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Service Builds Beneficial Relationships

Alison LaCarrubba, DVM, DABVP

You may have noticed that the Veterinary Medical Teaching Hospital recently became the Veterinary Health Center. This new name better encompasses all that we offer. We are a true health center with complete medical and surgical care for all of your animals, and this umbrella now encompasses our diagnostic laboratory services as well. We are proud of our facility and believe the new name better reflects our true capacity.

A number of our faculty, including Martha Scharf and myself, continue to work and train with the Boone County Fire and Rescue. Together we have formed a local large animal rescue team. The goal of this group of veterinarians and rescue workers is to better facilitate the rescue of large animals, improving safety and increasing the number of successful outcomes in difficult situations.

The group participated in a weekend-long training session with a world-renowned large animal rescue specialist, Rebecca Gimenez. By working together, the group has been able to utilize each other's strengths and improve upon our weaknesses. We have continued to meet and train together over the summer and fall. We plan to work toward community outreach by training other, more remote fire departments and veterinarians in techniques to safely rescue large animals.

Remember as we enter the winter months, it is important to consider the challenges that cold weather brings to our horses. Heated water troughs and buckets can encourage water consumption, even on the coldest days. Offering good-quality hay and shelter from the wind and pre-



A weekend course in large animal rescue brought together first responders and veterinarians.

precipitation is critical to getting our horses through these sometimes trying months.

For the third year in a row I have participated in the Missouri Veterinary Medical Association trail ride. This is when veterinarians turn in our stethoscopes, and enjoy a weekend of friendship and camaraderie with veterinarians from all over the state. It's wonderful to talk shop with veterinarians from all walks of life: large animal, small animal and mixed alike. The weekend-long trail ride and camp-out is relaxing and an excellent reminder of why we do what we do.

The most rewarding part of this job has been creating long-lasting relationships and friendships with my clients. Many of you have been such an inspiration for me to enjoy these beautiful fall days on horseback. Thank you all for your continued support and friendship over the years. We wish you the best this holiday season and look forward to seeing you in the new year.

Meet the MU Equine Ambulatory Team

Alison LaCarrubba, DVM, DABVP

Alison LaCarrubba, originally from New York, graduated from the University of Missouri College of Veterinary Medicine in 2001. LaCarrubba completed an internship in equine medicine and surgery at the university after graduation and subsequently spent a year working in an equine-exclusive private practice. She returned to the university in July 2003, and in 2009 she completed the credentialing process for the American Board of Veterinary Practitioners in Equine Practice. She is focused on becoming specialized in equine dentistry.

LaCarrubba continues to work with both the internal medicine and equine ambulatory services. She has focused her recent attention on expanding both the ambulatory and in-house dental programs. During the past couple of years LaCarrubba has attended a variety of advanced dental training courses and most recently spent time in Colorado learning new and innovative techniques for equine dental extractions. When she is not at work, she is spending time with her family, who fortunately share her horse addiction.

Martha Scharf, DVM

Martha Scharf practices equine ambulatory medicine at the Equine Hospital. Scharf was born in Chicago and grew up riding hunters/jumpers in St. Louis. Since moving to Columbia she has continued to ride and started to explore three-day eventing. After earning a DVM at MU, she completed a rotating equine internship at the university. She then continued to work as a clinical instructor for the equine ambulatory service.

Scharf spends the majority of her time instructing senior veterinary students while providing quality medical care for horses within the Columbia area. She is particularly interested in wound management and emergency care in the ambulatory setting. Scharf works closely with the referral clinicians in the Equine Hospital to provide superior care to horses.



Dee Whelchel, DVM, DACVIM-LA

Dee Whelchel works with both the equine internal medicine and ambulatory services. Whelchel is originally from Atlanta, where she grew up riding hunter/jumpers. She attended Emory University for undergraduate studies and completed a master's degree in physiology at the University of Georgia with a research focus on botulinum neurotoxin. She completed her DVM program at the University of Georgia followed by a one-year internship in large animal medicine and surgery at Texas A&M University. Whelchel then returned to UGA to complete a residency in large animal internal medicine in 2011. During her residency, she researched low molecular weight heparin therapy in horses.

For the past three years, Whelchel has been in private practice in South Carolina where she worked both as an ambulatory clinician and a boarded equine internal medicine specialist. Her most recent experience was in Aiken, South Carolina, which is a unique multidiscipline equestrian community that includes three-day eventing, hunter/jumpers, thoroughbred training centers, and Fédération Équestre Internationale-level driving. Her professional interests include equine infectious diseases, endocrine disorders, respiratory disease, critical care, cardiology and neonatology. In her free time, she enjoys riding horses, biking and hiking.

