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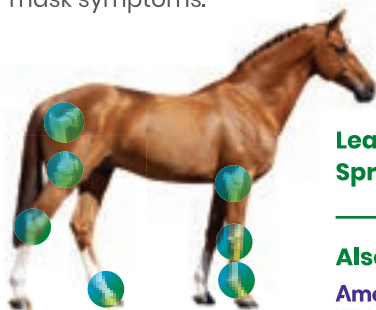
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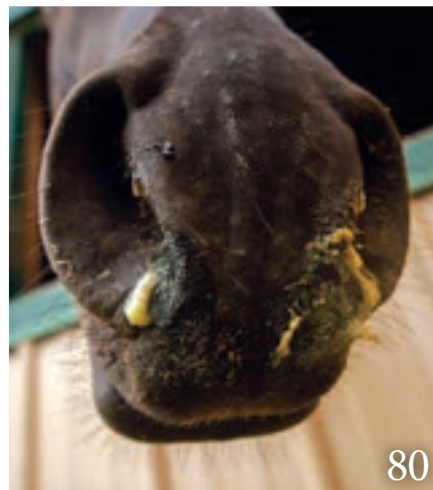
www.WiseOption.com



16



41



80

4 Publisher's Points: Jack of All Trades

By Kimberly S. Brown

6 What's Online

- The Business of Practice: Equine Veterinary Sustainability with Dr. Rob Franklin
- Disease Du Jour: Kissing Spines with Dr. José M. García-López
- Pelvic Bone Stress and Fractures
- Gender Wage Gaps in Equine Practice
- EDCC Health Watch, *brought to you by Boehringer Ingelheim Equine Health*
- Injectable Omeprazole for Horses

By Carly Sisson

16 Business Briefs: What Will Equine Practice Look Like in 2030?

While a recession seems inevitable in the next few years, equine practice will become a wonderful career by 2030.

Brought to you by CareCredit

By Amy L. Grice, VMD, MBA

8 Keeping Up

- Idiopathic Headshaking
- Ocular Penetration of Acetaminophen
- *Streptococcus equi* subsp. *equi* in Nasal Secretions

By Nancy S. Loving, DVM

18 Vet Wellness Briefs: The Arrival Fallacy

How do 'driven' vets find happiness?

Brought to you by Zoetis

By Amy L. Grice, VMD, MBA

4 AAEP Commission

Reports from the subcommittees

By Amy L. Grice, VMD, MBA

23 Stem Cells and Stem Cell- less Therapies for Tendon and Ligament Injuries

Researchers and practitioners are finding more protocols for stem cell and stem cell-less therapies for tendons and ligaments.

By Stacey Oke, DVM, MSc

36 Care and Feeding of Practice Support Staff

It is essential for practice owners and leaders to take the time to engage employees in the success of the business.

By Amy L. Grice, VMD, MBA

41 Donkey and Mule Medicine

While they fall under the heading "equid," donkeys and mules have differences from horses that are important for equine practitioners to recognize.

By Nancy S. Loving, DVM

50 Are You a Good Leader?

Whether you are an associate or practice owner, you can hold a leadership role in your practice.

By Amy L. Grice, VMD, MBA

58 Reduce Complications with Your Construction Project

Simplicity and planning can result in your veterinary construction project being a delight to you, your staff, your clients and your budget.

By Heather Lewis, AIA, NCARB

64 What Clients Want to Know About Hay

Nutritionists offer four common questions horse owners ask and provide research you can use to back your responses.

By Katie Navarra

70 Equine Stereotypies

Learn more about dealing with patients that have stereotypic behaviors and how to help them.

By Katie Navarra

75 A Deeper Understanding of Compassion Fatigue

Appreciating the connection between managing our stress and decreasing the impact of the trauma we encounter as veterinarians can help reduce our risk of compassion fatigue.

By Colleen Best, DVM, PhD, CCFP

80 Preventing Strangles Outbreaks

You might have to do some sleuthing to locate *Streptococcus equi* in a 'healthy horse' that is spreading strangles.

By Stacey Oke, DVM, MSc

85 Research Spotlight: Back Pain Rehabilitation

Dr. Hilary Clayton helps veterinarians understand some elements of equine back rehabilitation.

By Nancy S. Loving, DVM

88 Ad Index

SPECIAL ADVERTISING SECTION

49 Vetscan Imagyst— Mixed Practice, Positive Results

The team leader at Adobe Veterinary Center helps us understand how they have incorporated Vetscan Imagyst™ into their equine business. *Brought to you by Zoetis*

By Kimberly S. Brown

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Jack of All Trades

In my discussions with folks in the industry and in looking at this issue's mix of content, it is almost overwhelming all the things that veterinarians are supposed to know and do.

You should be knowledgeable about the latest in preventing physical issues in horses and bringing them back to good health. You should know about feeding and behaviors and genetic issues that might affect some of your patients more than others.

You need to be a good leader. (What is that, exactly?) You have to manage yourself and your staff so none of you get tired of the life associated with equine veterinary practice.

You need to be a caring, compassionate communicator with your clients and staff, but not so much that you burn out or suffer from compassion fatigue.

You should understand the nuances of rehabilitation and all the biologics now used in equine medicine, all the while focusing on meeting client demands for 24/7/365 service.

WOW! Is it any wonder that veterinarians in general—and equine veterinarians specifically—are becoming an endangered species?

Tools for the Trade

The good news is that acknowledgement of a problem is the first step in solving the problem. The AAEP has been taking the lead in understanding the underlying issues and building tools and resources to help grow and sustain equine veterinary practice.

EquiManagement has worked with AAEP and leaders in the industry to help bring useful information for veterinarians, vet techs/assistants, vet students and

those involved in the equine veterinary industry. We do this through the quarterly magazine, EquiManagement.com, newsletters, podcasts, surveys, focused columns in print and online, and special projects.

Special Issue Award

One of those special projects was last year's EquiManagement Business Special Issue, brought to you by CareCredit. That issue recently was awarded first place in the American Horse Publications' annual media awards for Equine Media Industry Single Issue Custom Print Publication.

The judge said: "This special edition magazine is geared toward 'the business' of equine management. Veterinarians tend to be educated experts in their field,

love what they do and are excited by the evolving science in their profession. Still, the business tasks they have to do could go neglected. This publication could be the cure to the business blues. It includes some serious information for veterinarians on how and what to do to build a successful

practice. The designer did a stellar job of continuity with a consistent color palette of black and teal throughout the design, photos that are narrative of the storyline, and uniformity of typographic design with large classic headlines and neatly laid out body copy."

EquiManagement's Art Director Phil Cooper and Content Specialist Laurel Scott made sure this special issue was pleasing to the eye, easy to use and correct in everything from facts to spelling.

Just like in veterinary practice, we strive to bring you the best we can offer. And sometimes, we get a pat on the back.

Now, back to work for all of us! 



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We publish new content and resources for vets on EquiManagement.com daily. Here is some of the most popular and helpful recent content that you might have missed. Search for all of these articles by name on the website to read the full stories or hear the podcasts.

The Business of Practice: Equine Veterinary Sustainability

Tune in for a discussion with AAEP President Dr. Rob Franklin about the Commission for Veterinary Sustainability's mission to transform equine practice. Franklin outlines the work the committee has done over the past three years and details the types of research, tools and deliverables the subcommittees are now making available.

Disease Du Jour: Kissing Spines in Horses

Kissing spines is a diagnosis that veterinarians will likely make frequently throughout their careers. Fortunately, the diagnosis is no longer a career-ender for most horses. In this podcast episode, we talk with José M. García-López,

Injectable Omeprazole for Horses

The potential efficacy of injectable omeprazole to heal gastric ulcers in horses has been a popular subject of discussion in recent years. This article examines a study that suggests that glandular ulcer healing is achievable in 20 days when treating with the Australian form of LAIO at a five-day dosing interval.

VMD, DACVS, DACVSMR, about diagnosing, treating and rehabilitating kissing spines.

Pelvic Bone Stress and Fatigue Fractures

This article written by Nancy Loving, DVM, provides an overview of a study that examined medical records from endurance horses with pelvic fatigue fractures to determine potential risk factors. The article details clinical signs of pelvic fractures, injury locations, prognosis and risk factors.



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EDCC Health Watch

EquiManagement continues to update readers daily on disease outbreaks across North America that are reported to the EDCC. Recently we have been following the vesicular stomatitis outbreak in California and Texas. Visit the "News" category on the website to stay up to date. *EDCC Health Watch is brought to you by Boehringer Ingelheim.*



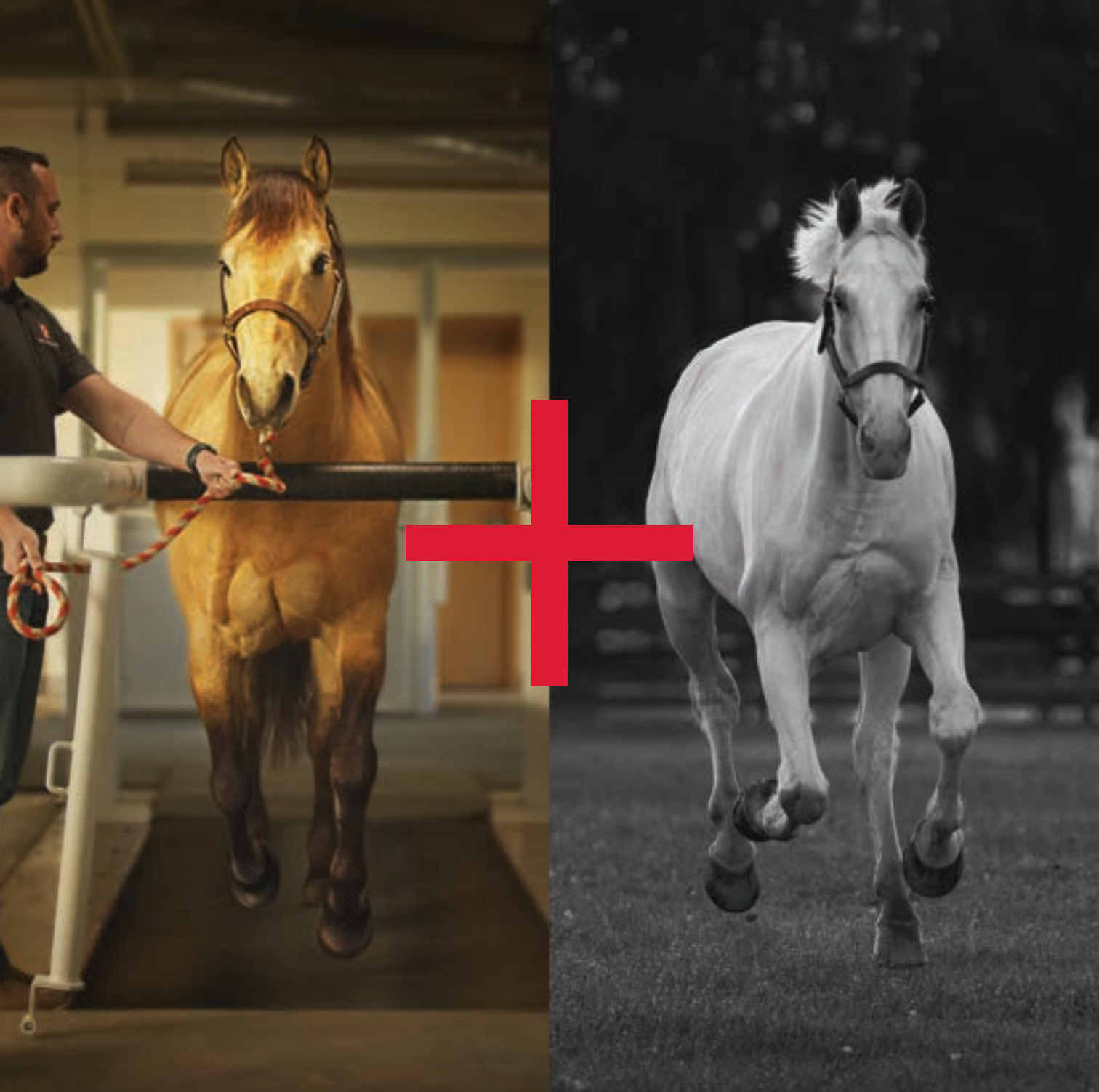
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Gender Wage Gaps in Equine Practice

The AAEP Commission on Veterinary Sustainability's Compensation Subcommittee launched a survey in 2022 that revealed gender differences in wages among equine practitioners. Read more about what that means in this article by Amy L. Grice, VMD, MBA. 



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Idiopathic Headshaking

One of the more frustrating issues that owners and veterinarians deal with is the headshaking horse. While not a common malady, it does occur in 2-4% of horses. Of that percentage, geldings are affected 75% of the time.

At the 2023 VMX Veterinary Meeting & Expo in Orlando, Florida, Sandy Taylor, DVM, PhD, DACVIM, of Purdue University, presented a comprehensive overview of idiopathic headshaking and potential treatments. She pointed out that the nerve itself is structurally normal and is not affected by inflammation or demyelination. Instead, it is a functional problem that affects both sides of the trigeminal nerve.

In one study she referenced (Aleman, et al., JVIM 2013), researchers performed nerve conduction studies on affected horses under general anesthe-

sia. A normal trigeminal nerve (TGN) doesn't fire until stimulated with 20 mA of current. In contrast, the TGN of a headshaking horse fires at 2.5 mA. To provide context, a normal horse senses pain at 10 mA or more. In comparison, a shock from an electric fence delivers 120 mA of current.

Triggers of headshaking include exercise and/or sunlight—particularly in the spring and early summer—while other cases have no identifiable trigger and the nerve is hypersensitized continually. An affected horse typically shakes its head violently—80% of the time it is a vertical shake; 10% of the time it is horizontal; and 10% of horses display both vertical and horizontal headshaking. The horse experiences an “electric shock sensation” that elicits varying degrees of anxiety, snorting, face rubbing on the legs, and striking at the face.

Taylor emphasized the importance of ruling out other possible differential diagnoses based on clinical signs that are associated with other health issues such as otitis externa/media/interna; temporohyoid osteoarthropathy (THO); TMJ (temporomandibular joint) arthritis; dental disease or tooth fracture; nuchal bursitis; nerve tumor; EPM (equine protozoal myelitis); or a behavioral issue.

In one study of 84 headshaking horses, only 22 had an identified primary cause that resulted in secondary headshaking. The other 62 horses were considered idiopathic headshakers because other causes were ruled out.

Referencing the “gate control” theory of pain, Taylor described how potential treatments might help.

A nose net applies “pressure” or touch that stimulates large A-beta fibers that close the “gate” in the central nervous



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Triggers of headshaking include exercise and/or sunlight, while other cases have no identifiable trigger.

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system to block pain sensation to the brain from small C fiber transmission. In 50% of cases, nose nets achieve 50% relief; in 25% of cases, they achieve 70% relief.

Cyproheptidine is a serotonin antagonist. While 50-75% of treated horses showed improvement in one study, the effects are often short-lived. In addition, this drug might cause drowsiness, is not approved for most competition venues, and is expensive (\$35/day). Taylor cautioned against relying on compounded formulations.

Although gabapentin has been used to address headshaking, it is poorly absorbed (16% bioabsorbable). High doses lead to sedation, and it is not allowed in competition. To date, gabapentin has not been scientifically studied in headshaking horses.

Nerve stimulation to desensitize the TGN has shown promise, but it requires multiple applications.

PENS (percutaneous electrical nerve stimulation) stimulates the nerve via a needle probed beneath the skin around the infraorbital nerve. Alternating current is applied for 25 minutes, up to three times, one week apart. In a 2019 study with 168 horses, 53% went into remission for at least 10 weeks. To date, PENS does not have FDA approval.

Electro-acupuncture uses electric current pulsed through an acupuncture needle over the infraorbital foramen. The sole study conducted thus far showed promising results.

Magnesium supplementation has been used. The mechanism is not clear, but magnesium might block neuropathic pain signals. A study (Sheldon, et al., JVIM 2018) evaluated magnesium in multiple ways: a) Six horses received IV magnesium sulfate (MgSO₄) to achieve 29% reduction in headshakes per minute while exercising; b) Six horses received four different

diets: i) hay only, ii) Equine Senior and no supplement, iii) Equine Senior + magnesium supplement, and iv) Equine Senior + magnesium supplement + boron (boron increases intestinal absorption of magnesium). The combination of magnesium and boron gave the best results—a 64% decrease in headshakes per minute during exercise.

Ocular Penetration of Acetaminophen

Six healthy horses with normal eyes were included in a study to determine if acetaminophen given orally could provide therapeutic levels within the eye [Peraza, J.; Hector, R.C.; Lee, S.; et al. Ocular penetration of oral acetaminophen in horses. *Equine Veterinary Journal* Dec 2022; <https://doi.org/10.1111/evj.13902>].

The horses received 20 mg/kg of crushed acetaminophen tablets orally every 12 hours for six total doses. The medication was mixed with corn syrup in grain.

One hour after the final dose of acetaminophen, the researchers performed an anterior chamber paracentesis to collect 0.4 ml of aqueous humor. At the same time, blood was collected for serum sampling. The horses underwent the same collection procedures three months later. Serum and aqueous humor were also evaluated for eicosanoids (thromboxane B₂, prostaglandins, F₂-alpha, leukotriene B₄, and 5- and 15-hydroxyeicosatetranic acid).

Acetaminophen penetrated the aqueous humor of normal eyes in this study. The concentration ratio of aqueous humor:serum was higher than what is seen with other NSAIDs—values of 45 compared to 4 for flunixin and 12 for firocoxib.

Characteristics of acetaminophen—low molecular weight and lipid solubility—allow it to pass through ciliary

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Indications: Zimeta® (dipyrone injection) is indicated for the control of pyrexia in horses.

Dosage and Administration: Always provide the Client Information Sheet with the prescription. Administer Zimeta by intravenous injection, once or twice daily, at 12 hour intervals, for up to three days, at a dosage of 30 mg/kg (13.6 mg/lb). **See product insert for complete dosing and administration information.**

Contraindications: Horses with hypersensitivity to dipyrone should not receive Zimeta. Due to the prolongation of prothrombin time (PT) and associated clinical signs of coagulopathy, dipyrone should not be given more frequently than every 12 hours.

Warnings: For use in horses only. Do not use in horses intended for human consumption. Do not use in any food producing animals, including lactating dairy animals.

Human Warnings: Care should be taken to ensure that dipyrone is not accidentally injected into humans as studies have indicated that dipyrone can cause agranulocytosis in humans.

Not for use in humans. Keep this and all drugs out of reach of children. In case of accidental exposure, contact a physician immediately. Direct contact with the skin should be avoided. If contact occurs, the skin should be washed immediately with soap and water. As with all injectable drugs causing profound physiological effects, routine precautions should be employed by practitioners when handling and using loaded syringes to prevent accidental self-injection.

Precautions: Horses should undergo a thorough history and physical examination before initiation of any NSAID therapy.

As a class, NSAIDs may be associated with platelet dysfunction and coagulopathy. Zimeta has been shown to cause prolongation of coagulation parameters in horses. Therefore, horses on Zimeta should be monitored for clinical signs of coagulopathy. Caution should be used in horses at risk for hemorrhage.

As a class, NSAIDs may be associated with gastrointestinal, renal, and hepatic toxicity. Sensitivity to drug-associated adverse events varies with the individual patient. Consider stopping therapy if adverse reactions, such as prolonged inappetence or abnormal feces, could be attributed to gastrointestinal toxicity. Patients at greatest risk for adverse events are those that are dehydrated, on diuretic therapy, or those with existing renal, cardiovascular, and/or hepatic dysfunction. Concurrent administration of potentially nephrotoxic drugs should be carefully approached or avoided. Since many NSAIDs possess the potential to produce gastrointestinal ulcerations and/or gastrointestinal perforation, concomitant use of Zimeta with other anti-inflammatory drugs, such as NSAIDs or corticosteroids, should be avoided. The influence of concomitant drugs that may inhibit the metabolism of Zimeta has not been evaluated. Drug compatibility should be monitored in patients requiring adjunctive therapy.

The safe use of Zimeta in horses less than three years of age, horses used for breeding, or in pregnant or lactating mares has not been evaluated. Consider appropriate washout times when switching from one NSAID to another NSAID or a corticosteroid.

Adverse Reactions: Adverse reactions reported in a controlled field study of 138 horses of various breeds, ranging in age from 1 to 32 years of age, treated with Zimeta (n=107) or control product (n=31) are summarized in Table 1. The control product was a vehicle control (solution minus dipyrone) with additional ingredients added to maintain masking during administration.

Table 1: Adverse Reactions Reported During the Field Study with Zimeta

Adverse Reaction	Zimeta (dipyrone injection) (N=107)	Control Product (N=31)
Elevated Serum Sorbitol Dehydrogenase (SDH)	5 (5%)	5 (16%)
Hypoaalbuminemia	3 (3%)	1 (3%)
Gastric Ulcers	2 (2%)	0 (0%)
Hyperemic Mucosa - Right Dorsal Colon	1 (1%)	0 (0%)
Prolonged Activated Partial Thromboplastin Time (APTT)	1 (1%)	0 (0%)
Elevated Creatinine	1 (1%)	0 (0%)
Injection Site Reaction	1 (1%)	0 (0%)
Anorexia	1 (1%)	1 (3%)

See Product Insert for complete Adverse Reaction information.

Information for Owners or Person Treating Horse: A Client Information Sheet should be provided to the person treating the horse. Treatment administrators and caretakers should be aware of the potential for adverse reactions and the clinical signs associated with NSAID intolerance. Adverse reactions may include colic, diarrhea, and decreased appetite. Serious adverse reactions can occur without warning and, in some situations, result in death. Clients should be advised to discontinue NSAID therapy and contact their veterinarian immediately if any signs of intolerance are observed.

Effectiveness: The effectiveness phase was a randomized, masked, controlled, multicenter, field study conducted to evaluate the effectiveness of Zimeta (dipyrone injection) administered intravenously at 30 mg/kg bodyweight in horses over one year of age with naturally occurring fevers. Enrolled horses had a rectal temperature >102.0°F. A horse was considered a treatment success if 6 hours following a single dose of study drug administration the rectal temperature decreased <2.0°F from hour 0, or the temperature decreased to normal (<101.0°F). One hundred and thirty-eight horses received treatment (104 Zimeta and 34 control product) and 137 horses (103 Zimeta and 34 control product) were included in the statistical analysis for effectiveness. At 6 hours post-treatment, the success rate was 74.8% (77/103) of Zimeta treated horses and 20.6% (7/34) of control horses. The results of the field study demonstrate that Zimeta administered at 30 mg/kg intravenously was effective for the control of pyrexia 6 hours following treatment administration.

