."

When a Tick Infiltrates the Perimeter

Despite using the suite of tick-prevention strategies described above, some owners might have found ticks on

Bird is Not the Word

Another "natural" approach some horse owners embrace is having free-roaming chickens or guinea fowl on the farm. These are birds known for feasting on ticks. Machtinger said that these birds will consume adult ticks (not immature ones), but only if they encounter them.

"Plus, there is no evidence chickens can consume enough ticks for this to be a reasonable prevention strategy," said Machtinger. "Adult female ticks can lay up to 3,000 eggs … it would be a challenge for a chicken to seek out and eat that many. In addition, chicken feed can attract rodent hosts and may themselves serve as tick hosts. I really wouldn't advise going out and buying chickens and guinea fowl for tick-control purposes."
—Stacey Oke, DVM, MSc

their horses or have convinced themselves they see signs of Lyme disease and would like testing performed.

Testing can be done easily, and although several options are available, Javsicas recommends using the Lyme Multiplex developed by Cornell University's Animal Health Diagnostic Center.

"The multiplex is the only test that provides quantitative measurement of antibodies present at different stages of infection," stated Javsicas.

She added, "But there are other tests available, such as the SNAP test and Western Blot (WB). The SNAP test is qualitative, not quantitative, making it more difficult to interpret and to detect a response to treatment. The SNAP measures the C6 protein, which does correlate well with OspF levels on the Multiplex. The WB is also a subjective test, plus it is labor intensive. It does, however, identify a broad range of antibodies and is able to differentiate vaccinated from infected horses."

Regardless of what test is selected, Javsicas reminded practitioners that the test results always have to be interpreted in light of the clinical signs.

"We know that many horses in the northeast are exposed to Lyme. Because of this, I like to see a high or increasing OspC and/or OspF titer on the Multiplex and to have ruled out other causes of the clinical signs," explained Javsicas. "Some of the most common signs that owners cite as 'proof' their horses have Lyme include a shifting leg lameness, attitude change and increased skin sensitivity.

"Performing a full physical exam and lameness and/or neurologic exam is always recommended, and scoping for gastric ulcers is often indicated," advised Javsicas.

When deciding whether to treat a horse for Lyme disease or not, Javsicas reminded practitioners that "treatment with antibiotics is never benign in horses as antibiotic-induced colitis is always a risk and can be fatal. Additionally, if we only have nebulous signs and questionable lab results to start with, it is hard to determine if the horse has responded to treatment."

Take-Home Message

Tick control requires a concerted effort on both the horse and the environment. No single product or strategy will effectively eliminate a horse's risk of tick bites or risk of tick-borne illness. Owners should be specifically consulting veterinarians regarding fipronil and Lyme vaccines. EM

A veterinarian's professional liability insurance policy does not cover expenses incurred in a veterinary license defense case.

SHAPECHARGE/E+ VIA GETTY IMAGES

Veterinary License Defense: Don't Practice Without It!

This article can help you understand veterinary license complaints and defense coverage.

By Cynthia G. MacKenzie, DVM

Veterinary license defense (VLD) coverage is generally available as an endorsement to a malpractice insurance policy. It's also available with a professional liability policy through the AVMA Trust's PLIT program. It is triggered when a client makes a formal complaint against a veterinarian's license to a state licensing board.

When triggered, the VLD policy entitles the veterinarian to legal counsel and provides coverage for legal expenses (up to the endorsement limits) incurred in defending the veterinarian's license. Such legal costs are not covered by a professional liability policy. Without VLD coverage, the veterinarian is left to find an attorney and pay all legal fees on their own.

The quality of legal defense is also an important factor. Attorneys assigned to license defense cases should be versed in administrative and regulatory law. They also should be familiar with the licensing agency's process and be experienced in

The only **dual ingredient** injectable corticosteroid approved by the FDA for use in horses

The link between **RAPID ONSET** and **LONG-ACTING RELIEF** of pain & inflammation[1]

BetaVet® (betamethasone sodium phosphate and betamethasone acetate injectable suspension) is indicated for the control of pain and inflammation associated with osteoarthritis in horses.
Learn more at www.betavetequine.com or call 1-800-458-0163.

Please see Brief Summary of Full Prescribing Information on the following page.

INDICATION BetaVet® (betamethasone sodium phosphate and betamethasone acetate injectable suspension) is indicated for the control of pain and inflammation associated with osteoarthritis in horses. **IMPORTANT SAFETY INFORMATION** For **Intra-articular** (I.A.) use in Horses. **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 congenital anomalies. Before use of corticosteroids in pregnant animals, the possible benefits should be weighed against potential hazards. **Human Warnings:** Not for use in humans. Keep this and all medications out of the reach of children. **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. 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, should be approached with caution. 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) at five percent (5%) and above 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; and depression, 5.9% BetaVet® and 1.6% saline control. **SHAKE WELL IMMEDIATELY BEFORE USE.** For additional safety information, please see full prescribing information. **CAUTION: Federal law restricts this drug to use by or on the order of a licensed veterinarian.**

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.

BetaVet®
betamethasone sodium phosphate and betamethasone acetate injectable suspension

BetaVet®
betamethasone
sodium phosphate and
betamethasone acetate
injectable suspension

BETAVET®

(Betamethasone Sodium Phosphate and
Betamethasone Acetate Injectable Suspension)

RQ1053A

BETAVET®

(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.

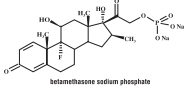
DESCRIPTION

BETAVET® is a sterile aqueous suspension of betamethasone acetate in betamethasone sodium phosphate injection. The combined betamethasone content of the suspension is 6 mg/mL where each mL contains 3.15 mg betamethasone (as betamethasone sodium phosphate); 2.85 mg betamethasone (as betamethasone acetate); 7.1 mg dibasic sodium phosphate; 3.4 mg monobasic sodium phosphate; 0.1 mg edetate disodium; and 0.2 mg benzalkonium chloride, as a preservative in water for injection. The pH is adjusted to between 6.8 and 7.2.

