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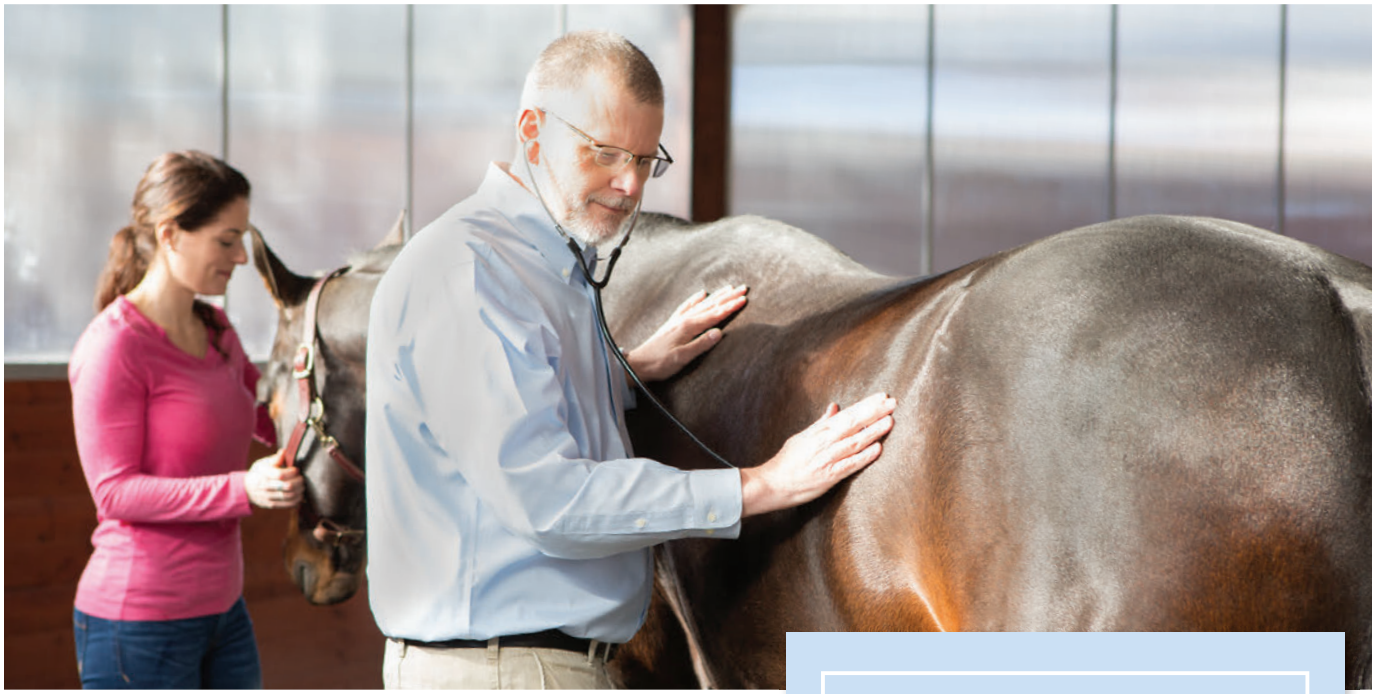

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INFECTIOUS DISEASE SPECIAL ISSUE

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Vets and Disease

All veterinarians will, at some point in their careers, encounter a horse with an infectious or contagious disease. Training kicks in, and the veterinarian assesses the situation, treats the horse and works to protect other horses. At the same time, that veterinarian has an obligation to protect the humans if the disease is zoonotic—and protect any other animals (equines or otherwise) that might become infected by that diseased horse.

Attorney Denise Farris notes in her article on page 20 that "a veterinarian's failure to consider and implement a response protocol can take a single infection and rapidly morph it into a very public event with attendant legal liabilities."

Those are scary words!

Yet the news in late July, when this column was written, contained stories of outbreaks of vesicular stomatitis virus, which can affect numerous animal species; several cases of equine infectious anemia, which usually has a death sentence in horses; and reports of anthrax, which can affect numerous animal species, including humans. And those are aside from the usual equine influenza, equine herpesvirus and strangles cases that are seen throughout the country.

If an owner refuses to vaccinate against infectious or contagious diseases, such as those core vaccines recommended by the AAEP, Farris recommends that you secure a signed waiver confirming the owner's informed consent as to the risks of the disease and the purpose of the vaccine, and signifying the owner's legal assumption of risk from failure to vaccinate.

Sound like a lot of trouble? What if a horse that is your patient isn't vaccinated against rabies, develops rabies, then exposes a barn full of people, horses and other animals? If you don't have that signed waiver, then at least some of the responsibility will likely fall back on you. And with responsibility comes liability.

Ethics of Disease

Diseases and ethics go hand in hand. While that seems like a strange statement on the surface, think about how many times you are asked to sign—or have signed—health papers that aren't strictly according to regulation. Whether or not you choose to sign those papers when asked, you face an ethical dilemma and the potential of losing a client to a colleague who will sign them. And if you sign the papers, and the animal with those mis-signed/dated health papers turns up with an infectious or contagious disease and infects other animals, then you could have a legal dilemma.

Disease Communication

This brings to light the need for honest communications in the mix of equine disease prevention. These communications need to take place with your clients, your colleagues and your staff. Your practice needs to be transparent when it comes to the prevention of disease and your role in that important mission.

Your practice also should adhere to the best biosecurity practices and teach those practices to your clients. It is very easy to skip or reduce quarantines, forget to wash/sanitize your hands between horses or farm calls, and to put off cleaning equipment when you are busy.

Preventing infectious and contagious diseases of horses is a mainstay of your equine practice. Keep in mind that there are legal and ethical considerations that go along with disease prevention. EM

EquiManagement

Equine Health Network
Group Publisher
Kimberly S. Brown
kbrown@aimmedia.com

EquiManagement Associate
Publisher/Advertising Sales
Michelle Adaway
madaway@aimmedia.com
859-619-8263

Advertising Sales
Tom Brazil
tbrazil@aimmedia.com
805-538-9986

Shelley Partridge
spartridge@aimmedia.com
859-327-7057

EQUINE NETWORK

Senior Editor
Laurel Scott

Creative Director
Philip Cooper

Production Manager
Diane Paolini

Prepress Specialist
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By Nancy S. Loving, DVM

Misoprostol for Equine Gastric Glandular Disease

Research has yielded more specifics on gastric ulcer disease, including the identification that two different forms exist: 1) equine squamous gastric disease (ESGD) and 2) equine glandular gastric disease (EGGD). The pathophysiology of each is different from the other, as, for example, EGGD is associated with a mixed inflammatory response of the mucosa rather than ulcerations as seen with ESGD. Most of the lesions of EGGD occur around the pyloric antrum; however, the inflammation results in generalized gastritis. Previous reports suggest that exercise more than five days a week is associated with 3.5 times greater risk of developing EGGD.

Omeprazole therapy has not been proven very effective for management of EGGD, further suggesting that the etiology might have more to do with inflammation than with acid contact with the glandular mucosal tissues. To date, there is no medication licensed for the treatment of EGGD.

A study compared the use of combined omeprazole and sucralfate with misoprostol, which is a prostaglandin E2 analogue used in humans with refractory glandular disease. Its effects include "inhibition of gastric acid and pepsin production and secretion, enhancement of mucosal resistance to injury, promotion of gastric mucosal proliferation, increase in gastric mucosal blood flow, as well as anti-inflammatory properties" [Varley, G.; Bowen, M; Habershon-Butcher, J.L. et al. Misoprostol is superior to combined omeprazole-sucralfate for the treatment of equine glandular disease. *Equine Veterinary Journal* 2019, doi: 10.1111/evj.13087].

Sixty-three sporthorses demonstrating signs of gastric disease that received no treatment were scoped to confirm and record changes in the squamous and glandular gastric mucosa. All lesions involved the pylorus and/or the pyloric antrum. Most of the horses were presented for poor performance with other signs of behavioral changes, girthing pain, weight loss, appetite changes, hair coat changes, colic and teeth grinding. Two or more of these clinical signs were present in 68% of the horses in the study. The most common combination of signs was poor performance coupled with behavior changes or girthing pain. Other studies have reported unexplained weight loss as a typical presenting sign of EGGD.

One group of 43 sporthorses received misoprostol (5 micrograms/kg) twice daily when concentrate was fed; the other group of 20 received omeprazole (4 mg/kg) once daily an hour before feeding hay or concentrate, plus sucralfate (12 mg/kg) twice daily at the time of concentrate feeding. Endoscopy

ISTOCK

Equine glandular gastric disease is different from equine squamous gastric disease. Misoprostol was found to be superior to combined omeprazole-sucralfate, both for improvement and healing of glandular lesions.

