Owner-Reported Response to Treatment of 130 Headshaking Horses

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Nose nets, face masks, and magnesium supplementation were the most efficacious nonmedical therapies for treatment of headshaking. Of the pharmacological treatments, cyproheptadine, corticosteroids, and melatonin resulted in greatest improvement. Each of these treatments resulted in improvement in approximately 50% of headshaking horses. Authors’ addresses: Department of Veterinary Medicine and Epidemiology, University of California Davis, CA 95616 (Pickles, Aleman, Madigan); Science Supplements, Unit 2A, Chase Road, Bury St. Edmunds, Suffolk, IP32 6NT, UK (Marlin); and PO Box 80, Bury St. Edmunds, Suffolk UK IP28 9BF, UK (Adams); e-mail: jemadigan@ucdavis.edu. *Corresponding author; †Presenting author. © 2014 AAEP.

1. Introduction

Idiopathic headshaking has been recognized for over a hundred years1,2 and is a spontaneously occurring disorder of mature horses causing violent head flicking, snorting, and muzzle rubbing. Due to this localization of clinical signs to the head, and in particular muzzle area, it has long been suspected that the disease pathogenesis involves the trigeminal nerve.1,3,4 Recently a decreased threshold for trigeminal nerve activation has been confirmed in headshaking horses compared to controls.5 The limited pathological studies performed to date have failed to determine any structural abnormalities of the trigeminal nerve, and therefore a functional disorder is proposed.5,6 Other unexplained features of headshaking include the predisposition of geldings to the disease and the seasonality of clinical signs.7,8 This seasonality and the fact that some horses go into spontaneous remission suggests that the documented aberrant activity of the trigeminal nerve may be reversible. However, due to our limited understanding of the etiopathogenesis of headshaking, current treatments are primarily directed at minimizing clinical signs and discomfort rather than correcting anomalous trigeminal neurophysiology and, consequently, have limited efficacy in many horses.4,9 There are few large scale studies reporting success rates of the various treatments for headshaking, which makes it difficult for veterinarians to provide such advice to owners. The aim of this study was to undertake a survey of owners of headshaking horses to determine the reported success rate of commonly utilized therapies.

NOTES
2. Materials and Methods

Questionnaires

An online questionnaire was designed using Survey Monkey®. The questionnaire contained 3 sections. The first section comprised 27 questions regarding the horse’s signalment and general management. Section 2 contained 15 questions regarding the horse’s headshaking including if the horse was currently headshaking, which months of the year headshaking occurred, which month headshaking was worst, evidence of seasonality and weather related headshaking behavior, and if headshaking had been diagnosed by a veterinarian. Additionally, owners were asked to complete a checklist of 20 particular headshaking behaviors for their horse and a 15 item checklist about activities associated with their horse’s headshaking. Section 3 comprised 11 subsections regarding 11 possible headshaking treatments: nose net, face mask, fly control, cyproheptadine, carbamazepine, corticosteroids, non-steroidal anti-inflammatory (NSAIDs), antihistamines, melatonin, magnesium, and combined melatonin and magnesium therapy. If a particular treatment had not been used, the respondent was directed to the next treatment subsection. Within each treatment subsection, owners were asked to specify what time of year the treatment had been trialed, describe the particular treatment (e.g., type of nose net) and dosage and administration details if appropriate (including if product was generic or compounded), if any response was observed (completely stopped headshaking, marked improvement, some improvement, no change, or worsened headshaking), and if any side effects of treatment were noted. The questionnaire was advertised via headshaking website forums and via Facebook®. Links to the questionnaire remained open for 2 months.

Data Analysis

Results are reported descriptively. A positive treatment outcome was deemed as improvement in headshaking behavior and was calculated as the sum of completely stopped headshaking, marked improvement, and some improvement responses. A negative treatment outcome was described as no improvement or worsening of headshaking and was calculated as the sum of no change and worsened headshaking responses. For geographical comparisons, data was assigned a location of North America, Europe, or Australasia. Mann Whitney tests were used to examine 2 non-paired variables.

3. Results

Questionnaire Response

Questionnaires were completed by 137 respondents. The treatment section was not completed by 7 respondents giving 130 useable questionnaires. Some respondents gave incomplete details for a particular treatment giving a useable response range of 122 to 130 (median 127) for individual treatments. Responses were received from the UK (n = 49), U.S. (n = 45), Canada (n = 8), mainland Europe (n = 11, 3 each from France and Germany and 2 from The Netherlands), Australia (n = 3), and New Zealand (n = 5).