Refer to the Product Insert for complete Effectiveness information.

Storage Information: Store at Controlled Room Temperature between 20° and 25°C (68° and 77°F); with excursions permitted between 15° and 30°C (59° and 86°F). Protect from light. Multi-dose vial. Use within 30 days of first puncture.

How Supplied: Zimeta is available as a 500 mg/mL solution in a 100 mL, multi-dose vial.

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KEEPING UP (cont.)



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Authors of one study used acetaminophen as adjunctive treatment of ocular pain with some success.

epithelial cells. Eicosanoids were not detected in the aqueous humor at either sample collection, although they were detected in serum of some study horses. Absorption of acetaminophen occurs in the proximal small intestine. Therefore, it is affected by the rate of gastric emptying, which in turn is affected by meal size and composition.

Acetaminophen serum concentrations were at or below what is considered the minimum therapeutic concentration in people; the therapeutic minimum concentration in horses has not yet been established. However, other equine studies have demonstrated that oral acetaminophen doses at 20-30 mg every 12 hours provides satisfactory analgesia. By its nature, acetaminophen has only mild anti-inflammatory properties, so it might not provide this effect in the eye. The authors used it as adjunctive treatment for ocular pain

with some success. More studies are warranted to determine if it can be an addition or alternative to traditional NSAIDs to manage ocular pain and inflammation.

Streptococcus equi subsp. *equi* in Nasal Secretions

Streptococcus equi is a highly infectious bacterial respiratory infection that can significantly impact a herd of horses with morbidity and forestall owner/rider participation in events off the premises. An evaluation of horses with acute onset fever and respiratory illness reviewed the effect of *S. equi* vaccination on qPCR status [Jaramillo-Morales, C.; James, K.; Barnum, S.; Vaala, W.; et al. Voluntary Biosurveillance of *Streptococcus equi* subsp. *equi* in Nasal Secretions of 9409 Equids with Upper Airway Infection in the USA. *Veterinary Sciences* 2023, 10, 78;

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For additional information, see brief summary of prescribing information on the following page.

References: 1. Zimeta® (dipyrone injection) [package insert], Rev. 12/2020. 2. Morressey 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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<https://doi.org/10.3390/vetsci10020078>].

The authors noted that many owners forewent *S. equi* vaccination due to potential side effects such as purpura hemorrhagica or localized abscesses. The study described the prevalence of *S. equi* in nasal secretions of 9,409 horses with acute respiratory disease and determined the impact of *S. equi* vaccination on diagnostic identification of the bacteria. Horses were included in the voluntary surveillance program from March 2008 to December 2020 across 261 U. S. equine veterinary practices.

A full physical exam and nasal swabs for PCR analysis were obtained in horses aged 3 months to 32 years. Guttural pouches were not sampled.

Participating veterinarians answered a questionnaire about signalment, intended use, transport history, number of affected horses, clinical signs and *S. equi* vaccine history. Horses testing positive for *S. equi* had clinical signs of nasal discharge, fever, lethargy, anorexia, cough and ocular discharge.

The results:

- qPCR positivity for *S. equi* occurred in 7.6% (n = 715) of 9,409 horses.
- Nasal swab testing detected other respiratory infections: EHV-4 in 10.5%; EIV in 9.7%; ERBV (equine rhinitis B) in 3.3%; EHV-1 in 1.6%; and ERAV in 0.1%.
- Horses with single infections tested positive for *S. equi* 6.6% of the time.
- Horses with co-infections tested positive for *S. equi* 9.4% of the time.
- Horses less than 1 year old tested positive for *S. equi* less than other ages.
- Horses aged 5-9 years were more likely to test positive for *S. equi* compared to horses aged 10-14 and those greater than 20 years of age.
- Competition and farm/ranch horses had greater likelihood of testing positive.
- Of the 26% of horses that were transported within an 8-week period, a little more than 10% of those tested positive for *S. equi*, suggesting that transportation history did not significantly

cantly impact positive *S. equi* results.

Geographic location had no effect on the percentage of horses testing positive for *S. equi*. Season showed a somewhat different disparity for qPCR-positive testing—more horses tested *S. equi* positive in winter/spring (27%) than in summer/fall (16%).

Regarding vaccination status, 9% were immunized against *S. equi*. Of those, 9% tested positive for *S. equi*. Those immunized against *S. equi* were less likely to test positive in their nasal secretions. Because there are so many types and administration routes of *S. equi* vaccines, the authors could not form a conclusion on efficacy of vaccine type. Approximately one-third of the horses were immunized against EHV-1/4 and EIV, yet there was no statistical difference with those horses and positive testing for *S. equi*.

In summary, the authors stated that vaccination against *S. equi* was associated with a lower frequency of *S. equi* qPCR-positive cases. **EM**



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Researchers found that vaccination against *S. equi* was associated with a lower frequency of qPCR-positive cases.



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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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What Will Equine Practice Look Like in 2030?

In my opinion, there are multiple events that will make a recession in the next few years inevitable. Those include stubborn inflation, the drawn-out war in Ukraine, global political unrest, continuing supply chain issues, and the financial burdens of extreme weather events along with other consequences of global warming. This will cool the strong revenue growth of equine practices. But, because the top 1% of U.S. income earners became markedly wealthier during the last decade, they will continue to enjoy equine sports despite the downturn.

Equine veterinarians will likely have fewer middle-income clients, but wealthy clients will continue to demand a high level of services. Practices closer to urban areas will thrive, especially those near established equine competition venues.

Rural areas will continue to use doctors from mixed animal practices. In more remote or impoverished areas, paraprofessionals similar to Physicians Assistants might arise due to a lack of clients who are able or willing to pay for the services of a veterinarian.

The total U.S. horse population will continue to slowly decline as many horse owners are priced out of the market. Racing and rodeo will continue to struggle to retain social license as society withdraws approval of sports that appear to them to be harmful to the animals involved.

While most large referral hospital practices will be corporately owned, small

private equine practices will dominate in many markets. These small practices will continue to thrive as veterinarians choose to chart their own courses, make their own rules and earn more income as practice owners than they would as associates.

Veterinary technicians will be utilized to provide selected services, especially as some earn more advanced degrees. Fees for services will be sharply higher, allow-



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ing equine veterinary compensation to be nearly comparable to that in companion animal practices.

Emergency cooperatives will be the norm in many areas, and many practices will refer after-hours cases to the corporate hospitals after a certain time in the evening. Some practices will require emergencies to haul into their small clinics and might charge higher fees to see horses in the ambulatory setting that are recumbent or unable to withstand travel. Emergency Service Only practices will be present in areas with high numbers of horses, providing multiple regional practices with urgent care for their

clients. These businesses might charge a subscription fee to participating practices or have higher client fees in order to be profitable. Ambulatory emergency care will be more expensive when it is available.

The physicality and injury risks of equine practice will still dissuade some from pursuing a lifelong career in equine medicine, but a new culture of practice will make safety of practitioners the norm rather than the exception. Practices will be more inclusive, collaborative and team-centered. Adoption of technology will result in improved team communication and streamlined customer service. Almost all practices will have payment at the time of service and minimal accounts receivable.

Because horses will be increasingly expensive, preventative health care will be more highly valued. That means veterinary treatment will be sought early and often for sick or injured equines. With medical advances continuing to develop, clients will increasingly demand the highest level of care, creating opportunities for practices to partner in offering new diagnostic modalities and to work collaboratively.

Equine practice will continue to be a wonderful career. And it will be improved by the new culture that values a full life outside of work, shorter work hours, better boundaries and higher compensation for the professional horse doctor. **EM**

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The Arrival Fallacy

Veterinarians are typically driven individuals who can set goals and achieve them. Just getting admitted to veterinary school required dedication to getting top grades in difficult classes such as calculus and organic chemistry. Once into veterinary school, the drive to be the best didn't let up. With exams every few weeks, and so many things to learn, pushing through to the next goal was essential. The prize was graduation, followed by the next goal of a prestigious internship (for most), then a residency or a great associate position. With each next step, there was the pleasure of anticipating the happiness that would be granted with each new achievement.

Unfortunately, that happiness is often fleeting, if it is experienced at all. Many people actually feel a letdown upon reaching a goal. They immediately think "What's next?" and respond by choosing a new destination to climb to, thinking it will help them feel better.

During the struggle to the next pin-

nacle, they tell themselves: "I'll achieve happiness when ..."

Dr. Tal Ben-Shahar, a positive-psychology expert who trained at Harvard University, coined the phrase Arrival Fallacy. He defined it as the false assumption that once you reach a goal,

to the North Pole—training that was arduous and painful. When the actual trip arrived and he succeeded, he described feeling nothing when standing on the top of the world. Not a shred of happiness, just exhaustion and cold.

Why are so many people afflicted by the Arrival Fallacy? In a study by the Making Caring Common Project of the Harvard Graduate School of Education, researchers found that nearly two-thirds of youth reported that both their parents and peers would rank achievement above kindness and caring for others.² Achievement as a path to a happy life is deeply ingrained

in our society. People consistently believe that more money, more prestige, more education, a better job or a bigger house will make them happier. But it simply isn't true, according to researchers in happiness. According to Ben-Shahar, "The Number 1 predictor of happiness is the quality time we spend with people we care about and who care about us. In other words, relationships."

you will experience enduring happiness. Unfortunately, despite the American Dream telling us that hard work and achievement deliver a happy life, achievement doesn't equal happiness over the long term.¹

In the book "Learning to Be Sad," the author described an interview with Ben-Shahar, during which he described training for years to finish an expedition



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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 monthly 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.

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Preventing the disappointment of the Arrival Fallacy comes from enjoying the process of achieving a goal. To this end, it might be helpful to set smaller goals to celebrate along the way toward the bigger goal. Looking for the perfect associate job? Look for innovative ideas and practice tips at every practice you visit. Writing a book? Celebrate the completion of each chapter, or maybe each page! Training for a marathon? Celebrate the first five-mile run, then the first six-mile run.

Another tip is to stay in the present and enjoy the life you have right now. Is it a beautiful, sunny day? Savor the warmth of the sun on a cold day. Do you have a child or a dog that fills you with love? Stop and notice your gratitude for their presence in your

life. In fact, keeping a gratitude journal can be one of the most powerful ways to increase your happiness. At the end of each day (or whenever you decide works best for you), spend five minutes writing down what you are grateful for in that moment. They can be simple things—that your kid didn't have a meltdown at bath time, that you got a supportive text from a friend, that you remembered to pick up milk on the way home.

Maintaining close relationships can be the most important step of all. Sometimes those connections have weakened because you made huge sacrifices to reach your goal. You might have worked long hours and neglected your own health and wellbeing, spent little time with family and friends, and dedicated

your life to achieving your objective. The result might be that you are feeling isolated, alone and unhappy once the achievement is made. A vicious circle can ensue if you then move on to pursue yet another step that you are sure will bring the happiness that eludes you. Instead, try leaning into closeness with the people around you to increase your contentment. Slowing down and connecting can make all the difference. 

1. <https://www.nytimes.com/2019/05/28/smart-er-living/you-accomplished-something-great-so-now-what.html>

2. <https://mcc.gse.harvard.edu/reports/children-mean-raise> Making Caring Common Project. *The Children We Mean to Raise: The Real Messages Adults Are Sending About Values*. Harvard Graduate School of Education.

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Creating Change

The AAEP Commission on Equine Veterinary Sustainability is initiating change in the equine veterinary industry through a coordinated effort with the five subcommittees. By spreading new ideas about compensation, emergency coverage, internships, practice culture and student life, the AAEP aims to turn the tide of declining participation of veterinarians in equine practice. Through various communication channels, the AAEP subcommittee teams and AAEP staff have been sharing data from surveys as well as educational materials about new ways to practice. By building tools for members to use to easily integrate new paradigms, change will become more accessible to all practices.

The **Emergency Subcommittee** recently met in-person and fleshed out multiple models for providing emergency coverage. These models include not offering emergency coverage, offering part-time coverage, offering emergency service only at haul-in facilities, utilizing referral centers for emergencies and tertiary care, solo practices offering emergency care in areas that have few to no options for sharing that responsibility, participation in emergency cooperatives, utilizing telemedicine for triaging and/or treating emergencies, utilizing veterinary technicians or mid-level practitioners for emergencies in underserved areas, utilizing relief veterinarians, and emergency-only practices.

The subcommittee plans to establish case studies and tool kits for each of these models and develop ways for members with similar models to form communities to support each other.

The **Culture Subcommittee** has further developed materials for the seven pillars of a healthy practice culture—safety, security, connection, mattering at work, balance of professional and personal life, communication and opportunities for growth. With the help of the AAEP staff, the group has created informational

6,564 active members of the AAEP, of which 1,378 responded. Average compensation in 2021 for recent graduates was found to be about \$89,000 for those graduating between 2016-2019. Thirty-two percent of respondents reported receiving 100% of the emergency fees for calls they attended, but 42% reported receiving no additional compensation for emergency duty. Fifty-eight percent reported that their educational debt was twice to four times the amount of their annual compensation. Finding ways to increase

compensation for equine practitioners to more closely approximate that of companion animal veterinarians is a focus of the subcommittee. Educating members on how to calculate fees for service, offering methods for increasing efficiency, and investigating gender differences in revenue production will all be part of this subcommittee's continued work.

The **Internship Subcommittee** has been revamping the AAEP Avenues program and preparing for a launch in 2024 with the new AAEP

website currently being designed. They have completed a series of comprehensive documents to help students choose externships and internships that are right for their goals, as well as materials to help mentors assess interns' progress and build an internship program that consistently attracts new veterinarians. They had several well-attended Roundtables and have had excellent reviews of their efforts.

The **Student Subcommittee** members and a cross-section of equine-oriented



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Fifty-eight percent of surveyed AAEP vets reported that their educational debt was twice to four times their annual income.

pieces to spread these ideas widely in the equine veterinary community. In addition, the group is designing a deep library of resources for each of the pillars to assist practices in bringing these important aspects of culture to life.

Data from the survey developed by the **Compensation Subcommittee** has been shared with members as a series of "small bites" on a number of platforms. Comer Research Consultants administered the survey in September 2022 by emailing



Veterinary students met with the Student Subcommittee group to find the most effective ways to spread awareness about the positives of equine practice.

veterinary students had an in-person meeting in June, where conversations

focused on the most effective ways to spread awareness about the many posi-

tive aspects of equine practice. A Speakers Bureau has been formed to provide experienced practitioners for SCAAEP groups to draw from for their members. Comer Research Consultants has prepared a survey for students, particularly those who have turned away from a career in equine medicine, in order to determine the most important reasons for their choices.

The **Steering Committee**, made up of the AAEP officers and the co-chairs of each subcommittee, met in person on July 6 to coordinate the Commission strategy for the remainder of 2023. The effort to transform equine practice is the most important strategic priority of the AAEP. This will help ensure that horses will continue to have access to veterinary care now and in the future. **EM**






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Stem Cells and Stem Cell-less Therapies for Tendon and Ligament Injuries

Researchers and practitioners are finding more protocols for stem cell and stem cell-less therapies for tendons and ligaments.

By Stacey Oke, DVM, MSc

Musculoskeletal injuries continue to plague the equine industry, remaining a leading cause of lost training days and attrition. Of the available therapies that veterinarians use to expedite quality healing, stem cells have opened a whole new world for repairing and regenerating these finicky tissues. There are, however, a surprising number of roadblocks to using stem cells

that limit either their use or effectiveness. A new technology is emerging that holds promise for alleviating many of the issues with using stem cells. It is called stem cell-derived extracellular vesicles (EVs).

“EVs are essentially intracellular ‘sacs’ that contain tons of information in the form of proteins and genetic material. EVs remove the hassle of dealing with live cells and potentially avoid the recipient’s immune system,” said Aimee Colbath, VMD, MS, DACVS (large animal),

an assistant professor in the Department of Clinical Sciences at Cornell University’s College of Veterinary Medicine.

This article briefly reviews tendon and ligament injuries and their “natural” healing phases. It relays our current knowledge of the role stem cells play in altering that “natural,” yet inefficient, repair process. The exciting world of EVs will then be introduced with suggestions on how this technology could drive advancements from repair to regeneration.



Regenerative therapies have the potential to restore tissue function, and stem cells are particularly promising for tendon and ligament injuries.

Troublesome Tendons and Languishing Ligaments

Tendon and ligament injuries pose major economic and welfare burdens on the industry due to injury frequency and poor healing capacity. The superficial digital flexor tendon (SDFT), for example, is a common site of injury in many disciplines, including racing, eventing and show jumping. The deep digital flexor tendon is often injured in elite show jumpers, and dressage horses are prone to hind limb suspensory desmitis.

“SDFT lesions are overstrain injuries,” said Christopher Elliott, BVSc (hons), MANZCVS, DACVSMR, Palm Beach Equine Clinic, Wellington, Florida.

He added, “You can think of the SDFT as an acute on chronic strain or accumulation of microdamage over a period of time...a superphysiological load on top of a cumulative stress or strain.”

When injured, tendons and ligaments

go through a defined series of healing phases: inflammation, proliferation and remodeling. The inflammatory phase begins immediately after an acute injury. A clot forms among the damaged tissue, and resident cells within this clot release a host of cytokines that cause local inflammation. The clot then serves as a scaffold for recruiting cells that participate in the healing process. Then the proliferative phase begins, characterized by the influx of fibroblasts that begin creating a scar. Angiogenesis is also initiated, as well as cellular proliferation—all orchestrated by a variety of cellular mediators. After about two weeks, the remodeling phase begins. This is where the scar undergoes remodeling and tenocytes and collagen fibers become aligned and cross-link in an attempt to create a tissue with tensile strength.

“The reason why horses’ tendons and ligaments are predisposed to reinjury

is because the ‘natural’ healing process results in the production of type III collagen rather than the stronger, more elastic, type I collagen,” Elliott explained.

In reality, all three phases overlap, and the remodeling phase can last months to years following injury. Regardless of how efficiently these phases of healing occur, the new tissue will always lack the same biochemical and biomechanical properties as the native tendon.

Thus, the “natural” healing process for these tendon and ligament injuries isn’t exactly natural.

“Another reason why tendons and ligaments heal poorly and are prone to reinjury is because they have poor vasculature, and it is typically the vessels that transport the elements that cause healing,” explained Colbath.

Moving from Healing to Regeneration

As mentioned above, the remodeling phase can last months to years, and the resultant tissue isn’t as good as the origi-



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BM-MSCs have helped racehorses that sustained SDFT injuries return to racing, with some racing five or more times following treatment.

nal tendon and ligament tissue.

“We want to promote healing with as much type I collagen as possible and minimize type III,” Elliott emphasized. “Therapies that promote type I will encourage more robust healing and reduce the likelihood of re-injury. We want to increase the quality of healing—not the speed of healing—to have horses successfully return to performance with a low rate of re-injury.”

Therapies designed to support maximal tendon and ligament healing include one, or preferably several, of the following:

- Rest
- Anti-inflammatory therapies
- Physical therapy/rehabilitation
- Cryotherapy
- Laser therapy
- Extracorporeal shockwave therapy
- Magnetic fields

- Therapeutic ultrasound

It is unclear based on the evidence we have to date which of these therapies—alone or in various combinations—best supports healing.

“What we can say is that they appear to have benefits, but science is limited regarding what exactly those benefits are and how exactly they help repair and regeneration,” explained Elliott.

The lack of “ideal” therapeutic plans and the continued high rate of reinjury at least partly explains why the equine industry met the introduction of regenerative (biological) therapies with open arms, eagerly embracing stem cells in particular for improving tendon and ligament healing.

The term “regenerative therapies” describes a collection of therapies that replace, regenerate or restore tissue or organ function. This field includes

tissue engineering as well as cell-based and cell-free stimulation of self-repair mechanisms. Examples include mesenchymal stem cells (MSCs), platelet-rich plasma, autologous conditioned serum and autologous protein solution.

Colbath and colleagues surveyed 423 board-certified equine specialists regarding the types of biologic (regenerative) therapies they used in clinical practice for the treatment of musculoskeletal disease (Knott, et al. 2022). Information regarding primary reason for use, route of administration, preferred protocols, perceived efficacy, adverse effects and limitations was collected.

Key findings from that survey included the following points:

- Bone-marrow-derived MSCs (BM- MSCs) were the third-most-common biologic therapy, slightly less popular than platelet-rich plasma and autologous conditioned serum. In total, 111 of 154 (72.1%) survey respondents reported using BM- MSCs.

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- Adipose-derived MSCs (AD-MSCs) were far less popular, with only 30 out of 154 (19.5%) survey respondents indicating they used this therapy.
- MSCs were primarily used intralesionally in tendon and ligament injuries.
- Most practitioners (80%) did not repeat intralesional MSC injections. When those MSC injections were repeated, they were most often repeated 1-2 months after the initial injection.
- Expense was the most common limiting factor for using regenerative therapies.

“Stem cell therapy is not inexpensive. It costs about \$2,000-\$4,000 for each round,” noted Elliott.

While some attest that the widespread use of regenerative medicine in equine practice currently exceeds the science supporting its use, others feel the available data are promising. Indeed, many studies do show encouraging results for stem cell therapy in tendon and ligament injury rehabilitation.

In early 2023, Elliott and colleagues published a study in the *Equine Veterinary Journal* comparing stem cell treatments to controlled exercise rehabilitation for racehorses with SDFT injuries.

The study included a cohort of client-owned Thoroughbred racehorses in Australia diagnosed with a novel, acute, unilateral overstrain injury of the SDFT. Core lesions were graded from II-IV ultrasonographically. Lesion length and cross-sectional area were measured. The veterinarian and owner then chose their preferred treatment plan: cultured BM-MSCs, allogenic mesenchymal stem cells (A-MSCs), or a controlled exercise rehabilitation program (CERP) alone.

The BM-MSCs collected from the patient were sent to a commercial laboratory for cell isolation and expansion. The lesions were therefore injected three weeks after bone marrow aspiration. The commercially available allogenic MSCs were injected intralesionally approx-

imately 7 days after ultrasonographic diagnosis.