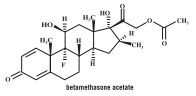
The formula for betamethasone sodium phosphate is $C_{22}H_{28}FNa_2O_8P$ and it has a molecular weight of 516.41. Chemically, it is 9-Fluoro-11β, 17,21-trihydroxy-16β-methylpregna-1,4-diene-3,20-dione 21-(disodium phosphate).

The formula for betamethasone acetate is $C_{24}H_{31}FO_6$ and it has a molecular weight of 434.50. Chemically, it is 9-Fluoro-11β,17,21-trihydroxy-16β-methylpregna-1,4-diene-3,20-dione 21-acetate.

The chemical structures for betamethasone sodium phosphate and betamethasone acetate are as follows:



betamethasone sodium phosphate



betamethasone acetate

Betamethasone sodium phosphate is a white to practically white, odorless powder, and is hygroscopic. It is freely soluble in water and in methanol, but is practically insoluble in acetone and in chloroform.

Betamethasone acetate is a white to creamy white, odorless powder that sinters and resolidifies at about 165°C, and remelts at about 200°C-220°C with decomposition. It is practically insoluble in water, but freely soluble in acetone, and is soluble in alcohol and in chloroform.

INDICATION

BETAVET is indicated for the control of pain and inflammation associated with osteoarthritis in horses.

DOSAGE AND ADMINISTRATION

Shake well immediately before use.

Using strict aseptic technique, administer 1.5 mL BETAVET (9 mg total betamethasone) per joint by intra-articular injection. BETAVET may be administered concurrently in up to 2 joints per horse.

Use immediately after opening, then discard any remaining contents.

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) are summarized in Table 1. One BETAVET treated horse was removed from the study for onset of acute non-weight bearing lameness on Day 4. Treatment for presumed joint sepsis was instituted immediately, but the horse was eventually euthanized several weeks later due to a thromboembolic event associated with prolonged intravenous catheter placement. One BETAVET treated horse developed bilateral forelimb lameness on Day 8, with snow packed in the shoes and poor hoof conformation noted by the investigator. The horse was diagnosed with laminitis. Radiographs showed no abnormalities, and the horse was sound shortly after shoeing changes were implemented.

Table 1. Adverse Reactions

Adverse Reaction	Number (%) of BETAVET treated horses	Number (%) of saline treated horses
Acute joint effusion and/or local injection site swelling (within 2 days of injection)	18 (15%)	16 (13%)
Increased lameness (within the first 5 days)	8 (6.7%)	10 (8.3%)
Loose stool	7 (5.9%)	10 (8.3%)
Increased heat in joint	3 (2.5%)	6 (5%)
Depression	7 (5.9%)	2 (1.6%)
Agitation/anxiety	5 (4.2%)	3 (2.5%)
Delayed swelling of treated joint (5 or more days after injection)	3 (2.5%)	4 (3.3%)
Inappetance	4 (3.4%)	3 (2.5%)
Dry stool	2 (1.7%)	0 (0%)
Excessive sweating	1 (0.8%)	0 (0%)
Acute non-weight bearing lameness	1 (0.8%)	0 (0%)
Laminitis	1 (0.8%)	0 (0%)

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. Maximum plasma concentrations (C_{max}) and time to C_{max} (T_{max}) values ranged from 2.70 to 3.88 ng/mL and 4.5 to 8 hours, respectively. The effective plasma terminal elimination half-life ranged from 4 to 8 hours. The non-compartmental area-under-the curve to the limit of quantification (AUC_{LOQ}) ranged from 29.24 to 42.96 hr*ng/mL. In contrast, most of the betamethasone disodium phosphate concentrations and all of the betamethasone acetate concentrations were below the limit of quantification in 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. A total of 119 horses received BETAVET and 120 horses received saline. 229 horses were included in the final effectiveness analysis. Clinical success was defined as improvement in one lameness grade according to the AAEP lameness scoring system on Day 5 following treatment. Table 2 summarizes the clinical success and failure in each treatment group on Day 5. 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).

Table 2. Clinical Effectiveness Results

	BETAVET (n=114)	Saline (n=115)
Number of Successes	87	61
Number of Failures	27	54

ANIMAL SAFETY

A 3-week target animal safety (TAS) study was conducted to evaluate the safety of BETAVET in mature, healthy horses. The study was designed with 4 treatment groups of 8 horses in each group. 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 (see table 3).

Table 3. Incidence of Injection Site Reactions

Group	Total Swelling Observations	Excessive/ obvious swelling	Pain at injection site	Knee flexed at rest	Lame or stiff
0x	14	1	0	0	0
1x	6	1	0	0	0
2x	11	2	0	0	0
4x	18	10	3	3	2

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.

STORAGE CONDITIONS

Store at 20° to 25°C (68° to 77°F) (See USP Controlled Room Temperature). **Protect from light.** Use carton to protect contents from light until used.

HOW SUPPLIED

BETAVET, containing 30 mg betamethasone/5 mL (6 mg betamethasone/mL) in 5 mL vials.

NDC 10797-720-01 5 mL Vials Packaged in boxes of 1

SHAKE WELL BEFORE USING

Approved by FDA under NADA # 141-418

AMERICAN REGENT, INC.
ANIMAL HEALTH
Shirley, NY 11967

(1-888-354-4857)

Rev. 8/2021

RQ1053A

NATHAPHAT/ISTOCK VIA GETTY IMAGES

The most common fines issued by licensing boards are for poor recordkeeping. Therefore, it is essential to maintain medical records in compliance with the state Veterinary Practice Act.

protecting veterinary licenses. They are there to help respond to the state licensing board's request for information and to answer any questions the veterinarian might have.

