

PERFORMANCE STRESS
Most performance horses develop ulcers. Having a dedicated healthcare team to care for these horses is essential to recovery.





EQUINE MEDICINE

Gastric Ulcers in Performance Horses

**MEET THE AUTHOR**

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Rachelle Boneff recently graduated from Purdue University where she earned her AS in veterinary technology in August 2016 and went on to earn her BS of science in May 2017. She grew up in Indiana but postgrad life led her to Colorado. An active AAEPV member and passionate about horses, she accepted a veterinary nursing position at an equine sports medicine hospital, where she hopes to lay the foundation to one day earn an equine specialty. In her free time, she enjoys hiking with her dog and has recently enjoyed learning to team rope.

When considering gastrointestinal problems of horses, colic is probably the first thing that comes to mind. However, one of the most common problems affecting nearly all performance horses globally is gastric ulceration. Recent advances in veterinary medicine have revolutionized the process of diagnosing and treating gastric ulcers in equids, and more horse owners have adopted preventative therapies and practices. Nonetheless, gastric ulcers remain one of the most common diseases affecting alarmingly high percentages of performance horses.

ANATOMY AND PHYSIOLOGY

The equine stomach is anatomically recognized as 2 sections: nonglandular and glandular. These sections are separated by a clearly defined line called the margo plicatus.

Nonglandular

The nonglandular, or squamous, region is considered an extension of the equine esophagus and runs from the esophagus across the fundus.¹ This section accounts for approximately one third of the entire 8- to 16-liter stomach and lower esophagus.

Glandular

The glandular region comprises the caudoventral two-thirds of the equine stomach and consists of subsections: cardiac, fundic, and pyloric.¹ The cardiac section is located near the margo plicatus; the fundic

section encompasses the body of the stomach, including the lesser and greater curvature, and the pyloric section encompasses the caudal portion of the stomach leading into the duodenum¹ (**FIGURE 1**). Each section of the glandular portion of the stomach contains cells that secrete mucus and glands that produce acid; each function is determined by different stimuli.¹

WHAT IS A GASTRIC ULCER?

In simple terms, a gastric ulcer is an injury to the mucosal lining of the stomach. Although gastric ulceration has many possible causes, it stems from the relationship between gastric secretions and pH. The pH is determined by the duodenal, salivary, biliary, gastric, and pancreatic secretions.¹

Gastric ulcers can occur at any location in the equine stomach; however, the severity and frequency of ulceration can be increased in certain locations within the stomach. Most gastric ulcers occur along the margo plicatus,¹⁻³ although ulceration along a broad area of nonglandular mucosa³ (which includes the greater curvature, lesser curvature, and cardia) is also common. More specifically, ulcers occur at even higher frequency and severity along the margo plicatus at the point of the lesser curvature.¹

CAUSES AND PREDISPOSING FACTORS

The list of things that cause or predispose horses to gastric ulceration is rather extensive. The list includes, but is not limited to, management practices, discipline/use, stress level, receipt of certain drugs, and other diseases. This article focuses on the first 4 causes.

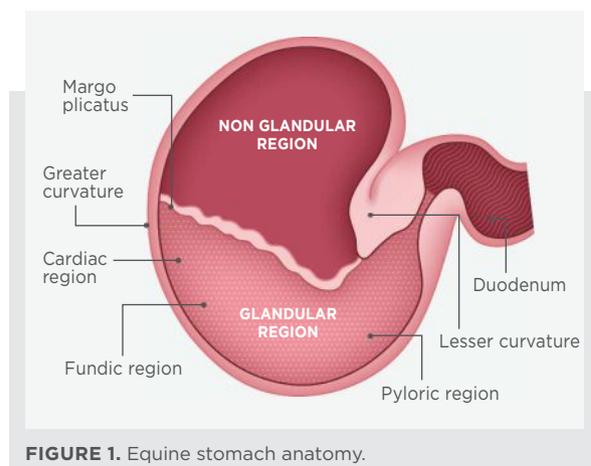


FIGURE 1. Equine stomach anatomy.

