

Topic Selection: The Causes of Cribbing in Horses

Explanation of Organization: My first article is a secondary article that gives a broad overview of cribbing and what we know about it, then the next few articles start going into the characteristics of cribbing horses themselves, such as how motivated horses are to crib and their physiological differences with non-cribbing horses. The ones following are the suggested causes of cribbing that have been tested, including heritability, weaning, diet, boredom and environmental factors, and stereotypic neighbours, and the last article talks about the different preventions that are and have been and used by owners of cribbing horses.

Organization:

- **Overview**

Wickens & Heleski (2010): Crib-biting behavior in horses: A review.

- **Characteristics of Cribbing Horses**

Haupt (2012): Motivation for cribbing by horses

Lebelt et al. (1998): Physiological correlates associated with cribbing behaviour in horses: changes in thermal threshold, heart rate, plasma β -endorphin and serotonin.

- **Causes**

- ***Heritability***

Hemmann et al. (2014): Crib-biting and its heritability in Finnhorses.

- ***Weaning***

Waters et al. (2010): Factors influencing the development of stereotypic and redirected behaviours in young horses: Findings of a four year prospective epidemiological study.

- ***Diet***

Gillham et al. (1994): The effect of diet on cribbing behavior and plasma β -endorphin in horses.

Albright et al. (2017): Does cribbing behavior in horses vary with dietary taste or direct gastric stimuli?

- ***Boredom and Environmental Factors***

Whisher et al. (2011): Effects of environmental factors on cribbing activity by horses.

- ***Stereotypic Neighbours***

Nagy et al. (2008): Possible influence of neighbours on stereotypic behaviour in horses.

- **Review of Current Preventions**

Hothersall & Casey (2012): Undesired behaviour in horses: A review of their development, prevention, management and association with welfare: Undesired behaviour in horses.

Wickens, C. L., & Heleski, C. R. (2010). Crib-biting behavior in horses: A review. *Applied Animal Behaviour Science*, 128(1–4), 1–9. <https://doi.org/10.1016/j.applanim.2010.07.002>

Summary:

This article reviews the research that has been done on crib-biting behaviour of horses from articles in the mid- to late- 1990s, to provide a detailed summary of causes and to identify areas for further study. Crib-biting is the behaviour where horses put their incisor teeth onto a fixed surface, pull their head backwards, contract their neck muscles, breathe in, and make a grunting sound. Horses could spend anywhere from 15-65% of their day crib-biting, causing tooth wear and could lead to dental disease.

Through survey studies, housing was one cause suggested, as domesticated horses were seen to crib more compared to those who were free-running. Genetics were another potential cause because crib-biting was found to occur in a family of horses that were involved in competitions. Learning wasn't found to be a likely cause of crib-biting. Physiologically, neuroendocrine physiology and brain function could play a role in crib-biting, as crib-biting horses possessed decreased heart rate and plasma cortisol concentration, and increased baseline cortisol concentration, all parameters to decrease stress. Gastrointestinal irritation is another possible cause. Domesticated horses eat less frequently than free-running horses, so they're more exposed to stomach acidity, making them more susceptible to forming gastric ulcerations. Crib-biting is believed to prevent this since salivation during crib-biting increases gastric pH.

Many owners have attempted to use physical preventions like cribbing straps or muzzles to stop crib-biting, but it was found that these short-term prevention led to increasing crib-biting after they were removed because there was a higher motivation to crib. Pharmacological agents showed some success in stopping crib-biting, but there's a high cost and labour with this method since the horses had to be continuously monitored. The best choice suggested was to allow the horses to forage in nature or to be able to socialize with others.

Contribution:

This review article summarizes the potential causes of crib-biting in horses and was able to go in-depth into how different factors may cause cribbing, suggesting that cribbing is mainly a response to stress or irritation. They covered causes from environmental factors, like housing and confinement, to biological explanations, like neuroendocrine physiology and gastrointestinal irritation, giving us a good range as to what could cause crib-biting. They also ended the review with how some physical preventions would be unfavourable to use, giving information to readers as to what prevention would work best and which wouldn't be effective.

