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Service Offers Quality Diagnostics, Care

We hope you all are enjoying this beautiful fall with your horses. Whether you are a trail rider, involved in organized competitions, or have pasture pets that are family, we know that how much your horses mean to you. We also are proud to have a full-service ambulatory program, which allows us to provide top quality state-of-the-art diagnostics and treatments to your horses, both in the field as well as in the clinic.

Our doctors cover all facets of equine medicine and surgery, including lameness work with the Lameness Locator, joint injections, castrations, routine dentistry, complex dental procedures, such as extraction, and a variety of medical challenges and emergencies. Due to a generous donation, we are one of the few practices in the mid-Missouri area to offer both upper airway endoscopy as well as gastroscopy requiring a 3-meter scope. The gastroscope capabilities allow us to view the horse's stomach looking for gastric ulcers or other abnormalities. Equine gastric ulcer syndrome is certainly a hot topic and being able to understand, diagnose, and treat this disease that plagues our performance horses has been a true gift.

We are so fortunate to have a tertiary referral center in our own backyard. Having an ambulatory practice that is associated with a referral center allows us access to the best doctors and equipment around. Just this year we installed the Equina system (Asto CT), a helical fan beam computed tomography system developed specifically for use in horses. The design allows us to scan the head, upper neck, and lower limbs of standing horses. We no longer have to put horses under general anesthesia to obtain CT images, and this



has revolutionized our practice. We are one of only a handful of practices in North America to have this piece of equipment, setting us apart.

As veterinarians, we do what we do for the love of these amazing animals, as well as a strong desire to help our fellow humans. We understand the human animal bond. We understand that horses are partners, athletes and family. We are proud and passionate and work hard to serve the diverse needs of our horse community.

Thank you for trusting us with your horses, and please contact us with questions you may have regarding our facilities or services.

Sincerely,
Alison LaCarrubba, DVM
Diplomate, ABVP (Equine Practice)

Mission Statement:

The mission of our equine ambulatory service is to provide the highest standard of medical and surgical care to our patients while training the next generation of veterinarians.

Meet the MU Equine Ambulatory Team

Alison LaCarrubba, DVM, DABVP

Alison LaCarrubba, originally from New York, grew up riding hunter-jumpers and dressage from a young age. After graduating from Cornell University with a degree in animal science, LaCarrubba moved to the Midwest to obtain her veterinary degree. She graduated from the University of Missouri College of Veterinary Medicine in 2001. LaCarrubba completed an internship in equine medicine and surgery at the university and subsequently spent a year working in an equine exclusive private practice. She returned to the university in July 2003 as a clinical instructor, and in 2009 she completed the specialty boards with the American Board of Veterinary Practitioners in Equine Practice.



LaCarrubba's love of equine dentistry has inspired her to continue her training in this area. In recent years she has attended a variety of advanced equine dental courses, which have allowed her to develop specialized skills and expertise in this field. As the equine dentist for the university, LaCarrubba is excited to see all things dental, from routine work to more complicated extractions. When she is not at work, she is spending time with her husband and three children. The whole family enjoys horses and riding together on Missouri's beautiful trails.

Martha Scharf, DVM, DABVP

Martha Scharf practices equine ambulatory medicine at the Equine Hospital. Scharf was born in Chicago and grew up riding hunter-jumpers in St. Louis. Since moving to Columbia, she has continued to ride and started to explore three-day eventing. After earning a DVM degree at MU, she completed a rotating equine internship at the university. Scharf has obtained certification in equine practice by the American Board of Veterinary Practitioners and completed chiropractic training for large and small animals. She continues to work as an assistant teaching professor for the Equine Ambulatory Service.



Scharf spends the majority of her time instructing senior veterinary students while providing quality med-

ical 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.

Kelly Gravitt, DVM

Kelly Gravitt, grew up in Waterloo, Illinois, a farming community just outside of St. Louis. She started riding horses when she was young, primarily showing in the jumper ring. After completing her DVM degree at the University of Missouri in 2019, she spent a year as a rotating intern through the Equine Medicine, Surgery, and Ambulatory services. Gravitt recently finished her equine ambulatory residency and has stayed for an additional year as a postdoctoral fellow while working toward an ABVP certification in equine practice. In her free time, she enjoys spending time with her husband and two Australian shepherds, cooking, and being with friends and family.



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 Jessy Maddux, Haley Rauch and Bethany Roof.

Jessy Maddux, DVM

Jessy Maddux is our 2023 2024 large animal rotating intern. Maddux will be splitting time on her internship between the Equine and Food Animal services. She is a 2019 graduate of Missouri State University, where she studied animal science, and the University of Missouri College of Veterinary Medicine Class of 2023. Her interests include sports medicine and ambulatory practice. Maddux grew up on a family farm, which fostered her love for large animals. In her free time, she loves spending time with family and friends, being with her dogs, June and Birdie, and loving her own horses back on her family's farm.



