Enteritis in Horses: Diagnosis and Treatment

Understanding enteritis
and how to manage it.

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Summary

When you are not proactively identifying and managing the widespread digestive issues among your clients' horses, your practice is at risk. It is increasingly clear that gastric ulcers and their diagnostic measures (scoping) and typical treatments (PPI, Sulcralfate, etc.) represent only the tip of the iceberg when it comes to digestive disease in horses. Issues past the pylorus and throughout the intestines, especially among performance horses, are common and significant.

As soon as veterinarians start looking beyond the stomach, the greater challenge begins. A wide range of poorly understood and difficult-to-diagnose intestinal pathologies exist with significant impacts on equine health and performance. This white paper explores the intricacies of diagnosing the specific etiologies contributing to enteritis in horses.

Table of Contents

Introduction to Enteritis

The term "enteritis" refers to inflammation of the small intestine. The cause is not definitively known, though the condition is most often associated with a bacterial infection.

Among the various conditions afflicting the equine gastrointestinal tract, enteritis is particularly challenging for the practitioner. First, clinical signs can appear quite suddenly and without warning. Further, the clinical signs may be severe, and traumatic to the owner. More importantly, left untreated, the progression of the disease is rapid and the effects quite serious and even life-threatening. Finally, many of the clinical signs are associated with other conditions, making a differential diagnosis more difficult.

Of the clinical signs most often associated with enteritis, the most obvious is the acute onset of moderate to severe abdominal pain. This often appears to the layperson as a colic episode. Additional symptoms include severe gastric reflux (orange-brown in color), increased heart rate, fever, excess fluid in the stomach and small intestine, and intestinal distention. The onset of such clinical signs can occur rapidly and left untreated, the condition can quickly lead to dehydration and endotoxemia. Excessive gastric and small intestinal reflux must be removed via nasogastric tube, or it can lead to rupture. Rapid intervention is critical.

Enteritis also describes the infiltrative diseases of the small intestine, e.g., granulomatous enteritis and eosinophilic enteritis. Enteropathy is often used interchangeably with enteritis, although enteropathy is broader, encompassing all diseases affecting the small intestine, including enteritis, as well as equine proliferative enteropathy (EPE) and neoplasia.
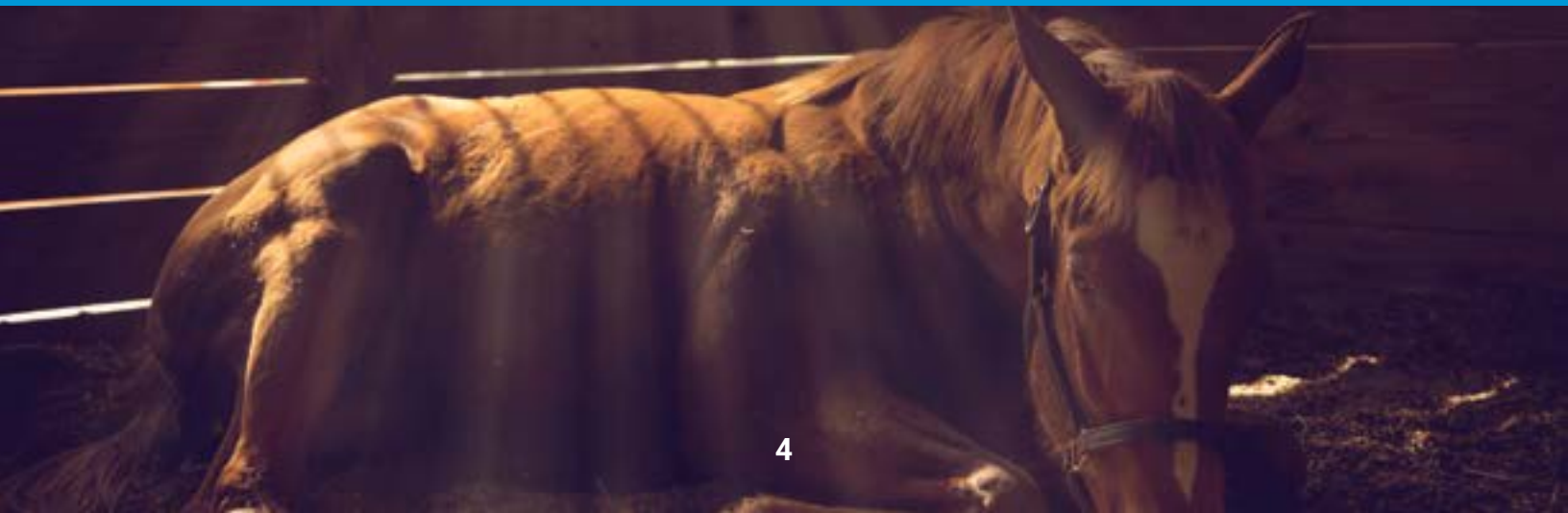
Types of Enteritis