Houpt, K. (2012) Motivation for cribbing by horses. *Animal Welfare*, 21(1), 1-7.
<https://doi.org/10.7120/096272812799129367>

Summary

It's believed that 5-10% of horses crib*, a behaviour that could lead to health problems such as colic or temporohyoid osteoarthritis. Owners have attempted to stop cribbing by using collars or removing surfaces, but these were found to be unsuccessful and only increased the horses' motivation to crib. This study explores that motivation by comparing the horses' motivation to crib and to feed, along with determining the force that horses exert when they crib.

First, they compared the horses' motivation to crib and to feed. 3 horses were tested for their motivation to feed first then for cribbing after 1-2 weeks, and vice versa for the other 5 horses, totalling 8 horses. They were trained to push a metal panel that'll open a door that'll allow them to either crib or get fed. After training, the horses must press the panel a preset number of times for the door to open. In the second part of the study, the horses must pull the bottom portion of their stall open to be able to crib, which was connected to a rope attached to a bucket with lead weights that gradually increased everyday. The amount of weights were equivalent to the amount of force they exerted. Overall, the horses pressed the panel a median of 35 times to both crib and for sweet feed, showing no significant difference, and the median force that the horses exerted to crib was 288N. These results suggest that cribbing horses find cribbing as important as food is and would exert a lot of energy to be able to do so, which could be very harmful to the horse. Therefore, further studies on the causes of cribbing could give us an insight as to how we can prevent it using preventions such as pharmacological treatments.

*The definition of cribbing is provided in the annotated bibliography of Wickens & Heleski, 2010

Contributions

This study was one of, if not the only study that studied and quantified horses' motivation to crib and the efforts that horses put into their environment to make it possible for them to crib. They showed that a horses' motivation to crib is equivalent to their motivation to feed and that they exert a lot of force to be able to do so, demonstrating how harmful it could be for the horses to continue this behaviour. Knowing this, researchers should dive into the causes as to why they perform this behaviour to find a solution to stop it.

Lebelt, D., Zanella, A. J., & Unshelm, J. (1998) Physiological correlates associated with cribbing behaviour in horses: changes in thermal threshold, heart rate, plasma β -endorphin and serotonin. *Equine Clinical Behaviours*, 27 (S27), 21-27.

<https://doi.org/10.1111/j.2042-3306.1998.tb05140.x>

Summary

Cribbing* was first mentioned in a paper in 1578, a stereotypy** that's believed to have a prevalence of 2.4-8.3% of horses. The objective of study was to determine the physiological difference between cribbing and non-cribbing horses to further define cribbing and to see if those effects could provide information about the function of cribbing. 11 horses of various breeds and ages were used for this study. Measurements were taken under basal conditions first, which was determined when cribbing weren't observed for more than 30 minutes, and then during cribbing conditions, where they had cribbed for more than 15 minutes. They measured nociception, using a device made specifically for this study that increased temperature and then recorded the individuals' reaction, and heart rate. Blood sampling was also used to determine levels of β -endorphin (an endogenous opioid), cortisol, and serotonin, samples taken under basal and cribbing conditions.

Nociception and heart rate were significantly lower during cribbing conditions than in basal conditions. Basal conditions of cribbing horses showed significantly higher levels of β -endorphin to that of control horses but no significant difference under cribbing conditions. Both cortisol and serotonin showed no significant difference between control horses, the basal conditions, and cribbing conditions, but all show trends of the control horses possessing higher levels of both hormones. The decreased nociception and heart rate during cribbing conditions suggests that stereotypies change the horse's responsiveness along with arousal. Previous studies have shown that during cribbing, horses possess less opioid antagonist, supporting the results of this study where cribbing horses possessed very high levels of β -endorphins. The study failed to show a difference in cortisol and serotonin levels due to insufficient numbers of blood samples, so future studies should consider focusing on these components and how they differ between cribbing and non-cribbing horses.

*The definition of cribbing is provided in the annotated bibliography of Wickens & Heleski, 2010

**The definition of stereotypies is provided in the annotated bibliography of Waters *et al.*, 2010

Contributions

Along with being able to determine the physiological difference between cribbing horses and non-cribbing horses, this study was able to make and use a new device to measure the nociception of horses without the presence of humans, which may explain the contradicting results about nociception between this study and previous studies. Continuing, the heart rates found in this study agreed with other studies that measured the heart rate of cribbing horses. This article was able to demonstrate that, other than the behavioural differences, cribbing horses also possess physiological differences, which could be an explanation as to why they crib.

