

Prevention of crib-biting: a review

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Summary

Crib-biting is a common oral stereotypy. Because of perceived deleterious effects on the health and appearance of subjects the prevention of crib-biting is regularly attempted. The resourcefulness of horses in satisfying their motivation to perform this behaviour often frustrates owners' efforts at prevention. This paper reviews the efficacy and observable consequences of attempting to prevent crib-biting by a variety of methods. These include attempts to prevent the grasping of objects, to interfere with air-engulfing and to introduce punishment for grasping and neck-flexion. Other approaches include the use of surgery, acupuncture, pharmaceuticals, operant feeding and environmental enrichment. A remedy that is effective for every crib-biter remains elusive. We conclude that, rather than concentrating on remedial prevention, further research should be directed at establishing why horses crib-bite and how the emergence of crib-biting can be avoided.

Introduction

Crib-biting is an oral stereotypy that, together with wind-sucking, has been reported in 5.5% of young Thoroughbreds (up to age 4 years, McGreevy *et al.* 1995a), in 7.3% of mature Thoroughbreds (more than 4 years, McGreevy 1995a) and in 6.3% of the general population (McGreevy *et al.* 1995c). During crib-biting, the horse seizes a fixed object with its incisors and pulls back, drawing air into its cranial oesophagus while emitting a characteristic grunt (McGreevy *et al.* 1995b). In wind-sucking, the horse achieves the same characteristic posture and grunt without grasping a fixed object (Owen 1982).

Crib-biting is generally thought to be a stereotypic behaviour because it clearly meets 2 defining characteristics: it is invariant (e.g. horses reliably grasp favoured substrates in their environment on which to perform the behaviour) and it is repetitive. One study estimated a mean daily cribbing rate of 1899.5 ± 331.28 ($n = 10$) with one horse performing 7,680 repetitions in one 24 h period (McGreevy 1995). The third defining characteristic of a stereotypy is that it should have no obvious function. However, this subjective criterion highlights one of the most controversial questions in applied ethology. While some have argued that stereotypies are functionless pathologies of the neural network (Stoessl 1990; Dantzer 1991), others have argued that they may function in stress reduction (Valenstein 1976) and allow animals to cope with aversive environments (Wood-Gush *et al.* 1983; Broom 1991). A

further suggestion is that a given stereotypy may retain a function within the motivational system from which it is derived (Kiley-Worthington 1987). Therefore, an oral stereotypy such as crib-biting may provide a route to normal feeding and digestive activity within an environment that severely limits normal forage intake (e.g. an intensive training programme characterised by the provision of high concentrate: minimal roughage diets).

The deleterious effects of crib-biting vary, with some owners reporting no ill-effects while others regard digestive disorders, incisor erosion and failure to thrive as important sequelae. Owen (1982) notes that crib-biting leads to chronic colic, flatulent colic and a distended abdomen. However, the extent to which these signs can be linked to aerophagia has been challenged by recent radiographic findings that indicate the ingestion of minimal volumes of gas during crib-biting (McGreevy 1995b).

Tooth wear is an inevitable consequence of crib-biting unless specially modified sites are provided. Tooth wear is unlikely to be associated with pain since nerves are not exposed, but it can result in difficulty in grasping and chewing forage which may ultimately result in loss of body condition. Weight loss may also occur in crib-biters if planes of nutrition are critical, because these horses expend energy performing the behaviour while spending less time resting and nourishing themselves (McGreevy 1995).

Management and prevention

Because of the perceived risk of copying, crib-biters are often isolated from nonstereotypic horses. This management complication further contributes to the unpopularity of crib-biters and their reduced market value. For these reasons, the prevention of crib-biting is regularly attempted. However, if crib-biting does serve a function in stress reduction or digestive activity, its prevention may compromise welfare.

Methods of prevention

Attempts to prevent the grasping of objects: Short-term prevention of crib-biting can be achieved by housing animals in projectionless boxes or modifying any ledges in a loose-box with plastic guttering and rolling bars (Kennedy *et al.* 1993). Bucket muzzles have also been recommended to eliminate the grasping component of the behaviour (Kennedy *et al.* 1993).