While enteritis is most often associated with infection, generally the condition comprises both infectious and non-infectious diseases.

Infectious

- Viral—Equine coronavirus, rotavirus
- Bacterial—E. coli (foals), Salmonella spp., Clostridium difficile, Clostridium perfringens, Lawsonia intracellularis (EPE), and possibly Mycobacteria spp. (a suspected cause of granulomatous enteritis—see below)

Non-Infectious and Infiltrative

- Idiopathic Focal Eosinophilic Enteritis (IFEE)
- Eosinophilic Enteritis (EE)
- Lymphocytic-Plasmacytic Enteritis (LPE)
- Granulomatous Enteritis (GE)
- Neoplasia—e.g., lymphosarcoma, adenocarcinoma. Not normally classified as an 'enteritis' but may produce very similar clinical syndromes to the other infiltrative enteric diseases.

Diagnosing Enteritis

As described above, the clinical signs of enteritis are also associated with other conditions that cause general colic signs, such as intestinal blockage or torsion which may require surgical intervention. Therefore, an accurate diagnosis that differentiates between these alternatives is critical.

Unfortunately, the accurate diagnosis of enteritis is not always easy. Diagnostic evaluation of the small intestine is challenging because the small intestine is long and convoluted. The duodenum of a full-sized adult horse measures approximately 1 meter (3.2 feet) in length, the jejunum 25 meters (82 feet), and the ileum 50 cm (1.6 feet) (Budras et al., 2012). These long loops of the intestine are largely inaccessible from outside the body of the horse. In some cases, only a presumptive diagnosis of enteritis can be made when the clinical signs and diagnostic evaluation fit, and other diseases have been ruled out.

Endoscopy cameras of sufficient length may be extended into the duodenum. However, peristaltic movement, intestinal fluids, and ingested feed matter all make achieving a good view of the small intestine, let alone a biopsy, challenging or impossible.

The new ingestible diagnostic video cameras—"swallowable" 360° cameras housed in rigid capsules—may provide practitioners with a view of small intestinal pathology. But the images only provide a fleeting glimpse of the small intestinal mucosa as the camera passes through (Montgomery et al., 2017), and may not be beneficial in acute cases due to the time-lapse needed for the development of the images.

But what other diagnostic options are available for enteritis? The first step toward making a diagnosis of enteritis is being able to recognize the combination of signalment, history, and clinical signs that coincide with small intestinal disease.

Step 1: Signalment

Age is of particular interest as different types of enteritis affect different age groups. Young foals are susceptible to rotavirus, E.coli, and other bacterial infections (Salmonella spp., Clostridium spp., etc); older foals at weaning age are at risk of equine proliferative enteropathy, while eosinophilic enteritis affects younger adult horses; anterior enteritis affects adult horses; coronavirus can infect horses of any age; and neoplasia tends to be seen in middle age to older horses. Breed is generally less relevant; however, eosinophilic enteritis is diagnosed more commonly in Standardbred horses (Schumacher, 2009).