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was repeated 28-35 days after the initial exam and start of the medication.

Healing in this study was considered as complete resolution of lesions. The results:

- Healing occurred in 72% treated with misoprostol and only 20% treated with combined omeprazole-sucralfate (OS).
- Glandular improvement occurred in 98% of misoprostol-treated horses compared to 65% of OS-treated horses.
- No lesions worsened over the 35-day time period in either group.

Misoprostol is used in humans to terminate pregnancy, so caution must be taken by owners and veterinarians administering the medication, including advice to wear gloves when handling. In this study, no horses demonstrated adverse effects, although there have been reported cases of mild, self-limiting diarrhea or pruritus that resolved when misoprostol was stopped.

The study concluded: "Misoprostol was found to be superior to combined omeprazole-sucralfate, both for improvement and healing of glandular lesions."

Effects of Diet and Weight on Inflammatory Cytokines

Pro-inflammatory cytokines, such as tumor necrosis factor-alpha (TNF) resulting from diet and obesity (adiposity), are associated with the pathogenesis of insulin dysregulation. In humans, intravenous injection of TNF was shown to initiate development of insulin resistance. TNF is known to increase with increasing adiposity, so the goal of this study was to determine if weight gain and dietary energy source could affect the inflammatory status of a horse.

The study used 15 mature Thoroughbred geldings with body condition scores (BCS) of around 4 (out of 9 on the

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Trimethoprim is 2,4 diamino-5-(3, 4, 5-trimethoxybenzyl) pyrimidine.

ACTIONS: Microbiology: Trimethoprim blocks bacterial production of tetrahydrofolic acid from dihydrofolic acid by binding to and reversibly inhibiting the enzyme dihydrofolate reductase.

Sulfadiazine, in common with other sulfonamides, inhibits bacterial synthesis of dihydrofolic acid by competing with para-aminobenzoic acid.

Trimethoprim/sulfadiazine thus imposes a sequential double blockade on bacterial metabolism. This deprives bacteria of nucleic acids and proteins essential for survival and multiplication, and produces a high level of antibacterial activity which is usually bactericidal.

Although both sulfadiazine and trimethoprim are antifolate, neither affects the folate metabolism of animals. The reasons are: animals do not synthesize folic acid and cannot, therefore, be directly affected by sulfadiazine; and although animals must reduce their dietary folic acid to tetrahydrofolic acid, trimethoprim does not affect this reduction because its affinity for dihydrofolate reductase of mammals is significantly less than for the corresponding bacterial enzyme.

Trimethoprim/sulfadiazine is active against a wide spectrum of bacterial pathogens, both gram-negative and gram-positive. The following in vitro data are available, but their clinical significance is unknown. In general, species of the following genera are sensitive to trimethoprim/sulfadiazine:

Very Sensitive	**Sensitive**	**Moderately Sensitive**	**Not Sensitive**
Escherichia	*Staphylococcus*	*Moraxella*	*Mycobacterium*
Streptococcus	*Neisseria*	*Nocardia*	*Leptospira*
Proteus	*Klebsiella*	*Brucella*	*Pseudomonas*
Salmonella	*Fusiformis*		*Erysipelothrix*
Pasteurella	*Corynebacterium*		
Shigella	*Clostridium*		
Haemophilus	*Bordetella*		

INDICATIONS AND USAGE: Trimethoprim/sulfadiazine is indicated in horses where potent systemic antibacterial action against sensitive organisms is required. Trimethoprim/sulfadiazine is indicated where control of bacterial infections is required during treatment of:

Acute Strangles	Acute Urogenital Infections
Respiratory Tract Infections	Wound Infections and Abscesses

Trimethoprim/sulfadiazine is well tolerated by foals.

CONTRAINDICATIONS: Trimethoprim/sulfadiazine should not be used in horses showing marked liver parenchymal damage, blood dyscrasias, or in those with history of sulfonamide sensitivity.

ADVERSE REACTIONS: During clinical trials, one case of anorexia and one case of loose feces following treatment with the drug were reported.

Individual animal hypersensitivity may result in local or generalized reactions, sometimes fatal. Anaphylactoid reactions, although rare, may also occur. **Antidote:** Epinephrine.

Post Approval Experience: Horses have developed diarrhea during trimethoprim/sulfadiazine treatment, which could be fatal. If fecal consistency changes during trimethoprim/sulfadiazine therapy, discontinue treatment immediately and contact your veterinarian.

PRECAUTION: Water should be readily available to horses receiving sulfonamide therapy.

ANIMAL SAFETY: Toxicity is low. The acute toxicity (LD50) of trimethoprim/sulfadiazine is more than 5 g/kg orally in rats and mice. No significant changes were recorded in rats given doses of 600 mg/kg per day for 90 days.

Horses treated intravenously with trimethoprim/sulfadiazine 48% injection have tolerated up to five times the recommended daily dose for 7 days or on the recommended daily dose for 21 consecutive days without clinical effects or histopathological changes.

Lengthening of clotting time was seen in some of the horses on high or prolonged dosing in one of two trials. The effect, which may have been related to a resolving infection, was not seen in a second similar trial.

Slight to moderate reductions in hematopoietic activity following high, prolonged dosage in several species have been recorded. This is usually reversible by folinic acid (leucovorin) administration or by stopping the drug. During long-term treatment of horses, periodic platelet counts and white and red blood cell counts are advisable.

TERATOLOGY: The effect of trimethoprim/sulfadiazine on pregnancy has not been determined. Studies to date show there is no detrimental effect on stallion spermatogenesis with or following the recommended dose of trimethoprim/sulfadiazine.

DOSAGE AND ADMINISTRATION: The recommended dose is 3.75 g UNIPRIM Powder per 110 lbs (50 kg) body weight per day. Administer UNIPRIM Powder orally once a day in a small amount of palatable feed.
Dose Instructions: One 37.5 g packet is sufficient to treat 1100 lbs (500 kg) of body weight. For the 1125 g packets and 12 kg boxes, a level, loose-filled, 67 cc scoop contains 37.5 g, sufficient to treat 1100 lbs (500 kg) of body weight. For the 200 g, 400 g, and 1200g jars, and 2000 g pail, two level, loose-filled, 32 cc scoops contain 37.5 g, sufficient to treat 1100 lbs (500 kg) of body weight. Since product may settle, gentle agitation during scooping is recommended.

The usual course of treatment is a single, daily dose for 5 to 7 days.

Continue acute infection therapy for 2 or 3 days after clinical signs have subsided.

STORAGE: Store at or below 25°C (77°F)

HOW SUPPLIED: UNIPRIM Powder is available in **37.5 g** packets, **1125 g** packets, **200 g** jars, **400 g** jars, **1200 g** jars, **2000 g** pails and **12 kg** boxes. Apple Flavored UNIPRIM Powder is available in **37.5 g** packets, **1125 g** packets, **200 g** jars, **400 g** jars, **1200 g** jars and **2000 g** pails.

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

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Henneke scale). All horses were walked for 35 minutes twice a day on an equine exerciser and fed for weight gain. All received the same grass-alfalfa mix hay, but differed in the offered concentrates: a) CON diet of a high proportion of non-structural carbohydrates (NSC, starch and sugar) or b) FAT diet high in fiber and fat. The nutrient composition of concentrates used was comparable to commercial feeds. Feeding for weight gain and adiposity lasted 32 weeks, whereupon the horses reached BCS 7 by the end of the study [Suagee, J.K.; Burk, A.O.; Quinn, W.; Hartsock, T.G.; and Douglass, L.W. Effects of diet and weight gain on circulating tumor necrosis factor-alpha concentrations in Thoroughbred geldings. *Journal of Animal Physiology and Animal Nutrition* 2011, vol. 95; pp. 161-170].

Blood samples, collected every two weeks, were analyzed for levels of tumor necrosis factor-alpha (TNF). "TNF concentrations were similar between treatment groups until week 12 of the study, at which point FAT fed horses were found to have lower levels of TNF than horses fed CON, except during weeks 20 and 32."

Suggested reasons for the differences in TNF concentrations between the two diets included:

- High NSC concentrate diets result in higher insulin concentrations than fat-fed diets.
- Hyperglycemic diets increase inflammation and insulin resistance in adipose tissue due to production of reactive oxygen species.
- High-concentrate diets affect bacterial flora in the hindgut, with the potential for microorganism die-off that generates systemic uptake of endotoxin, which increases TNF levels. In contrast, a high-fiber diet protects against bacterial disruption in the hindgut.

Both groups of horses reduced their hay intake in weeks 20 and 32 without modifying concentrate intake—this could have altered percentage of consumed NSC in those weeks.