All horses in the study participated in the CERP. The 52-week CERP graduated slowly from strict stall rest to hand walking, small yard rest and working under saddle, to large paddock turnout and light to moderate work. Horses were followed for 2 years after treatment, and race records were analyzed to compare racing success.

In total, 213 horses were included. One hundred thirty were subjected to the CERP alone, 66 were treated with BM-MSCs, and 17 were treated with A-MSCs.

In total, only 95 (44.6%) horses returned to racing and only 57 (26.8%) raced five or more times post-injury.

“Racing five or more times is the marker for ‘success’ in racing Thoroughbreds,” explained Elliott.

Of the 130 horses with CERP-only treatment, more than one-third returned to racing, but only one-fifth raced five or more times. More horses treated with BM-MSCs successfully returned to racing (59%) compared to CERP alone. Moreover, one-third of the BM-MSC-treated horses raced five or more times. Few horses were included in the A-MSC group but the same five horses (29.4%) that returned to racing also raced five or more times after treatment.

“Looking at the odds ratios, horses treated with BM-MSCs in combination with CERP were more than three times more likely to return to racing than horses participating in the CERP alone,” noted Elliott. “Similarly, horses treated with BM-MSC and CERP were more

than twice as likely to complete five or more races than horses treated with CERP alone.”

He added, “There are two main take-away messages from this study. First, it justifies the use of autologous BM-MSCs as a worthy treatment of core lesions in tendons in racehorses. It shows return on investment because these horses are significantly more likely to race and race five or more times. Second, the data helps relay the importance of CERP. It is the cake that all other treatments are built on. Anything you do on top of the CERP is icing with a cherry. If you don’t have the CERP, stem cells or any therapy are a waste of money and time.”

How Stem Cells “Work”

Of all the regenerative therapies, stem cells are widely considered promising for equine musculoskeletal injuries, particularly for ligaments and tendons. In this setting, the goal of stem cells—like any regenerative therapy—is to restore the normal function of damaged tissues. This is in stark contrast to what the “normal” tendon and ligament healing phases currently achieve.

MSCs are multipotent progenitor cells that are able to self-replicate and also differentiate into different cell types. And while cell “replacement” was initially thought to be the main function of stem cells, we now know that is not true.

“Gone are the days where we believe that stem cells grew more tendon or ligament. That is not the up-to-date science of how stem cells work. That was the original thought, but it doesn’t happen. Instead, stem cells have potent anti-inflammatory and cell-signaling

Therapy	Number of horses	Return to Racing	Raced five or more times
All horses	213	95 (44.6%)	57 (26.8%)
CERP only	130	51 (39.2%)	26 (20.0%)
BM-MSC and CERP	66	39 (59.0%)	26 (39.0%)
A-MSC and CERP	17	5 (29.4%)	5 (29.4%)



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Studies have shown that stem cells signal the body where the injury is and are a kick start to expedite quality healing, explained Dr. Christopher Elliott.

effects. They signal to the body where the injury is and are a kick start to expedite quality healing,” Elliott explains.

Colbath added that, “The primary mechanism of action of stem cells is to orchestrate healing. They direct other cells to come to the site of healing using paracrine factors, such as growth factors, chemokines, cytokines, etc. They tell the body, ‘Come here and fix this.’”

MSCs can, theoretically, be isolated from almost every tissue in the horse’s body, but in clinical practice, BM- and AD-MSCs are the most common.

For tendon and ligament injuries, stem cells—regardless of their source and post-collection processing—are most often injected directly into the injured region of the tendon or ligament (i.e., intralesionally) using ultrasound guidance, but some studies show that they can be injected intravenously or via regional limb perfusion.

What happens to those cells once they’re injected?

While one might think that because they’re the directors of tissue regeneration they would stay where they’re injected, that is not true.

According to Colbath, “There are some studies that have used nuclear scintigraphy, green fluorescence protein (GFP) or labels detectable by MRI to follow the fate of stem cells once they’re injected.

These studies indicate that cells are present at the lesion site following injection for days to weeks. In horses, though, we still don’t know exactly how long stem cells live. This may vary with cell type and lesion type.”

Detriments of Stem Cells

Despite the positive data associated with stem cell therapy, many disadvantages also need to be addressed.

Collecting bone marrow is not completely innocuous. The procedure might be associated with risks such as infection, hemorrhage, pneumothorax and pneumoperitoneum.

“Really, both are easy to obtain,” said Colbath. “Adipose tissue is easier to access, but it leaves a scar. Bone marrow is still relatively easy to obtain from the sternum.”

A study by Watts, et al. (2018) found that horses tolerate bone marrow aspiration well, and that aspiration of bone marrow from the sternum does not appear more painful than a sham procedure.

It takes approximately three weeks to generate stem cell cultures from bone marrow aspirates, leaving a delay between injury and implantation. To circumvent the delays associated with cultured MSCs, autologous stem cells can be used. These cells are banked, making them a ready-to-use product. Still, research by Watts, et al. (2017) suggested that allogenic stem cells are not immunologically privileged, bringing into question whether this is truly a viable approach.

Sometimes, the patient is not an ideal donor for stem cells. For example, Bagge, et al. (2022) found that the chondrogenic and osteogenic differentiation performance of both bone marrow-derived and adipose tissue-derived stem cells declined with increasing age.

They demonstrated this after collecting stem cells from bone marrow and adipose tissue (as well as dermal fibroblasts to serve as a control) from neonatal foals, yearlings, adults, middle-aged horses and geriatric horses. The chondrogenic differentiation of BM-MSCs was already declining in yearlings compared to foals.

Data are lacking regarding the ideal dose, timing or number of treatments. In Colbath, et al.’s survey of board-certified equine specialists, they noted that there is not a current consensus regarding the timing of the first injection or optimal treatment intervals.

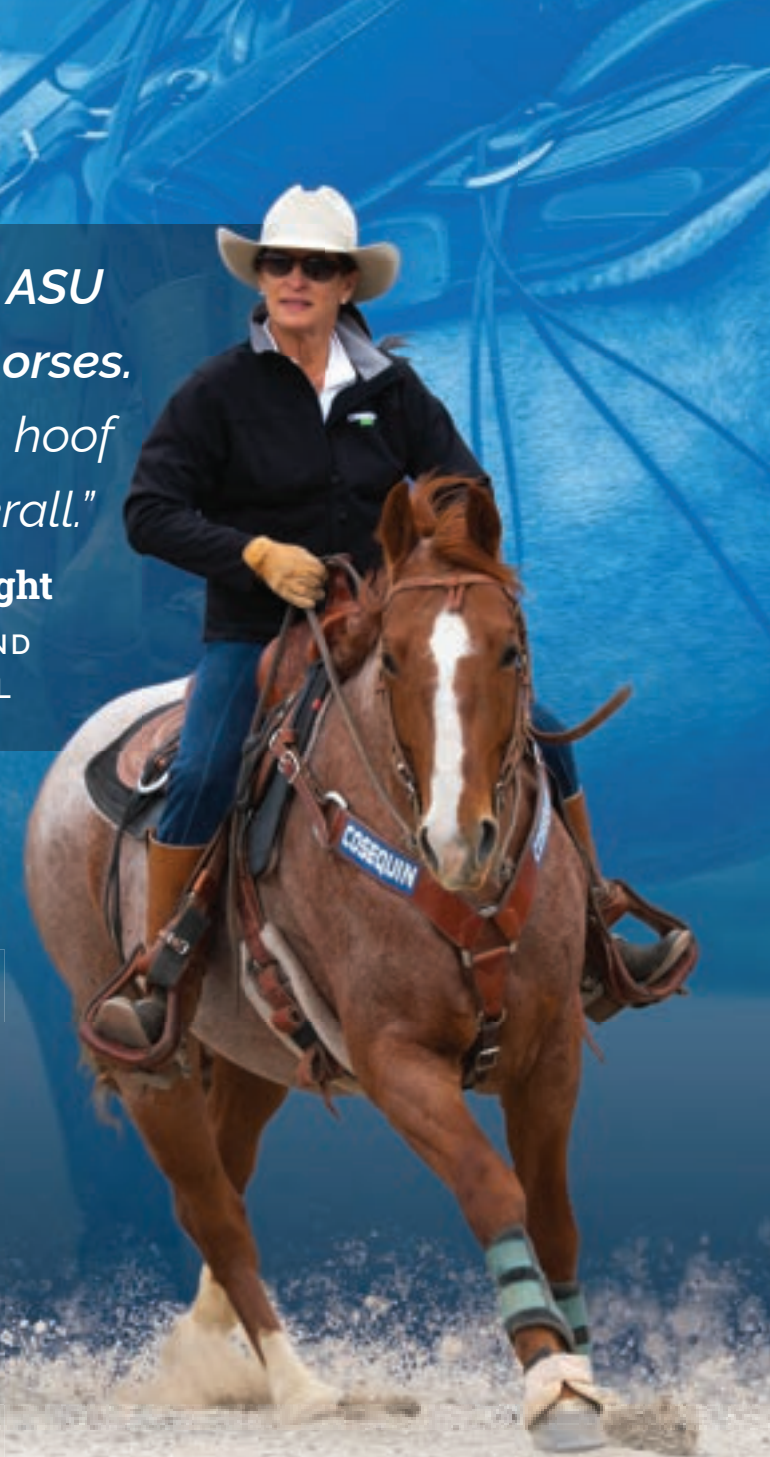
“In fact, our study identified a large

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disparity in current treatment intervals for all biologic therapies,” Colbath said. “Additional clinical studies are needed in this field to determine optimal treatment intervals and even dose.”

In terms of timing, Colbath said she injects BM-MSCs intralesionally while there is a ‘black hole’ in the tendon or

ligament to fill as seen on ultrasound.

“I do not re-inject if there is already fiber alignment appreciated on the ultrasound because I don’t want to add volume and disrupt those delicate fibers,” Colbath added. “At six weeks, if there is still a black hole [as seen on ultrasound], then I will go ahead and re-inject.”



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Prascend®
(pergolide tablets)
1 mg

Brief Summary: This information is not comprehensive. Before using Prascend® (pergolide tablets), please consult the product insert for full prescribing information. The product insert may be obtained from your veterinarian or by visiting www.prascend.com. Dopamine receptor agonist for oral use in horses only
Caution: Federal law restricts this drug to use by or on the order of a licensed veterinarian.
Description: PRASCEND tablets are rectangular light red colored, half-scored tablets containing 1 mg pergolide, as pergolide mesylate. Pergolide mesylate is a synthetic ergot derivative and is a potent dopamine receptor agonist.
Indication: For the control of clinical signs associated with Pituitary Pars Intermedia Dysfunction (Equine Cushing’s Disease) in horses.
Dosage and Administration: Administer orally at a starting dose of 2 mcg/kg once daily. Dosage may be adjusted to effect, not to exceed 4 mcg/kg daily. It has been reported that pergolide tablets may cause eye irritation, an irritating smell, or headache when PRASCEND Tablets are split or crushed. PRASCEND Tablets should not be crushed due to the potential for increased human exposure and care should be taken to minimize exposure when splitting tablets. The tablets are scored and the calculated dosage should be provided to the nearest one-half tablet increment (see Table 1).

Table 1 Dosing Table		
Body Weight	Dosage	
	2 mcg/kg	4 mcg/kg
136 - 340 kg (300 - 749 lb)	0.5 tablet	1 tablet
341 - 567 kg (750 - 1,249 lb)	1 tablet	2 tablets
568 - 795 kg (1,250 - 1,749 lb)	1.5 tablets	3 tablets
796 - 1,022 kg (1,750 - 2,249 lb)	2 tablets	4 tablets

Dosing should be titrated according to individual response to therapy to achieve the lowest effective dose. Dose titration is based on improvement in clinical signs associated with Pituitary Pars Intermedia Dysfunction (PPID) and/or improvement or normalization of endocrine tests.
In some cases, adverse events were reported after a dose increase (see **Post-Approval Experience**). If signs of dose intolerance develop, the dose should be decreased by half for 3 to 5 days and then titrated back up in 2 mcg/kg increments every 2 weeks until the desired effect is achieved.
Contraindications: PRASCEND is contraindicated in horses with hypersensitivity to pergolide mesylate or other ergot derivatives.
Warnings: Do not use in horses intended for human consumption. Keep PRASCEND in a secure location out of reach of dogs, cats, and other animals to prevent accidental ingestion or overdose.
Dogs have eaten PRASCEND tablets that were placed in food intended for horses or dropped during administration of the tablets to the horses. Adverse reactions may occur if animals other than horses ingest PRASCEND tablets (see **Post-Approval Experience**).
Human Warnings: Not for use in humans. Do not ingest the product. Keep this and all medications out of the reach of children. PRASCEND should not be administered by persons who have had adverse reactions to ergotamine or other ergot derivatives. Pergolide, like other ergot derivatives, may cause emesis, dizziness, lethargy or low blood pressure.
Pregnant or lactating women should wear gloves when administering this product. It has been reported that pergolide tablets may cause eye irritation, an irritating smell, or headache when PRASCEND Tablets are split or crushed. PRASCEND Tablets should not be crushed due to the potential for increased human exposure and care should be taken to minimize exposure when splitting tablets. Store this product separately away from human medical products and handle this product with care to avoid accidental ingestion.
In case of accidental ingestion seek medical advice immediately and show the package leaflet or the label to the physician.
Precautions: Treatment with PRASCEND may cause inappetence. The use of PRASCEND in breeding, pregnant, or lactating horses has not been evaluated. The effects of pergolide mesylate on breeding, pregnant, or lactating horses are not known; however, the pharmacologic action of pergolide mesylate suggests that it may interfere with reproductive functions such as lactation. PRASCEND is approximately 90% associated with plasma proteins. Use caution if administering PRASCEND with other drugs that affect protein binding. Dopamine antagonists, such as neuroleptics (phenothiazines, domperidone) or metoclopramide, ordinarily should not be administered concurrently with PRASCEND (a dopamine agonist) since these agents may diminish the effectiveness of PRASCEND.
Adverse Reactions:
Pre-Approval Experience: A total of 122 horses treated with PRASCEND Tablets for six months were included in a field study safety analysis.
Inappetence or decreased appetite occurred at one or more meals in 40 of 122 horses treated with PRASCEND. At the baseline evaluation 1.6% of owners reported a history of inappetence or decreased appetite as compared to the 32.8% of horses that experienced inappetence or decreased appetite during the study. Most cases of inappetence were transient and occurred during the first month of treatment; however, some horses experienced sporadic inappetence throughout the study. Two horses required a temporary reduction in dose due to inappetence during the first month of the study. Both horses returned to their original dose within 30 days.
Weight loss occurred in more than half of the horses in this study; however, weight loss that was considered abnormal was only reported in 11 horses.
Lethargy was reported in 9.8% of horses during the study. Behavioral changes were noted in 6 horses including aggression, kicking, agitation, nervous behavior and increased activity. One horse required a temporary reduction in dose due

to energetic behavior during the first month of the study. Eight horses died or were euthanized during the study due to worsening of pre-existing conditions (laminitis, dental disease, septic tenosynovitis) or colic (strangulating lipomas, large colon volvulus). One mare was inadvertently enrolled in the study while pregnant and experienced dystocia resulting in the death of the foal.

Table 2 Summary of the most common adverse reactions (N=122)		
Clinical sign	# Cases	Cases (%)
Decreased appetite	40	32.8
Lameness	22	18.0
Diarrhea/Loose stool	12	9.8
Colic	12	9.8
Lethargy	12	9.8
Abnormal Weight Loss	11	9.0
Laminitis*	10	8.2
Heart murmur	10	8.2
Death	8	6.6
Tooth disorder	8	6.6
Skin abscess	7	5.7
Musculoskeletal pain	6	4.9
Behavior change	6	4.9

*Three new cases and 7 pre-existing, recurring cases

Post-Approval Experience (2019):

The following adverse events are based on post approval adverse drug experience reporting for PRASCEND. Not all adverse events are reported. 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 in horses are categorized in order of decreasing reporting frequency by body system and in decreasing order of reporting frequency within each body system:
General: anorexia, lethargy, weight loss Gastrointestinal: diarrhea, abdominal pain/colic
Dermatological: alopecia, hyperhidrosis, dermatitis
Musculoskeletal: laminitis, muscle stiffness/soreness
Neurological: ataxia, seizure, muscle tremors
Behavioral: aggression (to other horses and humans), hyperactivity (anxiety, agitation), other behavioral changes (stud-like behavior, spooky, unpredictable, confused) Clinical pathology: anemia, elevated liver enzymes, thrombocytopenia
The above adverse events were reported in some horses at starting dose levels, while in the others following a dose increase.
Death (including euthanasia) has been reported. Adverse events have been reported in dogs following ingestion of tablets prepared for administration to horses.
To report suspected adverse reactions, to obtain a Safety Data Sheet (SDS), or for technical assistance, contact Boehringer Ingelheim Animal Health USA Inc. at 1-888-837-4251. For additional information about adverse drug experience reporting for animal drugs, contact the FDA at 1-888-FDA-VETS or online at <http://www.fda.gov/reportanimalae>.

Effectiveness: A field study evaluated the effectiveness of PRASCEND for the control of clinical signs of PPID. A total of 122 horses with PPID were enrolled in the study, 113 of which were included in effectiveness evaluations. The success of each horse was based on results of endocrinology testing (dexmethasone suppression test or endogenous ACTH test) and/or improvement in clinical signs related to PPID (hirsutism, hyperhidrosis, polyuria/polydipsia, abnormal fat distribution, and/or muscle-wasting) on the Day 180 evaluation. Based on endocrine testing and investigators’ clinical assessment scores, 86 (76.1%) of the 113 evaluable cases were treatment successes.

Animal Safety: In a six-month target animal safety study healthy adult horses received PRASCEND administered orally, once daily, at doses of either 0 mcg/kg, 4 mcg/kg, 6 mcg/kg, or 8 mcg/kg (0X, 1X, 1.5X, or 2X the maximum recommended dose). There were eight healthy horses (four males and four females) in each treatment group.
PRASCEND treated groups had lower mean heart rates and higher mean temperatures than the control group. Horses in all treatment groups had minimum heart rates within the normal range and maximum temperatures below 101.5°F. One 1.5X horse experienced a mild episode of spasmodic colic on Day 3 that resolved after treatment with flunixin meglumine.

Mean red blood cell counts and hemoglobin values were lower in PRASCEND treated groups as compared to the control group. Other hematology parameters including hematocrit, white blood cells, absolute neutrophils, and absolute lymphocytes exhibited mild, transient decreases as compared to the control group. The hematology parameters generally decreased over the first 30 to 60 days after treatment initiation and then returned to values similar to pre-treatment levels. No treatment related alterations were identified on histopathology evaluation of bone marrow.
Storage: Store at or below 25°C (77°F).
How Supplied: PRASCEND Tablets are available in 1 mg strength—packaged 10 tablets per blister and 60 or 160 tablets per carton.

NDC 0010-4489-01—60 tablets
NDC 0010-4489-02—160 tablets
Approved by FDA under NADA # 141-331
References:

Orth, B.N., Holscher, M.A., Wilson, M.G., et al. (1982) Equine Cushing’s Disease: Plasma Immunoreactive Proopiomelanocortin Peptide and Cortisol Levels Basally and in Response to Diagnostic Tests. Endocrinology, 10(4):1430-41
Wright A, Gehring R, Coetzee H (2008) Pharmacokinetics of pergolide in normal mares. American College of Veterinary Internal Medicine Forum, Abstract #36, San Antonio, TX.
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Reference: Product Insert 448901-03 Revised 05/2021

Extracellular Vesicles: A Stem Cell-less Regenerative Therapy

As an alternative to using actual cells—either autologous or allogenic—researchers instead have started looking at the stem cell “secretome.”

As described by Rhatomy, et al. (2020), the secretome is the medium where stem cells are cultured that contains soluble proteins, lipids, nucleic acids and extracellular vesicles (EVs). Those researchers suggested that the secretome could be used in place of stem cells for improved safety (e.g., to avoid transmission of infections for allogenic stem cells), removing the concerns for immune incompatibility, and for providing a readily available regenerative therapy at much-reduced costs than cell-based therapies.

Taking this technology one step further, some researchers are focusing on the EVs themselves.

Angela M. Gaesser, DVM, DACVS, is a veterinary surgeon and PhD student at the University of Pennsylvania School of Veterinary Medicine’s New Bolton Center. In reference to EVs, she said, “There are three categories of EVs: exosomes, microvesicles and apoptotic bodies. Exosomes are thought to be more bioactive and come from the endocytic pathway. Microvesicles are created by outward budding of the cell’s plasma membrane, and apoptotic bodies are formed by cells undergoing apoptosis (dying cells).”

These microscopic membrane-bound particles measure anywhere from 40-1000 nm.

“EVs can be isolated from the medium via ultracentrifugation, which is a special type of centrifuge that is not typically used in most laboratories,” noted Colbath.

These EVs contain proteins, lipids and nucleic acids that, according to Po Yee Lui (2020), reflect the cellular origin and metabolic state of the cell

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within 6 months.¹

IMPORTANT SAFETY INFORMATION: PRASCEND has not been evaluated in breeding, pregnant or lactating horses. Treatment with PRASCEND may cause loss of appetite. Most cases are mild. If severe, a temporary dose reduction may be necessary. PRASCEND tablets should not be crushed due to the potential for increased human exposure. PRASCEND is contraindicated in horses with hypersensitivity to pergolide mesylate or other ergot derivatives. Keep PRASCEND in a secure location out of reach of dogs, cats, and other animals to prevent accidental ingestion or overdose. Dogs have eaten PRASCEND tablets that were placed in food intended for horses or dropped during administration of the tablets to the horses. Adverse reactions may occur if animals other than horses ingest PRASCEND tablets. Refer to the package insert for complete product information.

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

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from which they are generated. That precious cargo is shuttled to neighboring or distant cells, “actively regulating gene transcription and functions of the recipient cell,” noted Lui.

In essence, EVs appear to be the functional unit of stem cells, providing all the benefits of stem cells without having to work directly with the cells themselves. They appear to possess anti-inflammatory and pro-regenerative effects (Mocchi, et al. 2020).

Gaesser added, “I think of EVs as being the signals that cells send to other cells. So, if we are talking about stem cells, EVs are the signals that help stem cells enact change in other cells. Many of these signals are anti-inflammatory and anabolic in nature to ‘turn on’ healing mechanisms within the tissue that they are injected into. I think about this technology as harnessing the bioactive properties of stem cells while reducing the immunogenicity associated with the cells themselves.”

