Equine Program

NEWSLETTER

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Cribbing Behavior and Gastric Ulcers: Are they Linked?

By Carissa Wickens and Nathalie L. Trottier

Research Outlook

Cribbing or crib-biting (CB) is an oral stereotypic behavior unique to horses. It is characterized as the grasping of a fixed object (e.g., fence) with the incisor teeth (**Figure 1**) and pulling backward, contracting the neck muscles (**Figure 2**) and drawing air into the cranial esophagus with emission of an audible grunt (McGreevey et al., 1995). In a recent survey conducted by animal science graduate student Carissa Wickens under the mentorship of faculty Camie Heleski, the prevalence of CB in horses in Michigan was 5.2 percent. Similar prevalence rates have been reported in the United States and other countries (Albright et al., 2009). Crib-biting is recognized both as a welfare and a management concern. For instance, CB is associated with epiploic foramen colic (Archer et al., 2008) and is suggested to be a coping mechanism to alleviate suffering or stress (McBride and Cuddeford, 2001). Crib-biting may limit eligibility for insurance coverage or acceptance into boarding facilities.

Methods employed to prevent horses from CB include the removal or alteration of crib-biting surfaces (e.g., application of repellents, installation of electric wire), neck collars, and surgical removal of the paired omohyoideus and sternothyrohyoideus muscles, known as the modified Forssell's technique. These approaches may further reduce the welfare of the horse and fail to address the underlying causes of CB.

Cribbing and the Stomach: Are they Linked?

The cause of CB remains unknown. Nicol and others (2002) found an association between CB and gastric mucosa ulceration and inflammation in foals. In that same study, consumption of a diet containing an

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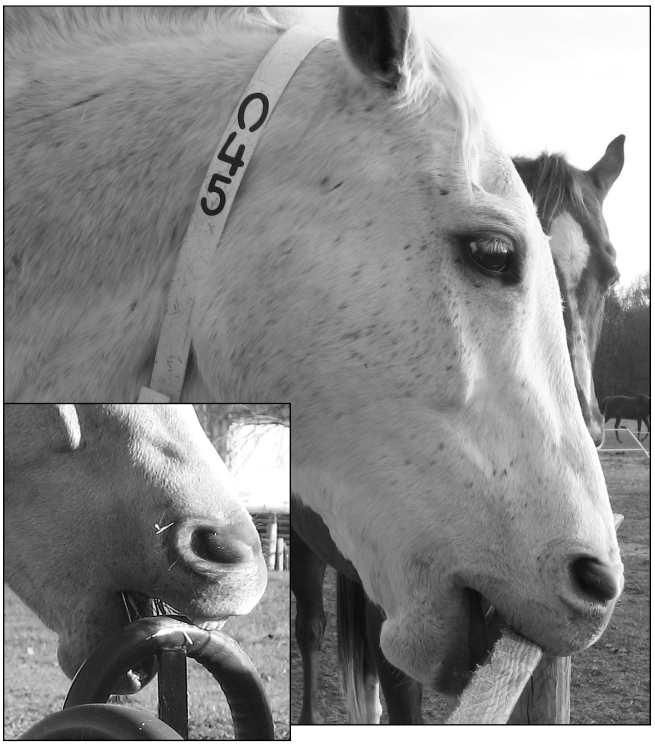

Figure 1. Two horses demonstrating the characteristic grasping of a fixed object with the incisor teeth.

Inside

(Cribbing Behavior, continued from page 1)

Figure 2. Horse exhibiting crib-biting behavior. Horse shown was part of the research study conducted by animal science graduate student Carissa Wickens and described in this Research Outlook article.

antacid reduced the degree of ulceration and inflammation of the gastric mucosa along with the amount of time horses spent crib-biting. In mature horses, CB is associated with lower gastric pH (Lillie et al., 2004), and long-term treatment with antacids has been shown to reduce the frequency of CB (Mills and Macleod, 2002). Nicol (1999) suggested that horses may crib in an attempt to reduce gastric acidity through additional production of saliva. Saliva contains buffering ions and thus acts as a buffer in an acidic environment. A recent study conducted by Moeller et al. (2008) that found that CB stimulated salivation seems to lend support to the salivation hypothesis.