While the horses' BCS moved from 4 to 7, TNF concentrations do not correlate with BCS until horses reach BCS of 9. With the FAT diet, TNF concentrations decreased by 12 weeks on the weight-gain feed. The study suggested that diet might be an important regulator of inflammatory markers, such as TNF.

In conclusion the study noted that "Feeding horses a concentrate lower in starches and sugars could decrease their levels of TNF. This adaptation occurs over a period of months."

THINKSTOCK

Research showed that feeding horses a concentrate lower in starches and sugars could decrease their levels of TNF. This adaptation occurs over a period of months.

Shoeing and Heel Movement

The barefoot hoof is flexible and has a normal elastic rebound following deformation with each step, which is instrumental in absorbing concussion and improving perfusion of the distal limb. Conventional shoeing restricts heel movement. With that in mind, a Belgian study compared medial-lateral heel movement of various shoe configurations to the barefoot hoof while horses were exercised on a treadmill at walk, trot and canter [Brunsting, J. Dumoulin, M.; Oosterlinck, M.; et al. Can the hoof be shod without limiting the heel movement? A comparative study between barefoot, shoeing with conventional shoes and a split-toe shoe. *The Veterinary Journal* Jan 29 2019].

Eight warmblood horses were used to test 16 forelimbs in a randomized crossover study. The hooves were fitted randomly with either:

- no shoes (barefoot);
- conventional shoe; or
- split-toe shoe (ST).

The conventional shoe was made of standard steel with a toe clip. The split-toe shoe is a newly developed shoe designed to enable heel expansion. It begins as a conventional shoe that has a toe clip and includes side clips placed between the second and third nail holes on each side. Once the shoe is nailed

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Conventional shoes showed the most restrictive effects in this study.

in place, it is sawn through at the toe, including through the toe clip, to leave two halves that move independently of each other. All the shoes were affixed with four nails on each side of the hoof.

Normally, the barefoot hoof experiences hoof expansion during impact and mid-stance followed by heel contraction during breakover. Heel expansion is greater at trot and canter than at walk, whereas heel contraction is consistent through all gaits.

Not too surprisingly, the conventional shoe created the most restrictive effects on heel expansion, with 36% less heel expansion compared to what occurs in a barefoot hoof. The authors report that there was no significant difference in heel expansion between the ST shoe and the barefoot hoof.

They also noted other adverse effects of using conventional shoes besides restriction of the normal mechanism of the hoof, such as increasing weight on the distal limb and an increase in shock impact. Benefits of shoeing include protection of the hoof from excessive wear along with improved traction on certain surfaces. The researchers propose that the ST shoe combines both the advantages of shoeing with the natural heel expansion incurred by the barefoot hoof. EM

What's your vision for the future of your practice?

3 Questions to ask as you enter discussions with potential partners.

NO. 01

Is it the right culture fit for your team?

As you begin considering your options for selling your practice, it's important to find a partner aligned with your values, respectful of the individuality of what you've built, and equipped to grow your business, while your team and culture remain intact.

Ask around to find out which buyers have the best reputation for investing in the animal health care profession, and the equine community specifically.

NO. 02

Do the partnership options make sense?

Because selling your practice is such a personal decision, you'll want to understand what types of options are available, and to what level they can tailor the terms to meet your needs.

YOUR OPTIONS:

- Selling 100% or staying onboard in a joint venture
- Providing the opportunity for your associates to buy in
- Selling your property or renting it to the buyer

NO. 03

How comprehensive are the support services?

As you contemplate transitioning your business, you'll want to know every aspect is covered. Seek out a partner with a dedicated team seasoned in everything from marketing and recruiting, to IT, HR, accounting, taxes, legal and more. Ask about access to capital for new equipment and renovations as well.

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NVA Equine

By Amy L. Grice, VMD, MBA

Business Briefs: Dealing with Dissatisfied Clients

If you are in the veterinary profession for any length of time, sooner or later you will encounter a client who is dissatisfied. This disgruntlement might be with lack of results after a treatment, the cost of services, the interaction with your office staff, or with just about anything related to your practice. There are well-established methods for easing clients' irritation, and most of them require taking a step back from the situation so you can think clearly.

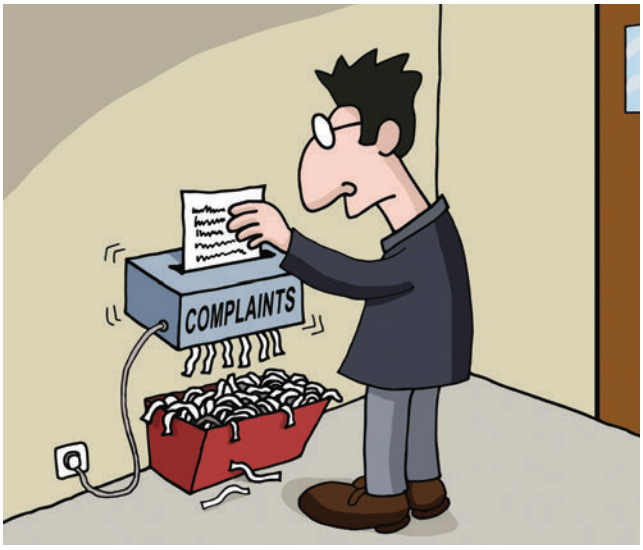
Clients can get rude or angry for many reasons, and while some are justified, others are not. How you respond can make the difference between a client who feels satisfied with the resolution and one who vows never to use your practice again and to tell all his or her friends about the bad experience.

Unfortunately, according to the White House Office of Consumer Affairs, a dissatisfied customer will tell between nine to 15 people about his or her experience, and 13% of customers will tell more than 20 people! In contrast, customers who get their issues successfully resolved tell about four to six people about their experience.

In his book "Understanding Customers," Ruby Newell-Legner stated that it takes 12 positive experiences to make up for one unresolved negative experience. Clearly, it is important to make a sincere effort to mitigate the complaints of unhappy clients.

The first step in resolving dissatisfaction is to know that it exists! According to a study by First Financial Training Services, 96% of unhappy customers don't complain, 91% simply leave and never come back, and 5% suffer in resentful silence.

Consider polling your clients with a short survey about their satisfaction with your practice, utilizing a simple online platform such as Survey Monkey. Examples of surveys can be found on the AAEP Touch website.



ISTOCK/ARTISTAN

Angry clients make their dissatisfaction easy to detect! That's one positive thing about it. Another is that you might discover some things about your practice's performance that you might never have known about otherwise.

Adopt an attitude of openness about learning where your practice's performance is failing to meet your clients' expectations. It is essential to be a good listener and make sure your frustrated client feels heard. You must remain calm and control your own emotions. If a client starts yelling or being otherwise rude, there is absolutely nothing to be gained by responding in a similar manner. However, setting boundaries is important. Utilize the phrase "I want to listen and try to resolve this issue, but you may not speak to my staff (or me) like that."

An angry or dissatisfied client wants to be heard and vent his or her emotions. By listening patiently, you can often defuse a situation, as long as that person feels acknowledged. After the client has finished explaining his or her angst, reflect back what you've heard and ask any clarifying questions.

Because up to 90% of communication occurs nonverbally, pay close attention to your body language! Maintain eye contact and a relaxed posture, keeping your arms uncrossed. Actively sympathize with the emotions the individual might have expressed. If an apology is in order, express it with sincerity. If it is appropriate, verbalize that you would never want your clients to feel the way this person feels.

Respecting the client's perspective goes a long way toward smoothing things over. Share your perspective only after hearing the complaints of the client.

Compassionate listening and appropriate boundaries are the key elements to successful management of client dissatisfaction. EM

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Infectious Disease and Quarantine Communication

Use these five tips to communicate information about infectious diseases or quarantines while protecting client confidentiality and limiting disease spread.

By Katie Navarra

No equine facility wants the stigma that often accompanies the discovery of infectious disease outbreak on the premises. The fear of losing business or having a tarnished reputation often discourages open communication.

At large barns where multiple veterinarians serve different clients, some health care providers might not even know there is an active infection at the stable, according to Nicola Pusterla, DrMedVet, MedVet, a professor of medicine and epidemiology at the University of California, Davis, School of Veterinary Medicine.

In some segments of the industry, there are unspoken rules where veterinarians do not talk about health issues observed at other farms. Kentucky Department of Agriculture State Veterinarian Robert C. Stout, DVM, highlighted this problem when discussing the 2001 mare reproductive loss syndrome (MLRS). Although MRLS was not an infectious disease, the lack of commu-

nication made it difficult to identify a trend that had a significant impact on the industry.