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Haley Rauch, DVM

Haley Rauch is one of our 2023-2024 equine rotating interns. She is from southwest Missouri and graduated from Missouri Valley College with a degree in biology. She earned her veterinary degree at the University of Missouri College of Veterinary Medicine. Her interests are ambulatory medicine and surgery. In her free time, Rauch enjoys hiking, spending time with her dogs, and tending to her houseplants.



Bethany Roof, BVM, MRCVS

Bethany Roof joins us as an equine intern after completing a rotating equine internship at Kansas State University. She pursued undergraduate studies in equine sciences at Colorado State University and her veterinary schooling at the Royal Veterinary College in London. With goals of an internal medicine residency, her interests include endocrinology, neurology and laminitis. In her free time, she enjoys playing video games, riding horses, and hanging out with her cats, Mayhem and Mischief.



Horse Deworming Recommendations

Haley Rauch, DVM

Should I deworm my horse? How often should I deworm my horse? What do I use to deworm my horse? All are great frequently asked questions. The truth is deworming is not an exact science. In general, horses are dewormed twice annually, once in the spring and once in the fall. However, we have learned that this blanket statement does not work for every horse.

There are several different parasites that affect horses and are regularly spread via flies and ingestion of grass. Typically, horses are most frequently exposed to parasites during the summer months. This is because during this time, horses spend most of their time grazing while flies are at their highest density. Parasites transmitted by flies include stomach bots, *habronema* and threadworms. Bots enter the stomach after the *Gasterophilus* fly lays eggs on the legs of horses, which are then consumed. *Habronema* larvae enter the horse through mucocutaneous junctions (lips, eyes, sheaths) and eventually lead to summer sores. The *Culicoides* fly is known mostly for causing sweet itch, but it can also transmit threadworms or onchocerca.

Ascarids, strongyles, pinworms, and lungworms can also affect horses following ingestion from feces-contaminated grass. Large strongyles are known to be the most pathogenic parasites and can lead to colic.

It is recommended that all horses should be dewormed at least twice a year. Common deworming medications include ivermectin (ivermectin or moxidectin), benzimidazole (fenbendazole), pyrantel (strongid), and praziquantel. Pyrantel is useful in the treatment of pinworms, and praziquantel is useful in the treatment of

Type of Shedder	Amount of Eggs per Gram (EPG)	Frequency of Deworming
Low	Less than 200 EPG	Twice per year
Moderate	200-500 EPG	Three times per year
High	Greater than 500 EPG	Four times per year

tapeworms. Avermectins are most commonly used because they are effective against most parasites. However, due to the frequent use of avermectins, parasite resistance has been observed.

Parasite resistance occurs when a previously efficacious treatment begins to lose this efficacy in treating the same parasite at the same dosage and route of administration. To combat parasite resistance, fecal egg counts are recommended. In recent years we have learned that even when horses share a pasture, some horses carry a higher parasite burden than their pasture mates. This difference in parasite burden and subsequent shedding are used to classify horses as low-, moderate-, or high-shedding individuals.

Most horses are considered low-shedding individuals, meaning a small portion of the population carry most of the parasite burden. Fecal egg counts prior to deworming are used to classify the level of shedding in an individual horse and help determine how frequently to deworm. A fecal egg count should therefore be performed once or twice a year to ensure that the horse is receiving appropriate care. Horses that are consid-

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Stall-Side Tests Can Guide Fast Decisions

Martha Scharf, DVM, DABVP (Equine Practice)

At the MU Veterinary Health Center, we pride ourselves on state-of-the-art diagnostics to help solve the puzzles of horses' health. Our onsite laboratory offers a wide range of tests for blood abnormalities, Coggins tests, hormonal imbalances, bacteria cultures, viral identification, tissue identification, genetic testing, drug testing, and more. Additionally, as technology has advanced, we are able to offer stall-side testing to help guide decisions within minutes of sample collection. These tests are good, affordable, objective, and available on each of our trucks to help guide us on some of the reasons, treatments, and prognoses of a horse's illness.

Serum Amyloid A (SAA)

This test measures a protein in the blood, abdominal, or joint fluid that marks inflammation or infection. A handheld reader can produce a result within 10 minutes of sample collection, indicating an elevation to alert your veterinarian of respiratory, gastrointestinal, joint, or muscle inflammation and more.

The liver produces this protein, and it is markedly increased in the face of inflammation. This change can occur dramatically within as little as six hours from a threat, marking the severity of disease before temperature, clinical signs or other blood work. While this test does not make a specific diagnosis, it can be paired with other tools to guide the nature and intensity of the recommended response. Following treatment, a decrease in the SAA reading can help mark a positive response within hours as well.

L-Lactate

Under normal conditions, horses produce energy in tissues using oxygen and other metabolites. However, when tissues lack oxygen, they produce lactate (or lactic acid) instead, which can be measured in blood or abdominal tissue. An elevation in blood is normal after intense exercise, but levels should quickly return to baseline with good hydration and blood circulation.