Description of Headshaking Horses

The median (range) age of the population of headshaking horses was 11 (2–27) years with a median (range) length of ownership of 6 (0–20) years. Most breeds were represented with Thoroughbred (including crosses) and Quarter Horse being most frequent comprising 22% and 14% of the population, respectively. Almost half of the horses were used for light activities only with 24% used for hacking/trail riding, 16% for pleasure riding, and 8% being retired/companion animals. Dressage was the most frequent competitive discipline performed by headshakers, reported by 13% of owners.

Of the 132 horses for which data were available, 84 (64%) had been diagnosed with idiopathic headshaking by a veterinarian. Headshaking behavior was seasonal in 79/132 (60%) horses whilst 53/132 (40%) displayed clinical signs all year or randomly intermittently, without any apparent predictability. The most common headshaking signs displayed were “vertical shaking of the head” (121/132; 92%), “acting as if an insect flew up its nose” (112/132;
85%), and “rubbing of the muzzle on objects” (108/132; 82%). Headshaking clinical signs varied with the weather in 91/132 (69%) of horses and was worse when exposed to bright light in 52 horses (39%). The prevalence of headshaking clinical signs is shown in Table 1. Horses with a veterinary diagnosis of headshaking were more likely to show excessive snorting of the nose ($P = 0.007$), reluctance to move ($P = 0.007$), striking at nose/muzzle with front foot ($P = 0.02$), have an anxious facial expression ($P = 0.0009$), and stare out into space as if seeing imaginary objects ($P = 0.009$) compared to owner-diagnosed headshaking horses. These horses were also more likely to display clinical signs when at rest in the stable ($P = 0.05$), when lunged without tack ($P = 0.01$), when ridden at canter ($P = 0.003$), when walked in hand in a bridle ($P = 0.04$) or halter ($P = 0.02$), and when eating grass ($P = 0.05$).

For the 131 owners that gave data, 9 (7%) described their horse’s headshaking as mild (occasional headshaking, rarely interferes with riding activity), 35 (27%) as moderate (some headshaking, interferes somewhat with riding activity), 41 (31%) as severe (frequent headshaking, interferes greatly with riding activity), and 46 (35%) as very severe (frequent headshaking, impossible to perform riding activity). Owners of horses with a veterinary diagnosis rated their horse’s headshaking as more severe than owner-diagnosed horses ($P = 0.007$).

### Treatment Outcome

#### Nose Net

Nose nets had been used by 110/128 (86%) respondents. Of those that had tried nose nets, 91 (83%) had used half nets extending from the noseband to cover the upper jaw and lip, 43 (39%) had used full nose nets covering both the upper and lower jaws and lips below the noseband, and 24 (22%) had tried both types of nose nets. A further 4 owners had used homemade nose nets made from nylon stockings, 1 used ropes dangling from the noseband and 1 used a dangling fringe from the browband.

A positive outcome was reported by 58/110 (53%) owners; 6 horses (5%) completely stopped headshaking, 21 (19%) showed marked improvement, and 31 (28%) showed some improvement (Table 2). Any improvement was seen immediately upon placement of the nose net although some horses required several sessions of wearing the net to accommodate its use. Six respondents said that the positive effect of the nose net had waned over time. A negative outcome was reported by 52 (47%) of owners with 40 horses (36%) showing no response and 12 horses (11%) headshaking worse with use of a nose net (Table 1). Negative side effects were shown by 32 horses (29%) of horses using nose nets with irritation by the net (24 horses) and panic (5 horses) described most frequently. There was no significant difference between half or full nets in outcome or the presence of adverse effects.

#### Face Mask

Face masks had been used as a treatment on 83/130 (64%) headshaking horses with 42 (51%) of these masks containing UV eye shades. Forty-four (53%) horses had a positive outcome from face mask use with 3 (4%) horses completely stopping headshaking, 13 (16%) showing marked improvement, and 28 (34%) showing some improvement (Table 2). A negative outcome was observed in 39 (47%) horses with 32 (39%) showing no response and 7 (8%) horses becoming worse following face mask use (Table 2). Negative side effects were noted in 18 (22%) horses with “spookiness,” tripping due to diminished vision and worsening of headshaking most frequently cited. The presence of UV eye shades did not affect outcome or occurrence of adverse effects.