Step 2: History and Clinical Signs

Enteritis can occur acutely, especially following viral or bacterial infections. The exception is infection with the bacteria Lawsonia intracellularis, which takes longer to develop significant pathology (EPE). As described above, acute
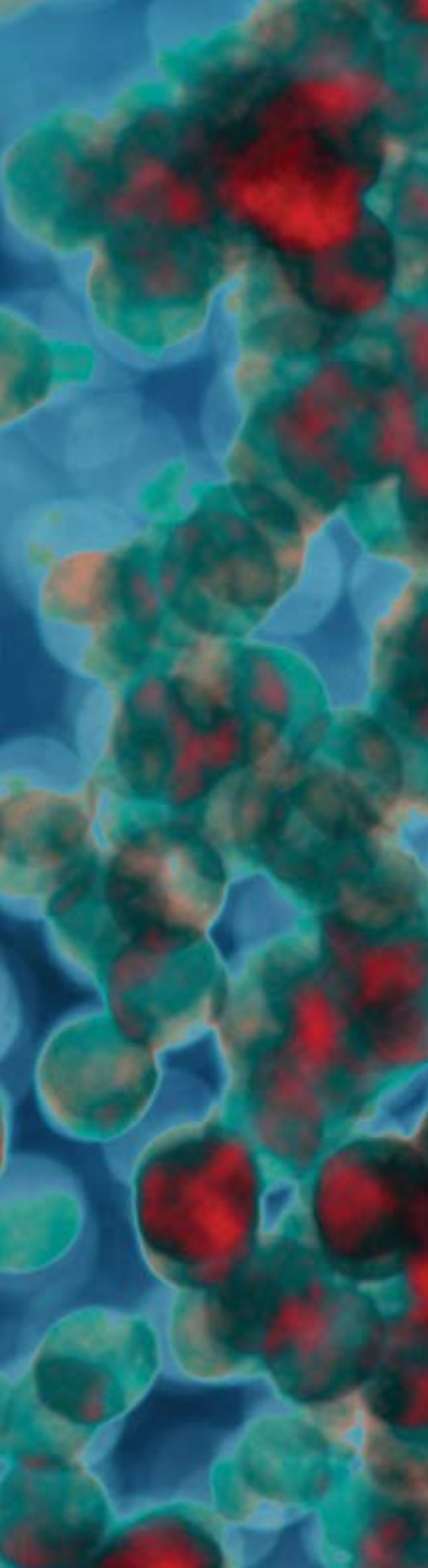
enteritis usually presents with typical colic symptoms, particularly abdominal pain, but also intestinal distention. Additional clinical signs include lethargy, inappetence, fever, increased heart and respiratory rate, stomach or small intestinal fluid, and gastric reflux (red-orange or reddish-brown in color). Discoloration or darkening of the mucous membranes may also be observed. Endotoxemia, septicemia, and neurologic symptoms (hyperammonemic encephalopathy particularly following coronavirus infections) may also be present.

Acute presentation of chronic disease is also possible, as is seen with colic caused by IFEE; however, the infiltrative small intestinal diseases tend to have a chronic presentation, with weight loss as the predominant clinical sign. Additionally, the horses may exhibit lethargy, decreased appetite, colic, loose stools/diarrhea, and peripheral edema.

Step 3: Clinical Evaluation

A thorough clinical examination is the next step in making a diagnosis of enteritis. Common/fixable problems such as inadequate nutrition, inappropriate feeding practices, and intestinal worm infestations should be ruled out early on.

Further workup includes:
- Complete blood cell counts with cytology
- Serum biochemical profiles
- Urinalysis
- Fecal analysis—including the Equine Fecal Blood Test®

Dysfunction of other intestinal organs such as the kidney and liver needs to be ruled out, as weight loss is a common complaint for disease of these organs.

Next steps could include:

Abdominocentesis—The color and cellularity of any free fluid in the abdominal cavity can provide beneficial information for diagnosis. Color can be indicative of a ruptured or necrotic portion of bowel and cellularity can be indicative of infection.