In the case of a sick horse, abnormal increases are seen with impaired tissue oxygenation like colic, shock, sepsis, muscle disease and organ failure. A lactate measurement can be read in less than a minute to reveal the severity or prognosis of a horse's condition. For example, this test is routinely used in painful horses with colic to indicate the possibility of dying gut. The lactate reading, combined with the type of disease, can guide treatment decisions in a horse. Additionally, measurements at different time points or on different fluids can indicate the need for referral, surgery or euthanasia.

Glucose

Just as in humans, the sugar metabolism in a horse is complex and can be affected by many factors. However,



measurement of blood glucose is a straightforward process and can be performed in less than a minute on the farm, helping to direct treatment decisions.

In adult horses, trends of elevated glucose (often paired with other parameters) can be used to help determine hormonal imbalances such as insulin resistance. These levels can lead to several chronic diseases and conditions that affect quality of life and ability to recover from disease.

Alternatively, low glucose (hypoglycemia) tends to be associated with sudden severe disease. Low glucose can indicate an increase in energy consumption due to more critical disease or a serious lack of energy intake. This measurement can be especially helpful on the farm in foals whose energy stores and balance are less robust and may indicate a need for hospitalization and critical care.

Immunoglobulin G (IgG)

An IgG snap can be used stall-side to measure the passage of antibodies from a mare to a foal after birth. Unlike humans, immunity is not transferred in utero for horses. Instead, most of a foal's initial immune system comes from ingestion of colostrum (the mare's first milk) within the first 12 hours of life. Without proper colostrum, a foal is at significant risk for infection and grave illness.

Failure to obtain these antibodies can come from a lack of production by the mare or a lack of ingestion by the foal. As a result, measurement is recommended in every foal at 12 to 24 hours of life. With a quick blood draw, a foal can be assessed for blood levels of these immunoglobulins on the farm within seven minutes.

MU's full-service laboratory is always available for more involved testing should the need arise, but the development and portability of the above tests are helping our veterinary team advance the level of care provided for you and your herd. These tests can help you and your veterinarian make crucial decisions in real time on the farm when your horse is having a crisis.

Know the Signs of Choke to Act Quickly

Alison LaCarrubba, DVM, DABVP (Equine Practice)

Equine esophageal obstruction, also known as choke, is a true emergency in horses, although quite different from choke in people. When people talk about choking, we think of an obstruction of the airway. When horses are choked, it is an obstruction of the esophagus or feeding tube. Although the animal is not in respiratory distress, it is often anxious and acts colicky and uncomfortable. An esophageal obstruction occurs when a food bolus or foreign body is lodged in the esophagus making it impossible for the horse to swallow.

Clinical signs of an esophageal obstruction include anxiety, distress, colic signs, inappetence, coughing, and retching or esophageal spasm. The tell-tale sign is feed and saliva coming from the nostrils and mouth. Horses can not vomit, but when we see feed and saliva pouring from the nostrils, this is most associated with a horse that has an esophageal obstruction. Any saliva or feed that is subsequently swallowed is regurgitated out of the nostrils or mouth.

Common causes of esophageal obstruction include dental abnormalities or dental attrition, bolting feed, changing feed and certain types of feed (dry pellets and dry beet pulp), a foreign body, neurological diseases affecting control of swallowing or esophageal motility, neoplasia, a mass or abscess press-

ing on the esophagus, and inflammation of the esophagus, which could affect motility.

How will you know if your horse is choked? Often horses choke during feeding when they are fed a concentrate meal. They will come into their stalls, start eating, and then abruptly stop eating and begin to display clinical signs of choke. That is not to say a horse will not choke when they are out to pasture or eating hay, but it is less common. They will typically stop eating abruptly and show acute signs of distress, such as pawing, sweating, and lying down. Sometimes there is esophageal spasm or retching. Horses that are choked will then have feed and saliva pouring from their nostrils and sometimes their mouth. This is distressing to the horse as they are obligate nasal breathers (cannot breath from their mouth).

A horse with an esophageal obstruction is a true emergency. It is important to call a veterinarian immediately. Place the horse in a quiet location and remove all feed and water. When the veterinarian arrives, they will conduct a thorough physical examination to determine if the horse is truly choked. Typically, if the veterinarian diagnoses an esophageal obstruction, the horse will be heavily sedated, and a nasogastric tube will be gently passed to the obstruction. The obstruction will then be lavaged with water until it is cleared. Clearing a choke can be difficult and time consuming. If

the obstruction is persistent or has been ongoing, it will be important to perform an endoscopy to visualize the obstruction and the integrity of the esophagus.

Once cleared, the horse will be held off feed for a period to allow the esophagus to rest. Also, the horse will be started on anti-inflammatory medication as well as antimicrobials. Horses with an esophageal obstruction are at risk for aspiration pneumonia as they inhale the feed material that is pouring from their nostrils. This is a real danger and must be anticipated to prevent serious consequences.

Typically, we will feed horses soaked grain for weeks after the initial choke. Sometimes horses will have to stay on soaked feed for the rest of their lives to prevent future choke episodes. Horses can damage their esophagus and develop diverticulum, or pockets, within the esophageal tube, or strictures of the esophagus, which can lead to chronic choke.