Gastric Acidity and Ulcers

Gastric acidity and mucosal damage are strongly associated. Although gastric acidity is essential in ensuring proper feed digestion, high sustained acid exposure can be detrimental to the stomach wall. The peptide hormone gastrin, secreted by the stomach, stimulates gastric acid secretion upon feed ingestion. Pelleted and sweet feed diets lead to higher increases in gastrin and thus acidity in the stomach than hay diets (Smyth et al., 1989). Concentrate feeding increases CB behavior, with increased CB frequency observed during the time of grain feeding (Gillham et al., 1994).

Figure 3 depicts a simplified schematic of the equine stomach. The proximal (upper) portion of the equine stomach is covered by squamous mucosa. The distal (lower) portion is covered by glandular mucosa containing glands that secrete hydrochloric acid, pepsin, bicarbonate and mucus. The two regions are separated by a cuticular ridge known as the margo plicatus. In mature horses, gastric ulcers primarily occur in the squamous mucosa adjacent to the margo plicatus (Dionne et al., 2003). The squamous mucosa is susceptible to ulceration because it lacks the protective factors, such as mucus and bicarbonate, found in the glandular region of the stomach, and the squamous mucosa area adjacent to the margo plicatus is frequently exposed to high acidity (Murray, 1999). Damage to the gastric mucosa is also associated with teeth grinding (bruxism) and behavioral signs of colic (Murray, 1998).

Animal science graduate student Carissa Wickens recently completed a study to investigate the relationship between CB and the functional integrity of the gastric mucosa in mature horses with a history of CB behavior. The project was a collaborative effort between animal science researchers Steve Bursian, Camie Heleski and Nathalie Trottier at Michigan State University and Cindy McCall at Auburn University in Auburn, Ala.

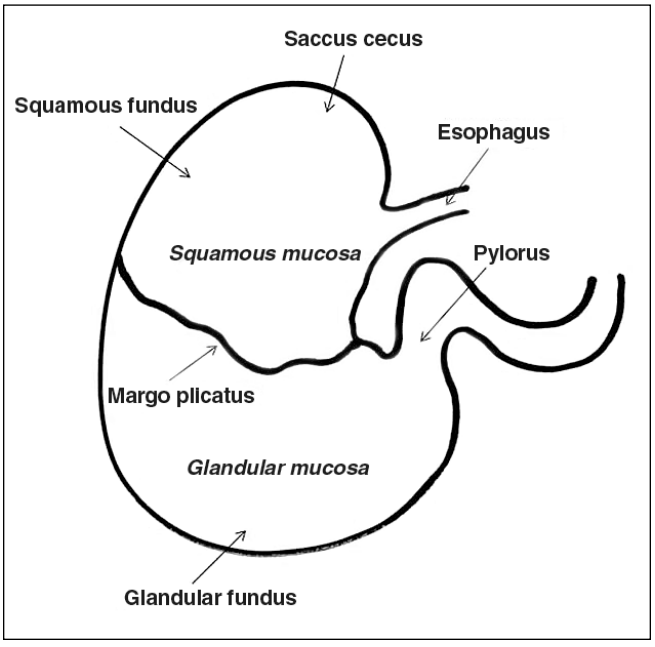

Figure 3. Simplified schematic of the horse stomach anatomy.

Eighteen mature horses housed at the Auburn University Horse Unit (primarily thoroughbreds and warmbloods), nine with history of CB and nine with no history of CB (non-CB) were used in the study. All horses were kept on coastal Bermudagrass pasture with free access to Bermudagrass hay and water. Twice daily, horses received 2 kg of a commercial pelleted diet. Endoscopic examinations were performed on all horses following a 24-hour feed removal period. The condition of the stomach was assessed by two experienced veterinarians (observers) using an accepted gastric ulcer scoring system as shown in **Table 1**.

Ulcer number and severity scores of CB and non-CB horses reported by the two observers are shown in **Table 2**. Ulcers in both groups of horses were mild, and there were no significant differences in ulcer number or severity between CB and non-CB as assessed by either observer.