The Importance of Recordkeeping

Thorough, well-maintained medical records are an important defense against a license complaint. Appropriate documentation will demonstrate that a veterinarian met the standard of care and can protect against false allegations of negligence. Right or wrong, the quality of a veterinarian's care will often be judged on the quality of his or her medical records.

It is also important to note that during a complaint investigation, the state licensing board gains access to the veterinarian's medical records. It can issue fines for lack of appropriate documentation, even if a client's complaint is ultimately deemed frivolous. In fact, the most common fines issued by licensing boards are for poor recordkeeping. Therefore, it is essential to maintain medical records in compliance with the state Veterinary Practice Act.

The purpose of medical records is to document the patient's condition and all aspects of the medical care planned and provided. These records also substantiate the veterinarian's standard of care and play an essential role in continuity of care for the next provider. A good rule to follow is that any veterinarian who reads another's records should be able to understand the animal's condition and pick up where the first veterinarian left off with treatment.

Items that should be included in medical records are written consent forms, anesthesia logs, surgery reports, physical exam findings, diagnostics recommended and those declined by the client, lab results, estimate sheets and all communications including texts, e-mails, voice messages and verbal conversations. Consult your state's Veterinary Practice Act for specifics on what needs to be included in the medical record. And remember, that list is a minimum requirement.

In addition, records should be accurate, legible and timely—meaning entries should be made on the same day or within 24-48 hours. It can be very difficult to maintain records in a busy ambulatory practice, and it can be challenging to slow down long enough to make medical record entries. But the longer you wait to document exams and findings, the more likely you are to forget items or details.

Also, the optics of completing medical records after a complaint has been communicated by a client can be bad and might even lessen their value in defending against a complaint. Conversely, documentation entered at or near the time of treatment can provide strong evidence should a board complaint be filed.

For example, in one case an upset owner filed a complaint against an insured veterinarian's license, alleging that the veterinarian wrote in the medical record after the owner accused them of not recommending a treatment. The record was time-stamped, clearly showing

PEOPLEIMAGES/ISTOCK VIA GETTY

The investigative process varies by state; veterinarians might be asked to provide the board with a copy of their medical records and a written response.

that it had been completed at the time of the visit. The investigator threw the claim out based on the time-stamped record.

One final note: The practice owns all medical records, including original radiographs. The client is entitled to copies of the records upon request within a reasonable time period. Again, consult your state's Veterinary Practice Act for more information and to remain in compliance.

What If I Receive a Complaint?

First, familiarize yourself with the process before you are contacted by the state licensing board. Many states explain the investigative process online. Review these websites periodically to ensure you understand your board's investigative process and your state's Veterinary Practice Act so you are prepared if you receive a board complaint. Understanding the basics might be helpful in case your board contacts you.

The investigative process varies from state to state. Your state's laws govern what information your board will provide at the start of an investigation and how the board will conduct the investigation. Some jurisdictions will mail or email you a copy of the complaint and ask that you provide the board with a copy of your medical records and a written response. Some will send you only a summary of the complaint. Other jurisdictions will not provide you with the complaint or even a summary. A small number of jurisdictions might simply send an investigator to your office to request records and to interview you.

Do not ignore written correspondence from your board.

Your time to respond will be limited. In many jurisdictions, the time in which you must respond is set by law.

Almost every complaint made to the regulatory agency leads to some level of investigative activity. Still, few investigations result in a "formal complaint" being filed against the veterinarian. A formal complaint is a public document or pleading that lists specific charges against the veterinarian's conduct and seeks to discipline the veterinarian's license. Disciplines can range from reprimand to revocation.

What If the Client's Complaint Has No Merit?

Remember, your state's veterinary licensing board is a regulatory agency whose job is to protect the public. They are obligated to investigate every complaint—including frivolous ones.

As the subject of a complaint, a veterinarian might face a demand for medical records, an investigative interview or a facility inspection. If you are on the receiving end of a board complaint—no matter how frivolous—and you have veterinary license defense coverage, contact your insurance carrier immediately.

Many license complaints are ultimately closed after finding that the veterinarian's conduct did not violate applicable state law governing the practice of veterinary medicine. These closures are largely due to the complaint's lack of merit. The quality of a veterinarian's legal representation also can affect the outcome of a complaint.

Be prepared. Be protected.

Your veterinary license is essential to maintain your ability to practice. It is essential to protect it. Having appropriate VLD coverage and practicing good medical recordkeeping is crucial to defending your license and maintaining your peace of mind.

If you do not have VLD coverage, you should consider adding it to your bubble of protection. If you do have it, you might want to review your coverage limits to ensure they are adequate for present circumstances. States with pandemic-driven backlogs are taking longer to process complaints, leading to increased legal fees. Don't get caught without the protection you need. EM

Boehringer Ingelheim | THE ART OF HORSE

Marquis®
(15% w/w ponazuril)

When it comes to EPM, time matters.

EARLIER TREATMENT CAN LEAD TO BETTER OUTCOMES.

TRUSTED TO TREAT EPM

FOR OVER TWO DECADES

Untreated, **EPM** (equine protozoal myeloencephalitis) can be fatal. The best chance for recovery is early diagnosis and treatment with a safe and powerful product like Marquis® (15% w/w ponazuril).

LEARN MORE AT DONTSTALL.COM

IMPORTANT SAFETY INFORMATION: The safe use of MARQUIS in horses used for breeding purposes, during pregnancy or in lactating mares has not been evaluated. In animal safety studies, loose feces, sporadic inappetence, lost weight and moderate edema in the uterine epithelium were observed. For use in animals only. Not for human use. Keep out of reach of children.

Havemeyer EPM Meeting Coverage

Here are two presentation summaries from the 2022 Dorthy Russell Havemeyer Foundation's EPM Advances in the Field Symposium.