Uncommonly, the esophagus can rupture when there is an obstruction. Although rare, the consequences are grave.

It is important to understand the clinical signs of choke in horses to initiate treatment in a timely manner. Horses that are immediately treated for esophageal obstruction have a better long-term prognosis, avoiding some of the difficult and hard-to-treat consequences.

Deworming, continued from page 3

ered high-shedding individuals require more frequent deworming, three to four times per year, compared to their low-shedding counterparts.

As previously stated, most of the equine population are considered low-shedding individuals. Therefore, in the spring it is recommended to deworm horses with an avermectin. In the fall, it is recommended to deworm again with an avermectin as well as praziquantel, to target tapeworms at their highest burden.

Routine deworming is important for maintaining the overall health and wellbeing of horses. Knowing which deworming medications to use and when, ensures parasites are targeted appropriately. As parasite resistance increases, the use of fecal egg counts will become increasingly important for guiding deworming protocols.

For those who would like to confirm that they are appropriately managing parasite burden in their horses, contact your veterinarian.

While Seldom Fatal, Strangles Can Cause Serious Complications

Kelly Gravitt, DVM

In the horse world, it is hard to find many people who have never heard of the upper respiratory disease, strangles. Strangles, which is caused by the bacterium *Streptococcus equi subspecies equi*, can affect equids of all ages and breeds and is highly contagious. A horse that is suspected of having strangles may initially have a fever three to 14 days after exposure and then is followed by respiratory signs about one to two days later. Thick, snotty nasal discharge coming from either one or both nostrils may be the first obvious respiratory clinical sign that is noted followed by a soft, non-productive cough often associated with eating. It is also quite common to see enlargement of the lymph nodes found in the horse's throat-latch region. If these grow to a certain size, the lymph nodes can compress the airway resulting in a harsh noise when breathing, thus the name "strangles."

The severity of clinical signs is associated with the age of the horse as well as their immune status. Older horses typically exhibit shorter, milder symptoms when compared to their younger counterparts.

Horses are commonly exposed to strangles in one of two ways — direct contact with an infected horse or via contaminated items. Contaminated items, or fomites, can include water buckets, grooming supplies, tack, and even the handlers themselves. After being exposed, the bacteria cross the mucous membranes, or lining of the nose and mouth, to eventually infect the horse's lymph nodes. Abscesses then develop in the lymph nodes, which cause them to enlarge and eventually rupture.

Most horses infected with strangles typically handle the disease without complication. It is recommended to rest the horse and provide pain management in most cases. After the lymph nodes rupture and drain, 75 percent of horses develop a strong, long-term immunity to protect them from future exposure. In fact, many strangles cases do not receive antibiotics because these medications can hinder that rupture and subsequent development of immunity.

Strangles is rarely fatal and most horses recover without difficulty, however, severe complications can occur in some cases. If the lymph nodes near the throat dramatically enlarge this may lead to issues with the horse's breathing. Therefore, it is important to monitor for any signs of respiratory distress as this could require emergency intervention. If lymph nodes outside of the throat latch region abscess, such as those in the abdomen, it is referred to as metastatic or bastard strangles. In these cases, horses may show signs of re-



current colic or weight loss and may require more aggressive treatment.

Long-term carrier states may occur in some horses if the bacteria remain present in the guttural pouch as hardened pieces of pus. This scenario can be confirmed via visualization and sampling of the area and may be treated medically or surgically. The most severe complication of strangles is referred to as purpura hemorrhagica. This is an immune-mediated disease that can lead to severe edema and eventual sloughing of tissues.

While strangles may appear obvious to the experienced horse owner by just looking at the horse, it is always a good idea to confirm by additional diagnoses. This can include a veterinarian swabbing the nasal passage, collecting fluid from the ruptured lymph node, or by lavaging or washing the nasopharyngeal area. These samples can then be submitted to confirm the presence of the bacterium.

The best way to prevent strangles from spreading is to quarantine all affected animals on the property. These horses should be handled last to ensure that no cross-contamination takes place. Positive horses should also have their own buckets and grooming supplies for the same reason. Hand sanitizer is also effective in disinfecting the bacterium from any person who may contact the horse.

Currently, a vaccine is available for horses that may be exposed to strangles. However, it is important to discuss vaccination with your veterinarian first as previously exposed horses may already have protective immunity against the disease and unnecessary vaccination may result in purpura hemorrhagica.

Discuss any questions regarding exposure to strangles, managing an outbreak, or vaccination for the disease with your veterinarian.

Laminitis Cause Key to Treatment

Bethany Roof, BVM, MRCVS

Laminitis is a common, painful and potentially debilitating condition that affects the hooves of horses, ponies, donkeys and mules. It can affect any foot but is most common in the front feet. The hoof wall comprises an outer insensitive tissue layer called the horn and an inner sensitive tissue layer called the laminae. These structures play a key role in the horse's weight-bearing ability as they suspend the coffin bone.