### Table 2. Owner Reported Response of 130 Headshaking Horses to Various Treatments

<table>
<thead>
<tr>
<th>Treatment Used</th>
<th>Positive outcome</th>
<th>Completely stopped</th>
<th>Marked improvement</th>
<th>Some improvement</th>
<th>Negative outcome</th>
<th>No change</th>
<th>Worse</th>
<th>Side effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nose.net</td>
<td>110 (86%)</td>
<td>58 (53%)</td>
<td>6 (5%)</td>
<td>21 (19%)</td>
<td>31 (28%)</td>
<td>52 (47%)</td>
<td>40 (36%)</td>
<td>12 (11%)</td>
</tr>
<tr>
<td>Face mask</td>
<td>83 (64%)</td>
<td>44 (53%)</td>
<td>3 (4%)</td>
<td>13 (16%)</td>
<td>28 (34%)</td>
<td>39 (47%)</td>
<td>32 (39%)</td>
<td>7 (8%)</td>
</tr>
<tr>
<td>Fly control</td>
<td>84 (67%)</td>
<td>18 (21%)</td>
<td>0</td>
<td>3 (4%)</td>
<td>15 (18%)</td>
<td>66 (79%)</td>
<td>66 (79%)</td>
<td>0</td>
</tr>
<tr>
<td>Cyproheptadine</td>
<td>29 (23%)</td>
<td>14 (48%)</td>
<td>4 (14%)</td>
<td>3 (10%)</td>
<td>7 (24%)</td>
<td>15 (52%)</td>
<td>13 (45%)</td>
<td>7 (2%)</td>
</tr>
<tr>
<td>Carbamazepine</td>
<td>8 (6%)</td>
<td>2 (25%)</td>
<td>0</td>
<td>0</td>
<td>2 (25%)</td>
<td>6 (75%)</td>
<td>6 (75%)</td>
<td>0</td>
</tr>
<tr>
<td>Corticosteroids</td>
<td>31 (24%)</td>
<td>17 (55%)</td>
<td>1 (3%)</td>
<td>7 (23%)</td>
<td>9 (29%)</td>
<td>14 (45%)</td>
<td>13 (42%)</td>
<td>1 (3%)</td>
</tr>
<tr>
<td>NSAIDs</td>
<td>22 (17%)</td>
<td>4 (18%)</td>
<td>0</td>
<td>1 (5%)</td>
<td>3 (14%)</td>
<td>18 (82%)</td>
<td>18 (82%)</td>
<td>0</td>
</tr>
<tr>
<td>Antihistamines</td>
<td>26 (20%)</td>
<td>12 (33%)</td>
<td>1 (3%)</td>
<td>4 (11%)</td>
<td>7 (19%)</td>
<td>24 (67%)</td>
<td>23 (64%)</td>
<td>1 (3%)</td>
</tr>
<tr>
<td>Melatonin</td>
<td>17 (13%)</td>
<td>8 (47%)</td>
<td>0</td>
<td>1 (6%)</td>
<td>7 (41%)</td>
<td>9 (53%)</td>
<td>9 (53%)</td>
<td>0</td>
</tr>
<tr>
<td>Magnesium</td>
<td>58 (45%)</td>
<td>25 (43%)</td>
<td>1 (2%)</td>
<td>11 (19%)</td>
<td>13 (22%)</td>
<td>33 (57%)</td>
<td>33 (57%)</td>
<td>0</td>
</tr>
<tr>
<td>Melatonin and magnesium</td>
<td>11 (9%)</td>
<td>6 (55%)</td>
<td>0</td>
<td>1 (9%)</td>
<td>5 (45%)</td>
<td>5 (45%)</td>
<td>5 (45%)</td>
<td>0</td>
</tr>
</tbody>
</table>

**NSAIDs** = non-steroidal anti-inflammatory; **n** = number of responses.

*Fifteen horses received compounded cyproheptadine, 12 horses received generic cyproheptadine, and 1 owner was unsure if cyproheptadine was compounded or not.
Insect/Fly Control
Insect control had been used by 84/126 (67%) of owners in an attempt to decrease headshaking. Of these, 18 (21%) reported a positive outcome, with 3 (4%) horses showing marked improvement and 15 (18%) some improvement immediately upon use (Table 2). No horses displayed increased headshaking following insect control measures. Two horses (2%) had negative side effects (skin irritation) following treatment.