"The first time we heard about the increased rate of abortions was in May 2001," he said. "By that time, it had been going on for two to three months, but no one was seeing the bigger picture."

Sometimes the owner of a single horse takes for granted the impact that just one sick horse can have on others it comes in contact with.

"Even if a person owns one horse, they have to think of horses as herd animals, and everyone in the barn has to get on the same page to help prevent further spread," said Laura H. Javsicas, VMD, DACVIM, a veterinarian at Rhinebeck Equine LLP.

Controlling the spread of an infectious disease is a group effort that includes the barn manager, stable help, horse owners and veterinarians. Communicating facts about the disease and the steps to treat sick horses and prevent disese spread can be challenging.

"It can be difficult sometimes when there are a lot of people involved," Pusterla said. "The issue arises when people don't take ownership."

Best practices for biosecurity are readily available and effective, but protocols for communication can be murky and constrained by client confidentiality. Ultimately, horse health for the greater good is the most important focus. In the article that follows, Javsicas, Pusterla and Stout offer five tips for communicating with clients about a quarantine while also protecting client confidentiality.

1. Be informed. Knowing which infectious diseases have been detected within your geographic area or at major industry events your clients are likely to attend provides the opportunity for mitigating risk to healthy horses. The Equine Disease Communication Center is one resource that provides timely information about disease outbreaks.

"Most of the state veterinary offices also send out an e-blast to all veterinarians that includes which diseases have been reported," Javsicas said. "It varies by state as to which diseases they will do that for."

Knowing the active diseases that might impact your clients provides an opportunity to remind horse owners or caretakers about the importance of staying up-to-date on vaccinations.

ISTOCK

Your clinic can bring attention to a specific equine health problem, but be aware of client confidentiality issues.

"If you know about a reported outbreak of strangles in your area, you can inform clients about the importance of vaccines and review biosecurity basics for reducing risk to educate horse owners about limiting risk to their horse," Pusterla said.

Not every disease that is reportable is actionable, Stout explained. When a state veterinary office is contacted about a disease outbreak, an investigation is started. The magnitude of the disease and the management practices are considered before a quarantine is instituted.

"At my office, equine herpesvirus is an actionable disease," he said. "Equine influenza is reportable, and it is something we observe; but it does not necessarily lead to a quarantine."

Each state has its own laws regarding how and when to report a disease. Following those guidelines is legally required. However, working with the veterinarian on situations that fall outside the law is helpful for providing critical data on early health concerns that have the potential to become larger issues.

"Vets are our eyes and ears out in the state," Stout said. "We depend on them to tell us when they are observing something."

2. Exercise caution in publicity. The ultimate goal is to contain the spread of infectious diseases. That includes reducing the risk for horses moving into and out of an affected facility for lessons, training or competition. There are tools that a veterinarian can use to inform clients about active diseases and promote biosecurity practices. For example, including information in an e-newsletter or on social media can inform local horse owners. However, there are client confidentiality considerations to take into account. Giving specific details that identify the specific affected barn is not permissible. However, there are ways to bring attention to an issue in broader terms.

"Look at how things are being reported through resources like the Equine Disease Communication Center," Pusterla suggested. "The alerts include information about the pathogen and the activity within a certain area without pinpointing a specific town or barn."

Routine visits can be a good time to

Disease Reporting Resources

State rules and regulations specify which diseases must be reported. State veterinarians review each situation and determine a plan of action to control the spread of the disease. There are several options you can use to stay informed of disease outbreaks in your area or around the country.

Equine Disease Communications Center
http://www.equinediseasecc.org

American Association of Equine Practitioners
https://aaep.org/news/updated-biosecurity-guidelines-available-aaep-website

World Animal Health OIE List
http://www.oie.int/animal-health-in-the-world/oie-listed-diseases-2019

remind clients about vaccinations and biosecurity best practices. It is appropriate for veterinarians to tell clients that "we're experiencing a greater frequency of flu," for example.

"Then educate the lay person on the signs they need to watch for, and encourage them to take proper precautions to reduce the risk of infection," Pusterla said.

3. Identify a point person. When an infectious disease has been diagnosed, disseminating timely, factual information is critical. In large facilities that involve multiple stakeholders, it's imperative that one person be appointed as a designated point person in charge of communicating updates. Pusterla emphasized that this should be the barn owner or manager and not the veterinarian.

"Clients often think it's the veterinarian's responsibility to communicate the disease and action for control, but it's really the barn manager or stable owner," he said. "In larger facilities that have more than one veterinarian serving clients, it's really up to the stable owner to communicate the message."

Asking the state veterinarian to take the lead can be helpful. These neutral third parties can dispense information and protocols without having a personal investment in the situation.

Most disease communication is focused on the barn manager and horse owner. However, veterinarians working at practices with other staff should also have a procedure in place for sharing information with colleagues. Having one person who takes the lead on providing updates can be helpful.

4. Nurture relationships. Competition between practices is an inherent part of veterinary business. When it comes to infectious diseases, however, it's necessary to work with other practices treating horses in the same facility. Open communication regarding diagnosis, treatment and biosecurity protocols ensures that all efforts are supporting the desired outcome.

"If I know another vet working in the same barn, I will let them know as much as I can about what is going on, while maintaining confidentiality, so that we are on the same page," Javsicas said.

Developing open lines of communication extends beyond veterinarians to all health care professionals, such as farriers, chiropractors and others coming in and out of facilities.

"The owner of an unaffected horse may be boarding at a facility with an outbreak," Pusterla said. "A farrier who comes to shoe a healthy horse needs to be aware of the situation to reduce the risk of becoming a source of spreading the pathogen."

5. Visit the affected site. Stopping the spread of an infectious disease is the number one goal. A phone call is a good starting point for discussing biosecurity practices when a disease has been identified. But there is no substitute for observing a barn's routine. When Javsicas learns of an infectious disease at a client's barn, she prefers to visit the barn before making a plan of action. This gives her the opportunity to physically observe the daily routines and flow of horses and people in the barn, and allows for modifications that might not be considered via a phone conversation.

"I try to find ways to prevent the spread by seeing the barn's routine," she said. "For example, if a barn uses a hose to fill each water pail and there's been an outbreak of strangles, dipping the hose end into each pail can inadvertently spread the disease. Same thing with barns that stack feed buckets on top of one another. Each horse is eating out of his own tub, but when the bucket goes into the stall, it could pick up pathogens and transmit them to another stall when stacked on top of each other. Those are things you just can't discover through a phone call."

It's everyone's inclination to move a horse once it is learned that one horse in the barn is sick with an infectious disease. Encouraging horse owners to stay put until it's determined whether that animal has been exposed is critical to halting the spread of disease.

"Even a horse that appears healthy can potentially take that infectious disease elsewhere, whether it's a secondary barn on the same property or a different facility altogether," Javsicas said. "Keeping horses where they are until the appropriate testing is done is important." EM

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Legal Issues Surrounding Infectious Diseases

Veterinarians should prepare to encounter infectious diseases and understand their own legal liabilities in those situations.

By Denise Farris, J.D.

All players in the equine industry will at some point encounter the scary words "infectious disease." Given the extensive travel of horses nationally and internationally, a veterinarian's failure to consider and implement a response protocol can take a single infection and rapidly morph it into a very public event with attendant legal liabilities.

A prime example occurred in Weld County, Colorado. In July 2018, a horse entered Colorado from out of state without a current Coggins. Its initial test result, received August 24, 2018, was positive for equine infectious anemia (EIA), with another positive confirmation received August 28. Even though the facility was placed under a quarantine, the Colorado Department of Agriculture reported that as of September 7, 2018, more than 240 animals passing through the same facility had been on the quarantined premises during the same time as the infected animal and had dispersed throughout the United States.

While equine infectious anemia can be passed through blood-sucking insects such as flies and mosquitos, the potential exposure quickly extended into nine additional Colorado counties as well as 20 other states receiving those horses

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[1] Hunyadi L, Papich MG, Pusterla N. Pharmacokinetics of a low-dose and DA-labeled dose of diclazuril administered orally as a pelleted top dressing in adult horses. *J of Vet Pharmacology and Therapeutics* (accepted) 2014, doi: 10.111/jvp.12176. The correlation between pharmacokinetic data and clinical effectiveness is unknown

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Import and export of horses can mean spread of diseases if the animals are not quarantined properly.

before the positive exposure had been identified. Although no identified horses have yet tested positive, the rapid spread of the exposed horses is an important indicator of the potential for a fast-moving, wide-spread disaster.

Your Responsibilities at Home

What are "infectious diseases," and what roles do the treating veterinarian, facility manager or event manager have in checking for, identifying and handling exposure risks?