Management

The frequency of gastric ulcers is consistently lower for horses that remain on pasture than for those kept in a stall or paddock. A sudden change from pasture to stall confinement, even when the horse is fed ad libitum, can induce substantial gastric ulceration.² Horses in stalls are less likely to forage, thus increasing the likelihood of gastric ulcer development.¹ As a horse eats, salivary secretions increase, which in turn decrease acidity, raising the pH by as much as 1 to 2 units.¹ With the concept that low forage diets decrease saliva production comes the belief that any equid on a low forage diet is at risk for high acidity and consequently gastric ulceration.

The following dietary factors can affect a horse's predisposition to gastric ulceration: frequency of feeding, time of feeding, and type and amount of feed.³ A recent study revealed a correlating trend between frequency of feedings and presence of gastric ulcers.² Researchers found that with fasting for 24-hour intervals, gastric ulceration was induced in as little as 96 hours but that with increased feeding frequency, even by adding just 1 feeding per day, the occurrence of gastric ulceration decreased significantly.² This study supports the concept of implementing a regimen of increased feeding frequency, especially during the day because horses tend to decrease or completely stop foraging between 3:00 AM and 9:00 AM.²

The type of feed can substantially affect gastric secretions as well as the likelihood of gastric ulceration. An all-hay diet leads to a postprandial increase in gastrin, which can increase acidity through hydrochloric acid production. The addition of grain to the diet leads to an even higher increase, which, in turn, indirectly lowers the stomach pH (more acidic).¹ Specifically, when carbohydrates from grains are broken down by the microflora of the equine digestive system, they become volatile fatty acids (VFAs).¹ When the pH of the stomach is lower than normal, as occurs when grains are consumed, VFAs become nonionized or lipophilic, which allows the VFAs to penetrate the nonglandular mucosa of the stomach, creating local acidification that results in a gastric ulcer.¹ Therefore, continued feeding of high carbohydrate diets can result in increased severity and occurrence of gastric ulcers.

In terms of hay, however, the ulcerogenic effects of carbohydrates are minimized by other factors. Although the concentration of carbohydrates is higher in alfalfa than in grass hay, fewer ulcers occur in horses fed alfalfa.¹ It is believed that the ulcerogenic

effects of carbohydrates in alfalfa are buffered by its higher protein and calcium concentrations. The best dietary management practice for minimizing gastric ulceration is to put a horse on pasture. If a horse does not have access to pasture or is housed in a stall, special consideration should be given to the ratio of feed the horse receives. Providing the proper ratios of forage:grain/carbohydrates:protein can substantially help prevent gastric ulceration.¹ The amount of forage recommended is 1.5 kg dry matter/100 kg body weight/day. Grain should be kept to a minimum and not exceed 1 to 2 kg/meal, and grain meals should not be fed less than 6 hours apart.³ For an otherwise healthy horse, the suggested amount of daily feed intake is 1% to 2% of the horse's body weight. If the horse is going to be fed hay only, hay analyses can indicate whether it contains sufficient amounts of protein for that horse's age and workload.

Discipline/Use

Performance horses of all disciplines rely on athleticism and overall good health to compete at their highest level. Unfortunately, gastric ulcers hinder performance, often through premature fatigue, reduced aerobic development, and reduced stride length.³ When analyzed by competitive discipline, ulcer prevalence is highest among thoroughbred racehorses; 37% of untrained racehorses are affected, and after 3 months of race training, this percentage increases to 80% to 100%. Among show/sport horses, 17% to 58% are affected, and among pleasure horses, 37% to 59%.³ Researchers hypothesize that the high prevalence among racehorses could result from decreased gastric motility and increased intragastric pressure.³ They further hypothesize that increased intragastric pressure could result from increased respiratory effort or increased effort by the abdominal muscles during work. The increased pressure within the abdomen probably displaces its acidic contents to the nonglandular region of the stomach, resulting in gastric ulceration.³