“The question remains, though, how much cell-to-cell contact do you need when using stem cells versus how much is simply the paracrine effect? When using EVs, we’re assuming that it’s what the cells are producing that is important,” Colbath pointed out.

Gaesser concurred, adding, “I think it’s probable that some of the actions of stem cells are direct cell-to-cell interactions that don’t involve EVs. The question is whether this is a large or small proportion of how stem cells work that would be lost when just EVs are used.”

Colbath suggested that EVs could be used in a similar fashion as stem cells in a clinical setting by injecting the product intralesionally.

“The goal would still be to get those paracrine messages to the area of concern,” she said.

One potential detriment to EVs is that once injected, they are not able to adapt to their environment or tailor their responses like stem cells might do.

“So, stem cells still have some advantages over EVs,” Colbath noted.

treatment is that it can be produced as an ‘off-the-shelf’ product. You wouldn’t need to wait two to three weeks for stem cell expansion like you do when using autologous cells.”

Although exciting, this research is still in its infancy. Much work needs to be performed to reliably produce standardized products.

“In our laboratory, we are working toward using them in an in vivo model for treating osteoarthritis, but we first need to validate them in vitro,” said

Gaesser.

Take-Home Message

Stem cell therapy appears safe, and it effectively allows horses to return to competition with lower rates of reinjury than horses not treated with stem cells.

According to Elliott, a multimodal approach, extending beyond just stem cells, is most likely to provide maximal effect.

“For example, the last tendon I treated, I used

platelet-rich plasma on Day 7, purely for natural anti-inflammatory effects and to ‘dull’ the collagenases,” said Elliott. “I injected autologous stem cells on Day 22 and began lasering that tendon. Based on studies conducted in Germany, laser therapy appears to promote appropriate healing and collagen development and alignment of the tendon fibers.”

Elliott added, “This is what I believe is the ‘diamond-encrusted’ treatment plan for horses with tendon and ligament injuries, which is better than a gold standard. But we are always looking to see how we can improve and are seeking the best way to make these horses heal.” **EM**

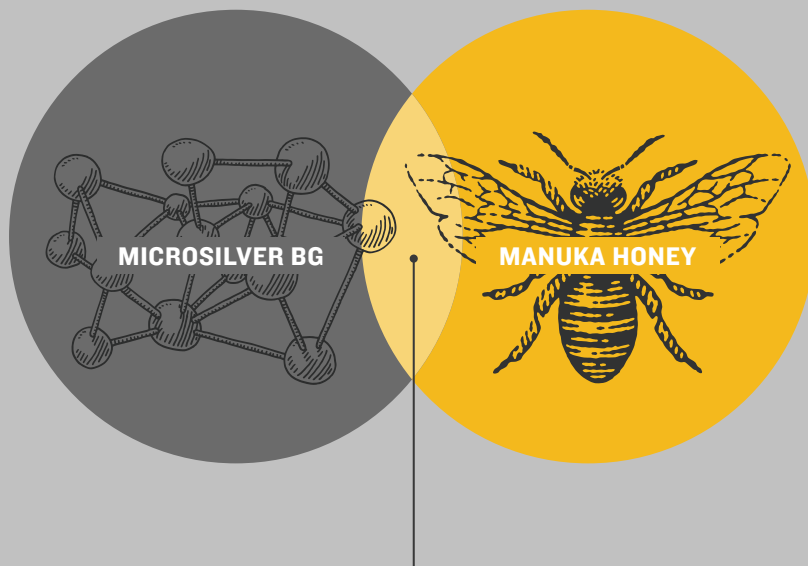


SHELLEY PAULSON

EVs could be a viable solution for horses with sub-par stem cells, such as sick horses and older horses.

She added, “Sick horses, older horses, horses on medications...all these animals could have sub-par stem cells and could therefore benefit from allogeneic EVs instead. That’s especially true if those EVs were collected from young, healthy horses and cryopreserved so they are immediately available. EVs, because they are a cell-less therapy, will also likely avoid the immune system.”

Gaesser noted that “because of the reduction in immunogenicity, we think they have a better potential to be used as an allogeneic treatment, whereas in the horse we typically use autologous stem cells to reduce the immune response. The benefit of having an allogeneic



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Managing your team effectively is pivotal for your practice's success.

Care and Feeding of Practice Support Staff

It is essential for practice owners and leaders to take the time to engage employees in the success of the business.

By Amy L. Grice, VMD, MBA

Most equine practices are small, employing just a few team members. Practice owners frequently find that managing their support staffs is a challenge that increases as the practice grows. Because these are very small businesses, most operate without the benefit of a practice manager. Even in larger practices with a manager in charge of human resources, overseeing employees is demanding. Leading a small team can be infinitely more satisfying and successful when utilizing best practices, fostering clear communication, and creating a collaborative team culture.

A recent study investigating the

predictors of employee engagement and work satisfaction in equine veterinary professionals revealed that levels of work engagement and satisfaction in the veterinary profession could be gauged using four factors:

- 1) The extent to which employees' personal core values align with the mission of the practice;
- 2) The relationships between staff members and owners;
- 3) The working conditions, level of collegiality and compensation; and
- 4) The team culture and opportunities to pursue personal and professional growth.¹

Support staff experience stress at work, even though they also receive satisfaction

from helping clients and their animals. However, high workloads, long work hours, emotionally charged interactions with clients, exposure to animal suffering and participation in euthanasia can cause burnout.

A toxic practice culture has also been shown to be highly implicated in decreasing quality of work life.²

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¹ Tnibar, A., Schougaard, H., Camitz, L., Rasmussen, J., Koene, M., Jahn, W., Markussen, B., An international multi-centre prospective study on the efficacy of an intrarticular polyacrylamide hydrogel in horses with osteoarthritis: a 24 month follow up. Acta Vet Scand. 2015; 57: 20-27.

² De Clifford, L.T., Lowe, J.N., McKellar, C.D., Chambers, M., David, F., A double-blinded positive control study comparing the relative efficacy of 2.5% polyacrylamide hydrogel (PAAG) against triamcinolone acetonide (TA) and sodium hyaluronate (HA) in the management of middle carpal joint lameness in racing Thoroughbreds. Journal Equine Vet Science; [epub 2021 Sept 24]



When practice owners' values align with those of their team members, conflicts are mitigated and decision-making is simplified.

expectations because most desire to do a great job at work. Having systems in place can make a practice run much more smoothly, with more autonomy for staff and less attention needed from the owner. Systems memorialize how things are done and the desired outcome. Many studies have shown the positive effect of having choice in the workplace. By focusing on outcomes rather than details, employees become more engaged and job satisfaction rises.

Creating job descriptions for each position in the practice is a key step. These documents spell out the expectations and daily functions of the employee. Every description can include "Help other staff members with their responsibilities whenever time allows or the workload requires." The listing of tasks should be fairly comprehensive, but excessive detail is not required.

Having an Employee Manual can ensure that policies and decisions are equitable across the workforce. By writing things down, a practice owner has a tool to know how to answer questions that only come up occasionally.

Practice Vision

Team members are inspired by being

a part of something bigger than themselves that creates a difference in the world.

A practice vision statement serves as a clear beacon by articulating the long-term goal that a practice aspires to achieve. When the practice leader communicates the vision clearly and repetitively, all staff members understand what they are trying to achieve through their work, and they can develop new ideas and ways to improve the journey.

Practice Values

The practice's values are the core of its identity—they are the principles, beliefs and philosophies that are held sacred and feel undeniable. The practice owners must continually demonstrate and communicate those values because they provide a guideline for the expected behaviors of the entire veterinary team. Therefore, it is essential that practice owners hire to support their values, because when values are not aligned, no one is happy.

Values serve three very important functions in a practice. They:

1) provide ethical guidelines and boundaries for the practice mission and vision;

2) simplify decision-making, because if something is not in alignment with the values of the practice, decisions become easy to make; and

3) resolve conflict because values become the standard of acceptable behavior within the practice.

According to Gallup's recent State of the American Workplace report, only 13% of U.S. workers strongly agree that their organization's leadership communicates effectively. Only three in 10 U.S. employees strongly agree that at work their opinions seem to count.

What this might signal is that team members want to be heard.³ A common complaint among employees in equine veterinary practices is that communication is lacking clarity or is not occurring frequently enough. Many practice teams struggle to operate with effectiveness when veterinarians operate within silos and information critical to smooth functioning and excellent customer service is not shared with the team.

Frequent, clear, transparent, inclusive communication between everyone on the team is one of the key ingredients in having a collaborative culture. There are many technologies available—such as Slack or Zoom—that can foster more connection. Weekly staff meetings create a team atmosphere, and those are the most effective when they are short and have a planned agenda. Sharing a quick story about a recent case that illustrates the values of the practice can help keep the purpose of the work personal to the team. Weaving in the mission, vision and values of the practice at every opportunity helps to keep them fundamental to the team's identity.

Leaders, whether they are practice owners or associate veterinarians, sometimes stop seeking the input of their support staff as they become more successful and experienced. High achievers in particular frequently fail to wonder what others' perspectives are

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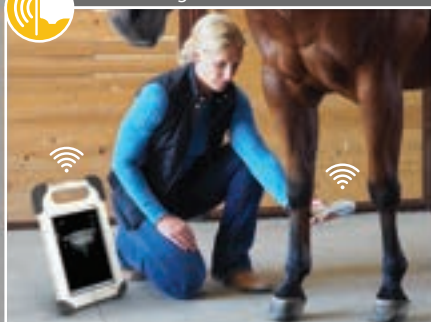
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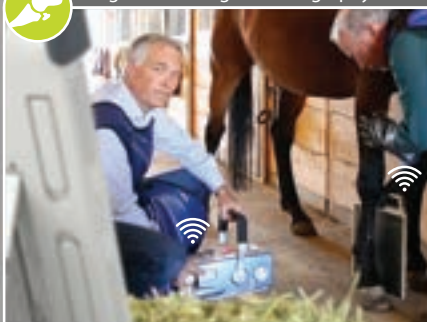
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When psychological safety is present in a practice, teams are stronger and employees feel more valued and understood, leading to more job satisfaction.

and what problems and solutions they see. Doctors are problem solvers and want to offer solutions, so sometimes they forget the value of asking questions and seeking others' perspectives. When leaders show interest in what others are seeing and thinking by asking questions, it helps to create a psychologically safe culture.

Psychological Safety

Psychological safety is a condition in which a person feels included, safe to learn, safe to contribute, and safe to challenge the status quo—all without fear of being embarrassed, marginalized or punished in some way.

Globally, studies have shown that only 47% of all employees feel that their workplaces are psychologically safe.⁴ When psychological safety is present, teams are stronger because mistakes are seen as ways to learn how to do things better in the future. People also speak up with ideas because risk is diminished. Because the pandemic ushered in an unprecedented amount of mental health challenges, it is more important than ever to care about your employees as

people. When people seek to understand the perspectives of others, it enhances connections to one another. The practice owner can model this behavior by regularly seeking input from the team. The leader should also check in with each employee individually on a regular basis, asking questions such as: What can I do to best support you? What do you look forward to when you come to work each day? If you could change something about your job, what would that be?

Take-Home Message

Recognizing small successes and embedding appreciation and empathy into a practice culture can increase employees' sense of belonging and help them feel their contributions have meaning. If the practice has an internal communication channel (e.g. Slack), giving recognition on a regular basis to employees who make efforts to embody the practice's shared values can boost engagement. When goals have been set and successfully met—such as increasing the number of patients that have annual dental floats—the celebration could be a

group breakfast or afternoon ice cream social. Remembering birthdays with a group card and cake or flowers can also build team spirit. Being remembered as a person rather than just a cog in the wheel of a business supports mental health and well-being.

While managing a team takes time away from clinical work, it is essential to make this investment. Creating an atmosphere of teamwork does not occur in a vacuum. The practice leaders must actively engage with their employees, put systems in place to streamline their work, provide autonomy in meeting expectations, take the time to communicate regularly and thoroughly, and walk their talk. Leaders model the way.

Shared experiences populate the stories that are the practice's oral history and communicate its values to the world. When everyone in the organization sees the practice team as a group of people who each contribute valuable, unique talents to the whole, and each member of the team feels appreciated, the practice can rely on its healthy culture to attract and sustain its people into the future. **EM**

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**Practitioners should
know donkeys' unique
care requirements.**

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Donkey and Mule Medicine

While they fall under the heading “equid,” donkeys and mules have differences from horses that are important for practitioners to recognize.

By Nancy S. Loving, DVM

My first encounter with the fact that there are differences between donkeys, mules and horses occurred in my first few months out of vet school. I tried to castrate a mule colt using the standard dose of xylazine and ketamine I'd used on horse colts. The mule just stood there, still upright on all four feet, looking at me as if to say, “What are we doing here?” It struck me that I needed to learn more about those differences

before proceeding further.

Another experience early in my veterinary practice career left a lasting impression while working a few days a week at the Palomino Valley Wild Horse and Burro Center in Northern Nevada. Newly admitted wild equids were “processed” upon entry into the facility. Standard protocol was to obtain dental age of the horses using tongs to open the mouth, gather blood for Coggins testing, immunize and deworm, freeze brand, and take care of any injuries or illnesses

of individual animals. One morning I was called in to help process a large group of wild burros, which are essentially a smaller version of a donkey. Their behavior was completely contradictory to how the wild mustangs behaved. Looking down the lane into the chute, all I could see were ears. I had no idea what I was in for. When faced with a stress situation like being shuttled through a narrow lane into a holding chute, burros tend to plant their feet and brace, back up or sit down rather than run amok



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Specific ear movements can be indicative of pain in donkeys, and a donkey pain ethogram is currently in development.

like the behavior displayed by many of the horses. The foal burros behaved the same as the adults.

It was an eye-opener that was preparatory for the many veterinary calls I had to make to treat wild burros adopted from the facility into the community.

Physical Differences

The more obvious differences stem from variations on an anatomical theme.

Anatomical features of the limbs vary between donkeys/mules and horses. The dorsal hoof wall of donkeys and mules is more vertical, and the hoof-pastern axis is more upright. The frog extends more toward the heel, and the sole is U-shaped. The distance between the proximal limit of the hoof wall and the extensor process used to help identify laminitis on radiographs is wider in

donkeys (10-13 mm) compared to 3-5 mm in horses. Donkeys and mules are prone to laminitis and hoof abscesses, the same as horses.

Attempting to do an intravenous stick to take blood or give medication can be a bit challenging with donkeys since a thick muscle (cutaneous coli) runs alongside the neck. It is best to capitalize on better venous access in the upper or lower one-third of the jugular groove.

Passing a nasogastric (NG) tube also requires some thought since nasal passages of donkeys and mules are narrower than those of horses, requiring a smaller bore NG tube. Mules and donkeys have a less sensitive cough reflex than horses, so you can't always rely on a cough to indicate inadvertent passage of the NG tube into the trachea. And, the nasal puncta of the nasolacrimal

duct, while situated on the inside floor of the horse's nostrils, is located more on the dorsal outside flare of the nostril in donkeys and in the lateral wall of the external nares in mules.

It helps to know the terminology when describing crosses between donkeys and horses:

Mule = offspring between a male donkey and a female horse

Hinny = offspring between a horse stallion and a female donkey

For the sake of this article, any cross between a horse and a donkey is referred to as a mule.

Medical Differences

A notable characteristic about donkeys and mules is that they can thrive on lower-quality forage and less water than horses. That makes them invaluable to people and economies in developing countries where they are often part of a family's livelihood as beasts of burden. They do like to have access to clean water and can be picky about that.

However, this "thriftness" quality can also cause problems when living as companion animals in affluent areas due to the high quality and dense caloric value of foodstuffs. They tend to become obese and are at risk for laminitis and fatty liver disease. Practitioners should be on the lookout for hyperlipemia that can occur both as a primary and secondary disease.

Donkeys are efficient at storing lipids and mobilizing fat stores rapidly. Predisposing factors to development of hyperlipemia include anorexia, fasting, late pregnancy, lactation, stress, endotoxemia, parasitism, liver or gastrointestinal disease, and laminitis. Triglyceride evaluation is not always helpful in diagnosing hyperlipidemia in donkeys and mules unless the levels are unusually high.

Donkey metabolic syndrome (DMS), similar to equine metabolic syndrome

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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.

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DESCRIPTION: Clodronate disodium is a non-amino, chloro-containing bisphosphonate. Chemically, clodronate disodium is (dichloromethylene) diphosphonic acid disodium salt and is manufactured from the tetrahydrate form.

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. 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.

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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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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(EMS) in horses, is prevalent when food is plentiful. Not every obese donkey has insulin dysfunction (ID), and even lean and/or young donkeys can develop DMS. A cut-off value >50 uIU/ml for insulin is more appropriate for donkeys and mules to determine the presence of ID. A specific donkey body condition score has

been developed ranging from 1 to 9, and a neck crest system ranges from 0 to 4.

Testing for insulin dysfunction takes a different form for donkeys and mules: Baseline glucose and insulin levels tend to be higher than in horses, and glucose stays elevated for longer despite the return of insulin to baseline. When pur-

suing dynamic testing due to inconclusive baseline insulin concentrations (20-50 uIU/ml), rather than fasting donkeys pre-testing, they should be offered a flake of hay the night before a dynamic metabolic test done in the morning. This is intended to prevent the risk of hyperlipidemia.

Commercial diets intended for control of ID in horses might not be appropriate for donkeys, especially because it is best to eliminate concentrates from the diet altogether. To test for PPID (pars pituitary intermedia dysfunction), the TRH-stimulation test is used in the same way as for horses. However, the validation of ACTH results in donkeys needs more sampling. At this time, a donkey is PPID-positive if plasma ACTH ≥ 110 at the 10-minute time point following IV injection of TRH.

Treatment with oral pergolide (2 ug/kg/day) has good bioavailability in donkeys. Plasma concentrations are similar to or higher than those achieved in horses on the same dose. The donkeys in the study tolerated this well with no adverse effects [Xue, C.; Davis, J.; Berghaus, L.J.; et al. Pharmacokinetic properties of pergolide mesylate following single and multiple-dose administration in donkeys. *Equine Veterinary Journal* Dec 2022; DOI: 10.1111/evj.13917].

A study of 138 domestic donkeys demonstrated that none of 15 hematologic values and only four of 20 biochemical values compared well between donkeys and horses [Burden, F.A.; Hazell-Smith, E.; Mulugeta, G.; et al. Reference intervals for biochemical and hematological parameters in mature domestic donkeys (*Equus asinus*) in the UK. *Equine Vet Educ* 2016; 28:134-139].

Coagulation testing is one issue for which coagulopathies could be underdiagnosed in donkeys since partial



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thromboplastin and prothrombin times are shorter in donkeys than in horses. Thyroid hormone concentrations in donkeys are higher than in horses.

Pharmacology

As noted, donkeys/mules tend to need higher doses of sedatives and anesthetics while also metabolizing drugs more rapidly than horses. Anesthesia wears off quickly, so drugs are often increased by 25-50%. Xylazine duration is less than detomidine. Butorphanol enhances the sedative effect of alpha2-adreno-receptor agonists. The half-life of guaifenesin in donkeys/mules takes longer to abate than in horses, leading to prolonged recovery times following anesthesia. Using propofol as an adjunct to ketamine or to guaifenesin-ketamine-xylazine combination might provide smoother induction and recovery for donkeys/mules.

NSAIDs (flunixin and phenylbutazone) and antimicrobial drugs are metabolized faster in donkeys and mules than in horses, necessitating higher doses or shorter dosing intervals.

Surgery

Surgery always has some peculiarities between individuals, no matter the breed or whether one is dealing with donkeys/mules compared to horses.

Castration is a common procedure in male equids, but it can be challenging in donkeys and mules because of their tendency to bleed. Extra care needs to be taken to ligate the vascular cord with both sutures and hemostats rather than or in addition to using an emasculator.

Preventive Care

Vaccine doses and frequency are administered the same in mules and donkeys as for horses.

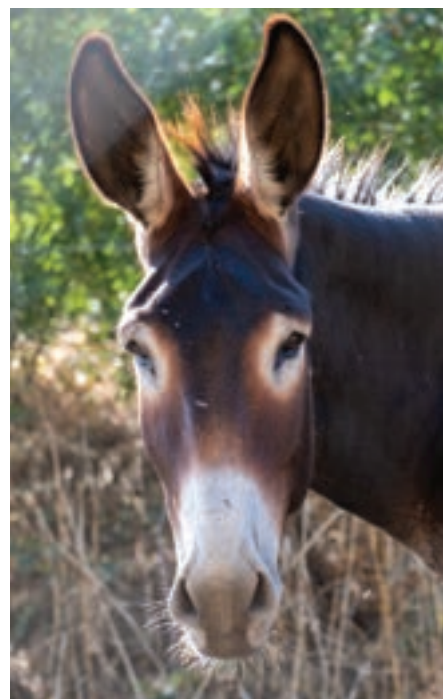
Deworming medications administered based on results of fecal egg counts and fecal egg count reduction

measures are similar to strategies for horses and efforts to mitigate worm resistance. Caution is recommended when deworming with macrolides, especially for donkeys in poor body condition—too great a dose can lead to neurotoxicity. To manage lungworms, moxidectin has greater efficacy than fenbendazole.

Dental care is similarly important as with horses, especially if a bit is being used in the mouth. Miniature donkeys often have genetic abnormalities of their dentition. Donkeys with poor dentition often are also in poor body condition.

Gastric Ulcers

Gastric ulcers, when they occur in donkeys/mules, are identified 95% of the time as non-glandular mucosal lesion—equine squamous gastric disease (ESGD). This is mostly found around the cardia and along the lesser curvature of



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Mules and donkeys tend to be more stoic than horses when in pain.

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Brief Summary: This information is not comprehensive. Before using Gastroguard® (omeprazole) Paste, please consult the product insert for full prescribing information. The product insert may be obtained from your veterinarian or by visiting www.gastroguard.com.

Caution

• Federal (USA) law restricts this drug to use by or on the order of a licensed veterinarian.

How Supplied

• GASTROGARD (omeprazole) Paste for horses contains 37% w/w omeprazole and is available in an adjustable-dose syringe. Each syringe contains 2.28g of omeprazole. Syringes are calibrated according to body weight.

