

So Much Acid

Common feeding practices could be causing your horse's stomach acid levels to rise.

Did you know the average horse's stomach only has a 2- to 4-gallon capacity?¹ That's because it was designed to digest a small but steady stream of forage throughout the day.¹ Horses evolved as grazers, spending two-thirds of the day grazing.¹ As they continuously graze, they produce a large amount of saliva and maintain a mixture of roughage and saliva in their stomach most, if not all, of the time to buffer and help pass acid from the stomach. However, the feeding styles of today's performance horses don't typically follow that schedule.



When horses are fed meals, especially concentrates containing cereal grains that are passed through the stomach more quickly than roughage, there are likely to be times during the day or overnight when the stomach is empty of feed material but is still producing strong gastric acid. In fact, horses produce up to 16 gallons of acidic gastric juice each day.²

That's equivalent to:

- The gas tank of an average car
- Three 5-gallon water buckets
- Half of an average bathtub

The stomach's lower part is lined by glandular mucosa and is where the acid is produced. That's where the acid is meant to reside and digest food. The glandular mucosa has a thick mucous layer, robust blood flow and naturally-produced sodium bicarbonate, all of which protect the lower portion of the stomach from the acid. The upper part of the stomach, lined by squamous mucosa, doesn't have the same protection from the acid. If the stomach doesn't have any food in it, the acidic juice accumulates and reaches the unprotected upper part of the stomach, burning the squamous lining and causing stomach ulcers.

"Horse owners have to consider the sheer amount of acid the horse's stomach produces, and that acid is being produced whether there is food in the stomach or not," says Hoyt Cheramie, DVM, MS, DACVS, Senior Equine Professional Service Veterinarian, Boehringer Ingelheim. "The most natural way to feed a horse is to provide grazing for most of the day. However, that isn't feasible for most performance horses that are fed large infrequent meals, have limited turnout and grazing, and are under the stress of training, showing and

traveling; yet their stomachs still produce all of that gastric fluid on relatively empty stomachs.”

The most natural way to decrease the strength of the acidic juice in the stomach and to keep it off the upper squamous lining is to take advantage of a quality roughage based diet, and Cheramie suggests:

- Increasing grazing time whenever possible
- Using a slow-feed or grazing hay net
- Replacing calories from cereal grains with good quality roughage
- Adding alfalfa to the diet where appropriate



A higher-roughage diet results in a lower acid level due to the buffering effect of the roughage and saliva.³

Ulcer Prevention and Treatment

When acid levels rise and cause stomach ulcers, the pain can cause your horse not to perform at their best.

The active ingredient in ULCERGARD® (omeprazole) and GASTROGARD® (omeprazole) inhibits acid production at the source – the proton pumps in the glandular mucosa.^{4,5} Only ULCERGARD and GASTROGARD have a patented formulation that protects the omeprazole from being broken down by acid. This ensures that the omeprazole makes it through the acid of the stomach into the intestines where it is absorbed into the bloodstream and then makes its way back to the stomach to work effectively.

As a result of the way performance horses are commonly fed, and in addition to the stress of training, showing and traveling, stomach or gastric ulcers are more common than you might think, with two out of three competitive horses affected.^{5,6} Help protect against ulcers during times of stress with the proven power of FDA-approved ULCERGARD.⁵ When ulcers are present, treat with GASTROGARD, the only FDA-approved equine gastric ulcer treatment.⁴

Feeding a performance horse isn't without challenges. Ask your veterinarian or equine nutritionist for feeding recommendations to help keep acid levels under control.

IMPORTANT SAFETY INFORMATION:

ULCERGARD can be used in horses that weigh at least 600 pounds. Safety in pregnant mares has not been determined.

Caution: Safety of GASTROGARD in pregnant or lactating mares has not been determined.