Laminitis is characterized by inflammation and damage to the laminae. When laminitis occurs, the blood flow to the laminae is affected, which causes inflammation and swelling to the laminae. This then disrupts the normal attachment between the laminae and the hoof wall, causing severe pain and structural changes to the hoof.

In severe cases of laminitis two things can happen due to the inability of the damaged laminae to support the coffin bone and from the pull of the deep digital flexor tendon.

1. Downward rotation of the coffin bone within the hoof capsule forces the tip of the bone down into the sole compromising the blood vessels in that area.
2. The entire bony column can drop within the hoof capsule (called sinking), which causes severe pain and extensive vascular injury. This can occur symmetrically or asymmetrically within the hoof capsule.

If the pedal bone sinks too far, it can penetrate the sole of the foot. In most cases this is irreversible. In fact, it is the severe and unmanageable pain experienced by horses with severe laminitis that prompts euthanasia in these cases.

Causes

Laminitis can arise in three general situations:

Endocrine Disorders

Endocrine disorders are the most common cause of laminitis. The exact mechanism of how these disorders cause laminitis is not entirely known; however, insulin appears to have an important role.

Pars Pituitary Intermedia

Dysfunction (Equine Cushing's Disease):

This disorder is associated with a degenerative process of the hypothalamus leading to dysfunction of the pituitary gland, which is found at the base of the horse's brain. These horses may develop a long, curly, and often patchy hair coat that fails to shed properly. They may drink and urinate more frequently than normal. Despite having an increased appetite, horses with equine Cushing's disease may experience weight loss or difficulty maintaining a healthy body condition. The disease can lead to muscle wasting, giving the horse a more bony or frail appearance. Additionally, it can cause abnormal fat distribution, resulting in the development of fat pads along the neck, tailhead, and above the eyes. These areas may appear swollen or lumpy. These horses may show reduced energy levels, become lethargic, and have difficulty maintaining their usual level of activity. They may also have trouble recovering after exercise. In addition to these symptoms, many horses suffer from laminitis as a result of having equine Cushing's disease.

Equine Metabolic Syndrome:

This is a collection of risk factors for laminitis. The disease mechanisms are poorly understood currently, but one of the key features is insulin dysregulation, or a reduced sensitivity to insulin and an impaired ability to regulate their blood sugar levels. These horses are frequently obese or considered "easy keepers." They also will frequently have abnormal fat deposits on their crests, shoulders, and tail head. Some breeds ap-

pear to be at high risk for EMS such as pony breeds, Morgan horses, Andalusians, and gaited breeds.

Diseases Associated with Inflammation

Inflammation leading to laminitis can occur through almost any inflammatory process. However, there are some that show a higher predilection to laminitis than others such as certain types of colic, diarrhea, retained placenta, severe pneumonia, sepsis, and black walnut toxicity. In diseases associated with inflammation, the exact identity of the laminitis trigger remains unclear, but there is activation of inflammation throughout the body that leads to inflammation of the laminae.

Mechanical Overload – Supporting Limb Laminitis

This laminitic process is associated with a non-weight-bearing or limited weight-bearing injury (such as a fracture or infected joint) in the opposite leg. This leads to increased weight bearing on the sound limb, which can cause the sound limb to develop laminitis. This is the most common cause of single limb laminitis and hind limb laminitis.

Clinical signs

The clinical signs of laminitis will vary with the severity of the damage to the lamella, as well as if the episode is acute (hours or days old) or chronic (lasting more than a week). The most common sign that you will see is lameness. This can range in severity from a subtle head nod to non-weight bearing and reluctance to stand up. These horses frequently are reluctant to walk and have the appearance of walking on eggshells when forced to walk, as well as a characteristic sawhorse stance with the horse leaning back on to its hind feet to reduce the weight on the sore feet. Horses with laminitis may shift their weight frequently, often trying to relieve pressure on the affected hooves. Due to the pain in the

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Laminitis, continued from page 7

affected hoof, horses will frequently be reluctant to pick up their feet due to the increased weight bearing on the sore feet. An increased pressure in the digital pulse of the arteries that supply blood to the affected foot and the hoof wall feeling warm to the touch can also be common findings, although not specific for laminitis. Laminitis most commonly occurs in both forelimbs but can also occur in any individual or all four hooves, particularly with circulating systemic disease. As the condition progresses, laminitis can cause changes in the shape of the hooves. This may include a widened white line (commonly called seedy toe), a dropped sole, rings of growth in the hoof wall indicating changes in the growth pattern of the hoof, and easily bruised soles.

Diagnosis

A diagnosis of laminitis is based on the clinical signs as well as radiographic changes. Radiographic changes will vary with the severity and chronicity. These changes will range from thickening of the tissue between the hoof wall and the coffin bone, changes in density of the coffin bone, rotation or sinking of the coffin bone and, in chronic cases, destruction of the coffin bone.

It is also recommended to test horses with laminitis for metabolic dysfunction, particularly if an inciting cause is not apparent.