Indications

• For treatment and prevention of recurrence of gastric ulcers in horses and foals 4 weeks of age and older.

Dosage Regimen

• For treatment of gastric ulcers, GASTROGARD should be administered orally once-a-day for 4 weeks at the recommended dosage of 1.8 mg omeprazole/lb body weight (4 mg/kg). For the prevention of recurrence of gastric ulcers, continue treatment for at least an additional 4 weeks by administering GASTROGARD at the recommended daily maintenance dose of 0.9 mg/lb (2 mg/kg).

Directions For Use

• GASTROGARD for horses is recommended for use in horses and foals 4 weeks of age and older. The contents of one syringe will dose a 1250 lb (568 kg) horse at the rate of 1.8 mg omeprazole/lb body weight (4 mg/kg). For treatment of gastric ulcers, each weight marking on the syringe plunger will deliver sufficient omeprazole to treat 250 lb (114 kg) body weight. For prevention of recurrence of gastric ulcers, each weight marking will deliver sufficient omeprazole to dose 500 lb (227 kg) body weight.

• To deliver GASTROGARD at the treatment dose rate of 1.8 mg omeprazole/lb body weight (4 mg/kg), set the syringe plunger to the appropriate weight marking according to the horse's weight in pounds.

• To deliver GASTROGARD at the dose rate of 0.9 mg/lb (2 mg/kg) to prevent recurrence of ulcers, set the syringe plunger to the weight marking corresponding to half of the horse's weight in pounds.

• If, after dosing, the syringe is not completely empty, it may be reused on following days until emptied. Replace the cap after each use.

Warning

• Do not use in horses intended for human consumption. Keep this and all drugs out of the reach of children. In case of ingestion, contact a physician. Physicians may contact a poison control center for advice concerning accidental ingestion.

• The safety of GASTROGARD has not been determined in pregnant or lactating mares.

Adverse Reactions

• In efficacy trials, when the drug was administered at 1.8 mg omeprazole/lb (4 mg/kg) body weight daily for 28 days and 0.9 mg omeprazole/lb (2 mg/kg) body weight daily for 30 additional days, no adverse reactions were observed.

• 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.

Efficacy

• **Dose Confirmation:** GASTROGARD, administered to provide omeprazole at 1.8 mg/lb (4 mg/kg) daily for 28 days, effectively healed or reduced the severity of gastric ulcers in 92% of omeprazole-treated horses. In comparison, 32% of controls exhibited healed or less severe ulcers. Horses enrolled in this study were healthy animals confirmed to have gastric ulcers by gastroscopy. Subsequent daily administration of GASTROGARD to provide omeprazole at 0.9 mg/lb (2 mg/kg) for 30 days prevented recurrence of gastric ulcers in 84% of treated horses, whereas ulcers recurred or became more severe in horses removed from omeprazole treatment.

• **Clinical Field Trials:** GASTROGARD administered at 1.8 mg/lb (4 mg/kg) daily for 28 days healed or reduced the severity of gastric ulcers in 99% of omeprazole-treated horses. In comparison, 32.4% of control horses had healed ulcers or ulcers which were reduced in severity. These trials included horses of various breeds and under different management conditions, and included horses in race or show training, pleasure horses, and foals as young as one month. Horses enrolled in the efficacy trials were healthy animals confirmed to have gastric ulcers by gastroscopy. In these field trials, horses readily accepted GASTROGARD. There were no drug related adverse reactions. In the clinical trials, GASTROGARD was used concomitantly with other therapies, which included: anthelmintics, antibiotics, non-steroidal and steroidal anti-inflammatory agents, diuretics, tranquilizers and vaccines.

Management Considerations:

Safety

• GASTROGARD was well tolerated in the following controlled efficacy and safety studies.

• In field trials involving 139 horses, including foals as young as one month of age, no adverse reactions attributable to omeprazole treatment were noted.

• In a placebo controlled adult horse safety study, horses received 20 mg/kg/day omeprazole (5x the recommended dose) for 90 days. No treatment related adverse effects were observed.

• In a placebo controlled tolerance study, adult horses were treated with GASTROGARD at a dosage of 40 mg/kg/day (10x the recommended dose) for 21 days. No treatment related adverse effects were observed.

• A placebo controlled foal safety study evaluated the safety of omeprazole at doses of 4, 12 or 20 mg/kg (1, 3 or 5x) once daily for 91 days. Foals ranged in age from 66 to 110 days at study initiation. Gamma glutamyltransferase (GGT) levels were significantly elevated in horses treated at exaggerated doses of 20 mg/kg (5x the recommended dose).

Reproductive Safety

• In a male reproductive safety study, 10 stallions received GASTROGARD at 12 mg/kg/day (3x the recommended dose) for 70 days. No treatment related adverse effects on semen quality or breeding behavior were observed. A safety study in breeding mares has not been conducted.

For More Information

• Please call 1-888-637-4251.

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Rev. 07-2020

Reference: Product Insert 147528-002 Revised 05/2019



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Lungworm can be prevalent in donkeys and mules without clinical signs. These asses can serve as an infective reservoir for lungworms.

the stomach. While prevalence might be as high as 50%, donkeys tend not to show clinical signs of gastric ulcer disease.

Respiratory Disease

Respiratory disease identified in a study of 1,444 geriatric donkeys commonly includes pulmonary fibrosis (35%), tracheal collapse (9%) and guttural pouch disease (5%). In addition to potential infection with EHV-1 and EHV-4, donkeys and mules can acquire asinine herpesviruses (AHV-1 through 6), for which there are no vaccines.

Lungworm can be prevalent in donkeys (68%–87%) and mules (29%) without showing clinical signs. Yet they can serve as an infective reservoir. With this in mind, it is best to separate horses in different grazing areas apart from donkeys and mules.

Ocular Disease

Donkeys and mules experience similar problems of the eye as horses, but corneal ulcers, kerato-conjunctivitis, uveitis and eyelid trauma are the most common issues. Recurrent anterior uveitis occurs less prevalently than

seen in horses, but it is still quite prevalent in donkeys. A thorough ocular exam is important.

Due to a larger conjunctival sac and periocular hair, foreign bodies can lodge more easily in donkey and mule eyes than in horse eyes. It is noted that not only is the eyeball more sunken in donkeys and mules than in horses, but the lateral aspect of the frontal bone that forms the upper portion of the orbit extends more laterally. These features make it more challenging to directly examine or ultrasound the eye. It often is necessary to sedate, nerve block and apply local anesthetic to enable opening the eye for examination since their palpebral muscles are so strong.

Cataracts and lens luxation can occur more often than in horses simply due to the long lives of donkeys/mules.

Dermatology Concerns

Horses, donkeys and mules develop Culicoides hypersensitivity, but donkeys and mules have lesions more often on the legs and head rather than the withers, rump and tail as in horses. Also, bilateral alopecia doesn't tend to develop along the trunk midline.

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Gestational length is longer in donkeys than in horses, ranging from 12-13 months.

Mutual grooming is common in donkeys, but owners and practitioners should be aware that this could cause traumatic alopecia, as well as stimulate stereotypic behavior in others in the herd.

Reproductive Differences

A jennet (female donkey, also called a jenny) enters estrus at a young age, 8-12 months. Ovulatory follicles are comparable to horse follicles, i.e., 25-35 mm diameter. Jennets that are protective of their foals might not show estrus while nursing.

Live cover of a jennet needs some precautions to people handling her as she often backs up to the jack, makes jawing motions with her mouth, and kicks him. While this might seemingly indicate that the jenny is not receptive to breeding, some jennies display this behavior even when in estrus.

For some jacks, this is considered courtship in order to get an erection. It can take 10-15 minutes (or longer) for full erection. Some donkey studs are extremely aggressive and might require a breeding muzzle. Handlers need to take caution. A jennet in estrus might be mounted by other jennets.

Because the donkey's or mule's pelvis is tilted down and back more than a horse, reproductive exams, ultrasound and managing dystocia can be somewhat challenging.

Gestational length is longer for donkeys than horses, ranging from 12-13 months.

Behavioral Differences

A well-described Horse Grimace Ethogram has been established to help detect pain in horses. Similarly, a donkey pain ethogram is in development.

One study indicates that a donkey's overall appearance and body stance have the most predictive value for pain. Other signs of discomfort or pain include orbital tightening of the eyes, muzzle and nostril tension, and specific ear movements. Researchers recommend careful observation of a donkey's head and facial expressions and looking at the donkey as a whole for other behavioral signs of pain.

Donkeys are quite stoic in their presentation of pain or discomfort. This can be challenging because a serious problem might go undetected until somewhat well advanced—colic and laminitis, as examples. The hard, narrow

hoof can make it difficult to elicit pain with hoof testers, so it is prudent to pursue diagnostic radiology with any suspicion of laminitis.

Even with severe colic, the only clinical signs a donkey or mule might demonstrate are dullness, isolation, reduced appetite and increased time lying down. Some might stand still, reluctant to move, with heads carried low.

With careful observation, other subtle pain behaviors can be noted—changes in ear position; eye and nostril shape and tension; and head, neck and tail movement. A thorough physical exam might identify more obvious signs of a problem.

The stoicism of donkeys and mules can also make it tricky to assess post-operative pain. One study evaluated pain behavior after castration in 40 donkeys and found that the only specific pain indicator was the lifting of the pelvic limbs. Additionally, some donkeys shook their heads and turned, and moved their ears. The authors concluded that insects confound those as indicators of pain [de Oliveria, M.G.C.; Luna, S.P.L.; Nunes, T.L.; et al. Post-operative pain behavior associated with surgical castration in donkeys. *Equine Veterinary Journal* May 2020; DOI: 10.1111/evj.13306]. The authors further noted that lifting of the hind limbs is also observed in horses after surgical castration and is associated with a high specificity and sensitivity for pain.

Take-Home Message

While it is tempting to extrapolate experience and data from horses and apply that to other equids, research strongly advises against doing so.

More studies are necessary to formulate appropriate clinical signs and treatment modalities for donkeys and mules. For now, these reported differences provide a starting point of consideration for equine practitioners involved in donkey and mule care. **EM**

VETSCAN IMAGYST™ — MIXED PRACTICE, POSITIVE RESULTS

The team leader at Adobe Veterinary Center helps us understand how they have incorporated Vetscan Imagyst into their equine business.

By Kimberly S. Brown

Small animal practices have been using Vetscan Imagyst as a multi-purpose platform longer than equine facilities for fecals, digital cytology image transfer, blood smears and now dermatology. We talked with Dana Reardon, the practice team leader at Adobe Veterinary Center in Tucson, Arizona, about the evolution of Vetscan Imagyst for equine fecal egg counts at their practice. Three of Adobe's veterinarians specialize in the care of dogs and cats and the other four veterinarians specialize in the care of horses, livestock and potbelly pigs.

Reardon said Adobe Veterinary Center was originally just using Vetscan Imagyst for small animal fecals when Zoetis asked the practice to take on a second Vetscan Imagyst for testing equine

fecal egg counts and report their findings. She said her team was excited to have another scanner to use to run equine and small animal fecals in addition to equine digital cytology!

VETSCAN IMAGYST EQUINE FECAL TESTING

"We like to run [fecals] in-house instead of sending them out to the out-sourced lab," Reardon said. However, she added, "Reading a fecal—even a McMaster's fecal—is very time-consuming."

Reardon noted that when using this technology, the images get back into the record. "All we had to do was call the owner with the results," she said.

With Vetscan Imagyst, "You can spin down several [fecals] at a time," said Reardon. "Then you can switch out the slide and do another one. With equine, the differences from small animal are that you need to weigh the fecal sample and spin down is not required."

Reardon said using Vetscan Imagyst does make life simpler for the staff. "Now they can step away for the 10 minutes while the machine is reading it," she said. "They can do something else. They don't have to sit there and stare into a microscope."

This AI-powered technology also helps avoid possible human error from looking at the microscope for hours on end, Reardon noted.

DIGITAL CYTOLOGY USAGE

The benefit of digital cytology and blood smear options from Vetscan Imagyst probably isn't equal among practices, said Reardon. "We are good at reading [cytology] samples," she said. "For a doctor that doesn't have the time or desire to read the slides," the cytology offerings with this specific technology are a benefit with results provided by a board-certified pathologist in less than two hours.

"You can free up doctor and tech time, that's huge!" said Reardon.

KEEPING UP WITH DEMAND

Reardon admitted that having a second set of the technology in the practice means they can do more in-house testing in less time, enabling them to run tests on dogs, cats, horses, or multiple patients simultaneously.

She said Adobe's practice is growing so fast that it is good to have a second Vetscan Imagyst at the practice!

Reardon shared that internet speed is an important factor while using Vetscan Imagyst. Working with their provider allowed them to resolve connection issues so they could get results in a more timely fashion and maintain efficiencies.

*Editor's note: For more information on Vetscan Imagyst for horses visit vetscanimagyst.com/equine and check out this article on EquiManagement.com: *Vetscan Imagyst: Benefits to Veterinarians, Technicians, Horses and Owners*.*



Mixed animal practice veterinarians have used Vetscan Imagyst for small animals, and they now are incorporating it into their equine business.



Learning your leadership style can help you run a better practice.

GETTY IMAGES

Are You a Good Leader?

Leadership is a quality, not a position. Learn more about what makes a good leader in equine practice.

By Amy L. Grice, VMD, MBA

What is leadership? If you are a solo practitioner, the owner of a small practice, or an associate veterinarian, you might be wondering, “What does leadership have to do with me?” It is important to realize that real leadership is a quality, not a position. Leaders are people who know how to achieve goals and inspire people along the way.

What makes a leader? Communication is the real work of leadership. You can reach people through logic, by appealing to their sense of what is rational, or through their emotions. Or, you can make an argument based on their sense of value or ethos. Great leaders spend the majority of their time communicating. They are also able to distill their messages, however complex they might be, into something more accessible for people who don’t share their knowl-

edge or background. Talented leaders understand simplicity; they are articulate and able to convey complicated concepts in just a few phrases. Knowing your audience is also essential for great communication. Leaders must have an appreciation for positioning. They need to understand the people they’re trying to reach and know how to communicate most effectively with them.

Great leaders are also pragmatists who can deal with difficult realities but still



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"The most powerful leadership tool you have is your own personal example."—John Wooden

have the optimism and courage to act. A true test of leadership is the ability to endure setbacks while maintaining the ability to show others the way to go forward. Leaders inspire others. They can quickly appraise situations and the relationships involved. Leaders know when to act quickly and when it is better to involve others in decision-making. They work to their strengths and leverage the strengths of others.

Let's consider the difference between small "I" leadership and big "L" leadership.

Big "L" leadership follows being appointed or recognized as the leader—you are the practice owner, the sports team captain, the mayor of your small community or the deacon in your church. Your leadership follows the authority vested in you by the office or position you hold. The leadership that flows from the power of position (big "L") includes the power to give rewards, the power to punish and the power to control information. Leaders who use coerciveness and the threat of their power to accomplish their objectives are usually seen as autocratic and dominating. They rarely succeed in

exerting any positive influence over their organization or the people they employ. Few people enjoy having power exerted over them and will do whatever they can to undermine those who try to control them through position.

Consequently, big "L" leaders must be sure to develop actual leadership skills, or they will preside over dysfunctional organizations that are struggling due to lack of leadership.

Everyone has a chance to be a small "I" leader. Think about the times when you had no official title and consider the ways in which you led by example; when you helped or taught others; when you spoke up about an issue that you are passionate about; when you assumed responsibility even if you weren't the one "in charge." This is small "I" leadership, and it is extraordinarily important in the world. Small "I" leaders inspire others around them to be their best every day.

Lead Yourself

Leaders cannot inspire others if they cannot lead themselves. Self-leadership includes the following:

- the ability to understand one's own

values, perspectives, strengths, weaknesses, leadership styles and emotions;

- self-awareness;
- self-management (the ability to nurture one's own passion, abilities, emotions and leadership capacity).

To lead others, an individual must have the ability to acknowledge and recognize the passion, gifts, strengths, weaknesses, potential and needs of others. He or she must also have the ability to motivate other people to develop their potential and/or fulfill the organization's objectives.

Every practice has struggles. Good leaders show resilience in the face of discouragement. Whether you are a big "L" or little "I" leader, you can be a beacon of light in times of trouble. Perseverance might be the most important habit of successful leaders. In fact, even if you struggle sometimes with your leadership, with perseverance you will eventually succeed. Because difficulties, obstacles, and stress show up frequently in a busy veterinary practice, this means leaders get lots of opportunities to be resourceful and feed the growth of a culture of optimism and confidence.

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Practitioners who identify with the Supportive/Participative Leadership Style enjoy forming interpersonal relationships with others.

Assessing Your Leadership Style

Author's Note: This test is designed to help determine your personal leadership style. There is no right or wrong answer. Just choose the answer that seems most like what you would naturally do and jot down the question number and your response (i.e., 1-A, 2-B, 3-C).

1. When your practice team is meeting, it is most important to you that:

- A) You stay on schedule and get through the material you planned for the group.
- B) You make sure that each person has a voice in the discussion.
- C) You let the discussion run its natural course and see what happens.

2. If you are leading a discussion and you find one person dominating it, do you:

- A) Invite others to participate in the discussion.

- B) Hope that the person will eventually get the hint and stop talking so much.
- C) Tell the person that you'd like others to have a chance to participate.

3. You arrive late at the start of an important practice event and discover that the two employees in charge have not set the room up properly and are busy in last-minute preparations. Do you:

- A) Figure it's too late to do anything and roll with the punches.
- B) Pull them aside and tell them what has to be done.
- C) Ask them if they can try to improve the setup.

4. Your new technician/assistant has recently consistently forgotten to submit the proper paperwork with your laboratory submissions. Do you:

- A) Find someone else that can do the job.
- B) Ask the technician what's going on

and offer to help.

- C) Ask the technician/assistant to try harder.

5. You've just asked an associate to help create a new protocol for laboratory samples to be handled in your new "in-house" lab. The best way to help them get started in their new role is to:

- A) Make sure all employees working on the project have a chance to get to know one another better before they begin.
- B) Let them have enough 'adjustment' time to get used to having an in-house lab before starting.
- C) Make sure they understand very clearly what is expected of them.

6. The best way to keep the practice up to date on emergency on-call schedule changes is to:

- A) Let everyone learn about the changes organically through daily interaction and let them know if anyone has questions to get in touch with you.
- B) Send out an email explaining the changes.
- C) Put it on the next team meeting agenda.

7. You are one of the partners in your practice. In a doctor's meeting, one of the younger associates questions a decision you have made. Do you:

- A) Explain why you arrived at your decision.
- B) Ask the person to elaborate on why they question your decision.
- C) Ask the person what decision they would have made.

8. You discover that a member of your practice has been openly critical of your leadership. Do you:

- A) Set up a meeting with the person to discuss why they have been critical.
- B) Wait for the other person to bring it up to you directly.



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- C) Immediately find the person and confront them on their attitude.

9. You are the managing partner, and you have some strong thoughts on how to lead the practice. However, your senior partner disagrees. Do you:

- A) Allow a little time to go by and see if the partner changes his mind.
B) Ask the partner to suggest other alternatives that will work.
C) Tell your partner that you appreciate his other ideas, but you have strong reasons for your decision and that you need to be trusted.

10. When solving a problem that affects others, do you:

- A) Present the problem, the solution and each person's part in the implementation.
B) Discuss the problem and try to get everyone to agree on a common solution.
C) Trust that each person will solve their part of the problem that affects them.

11. You are in charge of planning a practice client seminar. Do you:

- A) Plan a meeting to discuss the event with staff and answer questions.
B) Assign tasks so everyone knows what to do at the event.
C) Let people get in touch with you if

they have any questions.

12. When forming a group or asking an individual to plan and implement reorganizing the drugs and supplies in your pharmacy or truck, do you feel it is best to:

- A) Allow them to function at their own pace.
B) Ask them to establish their own timeline after they understand the objectives.
C) Give them clearly defined objectives, a timeline, and operating standards.

13. The best way to handle a difference in opinion between two team members in your practice is to:

- A) State the differences of opinion and present a compromise position that both can accept.
B) Encourage the two to meet and work out their differences.
C) Bring the two people together and help them arrive at a solution.

14. In a group of friends discussing a current event or colleagues discussing a new treatment option, do you:

- A) Try to make sure everyone has been heard.
B) Enjoy listening to the ideas of others.
C) Offer your opinion.

Scoring the Leadership Profile

Circle your answer on the scoring sheet below, and then add the total number circled in each column. The column with the highest number is your natural leadership style.

For those with a predominantly Directive Leadership Style:

- In challenging situations, you feel most comfortable working from clear guidelines.
- In meetings, you take charge early and are anxious to get down to business.
- You find it easy to assign tasks, provide schedules and monitor progress.
- You might tend to become impatient when subordinates want to prolong a discussion. You are more concerned with getting the job done than with meeting interpersonal needs.
- In situations in which you have complete control you relax more, assume an easy-going manner, and become more patient.

Comparison of Leadership Styles

Question	Directive	Supportive Participative	Laissez Faire
1	A	B	C
2	C	A	B
3	B	C	A
4	A	B	C
5	C	A	B
6	B	C	A
7	A	B	C
8	C	A	B
9	C	B	A
10	A	B	C
11	B	A	C
12	C	B	A
13	A	C	B
14	C	A	B

Area of Concern	Directive (Control Oriented)	Supportive/ Participative (Team Approach)	Laissez-Faire (Free Rein)
Who does the planning?	Leader	Leader plus group	Individuals or groups
Who does the Problem Solving?	Leader	Leader plus group	Individuals or groups
Who makes decisions?	Leader	Leader plus group	Individuals or groups
What is the direction of communication?	Down	Down, up and across	Across
Where is the responsibility for achievement felt?	Leader	Leader plus group	Not Felt
Where does the responsibility actually lie?	Leader	Leader	Leader
Leader's confidence level in subordinates	Little to none	High	High
Leader's rapport with subordinates	Low	High	Questionable
Amount of delegation of authority by leader	None	Lots	Lots
Crisis Management	Good	Poor	Chaotic
Change Management	Poor	Good	Ineffective

For those with a predominantly Supportive/Participative Leadership Style:

- The primary goal is to have good interpersonal relations with others—even at the sacrifice of the goal.
- You tend to be very sensitive to the individual members of the group and are especially concerned with their feelings.
- In a meeting you tend to encourage the participation of various members of the group.
- In high-stress situations you find it more difficult to reach the goal.
- You function best in moderate control situations where you can deal with interpersonal relations and deal effectively with difficult subordinates.