Table 1. Gastric lesion scoring system.

Lesion number score	Description
0	No lesions
1	1-2 localized lesions
2	3-5 localized lesions
3	6-10 lesions
4	More than 10 lesions or diffuse (or very large) lesions
Lesion severity score	**Description**
0	No lesion
1	Appears superficial (only mucosa missing)
2	Deeper structures involved (greater depth than No. 1)
3	Multiple lesions and variable severity (1,2 and/or 4)
4	Same as 2 and has active appearance (active = hyperaemic and/or darkened lesion crater)
5	Same as 4 plus active hemorrhage or adherent blood clot

Adapted from MacAllister et al. (1997).

Table 2. Ulcer number and severity scores by behavior.*

	Ulcer number score					Ulcer severity score					
	0	1	2	3	4	0	1	2	3	4	5
Observer 1											
Crib-biting[a]	5	2	0	1	1	5	2	2	0	0	0
Non-crib-biting[a]	6	1	1	1	0	6	1	2	0	0	0
Observer 2											
Crib-biting[b]	7	1	0	0	1	7	1	0	0	1	0
Non-crib-biting[b]	8	0	0	0	1	8	0	0	1	0	0

* Values are number of horses with ulcer number and severity scores of 0 to 4 and 0 to 5, respectively.

[a, b] Within each observer, ulcer number and severity did not differ between crib-biting and non-crib-biting horses.

After the endoscopic examination, horses were allowed continuous access to pasture, hay and water for three days. Horses were then tested for blood gastrin concentration. Gastrin, a hormone, is secreted into the blood. The first sample was drawn in the morning, before feeding. Horses were then fed 1 kg of their normal pelleted diet and allowed a 15-minute period to eat. All horses consumed the ration within the allotted time period, and the second and third blood samples were collected 60 and 120 minutes after feeding.

Results of serum gastrin concentration are shown in **Figure 4**. In both CB and non-CB horses, serum gastrin concentrations increased after feeding. CB horses, however, had a higher and more significant increase than non-CB horses. Also, serum gastrin concentrations measured at both times, 60 and 120 minutes, were higher in CB than in non-CB horses.

Implication

The results of this study suggest that, in mature horses maintained on pasture and with established CB behavior, gastric mucosal damage does not appear to be a factor associated with CB behavior. Thus, owners of CB horses who provide their animals with adequate foraging opportunities should not suspect gastric ulcers as being a primary cause of the behavior. However, the increased gastrin response to feeding in CB horses, is of interest. This finding may indicate altered gastrointesti-

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(Cribbing Behavior, continued from page 3)

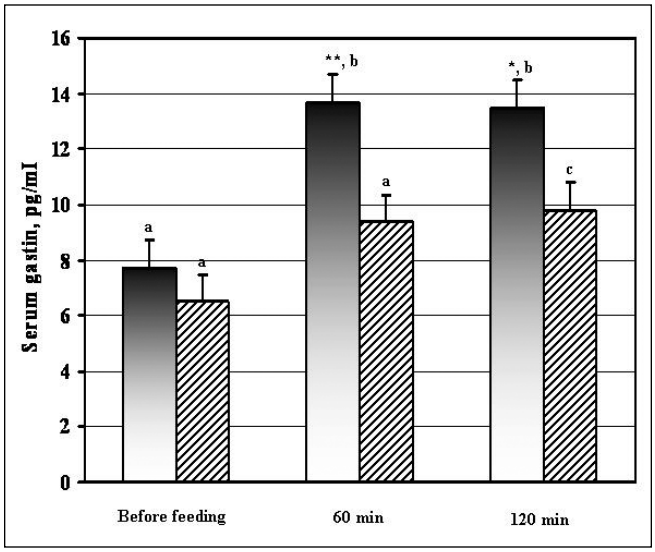

Figure 4. Serum gastrin concentrations in crib-biting and non-crib-biting horses before feeding, and 60 and 120 minutes after consuming 1 kg of a pelleted diet. Bars represent least squares mean estimates with standard error of the mean. Crib-biting (shaded bars) differs from non-crib-biting (hatched bars) at time 60 minutes at **P = 0.01 and at time 120 minutes at *P < 0.05.[a,b] Times 60 and 120 minutes compared with before feeding within crib-biting differ at P < 0.01.[a,c] Time 120 minutes compared with basal within non-crib-biting tended to differ at P = 0.09.