Treatment/management

Treatment for laminitis will vary for each horse depending on the primary cause of laminitis and the severity of the episode. The mainstay of treatment is aimed at treating the inciting cause. Additional treatment will focus on supportive care and improving comfort of the horse. Supportive care usually involves pain relief modalities such as phenylbutazone (Bute), nerve blocks or even constant rate infusions of stronger pain relief depending on the severity of the horse's pain. Keeping the horse in a stall with deep bedding of sand or shavings will also help cushion the feet and reduce move-

ment. Reducing the amount of non-structural carbohydrates and sugar in the diet is also a primary focus. It is recommended that a horse with laminitis only be fed hay that is low in non-structural carbohydrates or a very low-sugar pelleted feed if they cannot eat hay. For the hay, it is possible to have the carbohydrate content of the hay tested to know the make up. You can also soak the hay for 15-20 minutes and drain off the water before feeding to decrease the carbohydrate load. Legume-based hay, such as alfalfa, is also a good option for laminitic horses.

Once a horse develops laminitis and has recovered to a stable state, it will require special attention the rest of its life depending on how severe the overall clinical and radiographic signs are. Long-term care will usually consist of changing the diet to a low-carbohydrate/starch, soaking/steaming hay, corrective farriery on a frequent schedule (every three to five weeks), and regular recheck radiographs. Avoid grazing lush pastures, especially between late morning and late afternoon hours, since plant sugars are the highest during these times. Restrict pasture intake during spring or any time the pasture suddenly greens up. If pasture turnout cannot be avoided, then it is recommended to use a grazing muzzle or portable fencing to reduce the amount of pasture the horse can access at any time.

Similarly to treatment, prognosis of laminitis is directly related to the underlying primary cause, clinical signs and severity of diagnostic findings. What is most important is that the primary cause is corrected and the progression of laminitis stabilized. In many cases, horses may be able to go back to their previous level of work; however, in severe cases the clinical signs worsen and progression cannot be controlled. If uncontrolled, clinical signs worsen to where the horse may not be able to rise and either the tip of the coffin bone penetrates through the bottom of the sole of the hoof or there is complete detachment of the hoof wall from the underlying bone re-

sulting in the horse "walking out of its hoof." The most humane treatment option for the horse with severe laminitis may be euthanasia before the clinical signs get close to either of these points.

Prevention

Prevention of laminitis is focused on managing the horse's diet to decrease the risk of equine metabolic syndrome. This is primarily done through managing the diet of the horse, particularly if an at-risk breed. Feed little and often when possible. This mimics the horse's natural feeding pattern and will help keep the digestive system working correctly. It will also help prevent boredom for stalled horses. Feed high-fiber, low-carbohydrate and low-sugar products. It is best to avoid feeding cereal products and products with molasses. When making diet changes, do so slowly to allow time for the gastrointestinal system to adapt. Restrict grass intake by using electric tape to strip graze if out on large lush pastures. A grazing muzzle can also be used to help decrease intake.

Turning a horse out at night and bringing it in during the day can also help as the grass produces less sugar at night. Avoid turning a horse out on lush spring or frosted grass if possible as the stress from extreme weather can increase the sugars produced by grass. Turn out horses and ponies that need the same management together. This allows them to engage in normal behaviour as well as minimizes stress. Always turn out horses with at least one companion, or where they can see other horses if personalities prevent turning out with other horses. Maintain a consistent exercise regime to prevent obesity. Additionally, exercise helps the body utilize insulin and regulate glucose. Have a farrier attend to their feet regularly, ideally every four to five weeks, depending on the horse.

Additional resources:

<http://www.laminitis.org/>

<https://aaep.org/horsehealth/laminitis-prevention-treatment>

Potomac Horse Fever Can Quickly Become a Medical Emergency

Jessy Maddux, DVM

Potomac Horse Fever (PHF) was first recognized in Maryland in 1979 as an illness that affected horses living near the Potomac River in the eastern United States. In 1984, the bacterium *Neorickettsia risticii* (*N. risticii*) was identified as the causative agent of PHF. So, what does that have to do with Missourians and their horses? Unfortunately, the name “Potomac Horse Fever,” is deceiving, as this seasonal, sporadic, acute, and potentially fatal typhlocolitis has been reported in most states in the United States, including Missouri. In fact, PHF has become a common cause of diarrhea in Missouri horses in the summer and early fall.

Aquatic insects, such as caddisflies and mayflies, transmit PHF to horses. Horses consume aquatic insects when the insects die in the horse's water source. Once the horse has ingested the infected insect, the incubation period is approximately one to three weeks. During this incubation period, *N. risticii* travels into the gastrointestinal tract where it infects the cells lining the colon. The bacteria then enter cells and the systemic circulation, where they rapidly replicate within the horse's white blood cells.