For those with a predominantly Laissez Faire Leadership Style:

- In challenging situations, you allow great freedom to subordinates.
- You can become overly tolerant of non-productive team members.
- Your “best” day is one in which you spent most of your time working on projects and tasks that do not require you to interact with your team.
- You schedule meetings but might tend to have a difficult time bringing the discussions to any definitive conclusions or implementation plans.
- You tend to function best with subordinates who enjoy working on their own and need little day-to-day supervision from you.

Take-Home Message

However you scored, it is important to understand your tendencies in leadership. Everyone has different leadership tendencies.

Determine what you want to change, then focus on small steps to achieve those goals. **EM**

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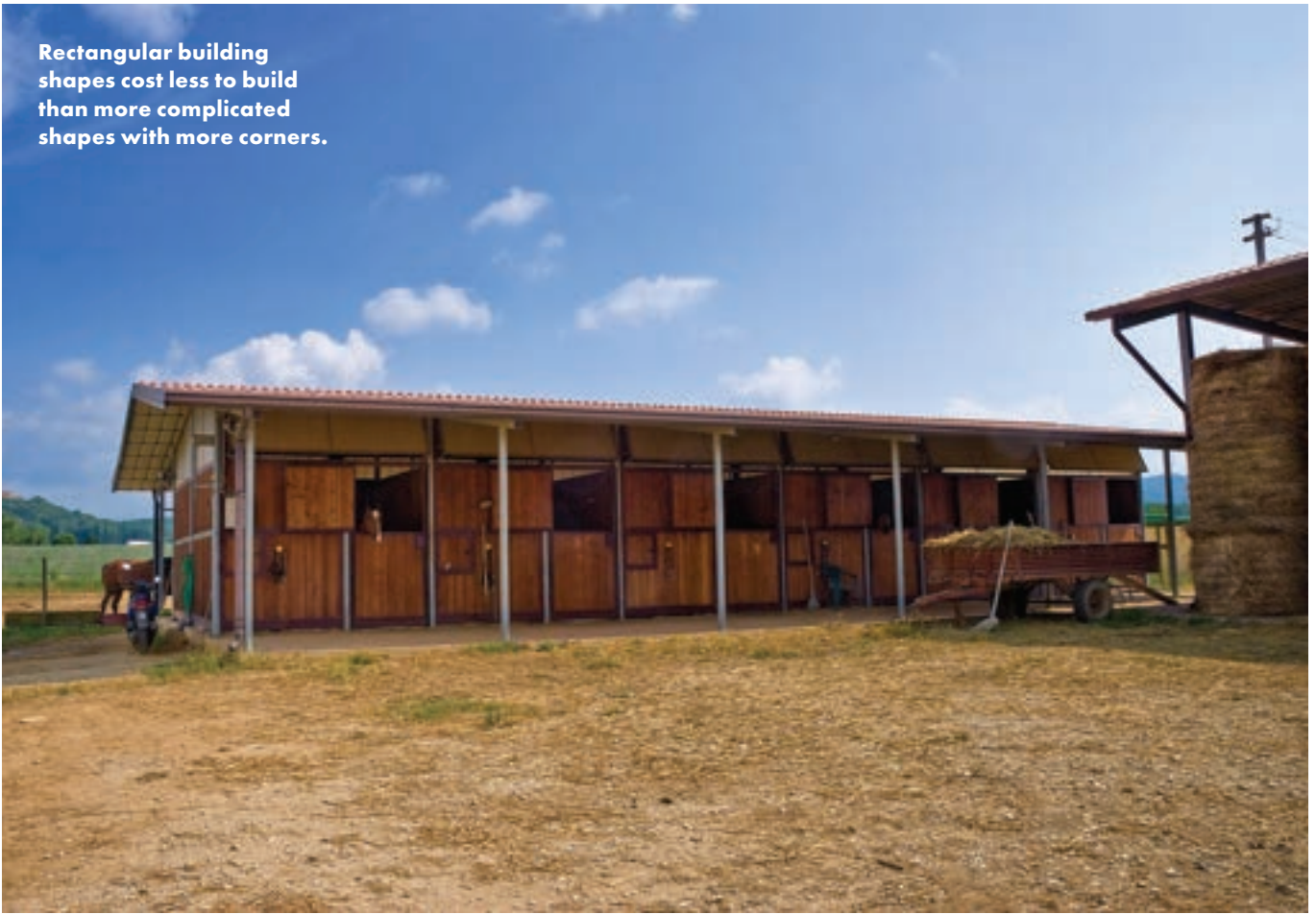


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Reduce Complications with Your Construction Project

Simplicity and planning can result in your veterinary construction project being a delight to you, your staff, your clients and your budget.

By Heather Lewis, AIA, NCARB

Considering labor issues, damaged supply chains, inflation and regulatory challenges, building anything recently has been frustrating and complicated. We have been designing projects for veterinarians for 40 years. We understand that you do not need further complications in your busy lives. So, let's all take a deep

breath and brainstorm the ways you can vastly simplify your construction project, whether you are tackling a small remodeling project or a major new build.

Plan Ahead with Site Work

Your buildings are small compared to the land they sit on. Therefore, your biggest money pit lies outside of the buildings' walls! Inadequate and poor site planning

leads to large construction change orders and many complications with equine veterinary projects. We recommend these minimum tasks to ensure you do not get stuck in the mud:

- Investigate your current utility capacity (power, water, cable, gas, sewer, septic, etc.) and size required upgrades before you begin planning or budgeting a construction project. Your architect,



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| THE ART OF HORSE



Consider drainage around your equine facility. This consideration not only includes natural water features such as a pond or lake, but how water will get around—and not into—your buildings, arenas, driveways and property.

- engineers, and contractor can help you size and plan the necessary service capacity.
- Prioritize utility upgrades over everything else with your project. If you have to upgrade your services, particularly power, it is important to know that electrical equipment has the longest lead times on today's job sites. For example, a transformer might take a year to get, so you cannot wait to size and order utility upgrades.
- Plan drainage across your project site. A civil engineer or experienced contractor will need to help design the grading and drainage improvements on your project site, as part of your project. So many difficulties with equine projects (examples include water getting into buildings, arenas that hold water, muddy roads and pastures, flooding in low areas) have to do with poor grading and drainage. If you're putting a building where water has to flow, consider how water will get around the building, or relocate the

building. Regrading after the fact can be far more expensive than executing grading correctly the first time.

- Plan the traffic flow patterns to separate horses, client traffic, staff traffic, pedestrians and trailers. This can be a low-tech exercise—simply draw out the paths of each type of traffic on your project site plan using different colors and try to eliminate areas where the different colored lines cross. Your clients cannot back trailers reliably, especially when they are under stress, so a circular traffic pattern is usually best for trailers.

Use Simple, Buildable Shapes

We use these methods to design less expensive and less complicated buildings:

- Design a regular building shape. Rectangles or L-shapes cost less to build than complicated shapes because there are fewer corners. Corners add money to projects.
- Make sure you can put a roof on it. When buildings get too wide, you can-

not roof them very well, so maximize the proportions for efficiency. Examples: For prefabricated metal buildings, widths wider than 60-70 feet start to require more structural capacity for the wider span. So, a 100-foot-wide arena will cost much more than a 70-foot-wide arena to build. For reference, 70 feet is approximately 20 meters. For lameness workups, an arena of this width might be sufficient.

- Keep the equine areas with high clearance and the office areas with lower clearance. Equine areas need 12 feet of clear headroom. More space is needed for surgery rooms to accommodate a trolley and hoist. Design the equine areas to be high so you are not squeezing in ducting and lighting while trying to maintain clear headroom for horse safety. On the other hand, the offices can be far lower. You only need nine feet clear for office areas and other human-only areas such as the laboratory.
- For traditional buildings, designing them to be less than 50 feet wide allows for simple roof shapes (such as a gable) and allows roof trusses to be built such that a single shape will fit on a truck for hauling to the job site. Of course, it is not essential to use this rule of thumb, but if simplicity is your goal, it is useful to know.

Work with the Climate

Equine buildings should be oriented to consider the climate, both for your comfort and for simplicity. For example, if you are in a northern latitude and your front door faces north, you will likely need robust gutters, an entry vestibule to keep out the cold air, and snow guards to keep snow from falling on clients. You will also buy more ice melt, and you might even need heated sidewalks. How about planning for that door to be on the south side instead, where you will get plenty of warm, low-angle winter sun for melting?

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Whether you are building or renovating, consider climate, building design, drainage and traffic flow for horses, humans and vehicles in your design.

That is far less complicated!

Consider other aspects of climate, keeping in mind your geographic location. For hot climates, minimize using the west face of the building, where it will be scorching hot in the summer afternoons. For hot climates, open-air barns with fans can be practical (as long as the air moves). For cold climates, enclosed barns with a higher roof to keep in heat can be more comfortable (envision New England shapes versus low, Texas ranch shapes).

Study the historical architecture of your area and think ahead about building orientation and the locations of doors, windows and openings. This will help you use the climate to your advantage for a simple, comfortable building.

Use Local Materials

Speaking of local influence, consider using the materials and building traditions that are most common to your area. If you're in Boise, use wood framing because Idaho has a long tradition of wood construction. If you're in Denver, use

concrete block walls, as Denver has a large number of block manufacturers. If you're in California, masonry materials are going to be harder to use because of seismic considerations. If you're in Central Texas, use limestone block because it is both beautiful and ubiquitous—it is easy to dig out of the soil in this region.

It is best to get advice from your local architects and contractors to discover the materials that will be most readily available, affordable and will help keep your hospital project on track without complications from unavailable materials or the labor to install them.

Use Some Prefabricated Structures

One of the tricks in our bag is to use cheap structures for things that simply do not have to be expensive. A great example is a prefabricated building used for central supply and pharmacy. Why use hospital-level construction when you are simply containing storage? You can use a utility-style, prefabricated structure with a canopy tacked on one

side for truck stocking and a covered connector to the more expensive hospital building.

Another example would be using a tiny house somewhere on-site to house veterinary students instead of upstairs in the hospital. The latter seems to be a great idea until you consider that you have to “fire separate” residential areas from commercial uses and install two sets of stairs, as this is often required for exiting from second floors.

Be smart about what can be done more cost-effectively. Use your architect as a resource to help you save money for expensive spaces such as surgical suites and imaging rooms.

Gather a Trusted Team

The less considered—but very important—aspect of any project is to hire the right building team. You and your staff need to run the hospital, which means you need to trust your design and construction team to get the job done without micromanagement. Check references and interview your building team members thoroughly prior to hiring them. Take them on a test drive by working with them on a small project to



see how that goes before you delegate responsibility for a larger project.

Communicate to your team the need to keep the project simple. You are required to meet building codes, and you should design a healthy building for you, your staff and the horses in your care. However, save your project embellishments for where they matter the most.

For example, wouldn't it be lovely to look out the window from your office? Wouldn't it be nice to have great footing in your lameness work-up area? Many things that aren't strictly necessary matter a lot to your everyday enjoyment of your facilities. These things are worth the investment. If you keep the design simple overall, you will be more able to afford them.

Take-Home Message

In today's age of "everything takes twice the time, costs twice the money, and causes twice the headaches," simplicity, simplicity, simplicity is a mantra that is serving equine veterinary practices well as they consider any construction project. **EM**



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There are nutritional, social and health reasons for selecting hay to feed horses and how owners should feed it.



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What Clients Want to Know About Hay

Nutritionists offer four common questions horse owners ask and provide research you can use to back your responses.

By Katie Navarra

Hay is a staple in the horse's diet. Extensive research has shown the benefits of consuming stemmy forage. Those benefits range from aiding in normal tooth wear to buffering stomach acid to keeping horses content through nibbling.

Experts recommend that forage comprise at least 50% of a horse's daily ration. Depending on the client's management style, that could be a mix of grazing and hay. Most horse owners heavily rely on hay to meet their horses' daily energy requirements.

"Hay in the program can help with

digestive health as chewing of long-stem hay results in more saliva production and greater buffering capacity in the stomach," said Bob Coleman, PhD, PAS, a University of Kentucky associate professor and equine extension specialist.

Many horses, especially easy keepers, can fulfill most nutritional requirements



Four Common Hay Questions

Horse owners often look to their veterinarians for advice on what type(s) and how to feed hay to their horses. Crandell and Coleman shared four common questions you might hear from clients and offered their advice for responding to the inquiries.

1) How much hay should I be feeding?

It depends. The horse's age, breed, medical status and performance level all factor into how much hay a horse needs, explained Coleman. As a general rule, Crandell said horses need at least 1.5% of their body weight in hay daily. Performance horses, hard keepers, growing horses and lactating mares could consume as much as 3% to 5% of their body weight.

Coleman cautioned about feeding strictly by a percentage of body weight without knowing the digestible energy (DE). DE is similar to a calorie count. On average, most hays range between 0.75-1.0 Mcal per pound.

Therefore, if a 1,100-pound horse requires 16.7 Mcals to maintain his weight and the hay DE is 0.87 Mcals/pound, the horse needs 19 pounds of hay daily.

"That is about 1.73% of the horse's body weight," Coleman said. "If we were to use 2.5% of the horse's weight, that would be 27.5 pounds of hay, giving 24 Mcals of DE. That equals 143% of the horse's requirements. So, the horse would be gaining weight."

Crandell said that if a horse has higher nutritional needs than what the hay provides, concentrated feeds or grains can top off the calories.

2) What is the best way to feed my horse his hay?

Feeding hay on the ground, from a rack or net, in a feeder, or under a hut are all common methods, and there is some debate about which method is "best." Each has its pros and cons, its fans and detractors. However, several recent research studies share new insights into

commonly used approaches to feeding hay.

The January 2023 *Frontiers in Veterinary Science* published the article "Which animal-to-feeding-place ratio at time-controlled hay racks is animal appropriate? Preliminary analysis of stress responses of horses."¹

The researchers examined the dynamics of group feeding horses hay, Crandell explained. The study used something similar to a hay hut, popular for reducing waste, to explore the impact of forcing horses to eat side-by-side versus being spread out. While the horses were eating, the team measured the horse's hormone levels.

"What they found was interesting. Horses eat more when spaced out rather than being forced to eat next to each other," Crandell said. "And their stress level was almost zero when they had at least twice as much room between their feeding stations than if they were side-by-side. So, when we force horses to eat close to each other, we're stressing them out and don't even realize it."

Two studies looked at hay nets and a correlation between neck strain. A preliminary study on the effects of head and neck position during feeding on the alignment of the cervical vertebrae in horses focused on hay feeding position and the horse's posture and neck strain.² Horses were fed at three different heights—on the ground, from a low-hanging net so the bottom of the net was at knee height, and with the bottom of the net at elbow height.

"When the hay was on the ground or at a medium height, it didn't significantly change the horse's posture. But when the bottom of the net was elbow height, it affected their neck and back posture, causing undue strain," Crandell said.

The other study, "Posture and Pull Pressure by Horses When Eating Hay or Haylage from a Hay Net Hung at Various Positions,"³ looked at hay net hole size. Again, the results revealed that smaller holes caused greater strain on

from grazing and hay. So, when clients feed good-quality hay, they can potentially reduce their overall feed costs.

However, performance horses, lactating mares, and hard keepers might require additional calories from a formulated feed to maintain a healthy weight.

"Our modern hay is almost the perfect food, but it's not 100% nutritionally balanced," said Kathleen Crandell, PhD, an equine nutritionist at Kentucky Equine Research.

She said if owners are soaking hay to reduce sugars, that process also "takes more nutrients out of it, so a vitamin and mineral supplement is needed to make up for those lacking in the hay. And if the hay doesn't have enough energy to support the horse's weight, then a feed may be necessary."

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Indications: EQUIOXX Tablets are administered once daily for up to 14 days for the control of pain and inflammation associated with osteoarthritis in horses.

Dosage and Administration: Always provide the Client Information Sheet with the prescription. The recommended dosage of EQUIOXX Tablets is one 57 mg tablet administered orally to horses weighing 800–1200 lbs, once daily for up to 14 days. For ease of administration, EQUIOXX Tablets may be given with food.

The overall duration of treatment with any firocoxib formulation in horses, including EQUIOXX Tablets, Injection or Oral Paste, should not exceed 14 days. Please see the package insert for EQUIOXX Injection or Oral Paste for appropriate prescribing information for those formulations.

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Warnings: For use in horses only. Do not use in horses intended for human consumption. Store EQUIOXX Tablets out of the reach of dogs and other pets in a secured location in order to prevent accidental ingestion or overdose.

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Precautions: Horses should undergo a thorough history and physical examination before initiation of NSAID therapy. Appropriate laboratory tests should be conducted to establish hematological and serum biochemical baseline data before and periodically during administration of any NSAID. Clients should be advised to observe for signs of potential drug toxicity and be given a Client Information Sheet with each prescription. See Information for Owner or Person Treating Horse section of this package insert.

Treatment with EQUIOXX Tablets should be terminated if signs such as inappetence, colic, abnormal feces, or lethargy are observed.

As a class, cyclooxygenase inhibitory NSAIDs may be associated with gastrointestinal, renal, and hepatic toxicity. Sensitivity to drug-associated adverse events varies with the individual patient. Horses that have experienced adverse reactions from one NSAID may experience adverse reactions from another NSAID. Patients at greatest risk for adverse events are those that are dehydrated, on diuretic therapy, or those with existing renal, cardiovascular, and/or hepatic dysfunction. Concurrent administration of potentially nephrotoxic drugs should be carefully approached or avoided. NSAIDs may inhibit the prostaglandins that maintain normal homeostatic function. Such anti-prostaglandin effects may result in clinically significant disease in patients with underlying or pre-existing disease that has not been previously diagnosed. Since many NSAIDs possess the potential to produce gastrointestinal ulcerations and/or gastrointestinal perforation, concomitant use of EQUIOXX Tablets with other anti-inflammatory drugs, such as NSAIDs or corticosteroids, should be avoided.

The concomitant use of protein bound drugs with EQUIOXX Tablets has not been studied in horses. The influence of concomitant drugs that may inhibit the metabolism of EQUIOXX Tablets has not been evaluated. Drug compatibility should be monitored in patients requiring adjunctive therapy. The safe use of EQUIOXX Tablets in pregnant or lactating mares has not been evaluated. Consider appropriate washout times when switching from one NSAID to another NSAID or corticosteroid.

Adverse Reactions: The safety and effectiveness of EQUIOXX Tablets was established in a relative bioavailability study, comparing EQUIOXX Tablets and EQUIOXX (firocoxib) Oral Paste. Therefore, additional field studies were not performed to support the effectiveness of EQUIOXX Tablets.

In controlled field studies, 127 horses (ages 3 to 37 years) were evaluated for safety when given EQUIOXX Oral Paste at a dose of 0.045 mg/lb (0.1 mg/kg) orally once daily for up to 14 days. The following adverse reactions were observed. Horses may have experienced more than one of the observed adverse reactions during the study.

Table 1: Adverse Reactions Seen in U.S. Field Studies with EQUIOXX Oral Paste:		
Adverse Reactions	EQUIOXX n=127	Active Control n=125
Abdominal Pain	0	1
Diarrhea	2	0
Excitation	1	0
Lethargy	0	1
Loose Stool	1	0
Polydipsia	0	1
Urticaria	0	1

In these field trials, EQUIOXX Oral Paste was safely used concomitantly with other therapies, including vaccines, anthelmintics, and antibiotics. The safety data sheet (SDS) contains more detailed occupational safety information. To report suspected adverse events, for technical assistance, or to obtain a copy of the SDS, contact: Boehringer Ingelheim Animal Health USA Inc., at 1-888-637-4261. For additional information about adverse drug experience reporting for animal drugs, contact FDA at 1-888-FDA-VETS or online at www.fda.gov/reportanimal.

Animal Safety: The safety of EQUIOXX Tablets was supported by a relative bioavailability study comparing EQUIOXX Tablets and EQUIOXX Oral Paste (see CLINICAL PHARMACOLOGY: Relative Bioavailability Study). Pharmacovigilance information, and target animal safety data for existing firocoxib containing products in horses. No additional target animal safety studies were conducted with EQUIOXX Tablets.

In a target animal safety study conducted to support the approval of EQUIOXX Oral Paste, firocoxib was administered orally to healthy adult horses (two male castrates and four females per group) at 0, 0.1, 0.3 and 0.5 mg firocoxib/kg body weight (0.1, 0.3 and 0.5X the recommended dose) for 30 days. Administration of firocoxib at 0.1 and 0.5 mg/kg body weight was associated with an increased incidence of oral ulcers as compared to the control group but, no oral ulcers were noted with 0.1 mg/kg. There were no other drug-related adverse findings in this study.

In another target animal safety study, firocoxib was administered orally to healthy adult horses (four males or male castrates and four females per group) at 0, 0.1, 0.3 and 0.5 mg firocoxib/kg body weight (0.1, 0.3 and 0.5X the recommended dose) for 42 days. Administration of firocoxib at 0.1, 0.3 and 0.5 mg/kg body weight was associated with delayed healing of pre-existing oral lip, tongue, gingival ulcers. In addition, the incidence of oral ulcers was higher in all treated groups as compared to the control group.

Clinical chemistry and coagulation abnormalities were seen in several horses in the 0.5 mg/kg (5X) group. One 5X male horse developed a mildly elevated BUN and creatinine over the course of the study, prolonged buccal mucosal bleeding time (BMBT), and a dilated sylvia of the right kidney. Another 5X male had a similar mild increase in creatinine during the study but did not have any gross abnormal findings. One female in the 5X group had a prolonged BMBT, bilateral tubulointerstitial nephropathy and bilateral papillary necrosis.

Tubulointerstitial nephropathy occurred in one 3X female, two 3X male horses, and the 5X female horse. Papillary necrosis was observed in one 3X male horse and the 5X female horse discussed above. Despite the gross and microscopic renal lesions, all of the horses were clinically healthy and had normal hematology, clinical chemistry and urinalysis values.