Hemmann, K., Raekallio, M., Vainio, O., & Juga, J. (2014). Crib-biting and its heritability in Finnhorses. *Applied Animal Behaviour Science*, 156, 37–43.
<https://doi.org/10.1016/j.applanim.2014.04.008>

Summary:

Previous studies have suggested that genetics could have some connection to crib-biting in horses, a behaviour where horses bite a fixed surface, contract their neck, and make a grunting noise. This article explores the possibility of if crib-biting could be a predisposed behaviour obtained through genetics in a population of Finnhorses by estimating heritability (h^2) and collected phenotypic descriptions of crib-biting through surveys given to the owners. The researchers used data that was collected from privately-owned Finnhorses from 2009 through 2013. The study consisted of 111 crib-biters and 285 non-biters. Surveys given to owners for phenotypic information included questions such as the situations where horses would crib and how long crib-biting persisted for. After using a robust linear model, they determined that h^2 equals 0.68, and surveys found that crib-biting mainly occurred after feeding, is associated with stress, from boredom, and following mismanagement.

The heritability determined through this study was able to confirm that there are genetic factors that play a role in onsetting crib-biting behaviour in horses, and that it's reasonable to predict that the crib-biting gene must be in the horses' genomes before a stimulus from the environment could trigger crib-biting. Therefore, this study has suggested that the combination between chronic stress and genotype leads to the crib-biting behaviour in horses. There is an estimated 400-1200 crib-biting Finnhorses in the world however, only 111 were used for the study, which could have affected the data collection and h^2 could've been much larger. By knowing that horses could inherit the crib-biting gene, we could enable prevention of onsetting crib-biting in susceptible horses. Future studies are needed to estimate h^2 in other breeds to clear our breed effect and to detect susceptible genes to understand how they interact with experiences of environmental or physiological stressors.

Contribution:

This article was one of, if not the first, study to determine the heritability of crib-biting in a horse population, demonstrating that horses who've inherited the crib-biting genes are predisposed to performing the crib-biting behaviour as an adult. The researchers also demonstrated that there's a likely interaction between genetic predisposition and particulate stressful environmental conditions, suggesting that possibly enabling earlier interventions and enhancements of management while the horses are young could prevent crib-biting in the future. Some follow-up questions included heritability in other breeds and the interaction between susceptible genes and environmental or physiological stressors.

Waters, A. J., Nicol, C. J., & French, N. P. (2010). Factors influencing the development of stereotypic and redirected behaviours in young horses: Findings of a four year prospective epidemiological study. *Equine Veterinary Journal*, 34(6), 572–579.
<https://doi.org/10.2746/042516402776180241>

Summary

Stereotypies are repetitive behavioural patterns that have no function and are usually displayed by captive animals, an example being cribbing* in horses. Younger horses, or foals, are more influenced by the environment compared to adult horses and therefore, more susceptible in developing stereotypical behaviours. Some causes of cribbing include wood-chewing, breed, sporting use, gender, management, along with weaning methods, which has been found to play a role in developing stereotypes in rodents. Therefore, this study focused on the factors that may have an influence on the development of stereotypical behaviour in young Thoroughbred and part-Thoroughbred horses, including weaning methods and dominance of mares, or mother horses. The study followed 225 horses of varying ages through 1995-1999, recording onsets of stereotypic behaviours including cribbing, weaving, box-walking, and wood-chewing, during preweaning and during weaning. After weaning occurred, owners were sent guidelines to record any stereotypical behaviours that were observed to retrieve post-weaning data .

Overall, cribbing was seen in 10.5% of the foals at the age of 20 weeks, where foals of dominant horses and foals who were box-weaned were highly likely to develop stereotypies. A post-weaning factor that caused cribbing was being fed grains. Foals who received grains were seen to be 4 times more likely to crib than being fed hay. Interestingly, concentrated feed was found to reduce the risk of wood-chewing, even though 74% of cribbing horses were shown to have wood-chewed before cribbing, so further investigation of the connection between wood-chewing, cribbing, and concentrated feed must be done. The development of stereotypies was the highest in the first 9 months of life, suggesting that, due to the stressful nature of weaning, abrupt weaning, such as barn- and boxed- weaning, should be avoided, as they could result in the development of stereotypic behaviour, like cribbing.