Attempts to interfere with air engulging: Permanent fistulation of the buccal cavity (Karlander *et al.* 1965) or the use of a fluted bit is claimed to control the air engulging phase of both crib-biting and wind-sucking by making it difficult for the horse to keep the mouth airtight (Miller and Robertson 1959).

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Attempts to punish grasping: The use of proprietary electric fencing inside stables is a common deterrent to crib-biting. It is arranged on all ledges in the same way that taste deterrents are applied (Haupt and McDonnell 1993). The list of taste deterrents for horses is exhaustive and ranges from sheepskin (Magner 1903) to asafetida (Leeney 1929) and creosote (Miller and Robertson 1959). Meanwhile, filing of the incisor teeth, metal inserts between them (Magner 1903) or others that impinge on the palate (Owen 1982) have been described as means of making the grasping of fixed objects unpleasant.

Commercially available electronic dog training collars can be adapted to fit the equine neck and can be remotely controlled so that the horse does not associate punishment with human presence (Haupt and McDonnell 1993). The principles of learning theory suggest that the use of dummy collars before and after aversion training of this sort may help to prevent the association of punishment with the collar itself (F. Ödberg, personal communication).

It is reported that, by applying an electric shock after the horse has grasped but before it has engulfed air, punishment and therefore extinction of grasping, rather than simple avoidance, may be achieved (Baker and Kear-Colwell 1974). The dose of shock is important here since learning may not occur above an optimal level of arousal (Lieberman 1993).

Attempts to punish neck-flexion: Because both crib-biting and wind-sucking are accompanied by characteristic flexion of the horse's neck, they can be discouraged by the application of a cribbing collar (Hayes 1968) which is the most common means of short term prevention. This device is a simple leather strap incorporating a galvanised, hinged arc that accommodates the trachea and allows normal breathing despite the collar being tightened to the point where neck flexing and/or the engulfing of air are not performed. Since the terminal grunting in this oral based stereotypy is known to involve distension of the cranial oesophagus (McGreevy *et al.* 1995b), it is possible that the presence of a constriction in this site may not only make crib-biting uncomfortable but that it may also make it less easy to consummate. Modifications of the collar include the use of leather spurs and metal spikes to heighten the discomfort applied when the horse flexes its neck (Owen 1982).

Surgery: Attempts at long term prevention by surgical intervention involve the excision of many combinations of different muscles and/or nerves of the ventral neck (Forsell 1929; Hamm 1977; Hakansson *et al.* 1992). Palatoschisis has been also described as a surgical approach to crib-biting (Smith 1924).

Acupuncture: Some success has also been claimed for the use of acupuncture in the treatment of crib-biters (Kuusaari 1983) and investigations into the use of ear staples to stimulate acupuncture points are proceeding (S. McDonnell, personal communication).

Pharmaceuticals: Sustainable pharmacological approaches to equine stereotypies are under investigation e.g. opioid antagonists (Dodman *et al.* 1987) but it has yet to be established whether these work by making the behaviours less rewarding or by eliminating the frustrating effects of the environment.

Operant feeding: Operant demand systems, using oral movements, for food rewards have been investigated as an approach to crib-biting prevention (Haupt 1982; Winskil *et al.* 1996). Working from the premise that this behaviour has its origin in frustration arising from low arousal environments,

these devices can be employed to deliver small aliquots of the horse's daily ration only when the horse has activated a trigger or moved a food cube several times. Therefore, the horse's time-budget can be replenished with behaviours that are neither stereotypic nor deleterious to its health.

Grazing: Giving the horse greater time in paddocks with *ad libitum* forage and social contact with conspecifics is widely acknowledged as the most successful means of reducing the frequency of crib-biting. Although there is no direct evidence that this is the case, these management factors are associated with a lower prevalence of abnormal behaviour in young Thoroughbreds (McGreevy *et al.* 1995a).

Efficacy of prevention

Reports of the success of the buccostomy and fluted bit are controversial since the mouth remains open during crib-biting and, therefore, it would appear that consummation of the behaviour does not rely on a sealed buccal cavity. Furthermore, it has been suggested that oral structures are not critical to the air-engulfing phase of the behaviour.

Despite promising early reports, follow-up studies in 60 cases of aversion therapy using electric shock collars indicated that only 9 'cures' were effected and of these 3 required reinforcement therapy after 9 months (Owen 1982). One problem with the technique may be that the horse may not crib-bite for a long period after the first shock. Considerable patience and constant observation may be required for the trainer to maintain the contingency between crib-biting and punishment.