nal function in CB horses which could result in a more acidic gastric environment following the feeding of concentrated meals. An increase in gastric acidity may be more problematic for horses receiving low forage diets in light of the evidence that increased roughage and provision of an antacid diet are effective in reducing CB behavior in established cribbers. Additional studies of the gastrointestinal environment, including measurement of gastrointestinal hormones in a large population of horses exposed to various management schemes, are needed to better understand a role for gastrointestinal disfunction in crib-biting behavior.

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Body Condition and Cold Weather

Horse Health

The 2008-09 winter in Michigan has been unusually cold, with temperatures well below freezing for many days in a row. This extreme cold weather can be particularly dangerous to animals that live outdoors, and the MSU Veterinary Teaching Hospital is reporting an increase in the number of animals it is seeing with starvation- and exposure-related problems.

During the winter, it is imperative that you monitor your horses' body weight by putting your hand on them frequently.

Furry coats make visual assessment of body condition impossible. The only way you can assess your animals' condition is by touch.

As temperatures continue to remain unusually cold, it is important to remember that your animals require extra calories to maintain body temperature and body weight. Once an animal's body condition has deteriorated, it may no longer be strong enough to eat enough food to survive.

Remember that older animals with poor teeth and young animals may require more feed and should be fed separately from other horses to ensure adequate intake.

Points to remember:

- The average inactive horse needs to eat 1.5 to 2 percent of its body weight in food per day just to maintain weight without any other energy demands. In the winter, the amount of food needed will increase because the amount of energy the horse expends to keep warm will increase.

  This means that the average 1,000-pound horse in good condition needs at least 20 pounds of hay during normal weather and may need as much as 35 to 40 pounds of hay and grain products during cold weather.

  If your horse is considered underweight, the amount of feed needs to be calculated on the basis of his ideal weight, not his current weight. Though hay diets are generally ideal, certain animals will require grain, complete feeds or fat supplements to maintain body weight.

- Separate young, old or debilitated horses. The dominant horse will frequently eat most of the food provided, resulting in some horses being healthy and others facing malnutrition.

- Blankets and shelters will help decrease energy demands. However, remember that a blanket hides body condition, so it is important to place your hands under the blanket and remove it at least every week or so to assess body condition.

- Old horses with poor dentition (teeth) may be unable to chew fiber (hay) adequately, so they may require complete pelleted feeds* that are easily broken down. For the average horse that should weigh about 1,000 pounds, at least one-third of a 50-pound bag needs to be fed daily just to maintain body weight, and more will be needed if severe energy demands are present.

- Water intake is also very important during the winter. Many horses will suffer from impaction colics due to inadequate water intake. Older horses may require the water to be not only frost-free but warmed because they have sensitive teeth.

- Remember, during extremely cold weather, to provide extra (free choice) hay. This will generate more energy and comfort than just increasing the grain (concentrate) portion of the diet. Just the physical aspect of moving and eating will make the horse more comfortable. The hay fermenting in the large intestinal tract will generate heat, and the horse will utilize the calories absorbed from the feed.

*A complete pelleted feed is a product that contains at least 15 percent crude fiber and can be fed as the sole source of nutrition for horses. Horses that are routinely fed a complete pelleted feed are senior horses that are lacking teeth or have severe dental problems. A complete pelleted feed can also be used as part of the diet when hay is in short supply (a hay extender) or fed to horses that have certain digestive disorders.

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Body condition score

The body condition scoring (BCS) system is based on a scale of 1 through 9 and is designed to assess a horse's overall condition. Horses with a BCS less than a 4 are at increased risk of hypothermia and starvation, especially when the weather conditions cause an increase in energy demands just to maintain weight. An individual that is already thinner than desired (BCS < 4) will not have adequate body mass (fat) to help provide insulation from the cold or a supply of energy when the diet is lacking in energy and demands are higher than expected.