By Stephanie L. Church

As long as opossums saunter through horse properties at night, leaving behind feces contaminated with *Sarcocystis neurona* or other protozoan oocysts or sporocysts, we'll continue seeing cases of equine protozoal myeloencephalitis (EPM) in horses. Meanwhile, various researchers—equine clinicians, pathologists, parasitologists, epidemiologists and others—continue to study the disease and how to best diagnose and treat it.

To that end, 28 delegates representing academia, private practice, and industry congregated in North Carolina in October 2022 for the Dorothy Russell Havemeyer Foundation's EPM Advances in the Field Symposium to learn about and discuss the latest EPM research.

The Dorothy Russell Havemeyer Foundation was founded in 1979 to conduct scientific research to improve the general health and welfare of horses. It's focused on a variety of topics, including infectious disease and, specifically, protozoal myeloma. Among other activities, including supporting principle investigators at several institutions, the foundation conducts special workshops like the one on EPM.

Many of the delegates presented on a variety of subjects; we've summarized two of those here. Look for more reports from this meeting coming on EquiManagement.com.

Treating EPM in Horses: Comparing Serum:CSF Titer, Treatment Trial Costs

Short summary: Performing a serum:cerebrospinal fluid titer ratio to confirm/rule out EPM in horses (versus treating without that test) substantially decreased cost for the owner.

When veterinarians are considering an equine protozoal myeloencephalitis (EPM) diagnosis in horses, they typically have three routes they can take: Treat the horse based on measuring serum (a component of blood) titers against the causative protozoa; treat based on serum titers plus a spinal tap; or treat the horse based on clinical signs alone. All paths can be expensive, so University of Pennsylvania researchers recently examined the accuracy and costs of each for horse owners. They determined, at least in their patient population, the option that might sound like the cheapest—beginning with a treatment trial without

COURTESY DR. SARAH COLMER/PENNVET

In most cases, performing a serum:cerebrospinal fluid (taken by spinal tap) titer ratio to confirm or rule out EPM in horses—versus treating without testing in this manner—substantially decreased cost for the owner.

Boehringer Ingelheim

Approved by FDA under NADA # 141-188

Marquis®

(15% w/w ponazuril)
Antiprotozoal Oral Paste

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

For the Treatment of Equine Protozoal Myeloencephalitis (EPM) in Horses

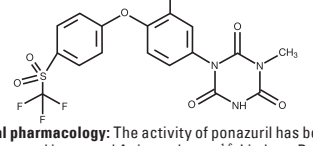
For Oral Use Only

Description: MARQUIS® (15% w/w ponazuril) Antiprotozoal Oral Paste is supplied in a ready-to-use syringe containing 127 grams of paste. Each gram of paste contains 150 mg of ponazuril (15% w/w). MARQUIS is designed to be delivered as an orally administered paste.

Each syringe barrel of MARQUIS contains enough paste to treat one (1) 1,200 lb (544 kg) horse for seven (7) days, at a dose rate of 5 mg/kg (2.27 mg/lb) body weight or to treat one 1,200 lb (544 kg) horse with a single loading dose of 15 mg/kg (6.81 mg/lb) body weight and for four days subsequently at a rate of 5 mg/kg (2.27 mg/lb) body weight. The plunger contains a dosage ring calibrated for a dose rate of 5 mg/kg (2.27 mg/lb) body weight and marked for horse weight from 600 to 1,200 lbs (272 to 544 kg). The syringe barrel is packaged with a plunger. The syringe barrels are packaged in units of four with four plungers and in single syringe units with one plunger.

Ponazuril is an anticoccidial (antiprotozoal) compound with activity against several genera of the phylum Apicomplexa.

Chemical nomenclature and structure: Ponazuril 1,3,5-Triazine-2,4,6(1H,3H,5H)-trione,1-methyl-3-[3-methyl-4-[4- [(trifluoromethyl)sulfonyl] phenoxy]phenyl]-(9CI)



Clinical pharmacology: The activity of ponazuril has been demonstrated in several Apicomplexans[1-6]. Lindsay, Dubey and Kennedy[7] showed that the concentration of ponazuril necessary to kill Sarcocystis neurona in vitro was 0.1 to 1.0 µg/mL. Furr and Kennedy[8] evaluated the pharmacokinetics of ponazuril in serum and CSF in normal horses treated daily at 5 mg/kg for 28 days. The time to peak serum concentration (T_{max}) was 18.20 (±5.9) days and the maximum serum concentration (C_{max}) was 5.59 (±0.92) µg/mL. The terminal elimination half-life for serum (calculated using Day 28 to 42 data) was 4.50 (±0.57) days. In CSF, T_{max} was 15.40 (±7.9) days and C_{max} was 0.21 (±0.072) µg/mL.

A pharmacokinetic study was conducted in eight horses to collect serum and cerebrospinal fluid (CSF) levels of ponazuril after a single dose of 5 mg/kg body weight. The estimated parameter values were used to model time concentration profiles for ponazuril in serum and CSF. The model results were used to estimate the size of the loading dose needed to support the achievement of steady state serum and CSF levels after the first dose. The appropriate loading dose, calculated on the basis of the accumulation ratio (i.e., the fold increase in serum drug concentrations once steady state conditions have been achieved) was 15 mg/kg (6.81 mg/lb) body weight. This dose represents the range of estimated accumulation ratios of 2.3 to 3.3. Thus, a three-fold loading dose (3*5 mg/kg) was selected, leading to achievement of steady state blood levels in horses after one or two days of ponazuril administration.

Indications: MARQUIS is indicated for the treatment of equine protozoal myeloencephalitis (EPM) caused by Sarcocystis neurona.

Effectiveness Summary: A field study was conducted at six sites with seven investigators across the United States.[9] The study was conducted using historical controls. In this study, each animal's response to treatment was compared to its pre-treatment values. The following standardized neurologic scale was used to grade the horses:

0 Normal, no deficit detected

1 Deficit just detected at normal gait

2 Deficit easily detected and is exaggerated by backing, turning, swaying, loin pressure or neck extension

3 Deficit very prominent on walking, turning, loin pressure or neck extension

4 Stumbling, tripping and falling down spontaneously

5 Recumbent, unable to rise

Improvement was defined as a decrease of at least one grade.