About Boehringer Ingelheim Animal Health

On January 1st, 2017, Merial became part of the Boehringer Ingelheim group. As the second largest animal health business in the world, Boehringer Ingelheim is committed to making the industry even better at improving animal health. With more than 10,000 employees worldwide, Boehringer Ingelheim Animal Health has products available in more than 150 markets and a global presence in 99 countries. For more information about Boehringer Ingelheim Animal Health, [click here](#).

About Boehringer Ingelheim

Boehringer Ingelheim is one of the world's 20 leading pharmaceutical companies. Headquartered in Ingelheim, Germany, Boehringer Ingelheim operates presently with a total of some 50,000 employees worldwide. The focus of the family-owned company, founded in 1885, is on researching, developing, manufacturing and marketing new medications of high therapeutic value for human and veterinary medicine. In 2015, Boehringer Ingelheim achieved net sales of about 14.8 billion euros. R&D expenditure corresponds to 20.3 per cent of net sales. For more information, please visit www.boehringer-ingelheim.com.

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¹Williams C. The Basics of Equine Nutrition. Available at: http://esc.rutgers.edu/fact_sheet/the-basics-of-equine-nutrition/. Accessed April 3, 2017.

²Kitchen DL, Merritt AM, Burrow JA. Histamine-induced gastric acid secretion in horses. *Am J Vet Res*. 1998;59(10):1303-1306.

³Murray MJ. Overview of equine gastroduodenal ulceration. *AAEP Proceedings*. 1997;43:382-387.

⁴GASTROGARD product label.

⁵ULCERGARD product label.

⁶Mitchell RD. Prevalence of gastric ulcers in hunter/jumper and dressage horses evaluated for poor performance. *Association for Equine Sports Medicine*, September 2001.

GASTROGARD®

(omeprazole) oral Paste for Equine Horses

Oral Paste for Horses and Foals

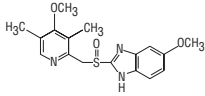
- NADA 141-123, Approved by FDA

Caution

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

Description

- Chemical name: 5-Methoxy-2-[[[4-methoxy-3,5-dimethyl-2-pyridinyl] methyl]sulfinyl]-1H-benzimidazole. Empirical formula: C₁₇H₁₉N₃O₃S. Molecular weight: 345.42. Structural formula:



How Supplied

- GastroGard (omeprazole) Paste for horses contains 37% w/w omeprazole and is available in an adjustable-dose syringe. Each syringe contains 2.28 g of omeprazole. Syringes are calibrated according to body weight and are available in boxes of 7 units or 72 units.

Storage Conditions

- Store at 68°F – 77°F (20-25°C). Excursions between 59°F – 86°F (15-30°C) are permitted.

Indications

- For treatment and prevention of recurrence of gastric ulcers in horses and foals 4 weeks of age and older.

Dosage Regimen

- For treatment of gastric ulcers, GastroGard Paste should be administered orally once-a-day for 4 weeks at the recommended dosage of 1.8 mg omeprazole/lb body weight (4 mg/kg). For the prevention of recurrence of gastric ulcers, continue treatment for at least an additional 4 weeks by administering GastroGard Paste at the recommended daily maintenance dose of 0.9 mg/lb (2 mg/kg).

Directions For Use

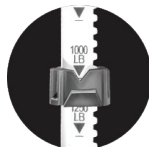
- GastroGard Paste for horses is recommended for use in horses and foals 4 weeks of age and older. The contents of one syringe will dose a 1250 lb (568 kg) horse at the rate of 1.8 mg omeprazole/lb body weight (4 mg/kg). For treatment of gastric ulcers, each weight marking on the syringe plunger will deliver sufficient omeprazole to treat 250 lb (114 kg) body weight. For prevention of recurrence of gastric ulcers, each weight marking will deliver sufficient omeprazole to dose 500 lb (227 kg) body weight.

- To deliver GastroGard Paste at the treatment dose rate of 1.8 mg omeprazole/lb body weight (4 mg/kg), set the syringe plunger to the appropriate weight marking according to the horse's weight in pounds.