Stress Level

In stressful situations, horses are likely to eat less and move around more, often in the form of pacing. The results are stomach contents with decreased pH coming in contact with less protected areas of the stomach, thus increasing the potential for gastric ulceration.² Chronic, ulcerative damage to the stomach is not likely to occur after the stressful stimulus is removed. However, if the horse has a naturally nervous and excitatory demeanor,



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chances of that horse developing or already having gastric ulcers are higher. When a horse is consistently stressed or nervous, chemical changes occur. Among other effects, stress increases cortisol levels in the serum. The effect of increased cortisol is similar to that of increased serum gastrin² in that cortisol indirectly increases production of hydrochloric acid, thereby increasing risk for gastric ulceration.²

Receipt of Drugs

Receipt of nonsteroidal anti-inflammatory drugs (NSAIDs) can be ulcerogenic. A study examining the toxic effects of phenylbutazone, flunixin meglumine, and ketoprofen found increased severity and number of gastric ulcers in horses with pre-existing glandular ulcers than in those without pre-existing glandular ulcers.¹ In horses that did not receive NSAIDs (control group), healing of previously existing ulcers was noted. Effects of NSAIDs were not evident on the nonglandular mucosa but were significant on the glandular mucosa. Overall, potential side effects should be weighed against drug effectiveness before NSAIDs are used to treat any condition.

CLINICAL SIGNS

A horse with gastric ulcers may display a wide range of clinical signs. These signs include poor appetite or anorexia, weight loss, poor body condition, failure to thrive (often seen in young horses/foals), poor hair coat, loose stools, decreased performance and increased resistance, change in attitude, increased recumbency, and stereotypic behaviors such as cribbing.³ Horses with more severe ulceration may show signs of abdominal



PREVENTIVE MEASURES: PASTURE, DIETARY RATIOS

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pain/colic and teeth grinding.³ However, clinical signs alone are often not enough to enable a proper diagnosis, and some horses may even be asymptomatic.³

DIAGNOSIS

For the veterinary healthcare team, diagnosing gastric ulcers in horses can be difficult because clinical signs are not always clear-cut, and ulcers produce no hematologic or biochemical markers.⁴ In addition, even if fecal occult blood is present, it is likely to be destroyed by the microflora from the hind gut, leaving none for testing.⁴ The only way to recognize gastric ulcers in a live horse is through gastroscopy with a

3-meter endoscope.⁵ For the mucosal lining of the stomach to be visible during endoscopy, the horse must be fasted for at least 6 hours before the procedure.⁵ Visualization of ulcers can confirm the diagnosis and enable objective assessment, but the precise depth and severity of the lesions cannot be entirely established during endoscopy. Measuring gastric ulcers is difficult because of their irregular nature, and obtaining the precise size and shape for future reference is not likely.⁶ However, some endoscopes have the ability to take pictures, which can then be used to document the ulcers for future reference. The severity of ulcers can be graded (**TABLE 1**). Thanks to gastroscopy and the picture-taking abilities of some endoscopes, the healthcare team can visualize gastric ulcers and document these for future reference. Doing so enables veterinary healthcare team members to compare a patient's improvement or regression over time so that treatment can be better individualized.

TREATMENT AND PREVENTION

Treatment and management of gastric ulcers in horses involves the client as much as the healthcare team. Clients must understand that they can help to prevent the occurrence and recurrence of gastric ulcers.