Abdominal Ultrasound—The wall of the small intestine should measure < 3mm in thickness. Thickened small intestinal wall, abnormal appearance of wall architecture (hypo- or hyperechoic), abnormal motility (hypo- or hypermotility), and abnormal dilatation can all be helpful in identifying small intestinal disease. Assessment of the volume and appearance of peritoneal fluid and assessment of the abdominal lymph nodes can also be useful.

Gastroscopy—Gastroscopy can provide imaging and possibly biopsies of the stomach and proximal small intestine. Imaging could show gastric ulceration or a gastric blockage that can lead to colic signs and NG reflux. This may not be possible or advisable in sick foals.

Rectal Biopsy—Histopathology can diagnose diseases such as EE and GE if present in the rectum and PCR performed on the biopsy can be useful to identify the presence of Salmonella spp. and Lawsonia intracellularis.

PCR Analysis (of feces, and possibly of the rectal biopsy)—Many laboratories now offer a PCR panel for feces that looks for rotavirus, coronavirus, Salmonella spp., Clostridial spp. (and associated toxins), Lawsonia intracellularis, Mycobacterium spp. Testing multiple samples might be required to obtain a diagnosis.

Serology, ELISA, and Electron Microscopy—Further testing that may be offered by your local laboratory as an alternative or adjunct to PCR.

Exploratory Surgery—Currently, the best way to get an accurate view of the small intestine is to perform an exploratory laparotomy and exteriorize the intestine of interest, which also enables good quality biopsies of the affected tissue. Clearly, this is a highly invasive and expensive procedure that requires weeks of aftercare and rest.

Use of a Fecal Blood Test to Support Diagnosis

While not calibrated specifically for enteritis, a fecal occult blood (FOB) test can aid the veterinarian's differential diagnosis of GI tract pathology generally, in cases of suspected enteritis, or as part of ongoing assessment of GI health in the equine patient. A FOB test is available commercially as the SUCCEED® Equine Fecal Blood Test™ (FBT).

The FBT consists of a two-part test cassette to test for two different equine blood proteins: albumin and hemoglobin. The presence or absence of these proteins in a fecal sample, taken together, indicates clinically significant GI tract pathology and serves to indicate generally where in the equine GI tract they originated. Unlike hemoglobin, albumin is naturally degraded by acids and enzymes in the stomach and small intestine. As a result, the detection of fecal albumin serves as a proxy for inflammation producing protein in the hindgut. Fecal hemoglobin indicates a digestive tract lesion producing whole blood anywhere in the GI tract.

The FBT is highly sensitive but non-specific. Akin to a thermometer, it is intended to serve as an indicator of disease rather than confirming a specific disorder. Thus the FBT is ideally used as a screen test to guide the practitioner's selection of additional diagnostic measures and/or treatment options.

The FBT is entirely self-contained, requires no laboratory analysis or additional processing, and has been designed to be easily used at the point of care with a fresh fecal sample and clean tap water.

In determining whether a case of diarrhea is a result of enteritis or colitis, the FBT can be a very beneficial tool. If the FBT shows a positive albumin result, the diarrhea most likely originated from a case of colitis, whereas a negative albumin result would suggest an enteritis origin.

Treatment and Prevention

By maintaining good digestive health, serious conditions like enteritis may be less likely to occur. Of course, horses used in performance, even moderately, are at risk under any reasonable standard of daily care and feeding. Once clinical signs associated with enteritis appear, giving notice to the owner, immediate treatment is in order.

However, what we are describing here as enteritis is actually a range of diverse etiologies and pathologies. Thus, an accurate differential diagnosis is an essential first step to ensure an appropriate targeted treatment with the highest odds of a positive outcome.

Treatment Options

As described above, the appropriate treatment approach is dependent on the specific pathological condition at issue in a given case.