To determine your horse's BCS, you must touch your horse, especially in the winter. Winter hair hides a horse's true BCS, often until it is too late to successfully correct the weight loss. Feel over the ribs, neck, shoulder area, mid-spine, hips and tail head. If your horse's ribs over the widest part of the barrel are easily felt, with little or no tissue between the skin and the ribs, the BCS is below 4. This horse is suffering from malnutrition and is at a high risk of hypothermia when the temperature drops, particularly if the wind chill is high and little to no shelter is available.

For more information on body condition and feeding horses during the winter, please contact your veterinarian. The Web site **www.extension.org** is also a very good source of information on feeding, care and body condition scoring.

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For related equine health articles — "Purchasing Hay," "Is Your Forage Supply Adequate for Winter?" "Impaction Colic," "Equine Winter Starvation Syndrome," "Winter Energy Needs in Horses" and "Winter Dehydration in Horses" — go to: **http://cvm.msu.edu/alumni-friends/information-for-animal-owners**.

2008 4-H Teen Leaders Conference Bigger than Ever!

Youth Corner

Participants from around Michigan traveled to Tustin to be a part of the 2008 Michigan 4-H Teen Horse Leaders Conference Nov. 22-23. This event is held each November at Kettunen Center, the Michigan 4-H Foundation's leader training facility. It alternates between adult and teen 4-H horse leaders each year. With more than 160 participants, this year's conference was the biggest in years.

The focus of this year's conference was inclusion. Participants discussed ways they could include all 4-H'ers in their club activities — horse lovers young or old, rich or poor, able-bodied or living with a disability, beginner or expert. The importance of reaching out to all who are interested in horses was emphasized.

Teen leaders also heard from speakers from throughout Michigan on a variety of topics. They learned about trail safety, toxic plants, proper saddle fitting, horse showing on a budget and more. Participants had an entertaining and educational history lesson about the Buffalo Soldiers from Washtenaw County 4-H leader Doug Lewis. Many teens even had the opportunity to tie rope halters to take home with them.

The event concluded with a judges' roundtable session that gave teens the opportunity to ask Michigan 4-H horse judges questions about the show ring. Overall, the event was a success thanks to the hard work of our volunteers. A big thank you goes to all of the guest speakers as well as our great programming committee members!

Make Your 2009 New Year's Resolution

Clean Up Your Horse's Environment

Free webcast series helps equestrians manage horse pastures and manure

What's New at MHU?

My Horse University and eXtension HorseQuest offer a free webcast series to help horse owners manage their farms in an environmentally friendly way. The first webcast featured Jenifer Nadeau, from the University of Connecticut, on Jan. 13; Dave Freeman, from Oklahoma State University, is the featured expert on Feb. 10; and Ann Swinker, Penn State University, on March 10. All webcasts are at 7 p.m. EST. Register now for the free webcasts at **www.myhorseuniversity.com**. All webcasts will be archived for future viewing.

The first webcast is titled "An Introduction to Environmentally Friendly Horse Management."

"The majority of horse owners enjoy spending time outside and are concerned about the environment. This webcast provides a variety of ideas about ways in which management by horse owners can help protect the environment — pasture management, manure management, runoff management, stream and riverbank management, and facility management," Nadeau said.

"Small acreages with a large number of horses, along with little knowledge about agronomic practices for farms, are typical scenarios of horse ownership across the United States," said Freeman, presenter of the second webcast, "Pasture Management for Horse Acreages." "Horse owners have to reposition themselves to becoming 'grass managers' if pastures are going to work out."

The last presentation in the series is "Horse Manure: A Renewable Resource."

"Manure, if used properly, can be a valuable addition to any operation's resource system. Many small-scale horse operators feel overwhelmed by the huge mound of manure and soiled bedding. A good manure management program benefits you, your livestock, your land, the neighborhood and the surrounding environment," presenter Swinker stated.

This free webcast series is an ongoing effort by My Horse University and eXtension HorseQuest to bring unbiased, science-based information to the equine community. For more information, visit **www.myhorseuniversity.com** and **www.extension.org/horses**.