The clinical signs of PHF can vary from case to case. The most common signs are lethargy, decreased appetite, and fever. A rectal temperature in a horse should be less than 101.5 degrees Fahrenheit. Most clinical disease appears to be mild or lack clinical signs completely. Another common, more serious clinical sign, is diarrhea, which ranges from mild to severe, watery, pipe-stream feces. The microvilli of infected cells lining the colon are damaged or lost, which prevents absorption of water and electrolytes. In severe cases, the compromise of the lining of the



colon can lead to ulceration and necrosis of the intestinal lining. Some horses become severely dehydrated due to fluid loss. Laminitis develops in 20-25 percent of PHF cases, it is often severe and difficult to treat. Pregnant mares infected with PHF are at risk of abortion several months after becoming infected. The reported mortality rate ranges from 5-30 percent.

PHF can become a medical emergency quickly in infected horses. The clinical symptoms of PHF are similar to other common causes of equine gastrointestinal diseases, which can make diagnosis more difficult. Definitive diagnosis of PHF is made by isolating *N. risticii* from the blood or feces samples taken from the horse. The bacterium may be present in one or both types of samples. Blood work can also be a helpful tool for veterinarians to diagnose and treat infected horses.

The most effective treatment for horses with PHF is the antibiotic oxytetracycline, delivered intravenously over a period of several days. Treatment with oxytetracycline can reduce the risk of death if given early in the disease process. Treatment of the disease with oxytetracycline should be initiated for horses living

in endemic areas with clinical signs. Improvement in clinical signs is typically evident within three days of administration of oxytetracycline. Horses with PHF that develop diarrhea typically require intravenous fluid replacement therapy and non-steroidal anti-inflammatory drugs to reduce pain and inflammation. In these cases, icing the legs is also recommended to help prevent the development of laminitis in horses with PHF.

PHF is not contagious; however, there are many other causes of diarrhea in adult horses, like salmonellosis, which are contagious, making it important to isolate sick horses immediately. Prevention of PHF includes limiting access to freshwater streams and ponds during the summer and early fall to help reduce exposure to the organism. Minimize insect ingestion in stabled horses by turning off barn lights at night and regularly clean your horse's water sources. A vaccine is also available to aid in prevention of PHF. No vaccine is 100 percent effective, therefore the vaccine for PHF may not prevent infection, but it may reduce clinical symptoms of the disease. Ask your veterinarian about vaccinating your horses for PHF.

Case Study

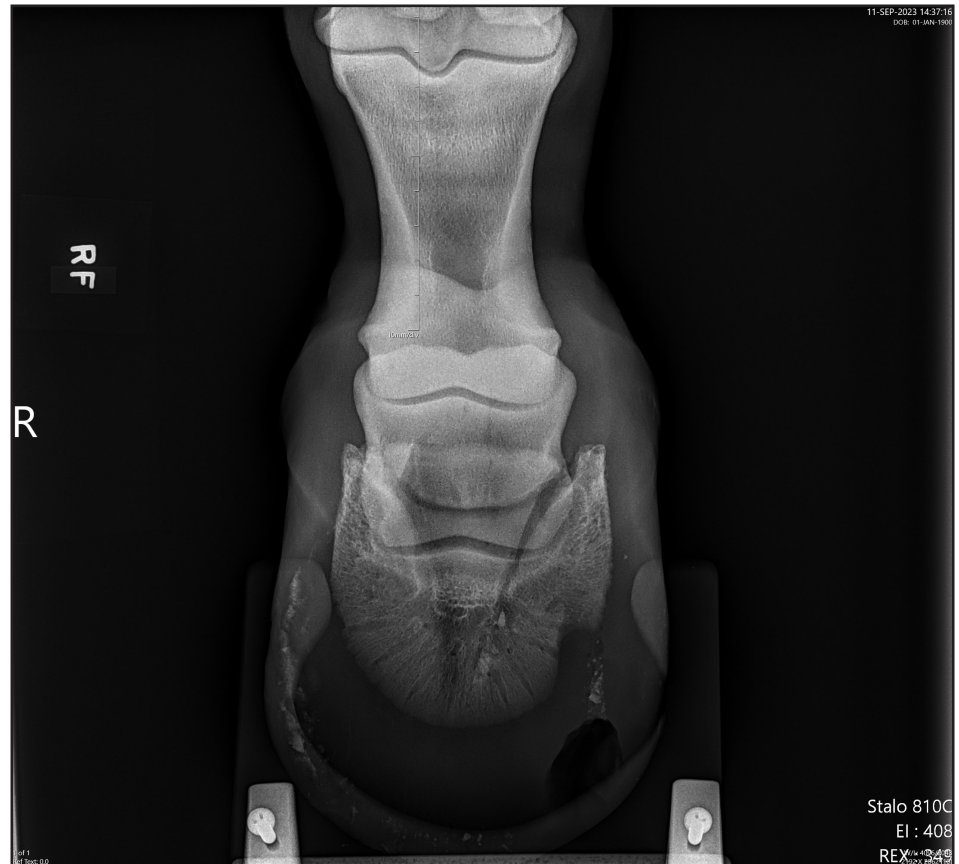
Teamwork Results in Diagnosis and Effective Treatment of Benign Tumor

Alison LaCarrubba, DVM, DABVP (Equine Practice)

Maggie is a 22-year-old quarter horse mare who presented to the Equine Ambulatory Service for acute onset lameness of the right front limb. The owner and farrier had noted that the mare had a defect in the right front sole prior to presentation and they were closely monitoring this development. Despite having this defect in the bottom of her foot, the mare had been sound to that point. There was never any drainage from the area and the area was not sensitive.