Equine infectious diseases are rapidly spread, either from horse-to-horse contact, horse-to-human-to-horse contact (or through other fomites) or through disease-carrying vectors such as flies and mosquitos.

Many of these diseases are preventable through standard vaccination protocols, including the four primary core vaccinations identified by the American Association of Equine Practitioners (AAEP): Eastern/Western equine encephalomyelitis (EEE/WEE), rabies, tetanus and West Nile virus (WNV). Core vaccinations are strongly recommended where they share four dramatic characteristics relative to the risk of the vaccine: 1) the disease is highly infectious; 2) the disease is endemic to a particular region; 3) the disease poses a risk of severe illness or death to the horse; and/or 4) the disease poses potential public health risks.

These four core vaccines have been tested for their efficacy and safety and found to exhibit a high enough level of patient benefit versus low enough level of risk to justify their use in the majority of horses. Thus, equine veterinarians through AAEP guidelines are encouraged to vaccinate their equine patients annually with each of these core vaccines.

Should owners refuse these recommended vaccines for their horses, practitioners are encouraged to secure a signed waiver confirming the owner's informed consent as to the risks of the disease and the purpose of the vaccine, and signifying the owner's legal assumption of risk from failure to vaccinate.

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1 Data on file.

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

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

4 Kim DY, Taylor HW, Moore RM, Paulsen DB, Cho DY. Articular chondrocyte apoptosis in equine osteoarthritis. The Veterinary Journal 2003; 166: 52-57.

5 McIlwraith CW, Frisbie DD, Kawcak CE, van Weeren PR. Joint Disease in the Horse.St. Louis, MO: Elsevier, 2016; 33-48.

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Even if horses arrive at your clinic or on a client's property with proper health papers, it is advisable to quarantine new arrivals 45-90 days.

sures, "infectious disease" also covers those diseases that share dramatic and foreseeable consequences if treatment and quarantine procedures are not immediately implemented when diagnosed. These include, but are not limited to, equine infectious anemia (EIA), equine influenza virus (EIV), equine herpesvirus (EHV), strangles, and more recently, the tick-borne virus piroplasmosis.

Most industry professionals intellectually understand the importance of guarding against infectious diseases, but they drop the ball when confronted with day-to-day realities.

Take for example the stable owner who allows a longtime boarding client to bring in a new horse without current health papers on the representation that "all is well and the papers will follow shortly." If the horse presents with an infectious disease, its mere entry onto the premises creates the initial exposure harm, either between horses or from the infected horse to its handler to other horses.

Thus, in a boarding barn context (or a vet clinic), all new horses should be kept in a separated quarantine area until either a) current health certificates, vaccination records and Coggins tests have been verified; or b) a minimum of 45 days of quarantine in a segregated area has passed.

In particular, stable owners and veterinarians must exercise heightened caution and implement even stricter protocols when allowing rescue horses or horses purchased from "kill lots" into the barn area. In many instances, these horses have been exposed to a wide variety of contagious diseases before arriving at the barn; thus they need the highest level of precautions put into place when admitting them to a new barn.

Even if horses arrive with current health papers, it is still advisable to quarantine the animals for a minimum of 45-90 days before moving them into proximity with the other horses housed at the facility.

Horse Shows/Events

Similarly, registration at a show or equine event can be hectic and rushed, with participants crowding around registration desks manned by volunteers attempting to check participant names, waivers, and horse Coggins and health certificates.

Often, a thorough and detailed review of the paperwork is sacrificed for speed. But understand that event sponsors, show veterinarians and show volunteers bear the responsibility to ensure that all paperwork is current.

It is the event sponsor's responsibility to provide a safe, disease-free environment for competition. If an owner brings a competition horse to an event without the requisite health papers, that horse should not be allowed on the premises until the required paperwork is in hand.

It is the legal responsibility of the event sponsor and its agents to deny entry to any horse lacking current health records and paperwork. It is the legal responsibility of the owner or trainer to secure and present that current paperwork as a condition to participation in the event.

What if the papers were inadvertently forgotten but can be secured soon? If such paperwork can't be secured immediately, the event sponsor must either reject the application or put it on "hold," identifying a separate quarantine area where the horse can be placed until health verification is received. Any deviation from this standard rule exposes the event sponsor and its agents to a claim of negligence should an infected horse be allowed into proximity with healthy horses who later fall ill to the same disease.

What other steps can a clinic or stable implement? Fortunately, we have access to a number of informative treatises on this important subject that generically suggest the following protocols:

1. VACCINATIONS: Ensure that all horses involved are current on the core vaccines, additional vaccines recommended for your particular area, and/or the competition areas where the horse will travel.

2. CLEAN STALLS AND BEDDING: Ensure that all horses are placed into recently cleaned and sanitized stalls with fresh bedding.

3. KEEP DETAILED RECORDS: Know the average body temperature of horses in your care and monitor temperatures twice a day at home and when traveling. Often, an elevated temperature is the first sign of illness.

4. PRACTICE GOOD HYGIENE: Be sure you and your technicians or employees wash their hands between handling horses. As in a hospital, consider placing hand sanitizer stations through-

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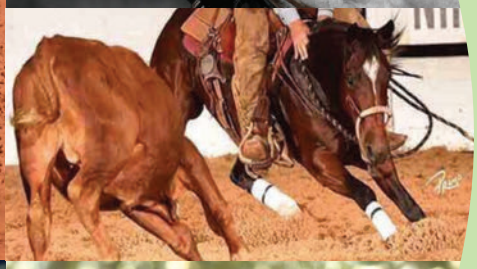

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* Freedom of Information Summary, Original New Animal Drug Application, NADA 141-427, for OSPHOS. April 28, 2014.

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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.

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

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

PRECAUTIONS: 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.

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out the clinic and the barn, and instruct your employees to use them frequently.

5. MINIMIZE NOSE-TO-NOSE CONTACT OPPORTUNITIES: Attempt to separate horses to prevent nose-to-nose contact. Avoid the use of community equipment and water sources, including hoses and buckets.

6. IMPLEMENT QUARANTINE AREAS FOR TRAVELING AND INCOMING HORSES: Even with current paperwork, it's a good idea to create a separate quarantine area for new incoming horses and horses returning from a competition or event. Separate and monitor these horses for 30-45 days for signs of infectious disease.

Additional guidelines can be identified through the following three primary treatises:

1. Equine Disease Communication Center (EDCC): equinediseasecc.org. This site was created to track and report via an automatic alert system the threats and outbreaks in horses by region. This site should be consulted before traveling to any event.

2. AAEP Biosecurity Guidelines: aaep.org/guidelines/infectious-disease-control. Written and updated by the AAEP Infectious Disease Committee, these guidelines suggest that veterinarians are expected to recommend measures for prompt containment of infectious disease that involve isolation and treatment of affected individuals while preventing spread of disease to the unaffected population. The Guidelines emphasize the importance of a "first response" plan with details.

3. EDCC National Equine Health Plan Roles & Responsibilities Guidelines: equinediseasecc.org/national-equine-health-plan and equinediseasecc.org/roles-and-responsibilities

These two publications outline the suggested roles and responsibilities of all relevant stakeholders, including government health officials, treating veterinarians and owners in identifying, addressing, containing and eliminating the spread of equine contagious diseases.

These provided protocols should be reviewed and implemented by all equine veterinary clinics as well as presented to the clinic's clients, either in pamphlet or educational symposium format.

Take-Home Message

The veterinarian is the most qualified person to guide an outbreak prevention and control plan. Each infectious disease outbreak is unique, and an existing plan might require modification depending on circumstances.