Cyproheptadine
Cyproheptadine treatment had been used by 29/128 (23%) of owners to control their horses' headshaking. Fifteen horses received compounded cyproheptadine, 12 horses received generic cyproheptadine, and 1 owner did not know if cyproheptadine was compounded. Six owners reported administering 0.3 mg/kg, 2 owners stated 0.1 mg/kg, 15 owners did not know the administered dose, and dosage was unable to be determined from information given by 6 owners using compounded product. Nineteen owners reported administering cyproheptadine twice daily, 2 owners once daily, and 8 owners did not report frequency of dosing.

Fourteen horses (48%) had a positive outcome with cyproheptadine treatment: 4 (14%) stopped headshaking completely, 3 (10%) showed marked improvement, and 7 (24%) showed some improvement (Table 2). Fifteen horses (52%) had a negative outcome with 13 (45%) having no change and 2 (7%) having worsening of headshaking. The median (range) time to observe a positive response occurred 3 (2–14) days following initiation of therapy. Additionally, 1 owner reported that clinical signs resumed within 2 days of cyproheptadine withdrawal. Three owners described a transient effect such that headshaking recurred during administration; 2 of these horses received generic cyproheptadine and 1 received compounded product. One additional owner commented that cyproheptadine had stopped working when changed to compounded product. Adverse effects were reported in 14 (48%) of horses receiving cyproheptadine including lethargy, drowsiness, incoordination, colic, and irritability.

Carbamazepine
Carbamazepine therapy had been tried by 8/125 owners (6%), 2 of which reported some improvement and the remaining 6 reported no change in headshaking (Table 2). Improvement occurred within several weeks in 1 horse and was not reported for the other improved headshaker. One owner reported administration of 5 mg/kg 3 times daily, 6 owners did not know the dosage administered, and the dosage could not be extrapolated from the information given by 2 respondents. Five of these horses with an unknown dosage received carbamazepine twice daily and 1 three times daily. Adverse effects of lethargy and drowsiness were reported in 3 horses.

Corticosteroids
Corticosteroid therapy had been given to 31/127 (31%) of headshakers. Of these, 9 received oral steroids, 12 were administered injectable steroids, 6 were given dexamethasone pulse therapy (DPT), and 2 horses received inhalational medication. A positive outcome was reported in 17/31 (55%) of horses of which 1 completely stopped headshaking, 7 (23%) showed marked improvement, and 9 (29%) had some improvement (Table 2). Improvement was most frequently described by owners (7/12) as occurring a few days after treatment commenced. Three owners reported a transient improvement only. A negative outcome was noted in 14 (45%) of horses with 13 (42%) having no change and one becoming worse following therapy. Adverse effects were observed in 3 horses (10%) and comprised 1 each of increased appetite, lethargy, and mania (as described by owner).

NSAIDs
NSAID therapy had been used by 22/126 (17%) of owners for treatment of their horses' headshaking. Phenylbutazone was listed as the most frequently administered NSAID (13/18 responses). Four horses (18%) improved with NSAID therapy with 1 horse showing marked improvement and 3 horses (14%) showing some improvement whilst the remaining 18 horses (82%) showed no change in headshaking (Table 2). Hives were listed as an adverse effect of treatment in one horse.

Antihistamines
Antihistamine treatment had been used in 36/122 (30%) of headshaking horses. Most frequently used drugs were chlorpheniramine (9 horses), hydroxyzine hydrochloride (8 horses), loratadine or desloratadine (8 horses), diphenhydramine (7 horses), and pseudoephedrine hydrochloride pyrilamine maleate (3 horses). A positive outcome was described within a few days to a few weeks in 12 (33%) of horses with 1 horse completely ceasing headshaking, 4 horses (11%) showing marked improvement, and 7 horses (19%) mildly improving (Table 2). A negative outcome was seen in 24 (67%) horses with no change in 23 (64%) and increased headshaking in 1 horse. Adverse effects were observed in 7 horses (19%) with drowsiness cited most frequently.