About My Horse University

My Horse University (MHU) launched its first online course in 2006. It has served nearly 1,000 learners, from high school and college students to adult horse enthusiasts. Our customers have high praise for their online experience. My Horse University was created through a partnership between MSU Extension, the Department of Animal Science and MSU Global. The internal roots have branched to include the best of MSU's equine researchers and practitioners to national experts through a partnership with national eXtension. My Horse University provides customers with a premier learning experience through a flexible online computer format. We offer our customers science-based research in all of our courses and products. For more information, visit **www.myhorseuniversity.com**.

About eXtension HorseQuest

eXtension is an interactive learning environment delivering the most researched knowledge from the best land-grant university minds across America. eXtension connects people who need information with those who can best provide it — experts who know their subject matter inside and out. At eXtension, you can get online answers to your questions from equine experts, locate horse events in your area, watch instructional videos, take short courses and participate in webcasts with equine experts across the nation. For more information, visit **www.extension/horse.org**.

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Editorial Board

Letter from the Editor

Happy New Year! The first 2009 edition of the Michigan Equine Newsletter is full of information to help you better care for your horse and learn more about the responsibilities of equine ownership. Cold weather brings an increased need for monitoring equine body weight. For more information on this issue, see our Health Corner section. In addition, My Horse University is conducting a series of webcasts around the topics of environmentally friendly "horsekeeping." Finally, if you have a horse that cribs, you won't want to miss our Research Outlook, which investigates the possibility of a relationship between cribbing behavior and equine gastric ulcers. We hope that you have a wonderful 2009 and enjoy our first issue of the year!

All the best,
Karen L. Waite

Calendar

(all events are at the MSU pavilion unless otherwise noted)

Feb. 20-22	**Spartan Stampede Rodeo** *Call Breslin Center for tickets, 517-432-5000*
Feb. 21	**UPHA Winter Tournament Show** *Location: South Barn, Call David Earehart, 248-437-1008*
Feb 27-3/1	**S. Michigan Spring QH and Paint Sale** *Call Tom Moore, 517-403-1786*
Mar. 7	**UPHA Winter Tournament Show** *Location: South Barn, Call David Earehart, 248-437-1008*
Mar. 13-15	**MHC Stallion Expo** *Call Ann Louise Budd, 863-635-3960*
Mar. 21	**UPHA Winter Tournament Show** *Location: South Barn, Call David Earehart, 248-437-1008*
Mar. 28	**UPHA Winter Tournament Show** *Location: South Barn, Call David Earehart, 248-437-1008*
Mar. 29	**4-H Hairy Horse Show** *Call Taylor Tenlen, 517-353-1748, or Carla McLachlan, 517-432-5402*

MICHIGAN STATE UNIVERSITY EXTENSION

For more information, call the MSU Horse Extension office at 517-432-5402.
or check the Equine Extension Web Site: **www.canr.msu.edu/horseadults**.

Equinomics:

Keeping Horses Healthy in Challenging Times

MICHIGAN STATE UNIVERSITY EXTENSION

Equine Program

Increased economic pressure is affecting all of us in a variety of ways. Join the MSU Extension Equine Team for a three-week short course designed to help you keep your horses healthy on a budget. Cost-saving tips on health, nutrition and general management will be shared.

Dates & Topics — **March 18, Basic horse care on a budget**
March 25, Cost-saving options
April 1, Equine nutrition on a budget

Location — **MSU Horse Teaching and Research Center, East Lansing, Mich.**
Time — **7 to 9 p.m.**
Cost — **$40 ($25 for additional family members)** *Includes handouts and refreshments.*
Registration deadline — **March 9, 2009**

For additional information, please contact: MSU Equine Team at 517-432-5402 or e-mail MCLACHL2@msu.edu.

Name: _____

Address: _____

City: _____ State: _____ Zip: _____

E-mail: _____ Telephone: _____

Please reserve for _____ person(s) @ $40 ($25 for each additional family members) totalling $_____

❏ Check: make payable to **Michigan State University** and send to: MSU Equine Team, 1287 Anthony Hall, East Lansing, MI 48824

Credit Card: ❏ VISA ❏ MasterCard ❏ AMEX ❏ Discover

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