For viral infections, symptomatic treatment is usually all that is required (especially for rotaviral infections in foals), although in an outbreak situation, antivirals may be considered for at-risk horses. Equine coronavirus can potentially induce necrotizing enteritis, with subsequent endotoxemia and septicemia, which will require intensive treatment. If neurological signs (encephalopathy) from hyperammonemia occurs, then lactulose syrup and/or oral neomycin sulfate might be considered (Pusterla et al., 2018).

10

For anterior enteritis, it is necessary to perform nasogastric intubation until reflux stops. Analgesia for pain is generally required. For endotoxemia or septicemia, other treatments might include NSAIDs, lidocaine infusions, antibiotics, hyperimmune plasma, polymyxin B, and icing the feet to prevent laminitis.

Lawsonia intracellularis infections can respond well to antibiotic therapy, such as macrolides +/- rifampin, tetracyclines, or chloramphenicol (Pusterla and Gebhart, 2009; Page et al., 2014). The thickening of the intestinal wall can take time to resolve. If hypoproteinemia is severe, parenteral protein (plasma) and/or osmotic pressure support (colloids) may be required.

EE has been reported to resolve with no treatment (Archer et al., 2014), or with the administration of corticosteroids, and/or the surgical removal of the affected intestine (Schumacher and Legere, 2018). If the horse has widely disseminated EE (or the systemic version, MEED), then the prognosis is guarded. LPE and GE do not respond well to treatment, although short-term improvements may be seen after the administration of corticosteroids. It is not yet known whether treatment for Mycobacteria would be effective in treating GE.

Supportive care for complications caused by any form of enteritis may include:

• Fluid therapy and electrolyte replacement
• Intravenous plasma or colloidal therapy for hypoproteinemia
• Vitamin and mineral supplementation
• Parenteral nutrition for inappetence, or inability to tolerate food
• Gastric ulcer prophylaxis or treatment
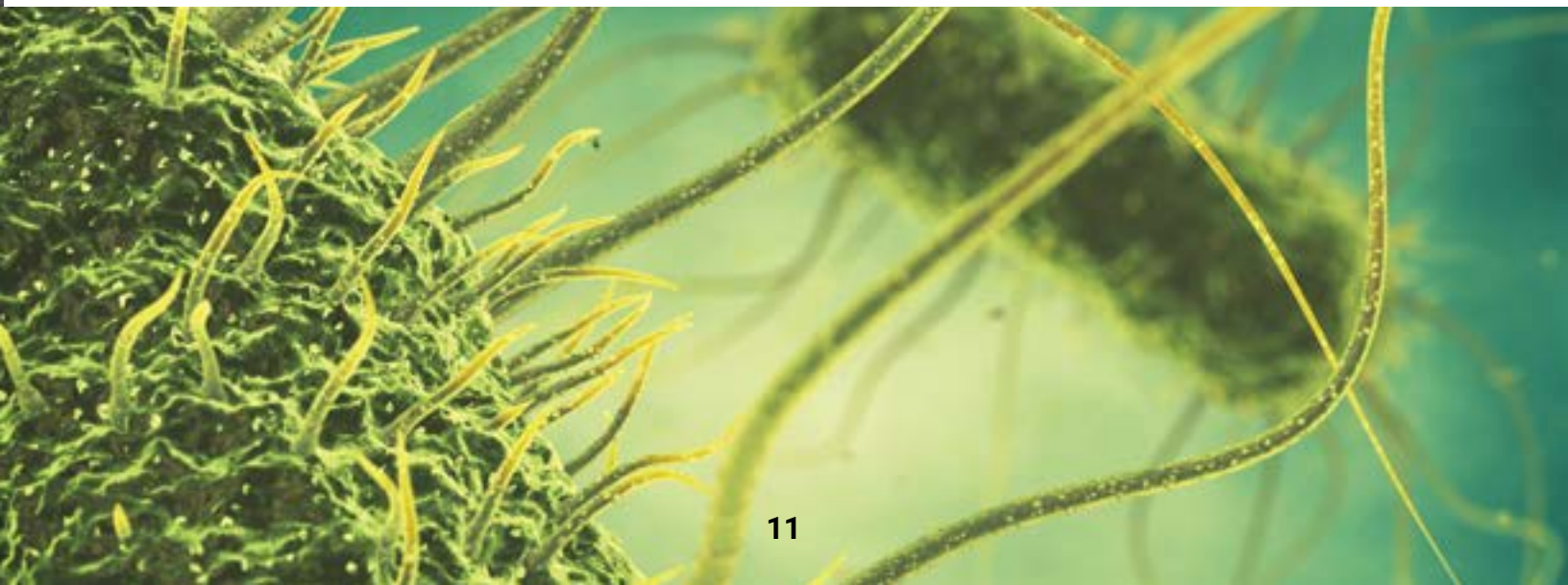
Managing GI Health to Reduce Enteritis Risk