Our interns have a special interest in working with horses, and potentially going on to complete a residency, specializing in either equine medicine or equine surgery. Every June we welcome a new crop of interns. This year our interns include Jael Pitts and Ellie Wahlberg.

Jael Pitts, DVM

Jael Pitts grew up in the small steel mill town of Follansbee, West Virginia. She attended The Ohio State University for her undergraduate studies in animal science and rural sociology. A 2014 graduate of the University of Missouri College of Veterinary



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Clinicians Help Teambuilding at VET

Martha Scharf, DVM

Two clinicians from the Veterinary Health Center Equine Hospital, Martha Scharf, DVM, and Shannon Reed, DVM, participated as facilitators during an annual communications and leadership training camp for incoming veterinary students held in the Missouri Ozarks.

During four days prior to the start of the fall semester, 120 first-year veterinary students and 35 facilitators (including faculty, staff and second-year veterinary students) traveled to a camp in Roach, Missouri, for an intense schedule of orientation, wellness seminars and team-building exercises. This interactive course, known as Veterinary Enrichment and Teambuilding (VET), provides a foundation of communication for the new professional students through team-based discussions and exercises.

During the course of the week, the students and facilitators faced numerous voluntary tasks directed at reinforcing the skills necessary for



VET gives incoming first-year students the chance to meet their new classmates and develop communication skills.

career-long personal wellness and professional communication. These activities are structured not only to foster new relationships between

classmates, faculty, and colleagues but also to develop leadership, trust, problem-solving and self-awareness.

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Interns, Continued from page 2

Medicine, Pitts completed a 13-month equine surgery internship at Hagyard Equine Medical Institute (HEMI) in Lexington, Kentucky. While at HEMI, she gained experience working with many breeds of horses that participated in varied equestrian discipline and also solidified her love of working with racing thoroughbreds.

Her professional interests include surgery and sports medicine. Following the internship at Mizzou, she hopes to pursue a surgical residency. In her free time, she enjoys spending time with family, friends and her dog, Roo2, and riding her off-the-track thoroughbred hunter, Sangria.

Ellie Wahlberg, BVetMed

Ellie Wahlberg, originally from Rhode Island, grew up riding horses and participated in local

horse shows until the age of 18, when she left to attend the University of New Hampshire. She graduated with a degree in equine science from UNH in 2008. After taking two years off, she attended the Royal Veterinary College in London, England, and graduated in 2014. She completed a year-long hospital internship in June of 2015 at Rood and Riddle in Saratoga, New York, where she primarily worked with thoroughbred and standardbred horses.



Her clinical interests include lameness, sports medicine and surgery. She plans to pursue equine general practice after her internship at Mizzou. In her free time she enjoys hiking, kayaking, biking and playing piano.

The camp was structured around core interactive sessions with large groups of students, focusing on communication, wellness, stress prevention and professionalism. These discussions prepare students for the challenges of professional school and allow sharing of mutual anxieties, experiences and knowledge.

These fundamental skills were then translated into extensive outdoor team-building activities in smaller groups, allowing direct interaction and participation. Tasks included search-and-rescue scenarios, low element tasks and high-ropes courses, each providing their own mental and physical challenges, and followed by a group-specific self-analysis, debriefing and correlation to veterinary medicine.

This experience was an opportunity for participants to learn about themselves and peers in a fun, challenging and deeply enriching environment. It served as an invaluable opportunity for clinicians to get to know the new students outside of the classroom setting, foster friendships, offer mentorship and expand communication.

Further, the underlying principles of the training offered profound insight into effective collaboration, understanding, teambuilding and empathy, all of which can be translated into daily interactions with students, colleagues, clients and patients. Concluding the 11th year of this program, Scharf and Reed say the success of these lessons can be seen in rich, non-technical skills of veterinarians and veterinary students in the college, and translate well into a good experience for clients and their animals.



Our doctors examine Snort and diagnose a disease affecting his neurological system.

EPM Responsible for Horse's Limb Weakness

Case Study

Martha Scharf, DVM

Snort, a 21 year-old American Saddlebred gelding, presented to the MU Equine Ambulatory Service this spring for a one-week history of left hindlimb weakness. The retired show horse lives on a 20-acre pasture with one other younger saddlebred. The horses are fed, cared for and checked daily, but otherwise allowed to self-exercise in their paddock. In the days prior to examination, the horses' caretaker noticed Snort's decreased willingness to move and apparent hindlimb weakness. A veterinary evaluation was requested as these signs progressed.