In another target animal safety study, firocoxib was administered orally to healthy adult horses (three females, two male castrates and one male per group) at 0, 0.25 mg/kg, 0.75 mg/kg and 1.25 mg/kg (2.5, 7.5 and 12.5X the recommended dose of 0.1 mg/kg) for 30 days. An additional group of three females, two male castrates and one male per group, was dosed at 1.25 mg/kg for 92 days but was monitored until Days 147-149. There were treatment-related adverse events in all treated groups. These consisted of ulcers of the lips, gingiva and tongue and erosions of the skin of the mandible and head. Gross and microscopic lesions of the kidneys consistent with tubulointerstitial nephropathy were seen in all treated groups. Papillary necrosis was seen in the 2.5X and 12.5X groups. In addition, several 12.5X horses had elevated liver enzymes (GGT, SDH, AST and ALT). In the 2.5X and 12.5X groups, increased urine GGT and urine protein levels which were due to renal hemorrhage and nephropathy. Gastric ulcers of the margo plicatus and glandular area were more prevalent in the 2.5X and 12.5X groups but not seen in the 12.5X group. The group of horses that were monitored until Days 147-149 showed partial to full recovery from oral and skin ulcers, but no recovery from tubulointerstitial nephropathy.

Storage Information: Store at room temperature, between 59°–86° F (15°–30° C). Brief periods up to 104° F (40° C) are permitted.

How Supplied: EQUIOXX is available as round, beige to tan, half-scored tablets, containing 57 mg firocoxib. EQUIOXX Tablets are supplied in 60 and 180 count bottles.

¹McGinn ME, Riekes EL, Hara DF, Cunningham PK et al. In vitro effects and in vivo efficacy of a novel cyclooxygenase-2 inhibitor in cats with lipopolysaccharide-induced pyrexia. Am J Vet Res. 2005 Jul;66(7):1278-94.
²McGinn ME, Anderson DR, Riekes EL, Hara DF, Cunningham PK et al. In vitro activity and in vivo efficacy of a novel COX-2 inhibitor in the horse. Proceedings of the Academy of Veterinary Internal Medicine. 2002; Abstract 114, p.789.

³Data on file. Made in France.
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Researchers have found that feeding horses close together causes stress, but feeding them separate will encourage them to eat more.

the horse's neck while pulling hay out of the smaller opening.

“We’re all really eager to go to small hole hay nets because it slows horses down,” Crandell said. “But we might be affecting how they are chewing and straining their neck and back posture. I think we still have a lot to learn about hay nets.”

3. Can I feed my horse straw?

Chances are it's unlikely a client will ask, “Can I feed straw to my horse,” but yes, it is possible, according to Crandell. The practice is more common in Europe as Warmbloods are known for being easy keepers.

“They feed straw because they want to keep something to chew in front of them,” said Crandell. “But if they give a lot of hay, the horse gets too fat. So, they add straw on top of whatever else they’re feeding. You would never want to feed more than 25% of the horse’s diet in straw unless it’s a donkey.

“A donkey can basically live off of straw,” she added.

Straw is high in lignin and indigestible fiber. Given in too great a quantity, it can increase the risk of impaction colic.

4. Should the hay be wet or dry?

The issue here is mold growth and combustion. However, feeding hay that is soaked, steamed or cut as haylage can have benefits.

Feeding haylage in European countries is a popular option because making good-quality dried hay is more difficult. Haylage is a forage that is cut at a younger plant maturity stage and preserved using fermentation while stored in a plastic bag or bunk. Haylage usually is softer and less dusty than hay.

The 2021 study “Dust exposure and pulmonary inflammation in Standard-bred racehorses fed dry hay or haylage: A pilot study”⁴ showed that haylage also has health benefits due to its higher moisture level and fermentation.

“This study looked at haylage versus dry hay and found that horses had a lot lower lung irritation when fed the haylage,” Crandell said. “They did a bronchial lavage and found that horses eating haylage had lower neutrophils in their lungs than horses eating dry hay.”

Steamed hay has similar benefits, Crandell said. Steaming is effective at reducing mold spores and bacteria.⁵ It also cuts down on dust particles that

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IMPORTANT SAFETY INFORMATION: As with any prescription medication, prior to use, a veterinarian should perform a physical examination and review the horse's medical history. A veterinarian should advise horse owners to observe for signs of potential drug toxicity. As a class, nonsteroidal anti-inflammatory drugs may be associated with gastrointestinal, hepatic and renal toxicity. Use with other NSAIDs, corticosteroids or nephrotoxic medication should be avoided. EQUIOXX has not been tested in horses less than 1 year of age or in breeding horses, or pregnant or lactating mares.

¹ EQUIOXX product labels and FOI summaries and supplements

² Kvaternik V, Pollmeier M, et al, Pharmacokinetics and metabolism of orally administered firocoxib, a novel second generation coxib in horses. J Vet Pharmacol Ther. 2007;30(3):208-217.

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Dr. Bob Coleman of the University of Kentucky suggested that veterinarians recommend a nutrient analysis of any hay owners want to feed.

can irritate horses' airways. Soaking hay is also commonly used to minimize dust. Soaking is a better choice for horses that are sensitive to sugar.

"Hay has a small amount of sugar that can range from 2%–25%," Crandell said. "Soaking hay is more effective than steaming to pull out excess sugar. It needs to soak for 30 minutes in hot water or one hour in cold water and drained."

Take-Home Message

In addition to what has been discussed thus far, Coleman and Crandell offered two parting thoughts to keep in mind when discussing hay with clients.

Crandell: "One of the measures we use when looking at hay quality is neutral detergent fiber (NDF). NDF is used as a measure of voluntary intake. The lower the NDF, the more likely a horse wants to eat it. The higher the number, the less likely. Higher NDF hay poses a

higher risk of impaction colic because of the stemminess and stiffness of the hay, so caution should be taken if feeding a hay with NDF higher than 65%."

Coleman: "The maturity when the hay is cut is more important than which cutting the hay comes from. In general, as the plant matures, the nutrient levels decrease and the fibrous components increase. In some cases, there might be a few more weeds in the first cutting, but that will depend on the stand quality.

"A nutrient analysis is best management practice regardless of which cutting a horse owner is going to buy and feed," Coleman continued.

"I would also feed hay first and let the horse start chewing to take a bit of the edge off his hunger," Coleman advised. "That way when the grain comes, the horse may eat at a slower rate which is particularly important if the horse has been outside with minimal feed or forage available." **EM**

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Sub-optimal environments can cause horses to develop stereotypies such as cribbing.



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Equine Stereotypies

Learn more about dealing with patients that have stereotypic behaviors and how to help them.

By Katie Navarra

Katherine A. Houpt, VMD, PhD, DACVB, is an emeritus professor of behavioral science. When she began her career at Cornell University College of Veterinary Medicine, she didn't believe cribbing caused colic. That was until she discovered her clinic lost one-third of crib-biting horses to surgical colic.

"These horses suffer terribly," she said. "One horse thrashed and rolled overnight, and it is really heartbreaking."

It's challenging to identify the exact percentage of horses with stereotypies—repetitive, purposeless behaviors—because the metrics people use to measure these are all different, explained Matthew Parker, BSc, MSc, PhD, FHEA,

a senior lecturer in neuroscience and sleep science at the University of Surrey, England.

The 2021 paper, "Factors Associated With the Development and Prevalence of Abnormal Behaviors in Horses: Systematic Review With Meta-Analysis," reviewed the data from many studies and found somewhere between 2.5% and 94% of horses have a stereotypy. But Parker believes the most sensible estimate is between 2% and 10%. Crib-biting horses garner the most attention, but stereotypies can also include stall walking and weaving.

Houpt had a client whose horse stall walked—but only the night before a fox hunt. The client braided and blanketed in preparation for the hunt, only to find

the gelding drenched in sweat the next morning. The ritual stressed the horse. As soon as he was let out of the stall, he picked a comfortable spot in the paddock and relaxed there.

"Stall walking and weaving can typically be eliminated with turnout or a buddy, whereas once a horse begins cribbing, it's nearly impossible to stop," Houpt said.

Stereotypic behavior is likely caused by a combination of genetic and environmental factors, according to Parker.

"Animals that are predisposed to develop habitual behaviors may be more likely to develop stereotypies when challenged with a sub-optimal environment," Parker said. "The contribution of each in terms of relative risk of heredity is hard to estimate."

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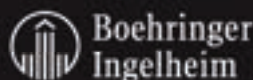
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Research on stereotypic behaviors showed that ungulates—including horses—can develop these behaviors when foraging is restricted for long periods.

Research focused on equine stereotypes is challenging because there is a lack of funding. Recruiting large enough sample sizes of horses that show stereotypes is difficult, according to Parker. Recent studies have advanced what is known about stereotypic behaviors and management practices that could help reduce them. However, still much remains to be discovered.

Dietary Link to Cribbing

A genetic link likely plays a role in the development of stereotypic behaviors. However, the horse's environment and management practices—such as limited access to forage and restricted turnout—appear to be more significant triggers.

In 2017, a study led by Arash Omid in Shirz University in Iran and Parker found that selenium deficiency might contribute to crib-biting in horses.¹

“Cribbers had significantly lower levels of selenium in the blood than non-cribbing horses,” explained Parker. “Selenium is needed for the production of an enzyme called glutathione peroxidase, which helps protect cells from damage caused by free radicals. Free radicals can accumulate in the brain (and elsewhere) and cause oxidative stress, which may lead to neural dysfunction.”

It remains unknown if adding selenium to the diet cures cribbing. Keep in mind that selenium poses toxicity risks if too much is given.

Parker's latest paper, “Risk factors for stereotypic behaviour in captive ungulates,”² confirmed prior research that ungulates—hooved mammals that are browsers and grazers—can develop stereotypic behaviors when foraging is restricted for long periods of time.

“Concentrate-only diets and lack of ad libitum feed substrates are associated with high stereotypic behavior prevalence. This applies to horses, of course,” Parker said.

Providing free-choice hay to stalled horses can help reduce the chances a horse develops a stereotypic behavior, although it likely has little effect on horses that already crib.³

Social Factors Associated with Stereotypic Behaviors

There is an established link between stress—such as weaning, confinement, travel and high-intensity training—and the development of stereotypic behaviors in horses.

Houpt pointed to a longitudinal study that followed horses from birth to identify when they started cribbing. In that study, the stress of weaning and the transition from milk to grass triggered the stereotypy.

“Interval weaning—where you leave

the foal on pasture and remove one mare at a time in the order of age of the foal—seems to help,” she said. “This seems to be the least stressful when the foal can be in that same social environment and on grass instead of grain.”

Parker’s 2022 study revealed a surprising new social factor associated with these behaviors in ungulates—restricted behavioral needs associated with mating.

“In the wild, an important social factor in ungulates was mating strategy,” he said. “The proportion of castrated animals and the proportion of females in a group also predicted stereotypic behaviors in models without the presence of intensively reared livestock.”

Social factors can often include imitation of others in the group. For example, a young foal learns to graze and eat hay by watching its mother. Fortunately, at least for equine stereotypes, it does not appear that horses learn these behaviors by watching others, Houpt said.

“There is very little evidence horses learn anything through observation,” she added. “When I give presentations, I ask the audience how many cribbers they have in their barn. Then I ask if another horse picks up the behavior when a cribber comes into the barn. It’s unusual to have any ‘yes’ responses.”

Cribbers Are Not Cognitively Impaired

A prevalent theory suggests that stereotypic behaviors indicate a horse is less likely to perform a reversal learning task as quickly as those that do not crib, stall walk or weave. (The National Institutes of Health defines this as, “During a reversal learning task, the animal first has to learn to discriminate between two stimuli to a predefined criterion during the acquisition phase. After passing the criterion, the signs of the stimuli are reversed, and the previously

positive stimulus is now changed into the negative stimulus and vice versa.”)

In the published study “Stereotypic horses (*Equus caballus*) are not cognitively impaired,”⁴ a team of researchers in Switzerland wrote, “Our results thus challenge the widely held belief that crib-biting horses, and stereotypic animals more generally, are cognitively impaired.”

Sabrina Briefer Freymond, MS, PhD, the lead researcher associated with Agroscope, Swiss National Stud Farm, said, “We were surprised that there was no difference in learning capacity between crib-biters and control horses in such reversal learning task. It was interesting to see how quickly all the crib-biters and control horses learned the second reversal learning task. They learned to learn or improve their performance from one reversal to the next.”

Briefer Freymond said the take-home message of this study was that crib-biter horses needed more sessions than controls to attain the learning criteria of the acclimation/pre-learning phase, probably due to a greater sensitivity to stress. Then they were able to perform the reversal learning task the same as the control horses. This high-stress sensitivity should be taken into account in daily work.

Helping Horse Owners Cope with Horses with Stereotypies

Stall walking and weaving are relatively easy stereotypic behaviors to reduce with increased forage, turnout and access to other horses. But even horses with extensive turnout can develop stereotypic behaviors.

For example, in a survey of 497 horse owners and 3,082 horses, almost half (45%) of horses displayed unusual behaviors such as licking or eating dirt, pawing, pacing, cribbing or bark-chewing.⁴



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The advertisement for Shank's Veterinary Equipment features a blue background. At the top is the company logo, which includes a white horse head silhouette and the text "SHANK'S VETERINARY EQUIPMENT". Below the logo are several images: a horse's head in profile, a large hydraulic table, a smaller table, a person working with a horse, and a blue hydraulic table. At the bottom, the text "Lifting Large Animals Since 1957" and the website "www.shanksvet.com" are displayed.



Turnout with other horses can provide stress relief through companionship and the ability to graze more consistently without competition for forage.

Researchers link this to the fact that even on pasture, horses' schedules and food selection are determined by humans.⁴ Around-the-clock turnout can be on dirt lots or in paddocks with sparse grass so their diet becomes similar to stalled horses.

Similar to stalled horses, pasture horses can benefit from having access to more free-choice hay, frequent high-fiber meals, and the ability to make eye contact with other horses if turned out alone.

However, free-choice forage and turnout is still not enough to reverse cribbing behaviors. When it comes to crib-biting, surgery might be an option, but it is not one Houpt recommended. The laser surgical procedure cuts the strap muscles in the lower part of the horse's neck—the group of muscles a horse flexes when he grabs onto a surface and sucks air.

"It's pretty invasive, and the horse can't flex those neck muscles after surgery," Houpt said. "And they've said it's only 100% effective on horses that have not been cribbing for some time. So, the longer the horse has been cribbing, the harder it is to change the animal's behavior."

Cribbing collars are frequently used to inhibit cribbing behaviors. However, agreement on their use is not universal. Houpt's research found no indication of elevated stress hormones when a horse's cribbing was interrupted with a collar.

"Given how terribly the horses suffered from cribbing-related colic and that the horses we tested did not show increased stress hormones while wearing the collars, they are useful even though they don't stop the behavior," she said.

Conversely, Briefer Freymond and Parker discourage the use of cribbing collars.

"Animals develop stereotypies in captivity related to repeated stress and frustration," Briefer said. "They are motivated to do behaviors such as eating or moving that they cannot do. The origin of stereotypies starts with the performance of redirected behaviors such as licking in the void and biting the stable wall, then develops into stereotypies. Studies have shown that crib-biting reduces stress, so it is counterproductive to prevent them from crib-biting and much more productive to improve the housing conditions to reduce the causes of stress."

Parker encourages education campaigns to reduce the negative connotation of stereotypy and increase understanding about how stereotypic behaviors function as stress-coping mechanisms rather than using mechanical devices.

"By raising awareness and promoting positive attitudes toward—and understanding (of owners) of—stereotypy, veterinarians could help reduce the stigma associated with these behaviors and encourage more humane management practices," he said. **EM**

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Compassion fatigue is not simply exhaustion due to providing compassionate care.

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A Deeper Understanding of Compassion Fatigue

Appreciating the connection between managing our stress and decreasing the impact of the trauma we encounter as veterinarians can help reduce our risk of compassion fatigue.

By Colleen Best, DVM, PhD, CCFP

Despite compassion fatigue having a name composed of words we understand, its definition is not as obvious as they would suggest—it is not simply exhaustion due to providing compassionate care. Compassion fatigue is comprised of two components: burnout and secondary

traumatic stress. In general, burnout is a state that is reached where one's capacity to function is diminished or lost as a result of depleted physical and mental resources.¹ When there are more demands than there are resources to meet them, burnout can result. The pathogenesis of burnout is most often related to the work environment, workplace culture

or amount of work itself.² We can also experience burnout in non-work environments, such as caretaking at home, volunteer work and so on. The visual that the term burnout evokes—that of a fire or match that has burned out—is an accurate way to envision burnout. There simply isn't enough "fuel" for the fire to continue.

Author's note: The increased attention surrounding veterinary mental health and well-being in the past few years has spurred critically important conversations in our profession. Many have thoughts and ideas about how and why so many in the profession are struggling. As a profession, we continue to gain knowledge from research studies, as well as each of us continuing to explore what is true for ourselves. What is clear is that there are profession-wide factors that influence our mental health, as well as individual-level factors. This article will focus largely on individual-level factors and strategies because that is what each of us has the most control over, and that focus is best suited to this type of piece. However, it's important to appreciate doing so is an oversimplification, and that we recognize that systemic level changes are necessary to create a thriving profession. Finally, experiences of compassion fatigue and trauma are particularly complex. We encourage readers to seek support if they are concerned about their well-being or mental health through public or private caregivers and by reading www.aaep.org/wellness/emotional-social-wellness.

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We can strive to fine-tune the care we provide to ourselves to reduce our stress on a daily basis.

Secondary traumatic stress is different; its origins lie in the nature of the work. Veterinary medicine—and any caring profession—involves outlay of emotion and exposure to the traumatic experiences of others (both clients and patients). It is this exposure that places us at risk because when we are exposed to the trauma of others, it can impact us the same way it would if we were directly experiencing the trauma.

It is critical to appreciate that trauma impacts each of us differently, which means that compassion fatigue can present with a wide variety of clinical signs and symptoms. Individuals tend to respond to the types of frequent and/or continuous stressors that lead to compassion fatigue in one of two ways: one can conserve energy or remain overcharged.³ These can be seen in a variety of scenarios, including physical, spiritual, behavioral, emotional and cognitive.⁴

If you are wondering whether you are experiencing compassion fatigue, there is a self-test accessible from

proqol.org/ProQol_Test.html.

When burnout and secondary traumatic stress occur together, compassion fatigue can result. It can be defined as “the final result of a progressive and cumulative process that is caused by prolonged, continuous and intense contact with patients [and clients], the use of self, and exposure to stress.”⁵

It’s important to appreciate that compassion fatigue can occur due to acute or chronic experiences. That means it can be due to one very difficult experience, or it can build up over time. While the definition is important to know, it doesn’t necessarily provide us with the information we need to understand how our daily experiences might lead to compassion fatigue. To start, we need to explore how our bodies respond to stress and trauma and how that impacts us in the short and long term.

Trauma and Stress: Occupational Hazards

First, let’s take a moment to better un-

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A critical consideration with trauma and compassion fatigue is the total amount of stress we are under and the length of time we've been stressed.

Understand the term trauma as it is used in this context. Trauma is often a word we reserve for serious or grave events or experiences, for instance a catastrophic car accident or a life-threatening diagnosis. However, our nervous system isn't as discerning. Everyday events can be traumatic, threatening and/or stressful. This means that our body's stress response is activated and we experience feelings of fear, helplessness, worry or anxiety. This is important to appreciate because of the consequences of an activated sympathetic nervous system. It changes how our body codes stress and our ability to access tools for coping with the stressor (i.e., trauma or threat).

Trauma is an unavoidable occupational hazard. This is a difficult truth, and often we seek to fight against it because these hazards are unpleasant and dealing with them is difficult. However, this

denial requires a lot of energy and is often unsuccessful.

Instead, we can choose small things to reduce the harm caused by these experiences, and we must in order to be able to withstand storms and stress that will inevitably happen.

Ultimately, this is the essence of resilience and self-care—lowering the effect of occupational hazards on your body. Just as you wouldn't take radiographs without a lead gown or do certain procedures without a twitch and sedation, you shouldn't take on veterinary practice without taking protective measures. These fall into the category of self-care.

The Relationship Between Stress, Trauma and Compassion Fatigue

We exist in a world of stress and stressors. We experience differing amounts

of stress on a daily basis. However, the ways in which we respond to any given experience or stressor—whether physically, emotionally or cognitively—varies in relation to a number of different factors.

A critical consideration in the context of trauma and compassion fatigue is the total amount of stress we are under and the length of time we've been experiencing it. These two things markedly influence the downstream effects of our experiences.

When we are stressed, our sympathetic nervous system is activated. This response prepares us to manage a physically threatening situation. Sympathetic nervous system activation results in increased heart rate, respiratory rate and muscle tension, as well as decreasing our executive function and other complex brain operations.

When the stimulus or stimuli for stress persists over time, our sympathetic nervous system can become dominant

(vs. the usual state of parasympathetic nervous system dominance). In that case, our brain becomes more vulnerable to traumatic situations that we encounter. This occurs because in states of stress, we process and encode experiences differently. This can lead to an increased risk of developing secondary traumatic stress in response to an individual experience or chronically over time.

You might be wondering what sort of “stress” counts. That is different for everyone.

It’s important to consider that our experience of stress is not black and white. We are often in the gray zone between not stressed at all and incredibly stressed.

To this end, even small stressors—such as not sleeping well or skipping breakfast—can influence how our body and mind process trauma.

What does all this mean? When we seek to manage the stress we are under on a daily basis, we are protecting ourselves against the trauma we encounter as part of our jobs.

Taking Action

Self-care is one mechanism through which we can manage our day-to-day stressors. It is important to note that self-care is an incredibly broad term, and we are all caring for ourselves with reasonable success already!

However, we can strive to fine-tune the care we provide to ourselves to reduce our stress on a daily basis.

Evidence shows that making small swaps on a more regular basis for even slightly better choices leads to more long-term success.⁶ This is particularly helpful for those of us who feel like we don’t have any space to add anything else to our days.

Instead of thinking of self-care as something you need to add to your plate, think of replacing an old behavior

with a different one that better supports your well-being and goals. This idea also encourages us to ditch all-or-nothing thinking where we’re either all-in with new habits, or not in at all.

Listen to your body. Getting into and through veterinary school is an overwhelmingly difficult task. For many of us, we pushed aside our basic needs in favor of studying and doing whatever it took to succeed academically.

Over time, this can result in us being disconnected from our bodies and minds, making it difficult to understand what we “want” never mind what we “need.” To this end, we need to consider how to reprogram ourselves to better understand what types of things we find restorative and what our basic needs are.