Few of the specific diseases associated with enteritis are truly preventable; however, some horses are at higher risk than others. Identifying and minimizing those risks is crucial for reducing the occurrence of enteritis.

For horses kept in stalls, fed a few discrete meals (vs. allowed to graze on quality forage), and facing the rigors of training and competition, the risk of digestive tract pathology is heightened. In these circumstances, it is advisable for the vet and owner to work together to maintain a healthy digestive tract for any horse facing these conditions. By supporting optimal GI and immune health, the owner and the veterinarian may take proactive steps that can help offset the risks. The result is a horse that is prepared physiologically to combat or resist disease pressure.

Altering the basic feeding program poses a practical challenge for the modern owner, especially in boarding environments. In these cases, daily supplementation with nutrients targeted at specific physiological functions may offer overall support for GI health.

The first aspect of GI health to address is a healthy microbial population in the horse's hind gut. This ensures (a) enhancing resistance to assault from pathogenic bacteria and virus, and (b) reducing the risk of inflammation associated with the immune response to such assault. Dietary microfiber provides a prebiotic effect—that is, it feeds the existing microbiota. Beta glucan derived from yeast or oats offers this prebiotic effect. It also supports immune function due to its known stimulatory effect on phagocytosis and macrophages (Czop, 1985).

Amino acids such as Threonine, Glutamine, and Arginine are safe and provide support for the production of mucus, muscle development, and strengthening of the gut barrier function (Roth et al., 1996; Bertolo et al., 1998).

Mannan oligosaccharide, extracted from the outer cell wall of the yeast species Saccharomyces cerevisiae, provides competitive blocking of bacterial lectins. Bacterial lectins have an affinity to bind with glycoproteins attached to the membrane of intestinal enterocytes which occurs in the first stage of infection (Mirelman and Ofek, 1986). Mannan oligosaccharides also aid immune

response by enhancing plasma and colostral IgG and bile IgA antibody levels (Bland et al., 2004; O'Quinn et al., 2001; Newman and Newman, 2001).

One commercially available feed supplement for horses that offers these nutrients in one daily-serve program is SUCCEED® Digestive Conditioning Program®. In addition, SUCCEED includes polar lipids from oat oil that is extracted through a proprietary process that retains higher levels of polar lipids. Polar lipids are known to help maintain the tight junctions between epithelial cells, the natural defensive mechanism within the gastrointestinal lining to protect against gastric acid, pathogens, and toxins (McNeil and Ito, 1989). Maintaining tight junctions helps reduce the risk of inflammation and lesions in the GI tract, both implicated in the development of enteritis.

Clinical Example: Thoroughbred Weanling Filly

Signalment and History

A 7-month-old thoroughbred filly with weight loss. The filly has a good appetite and is eating appropriate amounts of good-quality food (she was weaned at 6 months of age). She recently had a fecal egg count performed on her manure, which did not indicate worm infestation.

Clinical Evaluation

On presentation to the veterinary clinic the filly is in thin body condition (3 out of 10) and she has loose 'cowpat' feces. The clinical exam is otherwise unremarkable, with no fever, tachycardia, or evidence of peripheral edema.