At presentation, the horse was bright, alert, and reactive, willingly walking across the pasture to the gate. However, markedly atypical ambulation was apparent as he walked. The horse showed striking weakness on his left side, resulting in a significant leaning toward the right hindlimb. This abnormal weight distribution caused him to travel sideways across the pasture as he moved. Once the horse was haltered, he was willing to stand quietly for examination, but would lean heavily on the right hindlimb until

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Case Study, continued from page 4

he stumbled and righted himself. Additionally, while standing, Snort adopted several abnormal left forelimb positions, including crossing the limb over the right forelimb and spreading it far out to the side.

Examination of the limbs revealed no abnormalities that might indicate injury or lameness, but left-sided muscle loss was noted. The horse was also walked in hand to evaluate his gait, but he was too unsteady to perform a complete neurological examination safely. It was concluded that Snort lacked strength and awareness of his left forelimb and left hindlimb. Given the sudden onset and asymmetry of the weakness, it was suspected that Snort had experienced sudden neurological damage such as a traumatic injury to his nervous system or a disease like equine protozoal myeloencephalopathy (EPM).

EPM is a neurological disease caused by the protozoa, *Sarcocystis neurona*. Horses ingest sporocysts from this parasite through inadvertent consumption of opossum feces and become infected with the protozoa. The protozoa mature and migrate through the nervous system, creating an unpredictable pattern of inflammation and damage.

As a result of the parasites, the horse can experience a wide variety of neurological signs depending on where the migration occurs. Signs can mimic many different lameness and neurological diseases, but tend to include asymmetrical weakness, incoordination and muscle loss. The disease can be difficult to definitively diagnose. Diagnosis can be suggested by blood tests and confirmed by spinal fluid analysis.

Blood was collected to test Snort for EPM, and he was treated aggressively with anti-inflammatory medications until these results came back. His blood test confirmed marked exposure to *Sarcocystis neurona*. It was



Snort displayed significant weakness and incoordination prior to treatment.

Snort decided not to confirm this diagnosis with spinal fluid analysis due to the risk of necessary sedation or trailering a markedly uncoordinated horse.

Snort was treated with Marquis (ponazuril) paste and anti-inflammatory medications for the next week until he became refractory to the paste administration. He was then switched to treatment with Protazil (diclazuril) pellets. The horse slowly improved, gaining strength and coordination over the month of treatment.

Following cessation of medication, re-evaluation was requested due to mild recurrence of weakness, moderate lethargy and acute weight loss. Blood work, oral examination and fecal egg count results revealed no alternative explanation for the horse's weight loss beyond the previously diagnosed EPM. Therefore, a second month of Protazil treatment was initiated.

Within days, marked improvement in Snort's attitude and coordination were noted. He continued to improve over the course of the second month of therapy, improving his energy, body condition and generalized health to his pre-infection status. Since finishing treatment, Snort has maintained his health and coordination, playing in the pasture with his herd mate and seemingly unaware of his status as a senior horse.

Obesity and Health Issues in Horses

Ellie Wahlberg, BVetMed

What is obesity?

Obesity is defined as the presence of excess fatty tissue (adipose) in an individual. This happens when caloric intake is higher than caloric expenditure. In other words, when a horse eats more calories than it can burn in a day, it will gain weight. This can occur when a horse is turned out in lush green pasture, when we feed more grain than is needed or when horses don't exercise enough to match their food intake.

Horses in the wild go through yearly changes in weight; they gain weight in the summer when food is abundant and lose weight in the winter when food is sparse. They produce hormones that help them maximize their weight gain during the summer and early fall in order to survive through the long, cold winter.

Domesticated horses typically do not go through this period of weight loss in the winter because we are able to provide them with good quality, nutritious hay and grain all year long. However, they still go through the hormonal changes that wild horses experience to maximize weight gain in the summer and fall.

Why is it so bad?

Obesity in horses has been a growing problem in the industry for years. In some areas of the United States, up to 50 percent of the horse population is either overweight or obese. Our well-conditioned horses may be cuddlier, but too much weight can cause a lot of health problems that can be hard to

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fix. Excess weight can cause decreased athleticism; overweight horses have a higher energy demand, which results in a higher heart rate and respiratory rate and also poor heat tolerance. Laminitis, insulin resistance, liver disease and developmental bone disease in young horses are just a few of the disease conditions that can arise in horses that are overfed and overweight.

There is growing evidence that overweight and obese horses can be prone to a disease called equine metabolic syndrome (EMS). Horses that suffer from EMS are easy keepers, tend to have a cresty neck and abnormal patches of fat on their body, and are prone to suffering from laminitis, a devastating disease.

How does obesity appear?