A frank and truthful informational exchange between clients and veterinarians is essential. Prompt and honest communication will significantly reduce the liability exposure of both the veterinarian and the owner of the infected animal(s). EM

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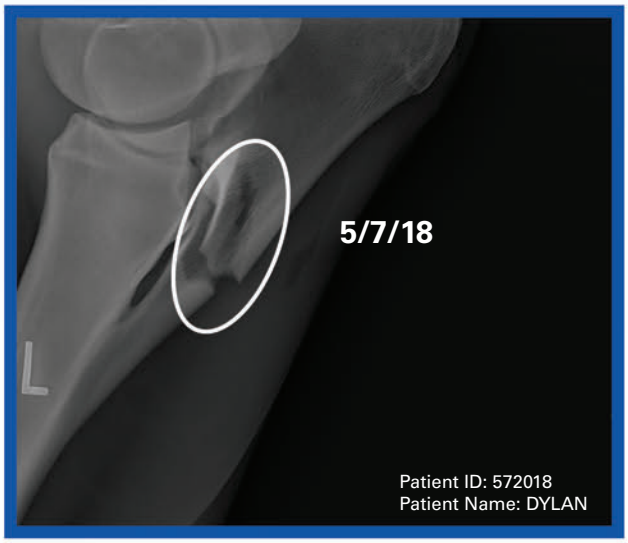

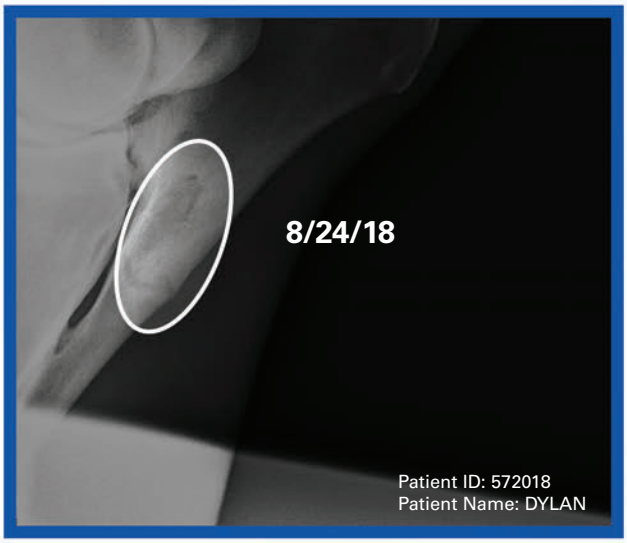

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"As horse owners, you know we will try anything especially when we are desperate.

My 24-year-old Thoroughbred, Dylan, broke his leg (Olecranon fracture) on May 7, 2018. It was a bad break for a 24-year-old and, at that age, you know it's a long road to recovery, if it heals at all.

My vets were amazed at the quick progress after we started Dylan on OCD Pellets. They said the improvement was remarkable and were impressed that he was still alive!

I have to say, going from the first day of injury wondering if I would have to put down my best friend to now trotting him in hand with no sign of lameness... Thank you, Doc's and OCD Pellets! **YOU SAVED MY HORSE DYLAN'S LIFE.**"

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Researchers are looking at a new live-attenuated, cold-adapted equine influenza vaccine.

Infectious Disease Research Studies

Ongoing research into equine infectious diseases will mean better ways to protect and treat the problems.

By Nancy S. Loving, DVM

There is always ongoing research on infectious diseases in horses. In this article we focus on three published research reports that might have implications for many of your equine patients.

Live-Attenuated Equine Influenza Vaccine

(Editor's note: There has been ongoing research on this equine influenza vaccine since this information was reported in peer-reviewed literature. Expect more information to be published soon, so be on the lookout for that journal article. Also please note that this is about an experimental vaccine, not one that is commercially available.)

It has been several decades since a live-attenuated equine influenza vaccine (EIV-LAIV) has been updated. Most flu

vaccine research has focused on inactivated (killed) virus in intramuscular and intranasal forms.

The H3N8 equine influenza virus has crossed beyond equines into dogs such as racing greyhounds sharing a track with horses, and also to pigs and camels; there is concern regarding its potential to threaten humans.

Researchers at the University of Rochester investigated an updated, intranasal, live-attenuated, cold-adapted flu vaccine administered first to mice and ferrets with following trials done in horses [Baz, M.; Paskel, M.; Matsuoka, Y.; et al. A Live Attenuated Equine H3N8 Influenza Vaccine Is Highly Immunogenic and Efficacious in Mice and Ferrets. *Journal of Virology*, Feb 2018, vol. 89. No. 3; pp. 1652-1659].

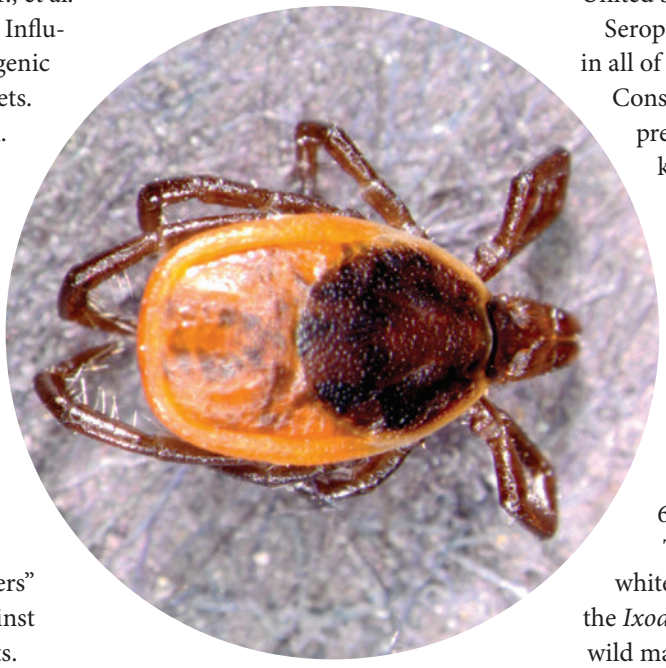
This influenza vaccine is being developed using reverse genetics—using recombinant DNA technology, it begins with a protein or DNA that contains no genetic information, then working backward, investigators produce a mutant gene phenotype with a specific function. A single dose of the vaccine significantly generated "robust neutralizing antibody titers" that provided full protection against viral challenge in mice and ferrets.

The vaccine was further tested on four yearling or 2-year old horses; two other similarly aged horses served as controls [Rodriguez, L.; Reedy, S.; Nogales, A.; et al. Development of a novel equine influenza virus live-attenuated vaccine. *Virology* 2018, vol. 516; pp. 76-85]. Control horses were separated so there would be no shedding of nasal vaccine to them from those immunized.

In the days immediately following intra-nasal administration of vaccine, none of the vaccinated horses developed fever; one horse coughed once; and three horses had a slight, bilateral serous nasal discharge on days 2 and 3 following challenge.

Virus shedding was identified with PCR of nasopharyngeal swabs on days 1-3, with its peak at day 2, indicative of viral replication. Viral challenge of H3N8 EIV was given via nebulizer at 27 days after the horses received a single dose of intranasal spray vaccine.

Despite viral exposure, none of the vaccinated horses developed flu-like signs such as fever, nasal discharge or cough, whereas both controls did. There was some swelling of the submandibular or parotid lymph nodes in all the horses, but the severity was greater and the duration longer in the controls.



***Ixodes scapularis,* better known as the black-legged tick**

An attenuated live vaccine is able to elicit greater immune responses that provide longer periods of protection than what is achieved with killed flu viral vaccines.

Administration through the nasal route simulates how a horse would acquire a natural infection and the subsequent mucosal immune responses. The study concluded that the horses vaccinated with this new EIV-LAIV are protected very quickly from EIV challenge with just a single dose.

Another key feature to this vaccine is the ability for the manufacturer to rapidly update it by introducing new influenza strains that develop through antigenic drift.

Lyme Disease

Lyme disease caused by *Borrelia burgdorferi* infection has become a more pressing problem in horses, people and dogs in endemic areas where *Ixodes* ticks (black-legged and deer ticks) abound, especially in the Northeast, Northwest and Midwestern parts of the United States.

Seroprevalence has been on the rise in all of these areas. The 2018 ACVIM Consensus Report provided a comprehensive description of all that is known about the disease in horses [Divers, T.J.; Gardner, R.B.; Madigan, J.E.; Witonsky, S.G.; Bertone, J.J.; Swinebroad, E.L.; Schutzer, S.E.; and Johnson, A.L. *Borrelia burgdorferi* Infection and Lyme Disease in North American Horses: A Consensus Statement. *J Vet Intern Med* 2018, vol. 32; pp. 617-632].

The bacterial reservoir occurs in white-footed mice and gray squirrels; the *Ixodes* tick reservoir includes large wild mammals. Several hours might be necessary to allow transfer of the bacteria to the mammalian host, following which *Borrelia* spreads through the connective tissue and into the blood for systemic dissemination.

It takes three to four weeks after exposure until testing methods can detect antibodies indicative of exposure. Exposure does not always mean a horse has developed active infection.

The ACVIM Consensus Statement noted that "Positive serology confirms past exposure or present infection but does not confirm clinical disease. Regardless of test methodology, a positive result does not prove causation of current clinical signs (clinical infection), nor does a positive result predict wheth-

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Clinical signs of Lyme disease can be widely varied and can include back and neck stiffness and shifting limb lameness.

er infection is likely to cause clinical signs in the future. There is no known correlation between magnitude of titer and likelihood of disease."

Clinical syndromes associated with Lyme disease infection include: 1) neuroborreliosis; 2) uveitis; and c) cutaneous pseudolymphoma.