Naturally-occurring clinical cases of EPM, characterized by signalment and laboratory diagnosis, were randomly allotted to one of two treatment doses (5 or 10 mg/kg/day for a period of 28 days), then evaluated for clinical changes through 118 days. Acceptance into the study was based on the results from a standardized neurological examination including radiography, serum S. neurona IgG level determination by Western Blot (WB), and a positive cerebrospinal fluid (CSF) for S. neurona IgG level by WB.

Response to treatment was determined by the investigator to be acceptable when a clinical improvement of at least one grade occurred by no later than 3 months after treatment, regardless of whether the CSF by WB was positive or negative.

Changes in clinical condition were evaluated first by the subjective scoring of the investigator, then by masked assessment of videotapes of the neurological examination. At 5 mg/kg for 28 days, 28 of 47 horses (60%) improved at least one grade by Day 118. Seventy-five percent (75%) of those improved, that had also been videotaped, were corroborated successes by videotape assessment. At 10 mg/kg, 32 of 55 animals (58%) improved at least one grade by Day 118 and 56% of those improved, that had also been videotaped, were corroborated successes using videotape assessment. With respect to the clinical investigators' scores there was no statistical difference between 5 mg/kg and 10 mg/kg treatment group results (p = 0.8867).

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

Precautions: Prior to treatment, EPM should be distinguished from other diseases that may cause ataxia in horses. Injuries or lameness may also complicate the evaluation of an animal with EPM. In most instances, ataxia due to EPM is asymmetrical and affects the hind limbs.

Neurologic deficits, primarily ataxia, have been reported to acutely worsen during the early treatment period. In some horses the worsening of the neurologic deficits was transient. (See Post Approval Experience Section).

Clinicians should recognize that clearance of the parasite by ponazuril may not completely resolve the clinical signs attributed to the natural progression of the disease. The prognosis for animals treated for EPM may be dependent upon the severity of disease and the duration of the infection prior to treatment.

The safe use of MARQUIS in horses used for breeding purposes, during pregnancy, or in lactating mares, has not been evaluated. The safety of MARQUIS with concomitant therapies in horses has not been evaluated.

Adverse Reactions: In the field study, eight animals were noted to have unusual daily observations. Two horses exhibited blisters on the nose and mouth at some point in the field study, three animals showed a skin rash or hives for up to 18 days, one animal had loose stools throughout the treatment period, one had a mild colic on one day and one animal had a seizure while on medication. The association of these reactions to treatment was not established.

Post Approval Experience (2015): The following adverse events in horses are based on post-approval adverse drug experience reporting. Not all adverse events are reported to FDA/CVM. It is not always possible to reliably estimate the adverse event frequency or establish a causal relationship to product exposure using these data. The following adverse events have been reported:

Neurologic deficits, primarily ataxia, have been reported to acutely worsen during the early treatment period. Although outcome was not always reported, in some horses the worsening of the neurologic deficits was transient.

To report suspected adverse drug events, for technical assistance or to obtain a copy of the Safety Data Sheet (SDS), contact Boehringer Ingelheim Animal Health USA Inc. at 1-888-637-4251.

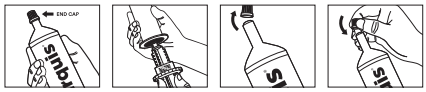
For additional information about adverse drug experience reporting for animal drugs, contact FDA at 1-888-FDA-VETS or online at www.fda.gov/reportanimalae.

Animal Safety Summary: MARQUIS was administered to 24 adult horses (12 males and 12 females) in a target animal safety study. Three groups of 8 horses each received 0, 10, or 30 mg/kg (water as control, 2X and 6X for a 5 mg/kg [2.27 mg/lb] dose). Horses were dosed after feeding. One half of each group was treated for 28 days and the other half for 56 days followed by necropsy upon termination of treatment. There were several instances of loose feces in all animals in the study irrespective of treatment, sporadic inappetence and one horse at 10 mg/kg (2X) lost weight while on test. Loose feces were treatment related. Histopathological findings included moderate edema in the uterine epithelium of three of the four females in the 6X group (two treated for 28 days and one for 56 days).

Dosage: Administer MARQUIS at a dose of 15 mg/kg (6.81 mg/lb) body weight as a loading dose for the first dose only. The loading dose is followed by a maintenance dose of 5 mg/kg (2.27 mg/lb) body weight once daily for a period of 27 additional days.

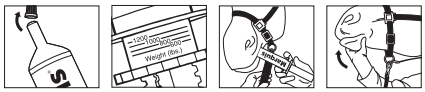
Day 1: Administer a loading dose of 15 mg/kg (three times the maintenance dose) once by mouth. Because the dosage ring is calibrated by weight for the maintenance dose (5mg/kg), adjust the dosage ring to the appropriate weight and administer this 5 mg/kg dose orally, three consecutive times for a total dose of 15 mg/kg.

Day 2 through 28: Administer the maintenance dose of 5 mg/kg once daily by mouth.



Assembling: Before administration, the syringe barrel and plunger require assembly. Ensure plunger is clean and dry.

1. End cap must be on syringe barrel when inserting plunger.
2. Carefully insert plunger into base of syringe barrel until it snaps into place, then remove end cap and gently apply pressure to the plunger until paste is seen at the tip of the syringe barrel.
3. Return end cap to tip of paste syringe.



Administering MARQUIS to the horse:

Note: The paste syringe is a multi-dose package. Ensure that the correct dose is administered with each use. For the first dose only, complete steps 3 through 6 three times, then continue with steps 7 and 8.

1. Remove end cap and gently apply pressure to the plunger until paste is seen at the tip of the syringe barrel. Return end cap to tip of paste syringe.