It is easy to check if your horse is overweight. Weight tapes can be used to get an approximate weight in pounds. There is also a body condition scoring (BCS) system for horses to assess their weight. The scale uses different places on the horse's body to assess for obesity, including the neck, ribs, spine and rump.

It is a 1 to 9 scale; a BCS of 1 is a horse that is severely emaciated, and a BCS of 9 is a horse that is extremely obese. The ideal BCS of a horse is a 5-6. Ribs should be palpable but not visible, the rump should be round (not heart shaped), the spine along the back should be flat without a crease, and the neck should be without fat patches and have a minimal crest (fat along the top of the neck). If your horse can hold water in his back, he is likely overweight or obese.

What can I do about it?

Decreasing caloric intake and regular exercise are simple things that you can do right away to help your horse lose weight. Limiting pasture access



A horse's weight can be estimated using a weight tape. This is an effective way to monitor the efficacy of a weight-loss program.

is perhaps the most important step when formulating a weight loss plan for your horse. Many horses and ponies affected by EMS should not have access to pasture, most importantly during the spring and fall growing seasons when the sugar levels in the grasses can be high and the pastures abundant. If you do not have a dry lot for your ponies, grazing muzzles can be a lifesaver.

There are also specific feeds directed at weight loss and low carbohydrate diets. These feeds can help limit your horse's sugar intake and overall caloric intake. Other tips include soaking hay to remove excess sugars or providing your horse with a hay net that limits intake so they have to work hard to get their daily feed intake.

Talk with your veterinarian to discuss a safe weight loss plan for your horse.

Regular Exams Can Uncover Dental Issues, Prevent Pain

Alison LaCarrubba, DVM, DABVP

For most of us, a visit to the dentist is not a favorite activity. If we could ask our horses, they would probably agree. But oral cavity health is critical to the health of the entire horse.

Most healthy adult horses do well with basic dental care; however, there are many horses that have significant and undiagnosed dental disease, which affects their overall health and well-being. As horses live longer lives, this becomes even more important. Horses can be stoic and have longstanding and significant dental issues that result in infections, abnormal wear of teeth and even premature tooth loss, without showing obvious signs of pain. Typically after dental disease is diagnosed and treated, owners notice a difference in eating behavior, temperament and performance.

Horses were designed to eat forage continuously throughout the day and night with their head down, rather than consuming fewer, large meals from a raised bucket. The types of feed a horse eats, along with grazing time and feeding conditions, influence the overall health of the horse's mouth. By changing the types and quantity of feed from mostly forage to mostly concentrate, we change how they chew and the amount they salivate. These changes can result in pathology and painful disease if left unchecked.

Horses chew from side to side and grind their feed with the rough surfaces of their teeth. As they chew, they sharpen the enamel layer near

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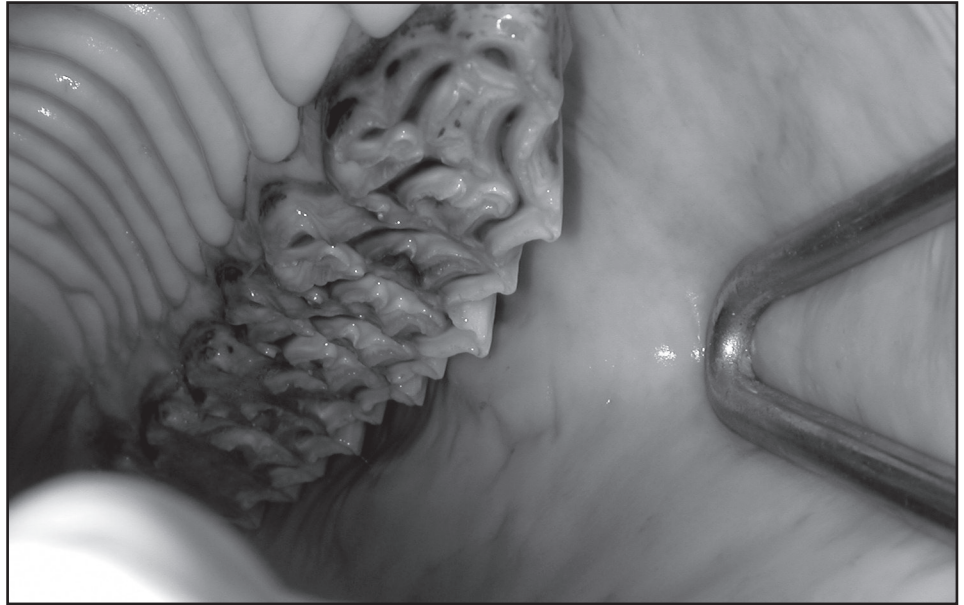
the cheeks on the upper arcades and near the tongue on the lower arcades. The most common signs horses show when they have sharp enamel points are dropping feed and abnormalities of chewing, either more slowly than usual or with their head to the side. Some horses also drool when they have sharp points, and some horses may even lose weight, especially older horses.