Lyme disease signs are highly varied, including:

- atrophy of spinous muscles
- dysphagia
- facial paresis
- laryngeal dysfunction and respiratory distress
- spinal cord ataxia and paresis
- behavioral changes
- hyperesthesia
- fasciculations
- neck and back stiffness with pain
- uveitis
- joint effusion
- cardiac arrhythmias
- cranial nerves dysfunction
- radiculoneuritis
- meningitis

Practitioners have noted that horses presumptively infected with *Borreliosis* often have shifting limb or intermittent lameness; however, the association of *B. burgdorferi* infection with stiffness and lameness is not well documented, according to the Consensus Statement. Many other equine diseases cause development of clinical signs similar to those of Lyme disease, so diagnostic testing needs to rule possibilities in or out. Co-infection with other disease should also be considered.

Treatment protocols have been extrapolated from human treatment guidelines, *B. burgdorferi* antibiotic susceptibility and anecdotal reports. In general, tetracycline and derivatives (doxycycline and minocycline) and β-lactam medications (penicillin and cephalosporins) are used.

To date, clinical trials are lacking for evaluation of which drugs best treat the myriad of overt and obscure clinical signs associated with Lyme disease. Bioavailability of oral medications is significantly different between humans and horses, so human information is not reliable for horses.

Duration of treatment is also not defined, but the report suggested basing it primarily on the horse's clinical response and to a lesser extent on decline in serum antibody levels. Horses might remain serologically positive for months, or even years, following antibiotic treatment.

There is a low positive predictive value for serological testing for clinical signs

of Lyme disease. With that in mind, the disease might be over-diagnosed in endemic areas. For horses that are seropositive, the Consensus Report recommended the importance of excluding other potential causes before initiating antimicrobial therapy.

Tick control is essential to prevention. Horse owners should check their horses often and remove ticks as soon as possible. The report also recommended "tick-scaping" practices for environmental control: Dry, sunlit, regularly disturbed and clean areas that are well-maintained have fewer ticks. Keep horses away from wooded areas and transition zones into wooded areas. Mow pastures and clear away leaves and debris. Exclude deer as best as possible from proximity to horses. That said, the report emphasized that ticks survive fine in stalls and pastures even through winter.

Insect repellants might deter tick attachment for a few hours, but most products need frequent re-application. Off-label use of canine Lyme disease vaccines has been attempted in horses, but protective antibody levels drop significantly by four months.

Antimicrobial Resistance

A review of recent infectious disease research studies would be incomplete without broaching the topic of antimicrobial resistance (AMR).

An editorial column in an equine veterinary journal stressed how important it is for veterinary practitioners to embrace antimicrobial stewardship [Rendle, D.I., and Page, S.W. Antimicrobial resistance in companion animals. *Equine Veterinary Journal* 2018, vol. 50; pp. 147-152]. The authors stated, "We must assume responsibility for the most efficient and parsimonious use of antimicrobials."

Part of the recipe for minimizing reliance on antimicrobial agents is to implement preventive and control measures to prevent disease in the first place, along with strategies and diagnostic

DUSTY PERIN

It is important for equine veterinarians to embrace antimicrobial stewardship when treating animals.

tools (bacterial culture and sensitivity testing, for example) for early recognition of illness.

Another principal element to consider with use of antimicrobials is their effect on the intestinal microbiome. Lately, much light has been shed on the importance of the microbiome to general health and to the immune system of all species.

Rendle and Page further stressed, "The use of critically important antimicrobials in the absence of sound clinical justification in equine practice remains common and is inexcusable when there is clear evidence that their use promotes the development of resistance that presents a significant threat to human and animal health."

Part of the reasons for using critically important antimicrobials such as fluoroquinolones and cephalosporins is based on convenience along with client demand. Equine practitioners can play an important role in educating clients and not succumbing to the ease of convenience.

Multiple drug resistant (MDR) pathogens and their genetic determinants of resistance are able to cross between animals and humans through close contact, through the food chain and through the environment. This possibility amplifies the adverse consequences of casual use of antimicrobial drugs without evidence-based science to justify their use. EM

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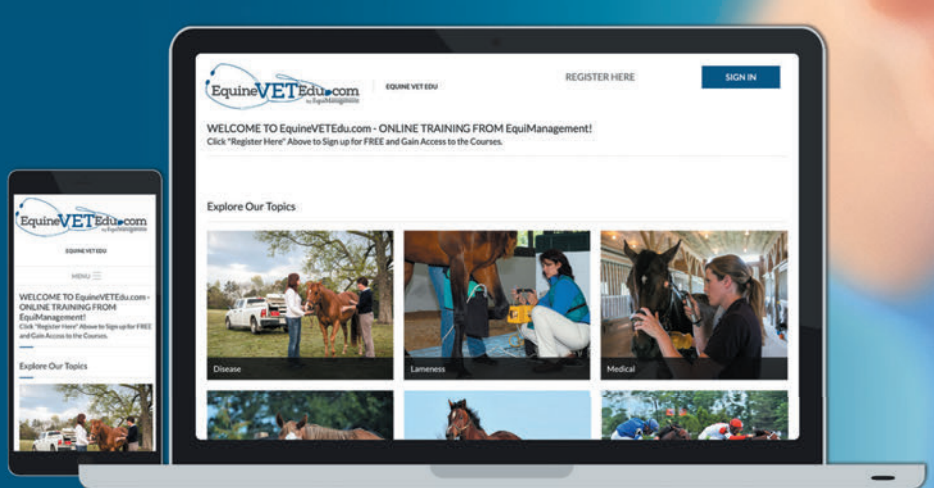

Have questions? Contact Michelle Adaway at madaway@aimmedia.com

This AquaPacer is located at Fossil Creek Equine Center in Texas.

COURTESY AQUA TREADMILL

Designing Equine Rehabilitation Facilities

Building a simple, cost-effective space can make physiotherapy a rewarding extension to an existing equine medical practice.

By Heather E. Lewis, AIA, NCARB

Most of us have had physical therapy after an injury. Often, physical therapy can supplement rest and anti-inflammatory medications to help us heal properly. The same is true of other species. As we understand more about how to treat and prevent musculoskeletal injuries in animals, the field of physiotherapy has grown. Equine physiotherapy is particularly interesting because of the need for excellent techniques to care for the equine athlete.

One challenge for those who want to develop their rehabilitation practices is that there is little written about the spatial and infrastructure requirements for accommodating equine therapies. In this article, we will explore the design considerations for common therapeutic modalities.

The Basics

With a few exceptions, rehabilitation spaces do not require fancy infrastructure, and they can be created in cost-effective buildings. This is different from equine medicine and surgery, which require specialized environments.

Nevertheless, if you want your rehabilitation services to be successful and efficient, there are some general design concerns, including:

- **Convenient access.** Horses visiting equine rehabilitation spaces are on controlled exercise regimens. So if you are designing a haul-in rehabilitation facility, ensure that the horses can be unloaded near the therapy areas.
- **A quiet environment.** For many reasons, equine physiotherapists need quiet and calm surroundings. It is difficult to perform many common therapeutic services, such as acupuncture, on horses when they are anxious. Infrastructure-intensive services (such as an underwater treadmill) become more dangerous in chaotic environments. Follow these general rules for facility design:
  - Place rehabilitation spaces away from the center of activity. You'll need to unload horses near the therapy areas, as previously described, but otherwise restrict activity and vehicular flow near where therapies are occurring.
  - Insulate the roofs of the rehabilitation spaces to prevent pounding rain and sliding snow from disturbing the horses.
  - Keep your rehabilitation horses calm by housing them in stalls near where they will be receiving therapies.
- **Open and flexible buildings.** Prefabricated metal buildings with free spans and no internal columns work well for practices with multiple modalities. For therapies that need to be enclosed with wall dividers, placing these within an otherwise open structure will allow for easier future reconfiguration. Free-span buildings also allow for completely open spaces for big equipment such as pools and free walkers.
- **Well-ventilated and -conditioned spaces.** Staff members working with the horses need to be comfortable, and the spaces need to be ventilated well enough to be safe and healthy. An equine rehabilitation space has higher ventilation needs than most barns and should be vented at least at four to six air changes per hour—and more, if aqua therapies are used.
- **Natural light.** Horses and staff members will be happier if natural daylight is introduced into the therapy spaces. Place openings along the tops of the walls or install frosted skylights in the roof that will introduce soft light without the visual distraction and safety concerns of low windows. Rolling barn doors on one side of a therapy space can also be a way to introduce fresh air and natural light into the space on nice days.
- **Care and consideration for footing and flooring.** The last thing you want is for a horse with a pre-existing injury or neurological condition to slip on a surface within the rehabilitation area. Many people use rubber mats over concrete, as this is inexpensive and effective. If this is your solution, clean the mats well and dry them often or seal them to the concrete slab to prevent bacterial growth.