- To deliver GastroGard Paste at the dose rate of 0.9 mg/lb (2 mg/kg) to prevent recurrence of ulcers, set the syringe plunger to the weight marking corresponding to half of the horse's weight in pounds.

To set the syringe plunger:

- 1) While holding plunger, turn the knurled ring on the plunger ¼ turn to the left and slide the knurled ring along the plunger shaft so that the side nearest the barrel is at the appropriate weight marking, aligning the arrows on the ring and plunger as shown in the pictogram.
- 2) Lock the ring in place by making ¼ turn to the right. Ensure it is locked.



- Make sure the horse's mouth contains no feed. Remove the cover from the tip of the syringe, and insert the syringe into the horse's mouth at the interdental space. Depress the plunger until stopped by the knurled ring. The dose should be deposited on the back of the tongue or deep into the cheek pouch. Care should be taken to ensure that the horse consumes the complete dose. Treated animals should be observed briefly after administration to ensure that part of the dose is not lost or rejected. If any of the dose is lost, redosing is recommended.

- If, after dosing, the syringe is not completely empty, it may be reused on following days until emptied. Replace the cap after each use.

Warning

- **Do not use in horses intended for human consumption.** Keep this and all drugs out of the reach of children. In case of ingestion, contact a physician. Physicians may contact a poison control center for advice concerning accidental ingestion.

Adverse Reactions

- In efficacy trials, when the drug was administered at 1.8 mg omeprazole/lb (4 mg/kg) body weight daily for 28 days and 0.9 mg omeprazole/lb (2 mg/kg) body weight daily for 30 additional days, no adverse reactions were observed.

Precautions

- The safety of GastroGard Paste has not been determined in pregnant or lactating mares.

Clinical Pharmacology

- Mechanism of Action: Omeprazole is a gastric acid pump inhibitor that regulates the final step in hydrogen ion production and blocks gastric acid secretion regardless of the stimulus. Omeprazole irreversibly binds to the gastric parietal cell's H⁺, K⁺ ATPase enzyme

which pumps hydrogen ions into the lumen of the stomach in exchange for potassium ions. Since omeprazole accumulates in the cell canaliculi and is irreversibly bound to the effect site, the plasma concentration at steady state is not directly related to the amount that is bound to the enzyme. The relationship between omeprazole action and plasma concentration is a function of the rate-limiting process of H⁺, K⁺ ATPase activity/turnover. Once all of the enzyme becomes bound, acid secretion resumes only after new H⁺, K⁺ ATPase is synthesized in the parietal cell (i.e., the rate of new enzyme synthesis exceeds the rate of inhibition).

- **Pharmacodynamics:** In a study of pharmacodynamic effects using horses with gastric canulae, secretion of gastric acid was inhibited in horses given 4 mg omeprazole/kg/day. After the expected maximum suppression of gastric acid secretion was reached (5 days), the actual secretion of gastric acid was reduced by 99%, 95% and 90% at 8, 16, and 24 hours, respectively.

- **Pharmacokinetics:** In a pharmacokinetic study involving thirteen healthy, mixed breed horses (8 female, 5 male) receiving multiple doses of omeprazole paste (1.8 mg/lb once daily for fifteen days) in either a fed or fasted state, there was no evidence of drug accumulation in the plasma when comparing the extent of systemic exposure (AUC_{0-∞}). When comparing the individual bioavailability data (AUC_{0-∞}, C_{max}, and T_{max} measurements) across the study days, there was great inter- and intrasubject variability in the rate and extent of product absorption. Also, the extent of omeprazole absorption in horses was reduced by approximately 67% in the presence of food. This is evidenced by the observation that the mean AUC_{0-∞} values measured during the fifth day of omeprazole therapy when the animals were fasted for 24 hours was approximately three times greater than the AUC estimated after the first and fifteenth doses when the horses were fed hay ad libitum and sweet feed (grain) twice daily. Prandial status did not affect the rate of drug elimination. The terminal half-life estimates (N=38) ranged from approximately one-half to eight hours.