It is important to have a veterinarian perform a dental examination every six to 12 months on all horses to ensure that they do not have sharp enamel points or more significant oral cavity problems.

Historically, equine dentistry was mostly limited to dental floating, or rasping of the sharp enamel points. However, over the years, we have learned that it is important to address not just the sharp points, but to ensure overall proper function of the teeth and soft tissues of the oral cavity. Today, we focus on balancing the mouth and reducing abnormal forces on the teeth due to abnormal wear.

It is best to start routine dental examinations during the first year of life. Young horses often have the sharpest enamel points. Young horses often experience pain and biting problems associated with wolf teeth, blind (unerupted) wolf teeth, or retained caps (deciduous teeth), all of which can be easily addressed by a veterinarian, thereby alleviating frustrating performance issues. Wolf teeth, which can cause the greatest problems with bit interference, can be removed in the standing horse. Retained caps in 3- 5-year-old horses can cause pain, and at times can result in soft tissue trauma, which affects both performance and eating behavior.

Common abnormalities of adult horses include hooks, ramps and wave mouth. Hooks often develop when a horse's upper and lower arcades do not meet exactly, causing the first or



Horses naturally develop classic sharp enamel points.

last tooth in the arcade to grow uninhibited. The hooks can become so large that they damage the opposing soft tissue or bony structures. Hooks cause pain and result in abnormal wear of the remainder of the dental arcade but can be easily addressed during a routine float.

A ramp is excessive height to the lower premolar, or first tooth in the bottom arcade. A ramp develops due to a malocclusion, sometimes associated with abnormal shedding of caps. This condition decreases the mobility of the jaw and can result in pain and inability to chew properly.

A wave mouth is the presence of an uneven surface to the teeth that looks like a wave. If left untreated, the condition will worsen over time and typically will result in significant periodontal disease, loss of mobility of the jaw, excessively worn teeth and premature loss of teeth.

Extracting a horse's tooth is a significant endeavor and can prove difficult. The younger the horse, the longer the root and the more complicated the procedure. We typically attempt extractions in standing, sedated horses to decrease risk to our patients. A

young horse with long tooth roots may require general anesthesia in order to facilitate removal. Sometimes the roots of the affected teeth are so long they project into the sinuses resulting in sinus disease and infection that must also be addressed.

Miniature horses can present with issues specific to their breed. Miniatures are known for having dental abnormalities due to a lack of space in the oral cavity, resulting in increased incidence of dental impactions and subsequent tooth root abscesses. Regular dental examinations on miniature horses are vital in order to avoid major dental issues as they age. Often miniature horses are small enough to require specialized, smaller equipment that will fit into their oral cavity.

Dental disease can cause significant pain, infection and premature tooth loss. If addressed early, many of the dental diseases that affect horses can be prevented or controlled to extend the life of the horse. Whether they are high-end performance horses or geriatric pasture friends, it is important to have routine dental work performed on all horses. Caring for their teeth can result in a longer life and improve their quality of life.

Navicular Syndrome Blamed for Many Cases of Forelimb Lameness

Jael Pitts, DVM

One of the leading causes of chronic forelimb lameness involves pain referable to the heel of the horse. Historically, we have spoken of navicular disease, but more recently we refer to horses with a conglomeration of heel pain as having navicular syndrome. Navicular syndrome denotes pain not only associated specifically with the navicular bone, but all of the many soft tissues associated with that bone and that region.

Most commonly navicular syndrome affects both front hooves. This syndrome has been reported to cause a full one-third all of chronic forelimb lameness.

What is navicular syndrome?

Navicular syndrome is a group of conditions related to the navicular bone and surrounding structures. Surrounding structures include the suspensory ligaments of the navicular bone, distal sesamoidian impar ligament, navicular bursa and deep digital flexor tendon.

All breeds of horses can be affected, but the American quarter horse is particularly predisposed. Horses are most likely to be diagnosed between 6 and 10 years of age.

Why does navicular syndrome occur?

The cause is unknown. Interference of the blood supply to the navicular bone may play a role. Trauma to the bone is also a suspected cause, along with conformation, which will stress the heel area.



Lameness caused by navicular syndrome may be more severe when a horse is trotted in circles.

What are the signs?