This information is foundational to self-care and how we manage stress because when we are disconnected from ourselves, we are unlikely to notice that we are stressed or experiencing trauma. This is problematic because then we are left without the knowledge that we could use more robust self-care to support ourselves.

When we can appreciate the impact of small stressors in the moment, small interventions or amounts of self-care are likely to be successful.

Dr. Jen Brandt, AVMA Director of Wellbeing, Diversity and Inclusion Initiatives, has an acronym to help us remember what we fundamentally need to be cognizant of addressing on an ongoing basis:

M—move

E—eat

D—(drink) water

S—sleep

These reflect our fundamental physiologic needs. When we neglect these, our

body’s stress levels start to increase.

The next step is to ask, “What do I need? What will I do to help myself right now?” Then we need to find a way to make it happen, which can feel overwhelming.

Remember, even connecting with yourself to acknowledge what you need is progress and is valuable. You can use that information to help you plan forward and have the resources available for the next time that situation arises.

Take-Home Message

We need to equip ourselves with knowledge about our occupational risks and hazards, such as secondary traumatic stress, burnout and compassion fatigue. Then we can assemble a toolbox that can help us thrive.

Appreciating the connection between managing our stress and decreasing the impact of the trauma we encounter as veterinarians can help reduce our risk of compassion fatigue. **EM**

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Diagnosing strangles isn't difficult, but figuring out where it came from requires some work.

AMY DRAGOO

Preventing Strangles Outbreaks

You might have to do some sleuthing to locate *Streptococcus equi* in a 'healthy horse' that is spreading strangles.

By Stacey Oke, DVM, MSc

Last week one of your patients had a high fever, over 104°F. Thankfully, you were called to the farm immediately and ensured he was isolated away from the others. Within 24 hours of spiking that fever, your patient developed a runny nose that progressed to a mucopurulent discharge. After you have

diagnosed *Streptococcus equi* subsp. *equi* (*S. equi*) and reported the outbreak, your patient is now "EDCC famous" and your county is listed as one of the many that report the strangles cases and outbreaks that occur every month throughout the United States.

Following the timeline of a typical case of *S. equi*, your patient became anorexic,

dull and depressed. He developed the tell-tale submandibular and retropharyngeal lymph node swelling. He stood with his head outstretched and appeared uncomfortable. Together, these clinical signs popularized the nickname "strangles."

Luckily, you were wise to isolate the horse immediately after identifying the



fever, and none of the other horses on the property developed similar clinical signs of this incredibly infectious bacterial disease.

Surreptitious Spreading of Strangles

As we can see from this hypothetical—yet realistic—scenario, diagnosing strangles is relatively straightforward in most cases. The high fever, depressed demeanor, swollen lymph nodes and nasal discharge are fairly telling.

But now your job becomes a little tougher: You should determine where he got this pathogen and how he needs to be managed so he doesn't spread it to other horses once he has recovered.

It usually takes between 3 and 14 days after being exposed to the bacteria for clinical signs of disease to develop in a horse. So, what was your patient up to 3 to 14 days ago? If your client cannot

recall the patient coming in contact with an obviously sick horse, you need to consider subclinical shedders.

"Subclinical shedders are horses that previously had strangles, recovered from infection, but still harbor *S. equi* in their guttural pouches," said Ashley G. Boyle, DVM, DACVIM, an associate professor in the field service section at the University of Pennsylvania's New Bolton Center. "The guttural pouches become infected with *S. equi* secondary to retropharyngeal lymph nodes draining directly into the pouches in clinical cases.

"Intermittent guttural pouch shedding from apparently healthy horses can persist for years after that horse has recovered from infection," noted Boyle. "These horses serve as an important source of this highly contagious bacterial respiratory tract infection."

The subclinical shedders can therefore serve as a reservoir of infection for any naïve horse.

Approximately 10%-40% of horses become carriers following a strangles outbreak, which is a substantial number.

In a study by Delph, et al. (2018), nine of 28 horses (32%) involved in a strangles outbreak had persistent guttural pouch infections. Only three of those 12 had endoscopically visible chondroids. (Chondroids are stone-like structures that form from hardened pus within the guttural pouches.)

As we can see, identifying these inapparent carriers would help protect naïve horses that have not previously been exposed to *S. equi*.

Detecting Inapparent Carriers

"Detecting these inapparent horses, however, can be exceedingly tricky without appropriate diagnostics," warned Katherine Delph, DVM, MS, DCVIM, a clinical assistant professor from Kansas State's College of Veterinary Medicine.

There are several potential sources of infection on the farm that might explain why the hypothetical patient described

above had strangles. For example, horses brought onto a property might initially appear healthy, then develop a fever and subsequent clinical signs of disease. In addition, apparently healthy horses brought onto a property might be shedding *S. equi* and never develop external signs of infection (i.e., they are inapparent shedders).

"I think not testing horses from unknown backgrounds is a common source of introducing carriers into a population, which can then infect the other horses," said Boyle.

Alternatively, apparently healthy resident horses that are carriers can spread the bacteria to newly introduced horses if they are naïve to the disease.

In a competition setting where horses are mixing, naïve horses are at risk either from 1) horses that have *S. equi* but haven't yet started showing clinical signs of infection, or 2) inapparent shedders.

Flushing Out the Offenders

A number of tests are available that can help diagnose *S. equi* in apparently healthy horses.

Swabs and Lavage. "Pharyngeal swabs may identify *S. equi* in subclinical shedders. However, false negatives can occur if the horse is not actively shedding at the time the sample is taken," Boyle warned.

Pharyngeal washes are better for diagnosis than swabs. However, even the washes can be inconsistent in picking up carriers because of intermittent shedding.

There is also a point-of-care PCR test that can be used in the clinic. According to the manufacturer (Fluxergy), nasopharyngeal samples can be tested in 50 minutes, with a sensitivity of 88.7% and a specificity of 100%.

"This point of care test was evaluated using nasal secretions from actively sick animals," said Boyle. "Clinically ill horses carry a much higher number of bacteria than some of the inapparent carriers do. And while it is theoretically possible



Horses can become infected with strangles through active, apparent disease or through inapparent carriers.

to test guttural pouch lavage samples using this point-of-care test, it has never specifically been tested on samples with low numbers of bacteria, so we do not know how well it will perform in that setting and could miss some positives.”

According to Boyle, endoscopically guided examination of the guttural pouch combined with nasopharyngeal lavage PCR is the best way to test.

“We found that testing the guttural pouch lavage fluid with PCR was 50 times more likely to find carriers in horses recovering from strangles,” said Boyle. “The horses used in that study were known to be recovering from strangles and were a few to many months out.”

She added, “This combined guttural pouch exam, flush and nasopharyngeal lavage is a test veterinarians can and should use if they are planning on testing the carrier status of new horses before introducing them to a herd.”

Alternatively, three negative nasopharyngeal lavage PCRs can be used to catch 90% of the intermittent shedders if scoping is not available. False negatives can still occur because of intermittent shedding from the guttural pouch.

Serology. It is very important to appreciate that measuring antibody titers

for the surface protein SeM will not help diagnose inapparent carriers.

In a 2018 study by Delph, et al., all 12 persistently infected cases of *S. equi* had SeM antibody titers ³6,400, and eight of the 12 persistently infected horses had SeM antibody titers ³12,800 eight weeks after the outbreak. The sensitivity and specificity (number of false negative and false positive tests) were very low (67% and 42%, respectively) when titers were ³12,800. Even when the cut-off was decreased to a titer of ³6,400, the specificity was unacceptable (26%).

“The elevation in SeM in horses with persistent guttural pouch infections following a strangles outbreak could be due to continued exposure to *S. equi*, eliciting an immune response,” suggested Delph.

Instead of being used to “screen” for subclinical shedders, the SeM test is more typically used to detect evidence of recent infections by at least a four-fold increase in paired titers taken 10 days apart. The SeM test, however, cannot differentiate between horses that have been vaccinated and those that are naturally infected.

An indirect enzyme-linked immunosorbent assay (iELISA) measures both Antigen A and Antigen C of the *S. equi*

bacterium and could be useful for diagnosing *S. equi* in some situations, but it is not currently available in the United States.

“In countries where the test is available, iELISA can identify animals without clinical signs of *S. equi* that may be carrying the bacteria. If positive, it could be used pinpoint horses that should undergo guttural pouch examination,” said Boyle.

Two factors must be considered when performing the iELISA:

One of the problems with this test is that most vaccines on the market cross-react with it, said Boyle. “We published a study in *Equine Veterinary Journal* in 2021 that showed that even horses that were not vaccinated for strangles had some cross-reactivity to this test,” she said.

A second study found that the combined Antigen A and Antigen C iELISA did not identify subclinical *S. equi* carriers, and therefore concluded that this test could not be used to confirm a carrier status. Instead, it only identifies potential horses that should undergo guttural pouch examination (Durham, et al. 2021).

Sussing Out New Additions

If you’re dealing with a farm setting, a new addition should be isolated for about three weeks before allowing the horse to join the herd. This falls within the 14-day incubation period. If a horse has *S. equi*, it should develop clinical signs of infection within that three-week isolation. If the horse does develop signs of strangles, it should be isolated for at least another three weeks following cessation of clinical signs of disease (i.e., nasal discharge). Also, an endoscopic examination of the guttural pouches and PCR of guttural pouch lavage fluid should be negative at that time.

Even if a newly introduced horse does not develop overt strangles, it still could

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After a strangles outbreak, expect a high number of horses to carry persistent guttural pouch infections.

be an inapparent shedder. That would put naïve horses on the farm at risk of infection.

“Some farms, especially those that have a history of dealing with strangles, elect to simply perform endoscopic examination and guttural pouch lavage on all new horses arriving on a premises,” said Boyle. “This testing involves qPCR testing.”

If positive, the horses can be treated appropriately based on the endoscopic findings. If no underlying pathology exists, then they can receive the recommended treatment of lavage and local application of an antibiotic (penicillin).

If underlying pathology exists, then additional treatment is needed. This could involve manually removing chondroids or empyema via endoscopic guidance. The guttural pouches must be

copiously lavaged with a 20% solution of acetylcysteine in buffered saline. Manual removal of chondroids or empyema might be required endoscopically or even surgically in some cases. Horses will require local antibiotics (penicillin) and systemic antibiotics (procaine penicillin or potassium penicillin) for seven to 10 days.

“In these horses, repeat the guttural pouch lavage and qPCR testing three weeks after cessation of treatment,” advised Boyle. “If using the guttural pouch lavage with endoscopic examination, then visually clear guttural pouches and a negative PCR at this recheck examination is considered sufficient.”

If, however, the horse is being tested with nasopharyngeal samples, then three negative test results are recommended before deeming a horse “clean.”

Screen for Shedders After an Outbreak

Immediately isolating horses with fevers and using appropriate biosecurity principles will minimize strangles outbreaks. After an outbreak, however, the high number of horses likely carrying persistent guttural pouch infections is concerning.

In the hypothetical horse described at the start of this article, should that horse be tested for a persistent infection afterward even if he appears healthy?

Boyle said yes.

“If the owners can do it, I recommend scoping all horses recovering from strangles,” she advised

Take-Home Message

“Effective strangles control measures require detection, segregation and treatment of carrier animals,” summarized Boyle. “And the best test is guttural pouch evaluation via endoscopy and guttural pouch sampling/testing.

“Some barns that have had problems with strangles require testing (scoping) prior to entering their barns,” she noted.

Another good time to perform endoscopy of guttural pouches is after a quarantine of horses that come from unknown backgrounds, such as auctions or rescues.

Clearly, it would be ideal to have a non-invasive test capable of identifying subclinical carriers (i.e., a test less invasive and cumbersome than endoscopic evaluation of guttural pouches). In countries where it is available, the iELISA is as close as we currently have, and still it is only used to identify horses that were exposed to *S. equi*.

“There is clearly a pressing need to develop an easily-performed, non-invasive screening test capable of identifying carriers and/or a 100% effective vaccine against *S. equi* to prevent continual spread of this highly contagious organism,” concluded Delph. **EM**

Rehabilitation of the horse's back requires understanding of structures involved.



GETTY IMAGES

Back Pain Rehabilitation

Dr. Hilary Clayton helps veterinarians understand some elements of equine back rehabilitation.

Horses with back pain pose a diagnostic and treatment challenge for equine practitioners. At the 2022 BEVA Congress, Hilary Clayton, BVMS, PhD, DACVSMR, FRCVS, of Michigan State University, offered some strategies.

She recommended multiple objectives in the rehabilitation of back pain:

- Stabilize facet joints to decrease

micro-motion and risk of future osteoarthritis;

- Restore range of motion;
- Enhance the horse's proprioception, particularly in tissues around the spine; and
- Build strength and coordination with progressive increases in exercise.

Another important element of managing a horse's back pain relies on reactivating deep stabilizing back muscles such as

the multifidus. This can be achieved with dynamic mobilization exercises such as baited stretches using five repetitions per day for three days per week. The lower the horse's nose stretches down, the greater the angle of the poll and stretch of neck and back tissues. The horse can be asked to pull its chin to the chest, carpi, between front fetlocks, girth, stifle and hind fetlocks. These exercises are relevant to do before tacking up

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

CONTRAINDICATIONS: Horses with hypersensitivity to pentosan polysulfate sodium or any of the inactive ingredients in Zycosan should not receive Zycosan. Do not use Zycosan concurrently with other anticoagulant drugs. Do not use in horses with clotting disorders or within 24 hours of surgical procedures (see Warnings and Precautions).

WARNINGS AND PRECAUTIONS:

User Safety Warnings: Not for use in humans. Keep out of reach of children. Pentosan polysulfate sodium is a weak anticoagulant. Caution should be used when administering Zycosan if you are taking an anticoagulant.

In case of accidental self-injection, seek immediate medical attention. If product comes into contact with skin, rinse skin thoroughly with water and seek medical attention if needed. To obtain a Safety Data Sheet (SDS), contact Dechra at (866) 933-2472.

Animal Safety Warnings and Precautions:

Zycosan has been shown to prolong coagulation parameters up to 24 hours after injection, therefore caution should be used when administering this drug before or after strenuous activities (see Target Animal Safety). Due to the anticoagulant effects, this drug may exacerbate Exercise Induced Pulmonary Hemorrhage (EIPH). The concurrent use of NSAIDs with Zycosan has not been evaluated. Due to the anticoagulant effects of Zycosan and known anticoagulant effects of some NSAIDs, caution should be used if NSAIDs are concurrently administered. Horses concurrently treated with Zycosan and NSAIDs should be monitored for hemorrhage or other clinical signs of abnormal bleeding (e.g., petechiae, ecchymosis, or epistaxis). The safety of long-term repeat use of Zycosan has not been evaluated. Pigmentary changes in the retina (pigmentary maculopathy) have been reported in human patients following long-term oral use of pentosan polysulfate sodium. It is not known if a similar finding occurs in horses. The safe use of Zycosan has not been evaluated in breeding, pregnant, or lactating horses.

Other Warnings:

Do not use in horses intended for human consumption.

ADVERSE REACTIONS:

Injection site reactions were the most frequently reported adverse reactions in the field study. Injection site reactions were associated with clinicopathology changes in some cases. Other adverse reactions reported in more than one horse were prolongation of coagulation parameters (activated partial thromboplastin time (aPTT) and prothrombin time (PT)), lethargy, behavior changes, and colic. To report suspected adverse events, for technical assistance or to obtain a copy of the Safety Data Sheet (SDS), contact Dechra at (866) 933-2472. For additional information about adverse drug experience reporting for animal drugs, contact FDA at 1-888-FDA-VETS or online at <http://www.fda.gov/reportanimalae>.

STORAGE CONDITIONS: Store at room temperature 68–77°F (20–25°C), with excursions to 59–86°F (15–30°C).

MANUFACTURED FOR:

Dechra Veterinary Products
7015 College Boulevard, Suite 525
Overland Park, KS 66211 USA

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RESEARCH SPOTLIGHT (cont.)



GETTY IMAGES

A tail pull moves the center of mass within the base of support. This can help improve overall back and body stability.

throughout a horse's career.

Clayton reported that whole-body vibration and neuromuscular stimulation (NMES) are helpful to increase the cross-sectional area of the multifidus muscles.

The range-of-motion of the spine in a standing horse is greater than the range of motion during locomotion because the horse stabilizes the spine while moving. While baited stretches work wonders for back muscles, stimulated stretches are also helpful: Pressure placed on the linea alba near the withers and pressure on the loins or a hand stroke down the haunches improves pelvic tilt to deepen the pelvic angle. Another technique places slow feeders on the ground so the horse continually lowers the head and neck.

When the horse's center of mass lies above the base of support, its destabilization elicits a corrective response. A tail pull moves the center of mass within the base of support. Picking up one leg decreases the base of support, and the horse can be pushed toward the lateral hindlimb. Another simple means of moving the center of mass is

to put the horse on unstable surfaces and/or use shoe pads to destabilize the base of support. Balance can be destabilized by changing the way the horse's limbs move in the swing phase such as walking over ground poles or with them slightly elevated. These techniques to destabilize a horse's base of support elicit corrective responses that strengthen the back and core muscles.

Proprioception

For proprioceptive improvements and to help a horse's eye-hoof coordination, use poles, grids, mazes, and up-and-down steps. Ask the horse to move in different directions such as rein-backs, forward turns and circles. Varying surfaces and/or terrain also improve a horse's proprioception.

Clayton further discussed an oft-asked question, "Lunge or ride, which is the lesser evil?"

If the horse is lunged, she advised starting on a large diameter circle at slow speeds. Also, allow the horse to lean inward to allow ground reaction forces along the long axis of the limb.

A rider's weight increases lumbo-



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Important Safety Information

As with all drugs, side effects may occur. For intramuscular use in horses only. Not for use in humans. Pentosan polysulfate sodium is a weak anticoagulant. Caution should be used when administering Zycosan if you are taking an anticoagulant. **In case of accidental self-injection, seek immediate medical attention. If product comes into contact with skin, rinse skin thoroughly with water and seek medical attention if needed.** Horses with hypersensitivity to pentosan polysulfate sodium should not receive Zycosan. Do not use Zycosan concurrently with other anticoagulant drugs. Do not use in horses with clotting disorders or within 24 hours of surgical procedures. Caution should be used when administering this drug before or after strenuous activities. Caution should be used when NSAIDs are administered concurrently due to the anticoagulant effects of Zycosan. If Zycosan and NSAIDs are used concurrently, horses should be monitored for hemorrhage or other clinical signs of abnormal bleeding. The safe use of Zycosan has not been evaluated in breeding, pregnant, or lactating horses. The safety of long-term repeat use of Zycosan has not been evaluated. The most frequently reported adverse reactions are injection site reactions, prolongation of coagulation parameters (activated partial thromboplastin time (aPTT) and prothrombin time (PT)). Refer to the prescribing information for complete details or visit www.dechra-us.com.

¹ Zycosan[®] Freedom of Information Summary NADA 141-559

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sacral joint flexion in both stance and motion phases. The horse's back slopes downward and forward in front of the croup. The amount of thoracolumbar hollowing is proportional to the weight of the rider.

She stressed that swimming is not recommended for back rehabilitation due to lordosis of trunk that is required for the horse to keep its head up.

As for choice of gait, each has different characteristics.

Walk is associated with low forces, low center of mass trajectory and very little vertical motion of the center of mass. The motion of the back is mainly bending.

Trot is affected by gravity, inertia and ground reaction forces to move

the back. As the body rises, the back rounds in suspension and epaxial muscles control the amount of flexion. As the body sinks, the back hollows in the stance phase. Abdominal muscles control extension, and the magnitude of the force is double the rider's weight. Movement is controlled by eccentric muscle movement.

Rehabilitation at the trot should start slowly on flat ground with minimal impulsion, i.e., a jog/slow trot. Clayton advised starting with small numbers of steps, alternating between walk and trot. For example, eight trot steps to 20 walk steps. Transitions between walk and trot build strength. With time and improvement, more steps can be added, as can impulsion and speed.

Saddle Fit

A saddle might no longer accommodate the shape of the back, especially when the horse has had a layoff period. The back shape also will change with rehab. Clayton suggested using a sheepskin pad for even distribution of saddle pressure. She urged riders to take note of behavioral signs of pain or discomfort.

Core Muscles

Finally, to build strength and coordination of the active core muscles, she recommended using a downhill slope at the walk. Short, controlled steps on an incline promote self-carriage that strengthens thoracic sling muscles. Halt also activates external abdominal oblique muscles to stabilize the trunk. **EM**

Ad Index

Blue = Sponsored Editorial

Red = Special Advertising Section

AAEP.....	69
American Regent Animal Health	15
Animal Arts.....	57
Asto CT.....	51
Bimeda	27
Boehringer Ingelheim Art of Horse.....	9
Boehringer Ingelheim (Prascend).....	32, 33
Boehringer Ingelheim (dewormer).....	53
Boehringer Ingelheim (gastric).....	46, 47
Boehringer Ingelheim (Equioxx)	66, 67
CareCredit (Business Briefs).....	16
Contura Vet.....	37
Dandy Products.....	57
Dechra (Osphos)	43
Dechra (ProVet).....	25
Dechra (Zimeta)	12, 13
Dechra (Zycosan)	86, 87
Disease Du Jour podcast, brought to you by Merck Animal Health	61
EDCC Health Watch, brought to you by Boehringer Ingelheim.....	59
EquiManagement Newsletter.....	20, 63
EquiManagement Subscription	77
Equine Diagnostic Solutions.....	63

Equine Podiatry Solutions.....	76
Heska.....	39
Horse Week, brought to you by Boehringer Ingelheim	65, 71, 83
Kaeco.....	22
Kent	29
Kentucky Performance Products.....	3
Kinetic Technologies.....	44
Merck Animal Health	5
Nutramax.....	31
PetVivo.....	Inside Front Cover
Platinum Performance.....	Back Cover
Purina.....	7
Shank's Veterinary Equipment.....	73
Soft-Ride	17
Sox for Horses.....	73
Straight Arrow	55
The Business of Practice podcast, brought to you by Merck Animal Health	61
Thrive	Inside Back Cover
Vetline Equine.....	45
Vetray/Sedecal.....	11
W.F. Young Inc	35
Wise Option	1
Zoetis (Vetscan Imagyst).....	49
Zoetis.....	19
Zoetis (Vet Wellness Briefs)	18



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