When treating a horse with gastric ulcers, the veterinary healthcare team should have 3 main goals: eliminating clinical signs, encouraging the healing of ulcers through treatment, and preventing the recurrence of ulcers and potential complications.⁴ Treatment to heal gastric ulcers is often necessary. The most commonly used classes of drugs are proton pump inhibitors (e.g., omeprazole) and histamine-2 H₂-receptor antagonists (e.g., ranitidine). Proton pump inhibitors work by irreversibly impairing the proton pumps that secrete hydrochloric acid. The body must form new proton pumps before acid production can resume, thereby extending the action of the drug.⁷ H₂-receptor

TABLE 1 Ulcer Severity Grades

GRADE	DESCRIPTION ³
0	The epithelium is intact and there is no hyperkeratosis
I	The mucosa is intact, but there are areas of hyperkeratosis (yellowing/thickening of mucosa) or hyperemia (reddening)
II	Small, single, or multifocal lesions
III	Large single or extensive superficial lesions
IV	Extensive lesions with areas of apparent deep ulceration

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antagonists, also called H₂-blockers work by blocking the H₂ receptors on the parietal cells.⁷ Regardless of the formulation or dose of medication, clients should know that approximately 70% to 80% of lesions will heal within a 21-day treatment period.⁸ Before treatment is completed, repeat gastroscopy is recommended to ensure that the ulcers are healing. However, after treatment is discontinued, the lesions are likely to recur if the same predisposing factors remain.⁹ To reduce recurrence, changes in housing and dietary management, exercise load, or stress level should be established.¹⁰ Ulcer recurrence may also be prevented with maintenance therapy after initial treatment.

CONCLUSION

Much remains to be discovered about these complex gastric lesions that affect many performance horses around the world. It takes a committed veterinary healthcare team to provide the excellent diagnostics and care these horses need. The foundation for helping the veterinarian diagnose gastric ulcers is built on the results of a complete history, nutritional assessment, and thorough physical examination performed by a veterinary nurse. When it comes to managing and preventing gastric ulcers, the front line of defense is client education. The many risk factors predisposing horses to gastric ulcers can be greatly reduced if skilled veterinary professionals properly educate clients on this complex disease. **TVN**

References

1. Bell R, Mogg T, Kingston J. Equine gastric ulcer syndrome in adult horses: a review. *N Z Vet J* 2007;55:1-12.
2. Hepburn R. Gastric ulceration in horses. *In Practice* 2011;33:116-124.
3. Sykes BW, Hewetson M, Hepburn RJ, et al. European College of Equine Internal Medicine Consensus Statement—equine gastric ulcer syndrome in adult horses. onlinelibrary.wiley.com/doi/10.1111/jvim.13578/full. Accessed April 2017.
4. Andrews FM. Gastric ulcers in horses—digestive system. merckvetmanual.com/digestive-system/gastrointestinal-ulcers-in-large-animals/gastric-ulcers-in-horses. Accessed April 2017.
5. Jones SL. Chapter 32. Diseases of the equine alimentary tract. In: Smith BP, editor. *Large Animal Internal Medicine*. 5th ed. St. Louis, MO: Mosby; 2015:638-842.
6. Tamzali Y, Marguet Y, Priymenko C, Lyazrhi N. Prevalence of gastric ulcer syndrome in high-level endurance horses. *Equine Vet J* 2011;43(2):141-144.
7. McClure SR, White GW, Sifferman RL, et al. Efficacy of omeprazole paste for prevention of recurrence of gastric ulcers in horses in race training. *JAVMA* 2005;226 (10):1685-1688.
8. MacAllister CG, Sifferman RL, McClure SR, et al. Effects of omeprazole paste on healing of spontaneous gastric ulcers in horses and foals: a field trial. *Equine Vet J* 2010;31:77-80.
9. Reese RE, Andrews FM. Nutrition and dietary management of equine gastric ulcer syndrome. *Vet Clin North Am Equine Pract* 1999;25(1):79-92.
10. Martineau H, Thompson H, Taylor D. Pathology of gastritis and gastric ulceration in the horse. Part 2: a scoring system. *Equine Vet J* 2009;41(7):646-651.



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