*The definition of cribbing is provided in the annotated bibliography of Wickens & Heleski, 2010

Contributions

This article investigated how the treatment of foals led to the development of stereotypical behaviours in their adult years. The researchers were able to demonstrate that the treatments that young horses received pre-weaned, during weaning, and post-weaned, are factors that causes horses to develop stereotypic behaviour when they become adult horses, such as their weaning methods and the bond made between a dominant mare and her foal, implying that focusing on preventing horses from developing stereotypies through proper treatment when they're foals is an effective way of stopping cribbing from occurring.

Gillham, S. B., Dodman, N. H., Shuster, L., Kream, R., & Rand, W. (1994). The effect of diet on cribbing behavior and plasma β -endorphin in horses. *Applied Animal Behaviour Science*, 41(3–4), 147–153. [https://doi.org/10.1016/0168-1591\(94\)90019-1](https://doi.org/10.1016/0168-1591(94)90019-1)

Summary

Highly palatable foods were previously reported to cause the release of β -endorphin in the brain, an endogenous opioid that's believed to induce cribbing* in horses, which could explain why horses crib more when fed sweet feed. This study was conducted to investigate this relationship between different feeds and β -endorphin with cribbing frequency in horses. 5 crib-biting horses and 6 non-biters were studied through 2 hour trials. The control phase was where horses performed normally for 30 minutes, cribbing frequency was recorded and blood was taken afterwards. Then, horses received 1 of 3 feeds, sweet feed, high protein, or high fibre, in a random order. Their blood was taken 5 minutes after the test started, and then the cribbing frequency was recorded in intervals of 5 minutes for a total of 30 minutes.

The results showed that cribbing frequency changed with different feeds, where frequency significantly increased with sweet feed and unsweetened grain compared to the baseline and the high fibre feed after a 30 minute period, and that the baseline and high fibre feed had no significant difference. The mean baseline of β -endorphin of cribbing horses was half of non-cribbing horses, showing a significant difference between the two groups but not between diets. From the results, the study was able to show that highly palatable feed did in fact show a significantly higher rate of cribbing, suggesting that palatability does indeed affect cribbing in horses. The lower baseline β -endorphin levels in cribbing horses proposes that cribbing horses impair the release of β -endorphin while simultaneously increasing their opioid receptor sensitivity or receptor density to allow for the increased response to the stimuli, but this needs further investigation. Decreasing grain components and increasing feeding time were also proposed as focuses for future studies.

*The definition of cribbing is provided in the annotated bibliography of Wickens & Heleski, 2010

Contributions

This article showed that a cause of cribbing is diet, demonstrating and supporting the findings of previous studies that stated that highly palatable diets cause horses to increase their frequency of cribbing. An interesting find from this study was that a high fibre diet showed no significant difference in cribbing frequency with the baseline measurement, suggesting that a diet containing high fibre may be a suitable one for cribbing horses. Along with fibre, future studies should focus on changing the components in the diets of cribbing horses', such as decreasing grain components, as a potential solution to reduce cribbing.

Albright, J., Sun, X., & Houpt, K. (2017). Does cribbing behavior in horses vary with dietary taste or direct gastric stimuli? *Applied Animal Behaviour Science*, 189, 36–40.
<https://doi.org/10.1016/j.applanim.2017.01.015>

Summary

An estimated 2-10% of horses perform a stereotypical behaviour* known as cribbing**. From previous studies, horses fed concentrated feed or sweet feed increased the risk-factor of developing cribbing, while roughage and plain oats did not. The objective of this study was to investigate the relationship between sweet-tasting substances and cribbing by comparing the effects of different types of sugars on cribbing when ingested by mouth and single-sugar solution transferred directly to the stomach using a nasogastric tube. The study was done on 6 client-owned cribbing horses, housed and treated similarly. The first experiment involved giving one of many sweet feed mixtures daily, 3-5 days a week. In the second experiment, horses were intubated once every 48 hours with a random order of three solutions; 12% grain, 10% fructose, or 100% tap water. The latency and frequency of cribbing were recorded after 15 minutes of being fed in both experiments.