Designing for Specific Therapeutic Modalities

Exercise protocols. The foundation of physiotherapy is directed activity, with protocols based on the injury. Thus, having access to a properly sized arena for workup or directed exercise is important. Indoor arenas are ideal because

This is an example of an outdoor arena for workup and directed exercise.

FOTO IMAGERY/TIM MURPHY

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You can add a special heat lamp system for use over a horse for therapy. Make sure you have the electrical infrastructure to support the equipment.

they can be used year-round. The arena should be at least 90 feet across on the shortest side of the working space.

Solarium. These specialized heat lamp systems are placed over where a horse is cross tied. Because the infrared/UV lighting equipment is expensive and hangs relatively low, the tie area should be an alcove and *not* a walking path. As an example, a typical wash-stall shape and dimension makes a good solarium, and sometimes solariums are integrated into wash stalls so the horse can receive warm therapies after bathing. The wattage of these figures is impressive, so ensure you have the electrical infrastructure in place prior to ordering the lights. The lights also give off heat (this is what benefits the horse), so locate a quiet exhaust fan near the solarium to expel overheated air. In hot climates, it might be necessary to separate the solarium so that it does not negatively affect the comfort of the other barn/arena areas.

Free walkers. Free walkers are used in some physiotherapy practices. These circular structures are designed to promote exercise without the unnatural restraints used in hot walkers. The equipment itself takes up a tremendous amount of room, and of the manufactured sizes, larger ones (60 foot and above) are used in rehabilitation and conditioning settings to avoid moving horses in tight circles.

There are almost no special spatial considerations for this equipment other than its physical space and power needs, which can be obtained from the manufacturer. However, if you plan to have a free walker indoors, follow these guidelines:

- Keep the equipment in its own space to keep dust down in the rest of the rehabilitation facility.
- Allow room to move completely around the equipment to access the horses for safety reasons.

Chiropractic and acupuncture services. Horses are typically held with a lead rope during these treatments. The physiotherapist must stand on a mounting block to properly access the horse's back. Considering the requirement for free access on each side of the horse, a standard barn aisle is often too narrow to feel comfortable and safe. If you were designing without constraints, a space for chiropractic or acupuncture should be a minimum of 16 feet in the smallest dimension and should be placed away from walking areas—such as barn aisles—to prevent distractions.

Other standing therapies. Many equine physiotherapies can be performed on a standing horse, including therapeutic ultrasound, equine shockwave therapy and some types of cryotherapies. These, like chiropractic and acupuncture services, are best done in a


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space that allows for adequate circulation all around the horse, or at least 16 feet in the smallest dimension. Ensure there is a power outlet in this space for plugging in equipment. Machines used for standing therapy can be expensive, so design a secure and lockable storage closet near the therapy area.

Vibration plate. Vibrating floor plates are meant for horses to stand on. While it is possible to purchase one that is set up in a set of stocks, we prefer the type that are integrated with a stall floor because they allow the option for the horse to move around normally. The area that is needed for a single horse to use a vibration plate is a 12 x 12-foot typical stall, although the stall can be larger in special circumstances. Coordinate the power requirements with the manufacturer.

Aqua therapies. Aqua therapies are the most complicated to incorporate in a design. From saltwater spas and underwater treadmills to in-ground treadmill pools and larger swimming pools, the key to a successful design is to ensure you hire professionals to design the space around specific manufacturer requirements. Verify the following:

- Clearance around the equipment item should be as required by the manufacturer and as required by you for the horse to safely enter and exit the water element.
- Structural support. Pools are incredibly heavy, and a structural engineer must confirm that they are properly supported by surrounding soil and concrete (if an in-ground application) or slab design (if set on a slab).
- Pumps and filtration equipment. Often a pump room is required.
- Drainage infrastructure for the equipment. The water must be drained and cannot simply sheet flow onto the floor. Ensure the dump from the aqua therapy machine is coordinated with the plumbing design. Dumping from a large machine will overwhelm a typical septic system. Coordinate locally legal means for discharging a large amount of water with a plumbing and/or civil engineer.
- Electrical infrastructure and safety is critical, as this will be a wet environment.
- Noise control. This is often overlooked, but aqua therapy spaces can be very loud. Engage a knowledgeable architect or an acoustical engineer to help you with sound mitigation in the aqua therapy room.
- Humidity and ventilation. Where there is a lot of water, there is also a need for enhanced ventilation. A mechanical engineer should review the space and design a ventilation system to accommodate the loads from the aqua therapy equipment.
- Cleaning equipment. You will need hoses, disinfectants, etc. to keep this room clean.

- Very safe flooring. A hydrotherapy room will be challenging, as water can make slips and falls more likely. Use non-slip rubber surfaces where horses are walking (rubber has a similar coefficient of friction when it is wet or dry), or you can use more expensive poured equine floors. Triple check the reputation of the flooring manufacturer and check references.

Hyperbaric oxygen therapy (HBOT). Hyperbaric oxygen is used increasingly in veterinary medicine for a variety of treatments and therapies. Equine HBOT is performed in a chamber that is horse sized, and the horse is alone in the chamber, without a handler, during the therapy. As with any large equipment, hyperbaric oxygen chambers have their own design challenges, including:

- The chamber must be placed into its location by a crane and rigging, so this must be considered within the design and construction sequence.
- Work carefully with the manufacturer of the equipment and ensure all requirements are met.
- Discuss the large liquid oxygen dewars with the local fire marshal to ensure they are set up to meet local and national fire protection codes.
- Prevent sparks at all costs. A 2012 explosion of an HBOT chamber at an equine rehabilitation facility revealed that the horse in the machine kicked the sides of the chamber enough to cause sparks, which led to the explosion. While spark prevention is mostly operational (i.e., the horse should be properly sedated, metal shoes should be removed or covered), there are several construction considerations, including:
  - Separate fuel burning equipment from the HBOT building.
  - Ventilate the space to prevent the buildup of oxygen.
  - Use anti-static mats where personnel will be standing and working.
  - Humidify the air during the winter, when indoor environments are dry, or all year around in a dry climate.
  - Follow all codes for electrical equipment, prohibit extension cords, ground outlets, etc.
  - Ensure that there is a safe, convenient and code-compliant exit or exits from the HBOT space. For example, use a human door for humans to enter and exit the space rather than a large rolling barn door.

Take-Home Message

While some of these modalities require a bit of design coordination, the opportunity to begin practicing some of these therapies within a simple, cost-effective space can make physiotherapy a rewarding extension to an existing equine medical practice or a stand-alone rehabilitation practice. EM

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Our website and social media platforms offer original content for readers.

By Kimberly S. Brown

If you enjoy the news, articles and equine health information found in *EquiManagement* magazine, then make sure you visit EquiManagement.com. We post new articles, news items and equine research synopses on the website throughout the week. Following are recent Research & Medical articles published on EquiManagement.com that you might have missed. You can search for them by article title or keywords.

Endocrine-Disrupting Chemicals Linked to Equine Metabolic Syndrome

The study demonstrated the presence of EDCs in equine plasma and an association with EMS.

Equine Core Muscle Rehab Following Colic Surgery

A study looked at the effect of core abdominal rehabilitation exercises for four weeks following colic surgery and how that influenced a horse's return to performance.

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Mowing pastures in active growing seasons can help reduce the NSC intake of horses, thus decreasing insulin response.

Disease Du Jour

We also post alerts to our bi-monthly podcast Disease Du Jour, where we delve into the research and current best practices for a variety of equine health problems with industry experts. Recent Disease Du Jour podcasts featured:

Episode 9—Kent Allen, DVM, talks about Lameness Diagnosis and ISELP.

Episode 8—Roberta Dwyer, DVM, MS, DACVPM, discusses biosecurity factors to best prevent and control disease spread on client farms.

Episode 7—Martin Nielsen, DVM, PhD, DipEVPC, DACVM, discusses the equine parasites.

Episode 6—Peter Timoney, MVB, MS, PhD, FRCVS, discusses equine infectious diseases that compromise normal pregnancy and the adolescent horse.

Episode 5—Robert Holland, DVM, PhD, talks about Respiratory Tips from the Field.

Episode 4—Bonnie Barr, VMD, DACVIM, talks about common neonatal problems.

Episode 3—Tom Chambers, PhD, who heads the OIE Reference Laboratory for equine influenza at the University of Kentucky, discusses equine influenza.

Episode 2—Tom Riddle, DVM, DACT (hon), discusses breeding season procedures that he has developed over his decades-long practice.

Episode 1—Steve Reed, DVM, DACVIM, discusses equine herpesvirus.

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