Melatonin
Melatonin had been administered to 17/128 (13%) of horses, all of which were located in the U.S. except one in Canada and one in the Southern hemisphere. Dose range was 12 to 20 mg with 15 mg once daily cited most frequently (6 responses). Ten respondents reported giving melatonin at 5 PM/dusk, 1 administered melatonin in the morning, and 1 gave melatonin twice daily. Six horses started melatonin therapy in winter, 6 in spring, and 5 in the
summer. Eight horses (47%) responded positively to melatonin within 1 to 4 weeks of therapy; marked improvement was seen in 1 horse (the horse given melatonin in the morning) and some improvement in the remaining 7 (including the horse given melatonin twice daily) (Table 2). No change in headshaking was reported in 9 (53%) of horses. Seven horses (41%) had a longer hair coat or did not shed their winter coat whilst on melatonin.

**Magnesium**

Dietary supplementation with magnesium had been used by 58/128 (45%) of owners as a headshaking treatment. Magnesium oxide was the most common formulation reported (26 responses) followed by malate (7 responses). Doses of 5 to 40 g were reported. A positive outcome was reported in 25 horses (43%) within 2 days to 4 weeks of initiating therapy; additionally 1 owner reported headshaking worsened within a couple of days of stopping magnesium supplementation. One horse completely stopped headshaking, 11 (19%) showed marked improvement, and 13 (22%) showed mild improvement (Table 2). A negative outcome was noted in 33 horses (57%) in which no change in headshaking was observed. Two owners reported that their horse seemed calmer whilst on magnesium, whereas 1 owner each reported nervousness and diarrhea as adverse effects.

**Melatonin and Magnesium**

Only 11/122 (9%) owners had used melatonin and magnesium combination therapy to treat their horses’ headshaking. Six horses (55%) responded positively with 5 horses (45%) showing some improvement and 1 horse (10%) marked improvement in headshaking whereas 5 horses (45%) had no change (Table 2). All respondents who gave data (n = 7) used a dosage of 15 to 20 mg melatonin (median 15 mg) at 5 PM and 5 to 40 g magnesium. Two owners initiated combination therapy in spring, 5 in summer, and 4 in winter. Adverse effects were observed in 4 horses (36%), 3 of which did not shed their winter coat and 1 which gained weight and became lethargic approximately 1 month after therapy was initiated.

4. **Discussion**

Treatment of headshaking horses is challenging as therapies are largely directed towards managing clinical signs rather than treating the cause itself, which remains elusive. There are a plethora of treatments recommended and utilized for management of headshaking; however, reported rates of success of such treatments are rare and often contain limited numbers of horses. This study describes the owner-reported outcome of 11 treatments used in the management of idiopathic headshaking in 130 horses.

The demographics of the survey population and prevalence of clinical signs were similar to that described in other headshaking studies. Some variation in observed clinical signs existed between horses diagnosed by owners and veterinarians, with the latter group representing a more severely affected cohort, as previously reported. Owners have proven reliable at using the clinical signs of vertical headshaking, rubbing the nose on the thoracic limb, and snorting for the diagnosis of idiopathic headshaking. As vertical headshaking was observed in over 90% of horses in this study, it is likely that owner-diagnosed horses were true idiopathic headshakers; however, other causes of headshaking cannot be excluded. Likewise, details of the veterinary diagnostic procedure of the veterinarian-diagnosed horses are also unknown. In field situations, veterinarian diagnosis of headshaking, like owner assessment, is usually based on observation and history. A single veterinary exam has limitations, and there is no diagnostic test for headshaking. Idiopathic headshaking is a constellation of signs, which persist in the absence of a rider, independent of tack, and apparent lack of underlying pathology (i.e., sinus mass, iris cyst, etc.).

The authors, therefore, feel that veterinary diagnosis and owner assessment of clinical signs, which are the basis of any headshaking diagnosis, are both equally valid.

Nose nets were the most frequently used treatment for headshaking having been used by almost 90% of respondents. Whereas some degree of improvement was seen in over 50% (58/110) of horses, complete resolution of headshaking was rare and observed in only 5%. These improvements are lower than that previously reported where use of nose nets resulted in some decrease in clinical signs in 75% of 36 headshakers in the UK but greater than the 33% improvement reported in the U.S. Geographical location was not analyzed in this study due to the heterogeneous nature of the data. In this study, nose nets resulted in one of the highest rates of positive outcome and, therefore, represent a simple first-line therapeutic option. Such physical treatments avoid competition medication regulations; indeed, the use of nose nets is now permitted in some equestrian disciplines. Adverse effects of nose nets have not been previously reported, to the authors’ knowledge, but were observed in approximately ¼ of horses and were reported for both types of nose net. Owners should, therefore, be advised of the possibility of irritation or panic upon their application. The method by which nose nets reduce clinical signs of headshaking is unknown; however, it is postulated that they reduce aversive stimulation of hyperesthetic areas or, alternatively, the constant presence of the net might work by adjacent receptor field inhibition or receptor adaptation of the contact area. Interestingly, some owners reported a waning of clinical effect with time raising the possibility of habituation.