The researchers found that there was no significant difference between the frequency or latency to crib between any solutions when ingested through the mouth except when fed a 100% grain, which saw a significant increase in frequency and significant decrease in latency. There were also no significant differences in cribbing frequency or latency observed between the solutions given nasogastrically either, although a shorter latency was observed after the administration of grain solution. The study showed that both grain and sweet feed were a major trigger to cribbing, sweet feed having less of an effect, suggesting that palatability affects cribbing. Also, the cribbing observed after nasogastric administration suggests that the parasympathetic system has some role in inducing cribbing behaviour as well. From these results, future studies may include how changing the components of the diet, such as adding less grains, could be a possible way of managing and preventing cribbing.

*The definition of stereotypies is provided in the annotated bibliography of Waters *et al.*, 2010

**The definition of cribbing is provided in the annotated bibliography of Wickens & Heleski, 2010

Contributions

This article demonstrated that diet is a major cause of inducing cribbing in horses too. In this article, it was shown that a grain, or concentrated feed diet significantly increases both cribbing frequency and latency in horses, therefore, suggesting to owners that giving a high grain diet to a cribbing horse isn't favourable. The article also showed that horses cribbed even when the solutions were administered nasogastrically, suggesting that diet signaling the parasympathetic system may affect cribbing too, supporting previous studies that found glucose in the gastrointestinal tract stimulating nerves involved in the parasympathetic system.

Whisher, L., Raum, M., Pina, L., Pérez, L., Erb, H., Houpt, C., & Houpt, K. (2011). Effects of environmental factors on cribbing activity by horses. *Applied Animal Behaviour Science*, 135(1–2), 63–69. <https://doi.org/10.1016/j.applanim.2011.09.001>

Summary

Stereotypies*, such as cribbing** could be a sign of welfare in horses. There are many suggested causes to cribbing, like the management and boredom. The objectives of this study were to define cribbing, compare the crib rates between sweet feed and oats, and to observe the cribbing frequency when provided with resources to prevent boredom. 16 cribbing horses were used for this study, housed in the same type of stalls with no tactile contact with other horses. Using a video camera and time lapse recorder, samples were taken every minute and behaviours before and during cribbing were recorded. Observations were recorded after the horses were fed with either oats or sweet feed for a total of 3 days. In the second part, horses were given a randomized order of food dispensing toys, alternating between having a toy for one week and a control week containing no toys, observations were recorded during both weeks. For exercise, horses were brought out to a pen for a short warm up of trotting, and then proceeded to periods of running that were increased gradually every session.

They found that horses tend to lick the surfaces they're going to crib on before cribbing, and that cribbing occurred a mean of 316 minutes per day, significantly increasing at night. All of the food dispensing toys showed no significant decrease in cribbing except one, nor did exercise. The results suggest that diet and oral enrichment may affect cribbing, where sweet feed affects cribbing rates long after consumption. Cribbing also occurs more at night, possibly as a behaviour that takes place of feeding. The study also suggested that cribbing could be more of a diet-influenced behaviour than boredom, but further research should be done to determine if diet changes would be most effective in decreasing cribbing.

*The definition of stereotypies is provided in the annotated bibliography of Waters *et al.*, 2010

**The definition of cribbing is provided in the annotated bibliography of Wickens & Heleski, 2010

Contributions

Although there were studies that suggested that horses crib more at night, this was one of the first studies during the time to exclusively study and report cribbing rates occurring during the night, successfully showing that cribbing happens significantly more frequently during the night compared to the day. Boredom was previously suggested to be a possible cause of cribbing, but this study was able to demonstrate that cribbing is more diet-influenced than boredom-influenced, which means that we should focus on modifying the diet of cribbing horses and less on providing behavioural enrichments.

Nagy, K., Schrott, A., & Kabai, P. (2008) Possible influence of neighbours on stereotypic behaviour in horses. *Applied Animal Behaviour Science*, 111(3-4), 321-328.
<http://doi.org/10.1016/j.applanim.2007.06.006>

Summary

Abnormal stereotypic behaviour (ASB), behaviours that are repetitive and seemingly functionless, include cribbing*, which occurs in 0.4%-5% of horses. ASB are hard to change once developed, so prevention is key. The objective of this study was to investigate the possibility of increasing the odds of another horse developing ASB through exposure of a stereotypic horse. Data was collected through questionnaire surveys given to 9 riding schools in Hungary to get information of ASB of 287 horses. Independent variables included horse usage, subject variable, housing and management conditions, problematic behaviour, and stereotypies of their neighbours, while the dependent variables were ASB, including crib-biting, wood chewing, weaving, and box-walking.