2. Determine weight of horse and ensure the horse's mouth contains no feed.

3. To measure dose, dosage ring collar and barrel collar should be flush. Hold plunger and rotate dosage ring with the other hand to the weight of the horse.

4. Remove end cap from tip of syringe barrel.

5. The selected dose of paste should be deposited onto the back and top of the horse's tongue. Introduce tip of paste syringe into the side of the horse's mouth at the space between the front (incisor) and back (molar) teeth. Deposit paste on the horse's tongue by depressing the plunger of the syringe as far as the dose ring permits. Remove tip of syringe from horse's mouth.

6. To aid swallowing of paste, immediately raise horse's head for a few seconds after dosing.

7. Clean the tip of the syringe with a clean disposable towel and return end cap to tip of syringe barrel.

8. For the next daily dose, repeat steps 1-7.

Note: At the end of the prescribed treatment period, partially used syringes should be discarded.

Storage: Store at 20-25°C (68-77°F), excursions permitted between 15-30°C (59-86°F).

How supplied:

Code: 86830183 Carton contains one (1) X 127 gram syringe applicator and one (1) syringe plunger.

Code: 86830191 Carton contains four (4) X 127 gram syringe applicators and four (4) syringe plungers.

Marketed by: Boehringer Ingelheim Animal Health USA Inc. Duluth, GA 30096

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US-EQU-0081-2021-V2

previous testing—likely isn't.

Sarah Colmer, VMD, DACVIM, a neurology fellow at the PennVet School of Veterinary Medicine's New Bolton Center in Kennett Square, and her advisor, Amy Johnson, DVM, DACVIM, recently conducted a retrospective study of 681 neurologic cases to assess the accuracy and costs of diagnosis and treatment using different approaches.

Colmer presented their results at the Havemeyer Foundation's EPM Advances in the Field Symposium.

Exposure to EPM Protozoa Is Common. Many U.S. horses have been exposed to the protozoan parasites that cause EPM, *Sarcocystis neurona* and *Neospora hughesi*. Exposure means a horse has encountered these organisms; it is not synonymous with true clinical neurologic disease.

Colmer cited a 2017 study in which researchers reported seroprevalence nationally. "Overall seroprevalence for *Sarcocystis* and *Neospora* was actually higher than a lot of previous studies, with 78% and 34% respectively, overall," Colmer said. "And 31% of these healthy equids were seropositive for both organisms; 18% were seropositive for neither."

PennVet's equine patient population consists of mostly sport horse referrals from the mid-Atlantic region. "We do occasionally see EPM," said Colmer, "but we see a couple other more common conditions: cervical vertebral stenotic myelopathy (Wobbler syndrome), as well as equine degenerative myeloencephalopathy (EDM), and EDM is our most common postmortem confirmed diagnosis in our neurologic horse population.

"These conditions often present indistinguishably and, so, diagnostics, of course, are going to be really important in terms of decision-making and management moving forward," she added.

EPM Treatment Trial: Not Always So Cheap. In the current study, Colmer and Johnson included horses with signs of neurologic disease that underwent a complete neurologic exam, EPM antibody testing on serum and CSF, and, if euthanized, neurologic necropsy.

Colmer reported postmortem exams were performed on 196 horses; 23 (12%) of those were diagnosed with EPM (postmortem diagnosis is the only way to definitively diagnose the disease).

Overall, more than 80% of horses had positive serum titers and more than 50% had positive CSF titers, which depicts again just how common *S. neurona* and *N. hughesi* exposure is among horses.

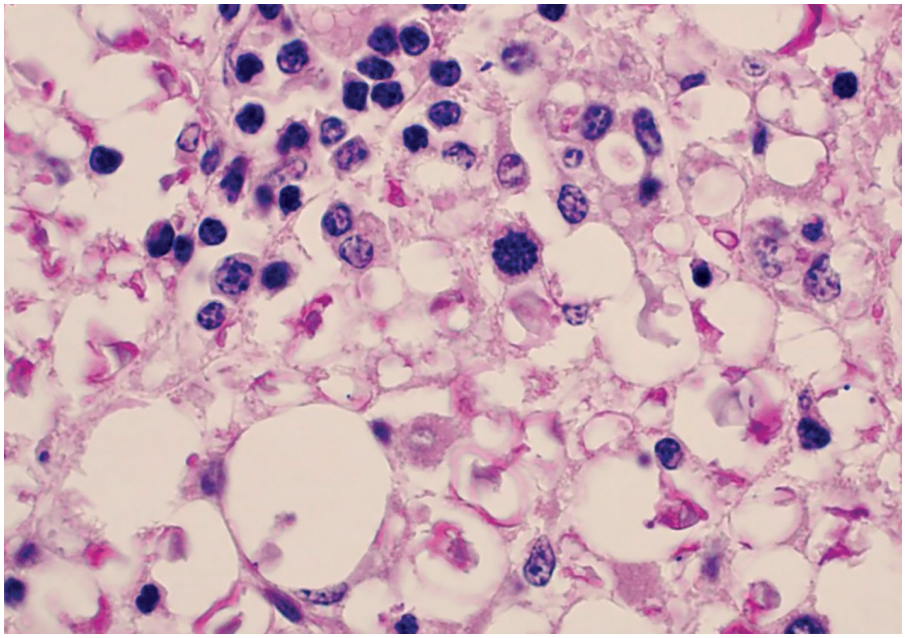
They estimated costs for serology alone, CSF centesis (spinal tap) and analyses, and treatment (using Marquis [15% w/w ponazuril]), based on PennVet's pricing. Although they also use other FDA-approved medications to treat EPM, they chose Ponazuril to represent cost for this data set. Colmer reported their results:

- Specifically, 83% of horses were *S. neurona*-positive on serology.
- For any individual horse there was a 12% chance EPM would be the diagnosis.
- CSF centesis:
  - Increased the cost by $547 (in diagnostics) in 12% of cases.
  - Decreased the cost by $1,030-2,060 (the cost of one or two months of treatment) in 88% of cases.
  - Overall accuracy was highest per serum:CSF (SAG 2/3/4) titer ratio.