Anecdotal reports, of horses showing the behaviour after up to 3 years in projectionless boxes (Hayes 1968), suggest that, once acquired, the behaviour is extremely persistent and can occur in environments very different from those in which it arose. This observation supports the idea that stereotypic behaviours become emancipated or detached from their initiating causes (Kiley-Worthington 1987; Mason 1993).

The success claimed for myectomy diverges between authors, Forsell (1924) quoting success rates of 100–60% and more recently, (Hermans 1973) a 53% 'cure' rate. Similar discrepancies arise for neurectomy, Monin (1982) and Fraufelder (1981) citing success rates of 60% while Firth (1980) and Owen *et al.* (1980) cite complete failure. It has been suggested that confusion in terminology, differing criteria of success, follow-up periods and post operative management may have contributed to these divergences (Owen 1982).

Of the surgical cases that show partial rather than complete resolution, grasping is reported to be more persistent than grunting. This supports the findings of McGreevy *et al.* (1995b) which revealed the involvement of the musculature of the ventral neck in the air-engulfing process that accompanies the characteristic grunt.

Transient elimination of crib-biting was reported in 100% of subjects treated with either naloxone, nalmefene or diprenorphine (Dodman *et al.* 1987). Crib-biting was prevented for up to a week by continuous infusion of 5 to 10 mg nalmefene/h (Dodman *et al.* 1987).

Data on the efficacy of acupuncture and operant feeding devices are extremely limited.

Physical consequences of prevention

Often horses adapt to the constriction of the collars which are

subsequently tightened, occasionally to the extent that skin trauma is apparent (Hachten 1995). Combinations of straps that can be tightened around different parts of the cranial neck have been advocated to reduce tissue damage at the poll (Hachten 1995).

Surgical approaches to crib-biting, especially myectomies, bring the likelihood of disfigurement which is particularly unwelcome in the case of show horses. Buccostomy wounds, on the other hand, regularly heal over.

The greatest impediment to the development of commercial forms of pharmaceutical cures appears to be the short half-life of their active ingredients (Dodman *et al.* 1987). Because the need for daily injections makes certain opioid antagonists unacceptable to many owners, the development of subcutaneous depot preparations would be a logical research pursuit.

Behavioural consequences of prevention

Any of the methods of prevention or punishment described may increase stress. It is possible that elimination of one stereotypy may precipitate the emergence of a modified or alternative stereotypy. For instance, thwarted horses occasionally develop the ability to crib-bite on their own limbs or conspecifics' bodies (Hayes 1968; Boyd 1986). Alternatively, crib-biters prevented from grasping may begin to wind-suck (Sambraus and Rappold 1991).

Muzzles may impair the ability of the horse toprehend food and may interfere with diurnal ingestive rhythms. Similarly, devices that deliver dental and palatal pain may interfere with the horse's ingestive behaviour and result in a failure to thrive. While horses rapidly learn to eat with bits in their mouths, the presence of a permanent fistula is sometimes associated with transient drinking difficulties and the more persistent effusion of ingesta (Owen 1982).

The extent to which unpleasant substrate-covers and aversion therapy increase arousal in horses has not been determined. It is possible that these approaches to crib-biting prevention may precipitate unwelcome behavioural side-effects e.g. horses in electrified stables may exhibit greater reactivity. Affected horses may be unable to groom themselves on projections in the box and therefore their welfare may be further compromised.

Operant demand devices rely on pelleted forms of food and therefore may fail to provide the level of oral stimulation that horses have evolved to require (Toates 1981; McGreevy *et al.* 1995b).

Lastly, if they are used as a palliative to the effects of poor management, psychoactive pharmaceuticals may be contraindicated on welfare grounds (Houpt 1995).

Conclusions

The need to prevent crib-biting, for aesthetic and occasional health reasons, has prompted a search for a permanent cure. A remedy that is effective for every crib-biter remains elusive. The resourcefulness of horses in satisfying their motivation to perform this behaviour seems to overwhelm man's ability to prevent established forms of the behaviour. This suggests that, rather than concentrating on remedial prevention, research should be directed at establishing why horses crib-bite and how the emergence of crib-biting can be avoided.

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