Overall, the occurrence of ASB were seen in 16.7% of all horses, with the most prevalent ASB seen was wood-chewing, seen in 10.10% of horses, then followed by cribbing, seen in 4.53%. The study suggests that the presence of an aggressive or stereotypic neighbour increases cribbing in horses that already perform cribbing behaviour due to the increased stress they experienced from the sound produced by the cribbing neighbour, especially if they're a sensitive individual. However, it's unlikely for non-cribbing horses to develop cribbing through observational learning, therefore, placing cribbing horses in isolation will have no positive effect and will just cause that horse to increase cribbing due to the stress of being alone. These results suggest that, instead of focusing on stopping cribbing horses from cribbing, we should focus on monitoring early signs of development and place precautions on younger horses to prevent the development of ASB. As this study was an observational study, the causal relationship of stereotypic neighbours and cribbing should be studied experimentally to further understand the effects of neighbours on cribbing and non-cribbing horses.

*The definition of cribbing is provided in the annotated bibliography of Wickens & Heleski, 2010

Contributions

Although an observational study and therefore couldn't definitively conclude the causality of stereotypic neighbours on cribbing, this article was a step closer in identifying the causes of cribbing, and was able to suggest a different factor for researchers to focus on in future studies. It also provides information for owners since lots of them believe that stereotypical behaviour could be learnt, leading them to isolate the stereotypic horses, and although the researchers couldn't completely confirm if they could or not, this article was still able to suggest that isolation isn't effective and could be causing more harm than good.

Hothersall, B., & Casey, R. (2012). Undesired behaviour in horses: A review of their development, prevention, management and association with welfare: Undesired behaviour in horses. *Equine Veterinary Education*, 24(9), 479–485.
<https://doi.org/10.1111/j.2042-3292.2011.00296.x>

Summary

This article reviews and introduces the current approaches to managing and interpreting undesired behaviours in horses, such as stereotypies*, from a collection of articles ranging from 1966-2010. The researchers stated that horses mainly perform three categories of behaviours; social contact, avoiding predators, and eating, which takes up ⅔ of the time. Undesirable behaviours aren't because of one motivator but a mixture of them, including pain and anxiety or any circumstances that prevents the horses from accomplishing any of the behaviours above. A set of undesirable behaviours are known as stereotypies, one example being cribbing**. Cribbing's believed to be caused by low foraging and high starch diets, neurological factors, and environmental factors too.

Cribbing collars that physically prevented horses from cribbing have been previously used but were found to be ineffective in stopping the behaviour long term. Other alternatives like making the surface bitter, electrifying, or removing it, or using muzzles, were found to have the same outcome. A long term treatment that has been used is surgical removal of nerves or muscles in the ventral side of the horse's neck. Although successful for some, this procedure failed to stop cribbing in all horses and could lead to many risks and complications afterwards. Since the poor welfare and environment is linked to cribbing, the use of straw bedding and high fibre diet could decrease cribbing as this allows for more foraging time and lower the use of concentrated feed. Other modifications that could be implemented to decrease the risk of cribbing includes environmental changes to allow for more social interaction and time spent foraging. These were some current and suggested preventions, but to find a completely effective solution, we must further our understanding of the underlying problems and causes that lead to cribbing.

*The definition of stereotypies is provided in the annotated bibliography of Waters *et al.*, 2010

**The definition of cribbing is provided in the annotated bibliography of Wickens & Heleski, 2010

Contributions

This article goes over why horses perform undesirable and stereotypical behaviours, as well as giving us a great overview of the preventions and modifications that have been or are currently being implemented on cribbing horses as an attempt to stop cribbing, and the reasons as to why they aren't successful. The article puts a huge emphasis on furthering our studies the surrounding causes of cribbing and the possible underlying problems that the horses are experiencing leading them to perform the behaviour, stating that until then can we produce and find solutions to stop it.