"The cost of performing a spinal tap is going to increase 12% of cases' bills," Colmer explained. "However, in 88% of cases you might actually decrease the ultimate cost to the client if you're not going to pursue treatment based on the fact that most horses will be negative based on these diagnostics."

Different Regions Could Mean Different EPM Treatment Costs. Colmer acknowledged that veterinarians cannot necessarily extrapolate data from the PennVet referral caseload across all populations.

"There are different EPM prevalences in different parts of the country, and



COURTESY DR. REBECCA RUBY

***Sarcocystis neurona*, one of the protozoan parasites that causes equine protozoal myeloencephalitis (EPM), seen within an infected horse's spinal tissue with associated inflammatory cells.**

so we are restricted to applying this information to and from the population around us and, for that reason, one of our future directions that we've discussed is potentially doing this on a larger scale and including more of a multicenter retrospective study to get numbers that might include other areas of the country. This would allow us to collect data from a wider population of horses that is more reflective of and applicable to the general population."

EPM Drugs, Disease Duration Don't Impact Post-Mortem Testing Results

Short summary: Pathologists detected S. neurona *DNA in preserved tissue from horses with acute and chronic neurologic disease, with and without EPM treatment history.*

When a horse doesn't survive equine protozoal myeloencephalitis, the body might be sent to necropsy so pathologists can confirm the cause of disease, whether for the owner's understanding, insurance purposes or both.

To confirm the diagnosis of EPM, pathologists must be able to see the causative protozoa, *Sarcocystis neurona* or *Neospora hughesi*, in tissue samples under the microscope or detect protozoal DNA with polymerase chain reaction (PCR) testing.

But until recently, it's been unclear whether EPM treatment, disease duration and tissue sample preservation methods interfere with results.

Rebecca Ruby, BVSc, MS, an assistant professor at the University of Kentucky Veterinary Diagnostic Laboratory (UKVDL) in Lexington, recently sought to examine the effects of these variables, along with Jennifer Janes, DVM, PhD, DACVP.

Ruby presented their results at the Havemeyer Foundation's EPM Advances in the Field Symposium.

Ruby looked at tissue samples and

PCR test results for *S. neurona*, the primary causative agent of EPM (and the one they typically test for in Central Kentucky), from 199 horses with neurologic disease tested from 2010 to 2021—the lab has a high equine caseload and keeps an extensive library of samples for research.

Of those horses, 78 had detectable DNA with cycle threshold (CT) values from 26.56 to 40.08 (average of 34.30). A CT value indicates the point where a real-time PCR diagnostic result changes from negative to positive (think about the time it takes for the test line to appear, or not appear, on a COVID-19 PCR test, for instance).

Within this group, 60 horses (75%) had experienced neurologic signs for a duration of one day to three years, with a mean of 60 days and a median of 10 days. Ruby reported that 31 of the horses (39%) were known to have received antiprotozoal treatment prior to death.

Pathologists tested 56 formalin-fixed paraffin embedded (FFPE) samples and 19 fresh nervous tissue samples, with average CT values of 34.78 and 32.83, respectively.

She described additional findings:

- In two cases pathologists detected *S. neurona* DNA in horses with non-compatible histopathologic lesions—in other words, they didn't see spinal cord damage that would suggest the horses had EPM, but the animals tested positive for it.
- In 121 horses where they didn't find *S. neurona* DNA, pathologists observed nervous system inflammation in 40 cases (33%). That warranted a presumptive diagnosis of EPM. "It's like our constellation of inflammatory changes considered consistent with EPM, so we're not seeing the protozoa necessarily, we are not identifying the DNA," she explained. "We're just saying, 'We don't know things that do this in horses that are not EPM.' "
- In the remaining 66% of cases, they pinpointed something other than EPM or a non-inflammatory neurologic condition (i.e., cervical vertebral stenotic myelopathy, aka Wobbler syndrome) as the primary diagnosis.

"Out of this whole group, it's really important to recognize 66% of those horses had a diagnosis that was not EPM," said Ruby. "So, these are horses that might have been on the necropsy floor due to a history of acute onset neurologic disease, resulting in testing for *S. neurona* immediately, and then they were diagnosed with something else."

Ruby said this subset of suspected—but not confirmed—cases of EPM is the group of horses she and her colleagues hope to study further. They want to look for other protozoal organisms besides *S. neurona* that could be causing the neurologic signs.

In the meantime, as far as postmortem testing for EPM, they said, "From a financial perspective it's probably smarter to run the test on targeted PCR than formalin-fixed, because this allows the pathologist to identify a site with active inflammation, which makes it more likely the protozoa will be in that section of the nervous system," said Ruby.

Take-Home Message

In summary, Ruby explained that *S. neurona* is detectable in formalin-fixed paraffin embedded (FFPE) tissue in horses with acute and chronic neurologic disease. These horses might or might not have had antiprotozoal treatment.

She also said pathologists rarely detected *S. neurona* DNA in horses with no histopathologic lesions that would support that diagnosis. EM

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MERCK Animal Health

By Nancy S. Loving, DVM

Equine sarcoids are common, and there are numerous treatment options available.

ARND BRONKHORST PHOTOGRAPHY

Equine Sarcoid Treatment Options

Here are some of the latest research findings for treating sarcoids in horses.

Equine sarcoids are commonly encountered in veterinary practice, with an incidence of 12.5%–67%, according to Reid Hanson, BSA, DVM, DACVS, DACVECC, Professor of Equine Surgery at Auburn University's JT Vaughn Large Animal Teaching Hospital. At a presentation sponsored by Merck Animal Health in 2022, Hanson discussed a variety of treatment options.