Intermittent bilateral lameness of the forelimbs is most commonly noted. Lameness is often more severe when the horse is trotted in circles, such as lunging, and when trotted on hard ground. When the horse is circled to the left, the left front lameness may become more obvious, and when the horse is circled to the right, the right front lameness may become more obvious. Pain can often be elicited with hoof tester application over the frog, but not always. Navicular syndrome is just one of the multiple causes of forelimb lameness, so the above symptoms are not diagnostic of navicular disease, but may lead you in that direction.

How is navicular syndrome diagnosed?

Generally, a lameness examination including diagnostic analgesia is performed (nerve blocks block sensation to specific areas of the hoof or limb). Lameness often significantly improves when the heel is blocked

using local anesthesia. Radiographs of the hoof may reveal changes to the navicular bone, but the syndrome can exist without specific changes noted on radiographic images. Magnetic resonance imaging may aid in confirming the diagnosis and further reveal soft tissue injury or damage. Horses with a navicular bone that appears normal on radiographic examination, but consistently blocks out to the heel region, can have soft tissue damage that can be difficult both to diagnose and treat.

What treatments exist?

Corrective shoeing performed by an experienced farrier is generally the first step in treatment. Generally, it is recommended to shorten the toe, ease the break-over and elevate the heels. Your veterinarian will be able to provide radiographs and recommendations to your farrier if needed.

Anti-inflammatory medications may also be beneficial. Firocoxib (Previcox or Equioxx) can be used for long-term treatment with fewer gastrointestinal side effects than phenylbutazone. Phenylbutazone is a more potent anti-inflammatory, but has a greater chance of side effects and cannot be used safely long-term like firocoxib. Phenylbutazone can be used on an as-needed basis to control pain.

Depending on the exact cause of navicular syndrome, injections of the navicular bursa may be performed by your veterinarian. Other possible treatments include shockwave therapy, Tildren administration or OSPHOS injections. Consult your veterinarian to determine which options are best for your horse.

Equine Herpes Myeloencephalitis: An Emerging Disease That's Here to Stay

Dee Whelchel, DVM, DACVIM-LA

Many people have heard about equine herpes myeloencephalitis (EHM). This year EHM hit close to home with positive cases reported in the St. Louis area. Other states, including Colorado, Minnesota, Michigan, Oregon, New Jersey, Pennsylvania, Texas and Virginia, also reported cases this year. During the past 10 years, EHM outbreaks have been documented at racetracks, horse shows, veterinary hospitals, riding schools and group trail rides throughout North America and Europe.

In light of a perceived increase of occurrence, EHM has been characterized as an emerging disease, yet the virus responsible for the neurologic syndrome, equine herpesvirus 1 (EHV-1) has been around for a long time. With numerous reports in the horse media and cases closer to home, a lot of worry and at times false information has been circulated among equestrian communities. This article will arm you with some facts and ways to help you protect your horses.

EHV-1 is a common upper respiratory virus that infects most horses in the first year of life, causing symptoms including fever, nasal discharge and cough in younger horses. After initial infection, EHV-1 establishes latent infection for life in up to 80 percent of the equine population, making it almost impossible to eradicate. Further, latent infection can be reactivated in horses of any age, allowing these horses to shed virus and spread it to naïve populations. The virus is typically spread via nose-to-nose contact, contact with contaminated water buckets, water hoses, feed tubs, hoses, tack, stall cleaning equipment or personnel handling

The virus is typically spread via nose-to-nose contact or contact with contaminated water buckets, feed tubs, hoses, tack, stall cleaning equipment or personnel handling horses.



Stringent monitoring, quarantine and biosecurity measures are necessary to limit outbreaks of equine herpes myeloencephalitis, particularly at equestrian events.

horses. The virus does not usually survive for long periods of time in most environments.

Although the majority of EHV-1 infections result in upper respiratory disease, EHV-1 infection can also cause late-term abortion in pregnant mares, fatal pneumonia in neonatal foals, uncommon eye problems and neurologic disease. In most outbreaks, the majority of horses will suffer from mostly fever and respi-

ratory disease with between 10-40 percent developing EHM. Currently, we do not fully understand why some horses come down with the neurologic form of disease while others do not. However, infection with a specific genotype of the virus (D752), high fevers following exposure, stress, introduction of new horses, horses older than 3 years of age, and exposure to a greater number of biosecurity risks have been identified as potential risk factors for EHM.

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Symptoms of neurologic disease include ataxia (wobbliness), weakness that is often worse in the hind limbs and urinary incontinence. Severely affected horses may even become recumbent and unable to rise. Horses with longer durations of high fevers have been shown to have higher levels of circulating virus, thus increased loads of virus are more likely to affect the vasculature of the nervous system. Often when neurologic symptoms are noted, these horses are no longer febrile; however, other horses within the herd or facility may develop fevers, respiratory symptoms or neurologic disease as the virus is highly contagious.