Upon the Equine Ambulatory Service's arrival at the farm, the mare was bright and alert and behaviorally normal. The mare was noted to be lame at a walk on the right front (AAEP lameness scale 4/5). All the vital parameters were within normal limits, and the mare had increased digital pulses on the right front. Hoof testers were applied to the right front and no response was obtained, although the hoof was very hard at the time. The defect in the sole was clean and dry. Due to the acute severe lameness and the unusual defect in the sole, radiographs were taken of the right front foot. Interestingly, it was discovered that there was not only a defect in the sole of the hoof, but there was a significant defect in the coffin bone over that same area. The defect had the characteristic appearance of a keratoma.

A keratoma is a benign tumor that originates from horn-producing cells of the hoof and grows within the hoof itself. Keratomas can cause mild, intermittent lameness but are commonly discovered when an abscess develops secondary to infected tissue associated with the keratoma. This was the case with Maggie. The keratoma develops the characteristic radiographic appearance as the



pressure of the tumor results in bone loss of the coffin bone, which is symmetric and round, similar to the mass. This can be appreciated on the associated radiograph, and is typically how keratomas are diagnosed.

After radiographs were taken of Maggie, the MU VHC surgery team was consulted, and a standing computed tomography scan was scheduled. A standing CT provides state-of-the-art imaging without the risk of general anesthesia. The CT allowed for a more detailed understanding of the size, shape and location of the keratoma in order to make a surgical plan. After the CT was complete, Maggie stayed overnight and standing sedated surgery was performed to remove the keratoma. The surgery was done by blocking sensation to the hoof and performing a hoof wall resection (removing a window

of hoof over the tumor) and then resecting the tumor tissue. The sensitive tissues inside of the hoof are exposed and must be bandaged and kept clean until the hoof begins to keratinize and create a natural barrier to the sensitive tissues. A special shoe with a treatment plate was also placed to keep the foot clean and dry and allow access to the defect on the sole of the hoof.

Maggie's owner and the entire MU team is working closely with the farrier to get Maggie back to soundness and health. She has done well post-operatively.

This case outlines the importance of a good relationship between horse owners, farriers and veterinarians to ensure the best possible outcome. We are so grateful for our fantastic farriers who work tirelessly to provide the best care.

Drought Contributes to Unusual Spike in Bacterial Infections

Alison LaCarrubba, DVM, DABVP (Equine Practice)

Recently, we have seen a surprising number of cases of an uncommon bacterial infection in our region. Due to the drought and warmer than usual conditions, we have seen a number of cases of Pigeon Fever here in mid-Missouri. Pigeon Fever, caused by the bacteria, *Corynebacterium pseudotuberculosis*, actually has nothing to do with pigeons. The disease took its name from a common clinical sign of Pigeon Fever, the development of large abscesses over the horse's chest, give the affected animals a "pigeon breast" appearance. This bacterium has been known to affect not only horses but also sheep, goats, cattle, camelids and buffalo.

Corynebacterium pseudotuberculosis thrives in a hot, dry environment and historically has been more commonly found in places like California, Colorado, the desert Southwest, and parts of Texas. The most common time of year to diagnose this disease is the late summer and early fall. Horses contract this disease through wounds, and the bacteria are also spread via ticks and biting insects, such as flies, as well as through direct contact with animals that have exudate draining from abscesses.

There are three different forms of Pigeon Fever described in horses. In the most common form of the disease, horses present with swelling of the chest/pectoral region. Horses



may also develop abscesses along their belly, extending into the sheath in geldings and stallions or udder in mares. Less commonly, the infection can also spread to the limbs, resulting in what is called ulcerative lymphangitis (swollen limbs with draining wounds). Uncommonly, (about 8 percent) individual horses develop internal abscesses that are exceedingly difficult to treat. Horses with ulcerative lymphangitis or internal abscessation often need to be treated with long-term antimicrobial therapy. Horses with only external abscessation usually need only to have the abscesses drained and wounds kept clean.

Definitive diagnosis of Pigeon Fever is made through bacterial culture of the abscess. Any horses

diagnosed with or suspected of having Pigeon Fever should be isolated from other animals to reduce spread of the disease.

The best way to prevent this disease and control spread is to isolate affected animals. The bacteria can be spread on pitchforks, buckets and even the shoes and clothing of horse owners. Fly control is also critical in controlling spread of the disease. Most horses that contract the disease will recover in a few weeks with appropriate care.

Although the recent Missouri drought has contributed to the spike in the number of affected horses this year, it is likely that the number of affected horses will decrease as the winter weather takes hold.

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

- John Lyons

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