Electrosurgical excision removing a minimum margin of 12 mm around the tumor has a success rate of around 87%. This method must follow a strict protocol to not contaminate surrounding tissue, especially if the sarcoid cause is related to bovine papillomavirus.

Laser ablation causes less damage to surrounding tissues and less spread of malignant cells to healthy tissues compared to sharp surgical excision. Hanson reported an 83% success rate overall. This might improve when combined with intralesional treatment such as cisplatinin injection with or without electrochemotherapy.

Ultrasound coagulation is a method that coagulates and cuts tissue at the same time. A thin layer of charred tissues at the cut surface involves less collateral thermal damage.

Cryotherapy is a commonly used

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For sarcoids near the eye, radiotherapy is especially useful, although that treatment can be costly for owners.

method with 1960 C liquid nitrogen. The intense cold destroys tumor cells through the formation of intracellular ice crystals that rupture the cell membranes. This usually requires three cycles of freeze-thaw to decrease tissue temperature to minus 2008°C to minus 300°C. Hanson recommended freezing 1 cm margins beyond the tumor.

Large lesions might need a repeat cycle at 10-14 days.

Due to potential damage to nearby tissues and potential scar contraction, this technique might not be appropriate to use around joints, the coronary band or the eye. The success rate is around 70-80% with prior surgical debulking using a laser or scalpel. It is important to wait until the wound stops bleeding to begin the freeze. A potential cell-mediated immune response might cause spontaneous resolution of other sarcoids in other body parts.

Hyperthermia heats tissue to 500°C for 30 seconds via a radiofrequency probe to elicit apoptosis (cell death). Disorganized and compact vascular structures have difficulty dissipating heat, thus are amenable to hyperthermia treatment. Hanson advised that the probe should be held against sarcoids less than 1 cm in diameter to achieve the desired heating effect and cell death. Regression might be achieved for at least seven months.

Radiotherapy uses a linear accelerator to create ionizing radiation that kills neoplastic cells by damaging DNS and proteins. This procedure requires special equipment, licensing and housing. There are two forms of this treatment:

1. Teletherapy uses high-energy electrons or protons targeted by the linear accelerator at 80-100 cm from the tumor. This procedure is accomplished under general anesthesia for 30-45 minutes. Cost is high, about $8,000.

2. Brachytherapy implants iridium-182 beads into the tumor to give a high radiation dose for days to weeks. This is especially useful around the eye when the objective is to minimize damage to normal tissue. The horse remains at the hospital for 3-4 weeks, thereby incurring additional expenses above the $8,000 treatment cost.

Immunotherapy achieves a cell-mediated immune response with up-regulation to attack and kill tumor cells via activation of T-cells and natural killer cells. This procedure is done with a variety of options:

- Bacillus Calmette Guerin (BCG, which is attenuated *Mycobacterium bovis*) is injected directly into the tumor every 2-4 weeks until regression. This might elicit severe local swelling and a rare anaphylactic reaction, but the success rate is 83%-100%, especially around the eye.
- Mycobacterium cell wall extract is useful for small tumors—such as those around the eye—and for fibroblastic sarcoids. There is poor success for occult or verrucous periorbital tumors. Local swelling can be severe, and there is a potential for fatal anaphylaxis after the second injection.
- XXterra is an herbal product containing bloodroot and zinc chloride that stimulates local immune activation to kill tumor cells. There are no controlled studies to compare its efficacy to other methods.
- Imiquimod 5% cream (Aldara) is used to treat basal cell carcinoma in people. The protocol for equine sarcoids is to apply it three times every week until resolution (or until 32 weeks). Skin should be washed eight hours following application of the cream. There is 60% success for complete regression while 80% achieved a 75% reduction.

Chemotherapy can takes many forms. It can manage uncontrolled cell division and to saturate large volumes of sarcoid tissue.

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Cisplatin inhibits DNA synthesis by binding directly to DNA. This can be administered via percutaneous injection of a viscous fluid from powder mixed with sesame seed oil. Oil delays uptake to increase contact with the tissue. By four years, 33%-96% of lesions resolved. Cisplatin is given every two weeks for at least three treatments.

Another treatment involves implanting cisplatin beads into the lesion via stab incisions at 1.5 cm intervals into the tumor bed and surrounding skin. Large tumors greater than 1.5 cm must be debulked first. The success rate is around 91%.

Acyclovir (5% cream) can be administered daily for two months. It converts via viral and host kinases to inhibit viral DNA synthesis. Small occult tumors regressed in 68% of cases, with no side effects. Failure to resolve is associated with deeper lesions.

5-Fluorouracil (F-FU) inhibits DNA synthesis. This is especially useful for small mucocutaneous squamous cell carcinoma. It can be injected into a sarcoid tumor every two weeks for up to seven treatments. Compete resolution occurs in 61% of tumors, with best results in small lesions.

Electrochemotherapy first requires debulking, then treating the base of a dry tumor by saturating it with cisplatin (or another chemo agent) that is then combined with high-voltage electrical pulses over 5-10 minutes to increase the permeability (reversible) of the cell membrane to the chemotherapeutic agent. Treatment requires multiple efforts—three times every three weeks—under general anesthesia. Cost is about $800 per treatment. Success ranged from 92%–100% over four years and was indirectly correlated with the size of the tumor.

Photodynamic treatment utilized a light-sensitive cream that is absorbed by metabolically active cells. A specific wavelength destroys cells with little damage. This can be used alone or alongside laser treatment for deeper lesions.

An **autologous tumor vaccine** is prepared by debulking a tumor, cubing it, and freezing it in liquid nitrogen. These "cubes" are then placed subcutaneously beneath a horse's mane to elicit a cell-mediated immune response that attacks distant sarcoids. This might be combined with cisplatin and chemotherapy. As an adjunctive treatment, this achieved 69% resolution. EM

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