In order to make a diagnosis of EHM in symptomatic horses, nasal swabs and blood are collected to determine levels of viral shedding or viremia (virus in circulating in the blood) through quantitative PCR techniques. In addition, virus isolation from affected tissues post mortem can be confirmatory.

Unfortunately, there is no vaccine labeled to prevent EHM; however, the current available vaccines for EHV likely reduce the severity of respiratory disease and associated viral shedding, which can help control spread of the virus. We recommend vaccinating most horses every six months for EHV 1 and 4. Horses entering high-risk areas where recent EHV cases have been reported should be administered a booster vaccine if the horse has not been vaccinated for EHV within the past 90 days.

These recommendations are made based on the AAEP vaccination guidelines for adult horses. Blanket vaccination of horses during an outbreak is not recommended and remains controversial.

Due to the biology of the EHV and the inability of available vaccines to prevent EHM, stringent monitoring,

quarantine and biosecurity measures are necessary to limit outbreaks, particularly at equestrian events. Horse owners should consider the following measures when traveling to or participating in equestrian events:

- Monitor the temperature of all horses twice a day, and report any fever higher than 101.5 F or any horse with neurologic symptoms to the veterinarian on call for the event.
- Immediately quarantine any horse with a fever or neurologic symptoms from the general population, and monitor all horses with prior direct contact. Consult with the facility or state veterinarian on further quarantine recommendations.
- Bring your own water buckets, feed tubs and water hoses to the horse show. Do not let horses drink directly from the hose or shared trough.
- Do not share tack or above items with other horses.
- Avoid nose-to-nose contact with other horses.
- Limit your contact with other horses, and discourage other people from petting or feeding treats to your horse.
- Wash your hands frequently. Carry and use disinfectant wipes on stall door latches, truck and car handles, steering wheels, etc.
- Have hand sanitizer readily available and encourage caretakers or grooms to use between horses when cleaning stalls, braiding, grooming or tacking up for events.
- Disinfect all equipment, horse trailers or vans upon returning from a horse show. Remove all organic material (manure, shavings and hay) first, followed by a phenol-based disinfectant.

Horse Wisdom

Every time you ride, you're either teaching or un-teaching your horse.

— Gordon Wright

There are only two emotions that belong in the saddle; one is a sense of humor and the other is patience.

— John Lyons

There on the tips of fair fresh flowers feedeth he; How joyous is his neigh, there in the midst of sacred pollen hidden all hidden he; how joyous is his neigh.

— Navajo Song

Bread may feed my body, but my horse feeds my soul.

— Arabian Poet

I discovered that the horse is life itself, a metaphor but also an example of life's mystery and unpredictability, of life's generosity and beauty, a worthy object of repeated and ever changing contemplation.

— Jane Smiley

The essential joy of being with horses is that it brings us in contact with the rare elements of grace, beauty, spirit and freedom.

— Sharon Ralls Lemon

Horses change lives. They give our young people confidence and self-esteem. They provide peace and tranquility to troubled souls. They give us hope!

— Toni Robinson

There is something about the outside of a horse that is good for the inside of a man.

— Winston Churchill

No hour of life is wasted that is spent in the saddle.

— Winston Churchill

When you're young and you fall off a horse, you may break something. When you're my age, you splatter.

— Roy Rogers

The Future is Now: Gastrointestinal Health, Microbiomes and Metagenomics

Philip Johnson, BVSc, MS, MRCVS, ACVIM, ECEIM

In recent years, there have been remarkable advances in our understanding of the complicated and critical relationship between the mammalian host and the teeming population of microorganisms with which it is invested. The newly designated University of Missouri Metagenomics Center (MUMC) places those of us interested in equine gastrointestinal health in an especially good position to take advantage of this modern technology and to apply it for the health benefit and welfare of our equine patients.

The term microbiome (or microbiota) has been adopted to represent the ecological community of commensal, symbiotic and pathogenic microorganisms (including bacteria, fungi, worms, protozoa, and viruses) that share our body space. For example, the human microbiome consists of approximately 100 trillion microbial cells that outnumber human cells by a factor of 10 to 1. Thinking of it in terms of the number of genes that it brings to the table, the microbiome of the human gastrointestinal system consists of approximately 3.3 million genes — an enormous number when compared to the paltry 25,000 genes that are responsible for the biological composition of the human organism. As such, the gastrointestinal tract microbiome represents one of the most complex microbial ecosystems anywhere in any environment.