The complete blood cell count is within normal ranges, and the cytology of the blood cells is unremarkable. Biochemistry reveals moderate hypoproteinemia, hypoalbuminemia, and hypocalcemia, with a mildly elevated GGT. Urinalysis is within normal ranges. Gastroscopy is negative for stomach ulcers. On abdominal ultrasound, the small intestinal wall appears thickened in some segments, measuring between 4-8 mm (normal <3 mm). The feces are sent away to a diagnostic laboratory for bacterial culture and a fecal PCR panel. The culture was negative for Salmonella spp., but the PCR was positive for Lawsonia intracellularis.

The diagnosis, based on the PCR results and the appearance of the small intestine on ultrasound, is equine proliferative enteropathy caused by an infection of the small intestine by Lawsonia intracellularis.

Treatment

The owners of this filly did not have a lot of money to spend, so it was decided that since the hypoproteinemia was not yet causing edema, and the filly was otherwise bright and eating well, intravenous plasma was not administered.

The filly was treated with oxytetracycline for three weeks. As oxytetracycline can be nephrotoxic, intravenous fluids were administered for the first few days to ensure the kidneys were appropriately perfused. Urinalysis was performed once a week to continue to monitor kidney health.

Clinical Example: Juvenile Standardbred Filly

Signalment and History

A 2-year-old Standardbred filly with colic symptoms that come and go but are particularly severe on presentation. The filly has a history of eating less in the last week, with mild weight loss. She is regularly dewormed following her veterinarian's recommendations. The filly lives out at pasture with a group of young horses. She has passed at least three normal manures in the past 24 hours while being kept in a stable for monitoring.

Clinical Evaluation

During the clinical exam, the filly is demonstrating behaviors attributable to pain from colic (pawing at the ground, wanting to lie down and to roll on her side). The filly is tachycardic with a heart rate of 60 beats per minute, but her respiratory rate and rectal temperature are within normal ranges. The filly has audible intestinal borborygmi, and on rectal examination, the large intestine is not gas distended or impacted, and the small intestine cannot be palpated.

When a nasogastric tube is passed, 5L of gastric reflux is collected, but the filly's colic indicators (behavior and tachycardia) do not improve. The blood work is unremarkable except for a mildly elevated hematocrit and total protein. As the urine specific gravity is also mildly elevated, the filly is dehydrated but not severely.

On abdominal ultrasound, the small intestinal wall measures 2-3mm thick (normal <3mm). The small intestine appears dilated in parts but has reasonably good motility.

After three days in the hospital with colic signs that wax and wane, and occasionally being quite severe, the owners decide to proceed with exploratory laparotomy.

Treatment (further clinical evaluation)

A focal circumferential fibrous mural band is discovered in the small intestine, causing partial obstruction of ingesta flow. This abnormal intestinal segment is surgically excised and sent for histopathology, which provides a diagnosis of eosinophilic enteritis (EE) with idiopathic focal eosinophilic enteritis (IFEE).

The filly also has half a meter of thickened small intestine surgically removed with an end-to-end anastomosis performed to rejoin the healthier segments of small intestine. The filly took several weeks to recover from this surgery but was eating normally and gaining weight after three weeks. At this stage, after the surgical incisions were deemed sufficiently healed and no evidence of infection of the surgical sites was seen, the filly was placed on a three-month course of corticosteroids to try to remove any lingering EE that may still be present in the small intestine that was not excised.

Conclusion

When a horse suffers from enteritis, the disease can range from being acute onset, requiring immediate intensive care, to a low-grade chronic disease that can go on for months or years. Either way, enteritis has an impact on the well-being, health, and performance of the horse. Because the course of the disease can be rapid, and the clinical signs potentially traumatic to the owner, ongoing support of gastrointestinal health is of particular value.

With modern diagnostic tools such as quantitative PCR, the ability to make a diagnosis is becoming more efficient. With emerging diagnostic tools such as keyhole endoscopic surgery, fecal occult blood test, and ingestible cameras, the ability to diagnose enteritis may become easier and more accurate for the practitioner and less invasive to the horse.

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