Efficacy

- **Dose Confirmation:** GastroGard (omeprazole) Paste, administered to provide omeprazole at 1.8 mg/lb (4 mg/kg) daily for 28 days, effectively healed or reduced the severity of gastric ulcers in 92% of omeprazole-treated horses. In comparison, 32% of controls exhibited healed or less severe ulcers. Horses enrolled in this study were healthy animals confirmed to have gastric ulcers by gastroscopy. Subsequent daily administration of GastroGard Paste to provide omeprazole at 0.9 mg/lb (2 mg/kg) for 30 days prevented recurrence of gastric ulcers in 84% of treated horses, whereas ulcers recurred or became more severe in horses removed from omeprazole treatment.

- **Clinical Field Trials:** GastroGard Paste administered at 1.8 mg/lb (4 mg/kg) daily for 28 days healed or reduced the severity of gastric ulcers in 99% of omeprazole-treated horses. In comparison, 32.4% of control horses had healed ulcers or ulcers which were reduced in severity. These trials included horses of various breeds and under different management conditions, and included horses in race or show training, pleasure horses, and foals as young as one month. Horses enrolled in the efficacy trials were healthy animals confirmed to have gastric ulcers by gastroscopy. In these field trials, horses readily accepted GastroGard Paste. There were no drug related adverse reactions. In the clinical trials, GastroGard Paste was used concomitantly with other therapies, which included: anthelmintics, antibiotics, non-steroidal and steroidal anti-inflammatory agents, diuretics, tranquilizers and vaccines.

- **Diagnostic and Management Considerations:** The following clinical signs may be associated with gastric ulceration in adult horses: inappetence or decreased appetite, recurrent colic, intermittent loose stools or chronic diarrhea, poor hair coat, poor body condition, or poor performance. Clinical signs in foals may include: bruxism (grinding of teeth), excessive salivation, colic, cranial abdominal tenderness, anorexia, diarrhea, sternal recumbency or weakness. A more accurate diagnosis of gastric ulceration in horses and foals may be made if ulcers are visualized directly by endoscopic examination of the gastric mucosa. Gastric ulcers may recur in horses if therapy to prevent recurrence is not administered after the initial treatment is completed. Use GastroGard Paste at 0.9 mg omeprazole/lb body weight (2 mg/kg) for control of gastric ulcers following treatment. The safety of administration of GastroGard Paste for longer than 91 days has not been determined. Maximal acid suppression occurs after three to five days of treatment with omeprazole.

Safety

- GastroGard Paste was well tolerated in the following controlled efficacy and safety studies.
- In field trials involving 139 horses, including foals as young as one month of age, no adverse reactions attributable to omeprazole treatment were noted.
- In a placebo controlled adult horse safety study, horses received 20 mg/kg/day omeprazole (5x the recommended dose) for 90 days. No treatment related adverse effects were observed.
- In a placebo controlled tolerance study, adult horses were treated with GastroGard Paste at a dosage of 40 mg/kg/day (10x the recommended dose) for 21 days. No treatment related adverse effects were observed.
- A placebo controlled foal safety study evaluated the safety of omeprazole at doses of 4, 12 or 20 mg/kg (1, 3 or 5x) once daily for 91 days. Foals ranged in age from 66 to 110 days at study initiation. Gamma glutamyltransferase (GGT) levels were significantly elevated in horses treated at exaggerated doses of 20 mg/kg (5x the recommended dose). Mean stomach to body weight ratio was higher for foals in the 3x and 5x groups than for controls; however, no abnormalities of the stomach were evident on histological examination.

Reproductive Safety

- In a male reproductive safety study, 10 stallions received GastroGard Paste at 12 mg/kg/day (3x the recommended dose) for 70 days. No treatment related adverse effects on semen quality or breeding behavior were observed. A safety study in breeding mares has not been conducted.

For More Information

- Please call 1-888-637-4251.
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