The understanding that the microbiome is directly involved in the health maintenance of its host has led to it being referred to as the “forgotten organ.” Any individual (human or horse) possesses different microbiomes at different locations of the body. For example, a complicated and diverse population of bacteria lives on the skin

and is essential for cutaneous health. The skin microbiome is further differentiated by location such that the population of bacteria on the face is distinctly different from that on the fingers, for example.

Although the newborn baby or foal is sterile or devoid of microorganisms within the confines of the intra-uterine environment, it quickly establishes discrete and diverse microbial populations following exposure to the female parent’s vaginal, perineal and skin microbiotas. These initial colonizers or “pioneer” microbes rapidly establish themselves in the newborn and create the organ-specific microbial populations that will, in health, predominate throughout the individual’s life.

Many medical conditions have been linked to changes in status of the gastrointestinal microbiome, especially in people. The lay press regularly reports new disease associations to the microbiome. Specific disruptions of the gastrointestinal microbiome have been reported in the context of many chronic human bowel ailments, including ulcerative colitis, Crohn’s disease, irritable bowel syndrome and celiac disease. Hospital-acquired *Clostridium difficile* enterocolitis, which is also a problem for horses and foals, is a commonly reported and potentially fatal complication of antibiotic use.

These cases represent an especially devastating disruption of the microbiome and, in some cases, have been successfully solved by administering fecal microbiota from a healthy person to the patient when antibiotics had failed. The influence of the gastrointestinal microbiome on health extends beyond the intestinal tract,

and specific changes in the microbiome have been linked to the development of obesity, risk for diabetes, autism, Alzheimer’s disease, atherosclerosis, chronic fatigue syndrome and some forms of cancer.

Key to the recent explosion of knowledge depicting such a powerfully intimate relationship between the microorganisms of our bodies and the state of our health has been the development of next generation sequencing or NGS. This method has allowed scientists to identify and characterize the vast population of microorganisms that inhabit the body in an affordable and rapid manner. This method employs a DNA fingerprinting approach in which the genetic identity of microorganisms can be determined and catalogued using polymerase chain reaction technology.

Prior to the introduction of NGS, microbial identification was largely based on methods that depended on laboratory propagation or cultivation. Frustratingly, the majority of organisms are simply not cultivable in the laboratory or the specific conditions for laboratory growth are time consuming, complex and impractical, often requiring distinctive and precise conditions for each organism. The MUMC acquired the equipment for ultra-fast NGS and introduced and encouraged its employment to help answer questions about the microbiome in different species.

The existence of the horse itself is predicated on the health of a substantial large intestinal microbiome for nutrient derivation from their grass/forage-based diet; therefore, we wasted no time in moving ahead

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Microbiome, continued from page 11

with a project to map the microbiome along the entire length of the equine gastrointestinal tract.

Using this approach, we plan to develop knowledge and a basis upon which to better understand certain types of gastrointestinal disease. For example, a causative explanation for the majority of horses that are presented to our hospital for treatment of diarrhea and colitis cannot be identified, even following extensive and sometimes expensive testing and a post-mortem examination. Although well-known causes for diarrhea may be identified in a few cases (such as for salmonellosis and Potomac horse fever), tests for known pathogens lead to negative findings in most cases. This observation has led us to the hypothesis that a professional pathogenic microbe may not be responsible for diarrhea in most instances and that a non-specific shift

in the relative proportion of different groups of microorganisms within the microbiome may represent the cause of diarrhea in most instances. Such a population rearrangement has been termed dysbiosis. This newer NGS technology represents an insightful method to study gastrointestinal dysbiosis in horses, and our team is well placed for this purpose.

Ultimately, we hope to identify novel changes in the gastrointestinal tract microbiome that may have relevance to equine intestinal disease conditions such as colic, diarrhea and even laminitis. We're also interested in the potential link between the equine gastrointestinal microbiome and risk of obesity, insulin resistance (equine metabolic syndrome) and endocrinopathic laminitis. There is great hope and evolving evidence that specific micro-organisms usually bacteria can be engineered so that, when

added to the intestinal microbiome as a probiotic, they can provide specific treatment advantages for the patient. Work in mice has shown that engineered bacteria can help regulate glucose during the treatment of diabetes. There probably isn't another mammalian species in which the health and composition of the large intestinal microbiome is more essential to the well-being of the mammalian host than that of the horse.

There is so much to be learned and there are so many potential areas in which veterinarians need help to do a better job for our equine patients affected by crippling gastrointestinal diseases that we're really excited to get started with this line of investigation. We welcome any questions and conversations about this potentially very important new line of investigative clinical research. We welcome any gifts to facilitate our studies.