A positive treatment outcome of 53% (44/83) of headshaking horses with a face mask was similar to...
that previously reported\(^7\)^9 and equivalent to use of a nose net in this study, although 20% fewer respondents had tried them. Again, adverse effects noted previously reported such as “spookiness” and stumbling due to presumed reduced vision were frequent and observed in over \(\frac{1}{5}\) of horses using face masks. Whereas observed less frequently than with use of a nose net, these reported adverse effects were of a more disruptive nature.

A surprisingly large percentage of horses (21%; 18/84) were reported to derive some benefit from the use of fly control, in contrast to only 2% previously described.\(^7\) The current study population may have comprised more mildly affected horses than the aforementioned study,\(^7\) despite \(\frac{2}{5}\) of owners describing their horse’s headshaking as “severe” or “very severe.” It is likely that a positive outcome rate of approximately 20% is heavily influenced by response bias, as no treatment achieved lower than 18% positive outcome. Such bias may have arisen from multiple sources including the difficulty in objective assessment of headshaking and any treatment response, a proxy-placebo effect, the phenomena of spontaneous and seasonal remission, fluctuation of clinical signs, regression to the mean, any contemporaneous treatments, and recall bias. Whereas such bias limits interpretation of all observed responses to treatments, the variability in reported outcomes gives confidence that a genuine treatment effect, above and beyond any bias, was noted for some treatments.

The positive response of over 50% (17/31) of headshakers to corticosteroid therapy was also unexpected given the documented aberrant trigeminal nerve activity\(^3\) and the failure of a recent blinded, clinical trial of pulsed high dose dexamethasone to have any effect on idiopathic headshaking.\(^15\) Whereas not a first-line treatment for neuropathic pain, corticosteroids have been shown to reduce spontaneous discharge in injured nerves and might be useful as adjunct therapy.\(^16\) Although nerve injury is not suspected in idiopathic headshaking, a reduced threshold for activation of the trigeminal nerve has been documented\(^9\) and corticosteroids might act to decrease such aberrant activity. It is also possible that, in the responding subset of headshaking horses, there was a degree of low grade inflammation or allergy contributing to clinical signs observed by owners. As prolonged, ongoing management of headshaking is usually required, corticosteroids are unlikely to be useful as a therapeutic option due to the risk of serious adverse effects such as laminitis.

One-third of owners reported general antihistamine treatment improved their horse’s headshaking (12/36). Such improvement may suggest an allergic component to headshaking in these horses; however, the reported effect may be largely due to bias as previously discussed. A positive response to cyproheptadine treatment was observed in approximately 50% of horses (14/29). Cyproheptadine is a first generation antihistamine with additional anticholinergic, antiserotonergic, calcium channel blocking, and local anesthetic activity,\(^17\) which is used to treat human vascular headaches. Previous reports describing the response of headshaking to cyproheptadine treatment has varied widely, from no improvement\(^4,18\) to 70%.\(^7\) Such variation in efficacy is difficult to explain. The percentage of horses with a photic component to their headshaking is variable across these studies (none\(^4\); 39%; current study; 60%), which may be relevant in responsiveness to cyproheptadine. Inappropriate dosage may have affected treatment outcome with cyproheptadine in the current study as, whereas only 2 owners reported using an inadequate dosage, many owners reported they did not know or omitted administration details. Adverse effects such as lethargy and drowsiness were noted in almost 50% of horses treated with cyproheptadine, which is likely to limit its use in ridden horses.

Carbamazepine, an anticonvulsant, which stabilizes voltage-gated sodium channels, had one of the lowest positive outcome rates of all treatments (25%; 2/8) and, therefore, does not appear to be an efficacious treatment for headshaking. Additionally, negative side effects were reported in \(\frac{1}{4}\) of treated horses. Although carbamazepine is the treatment of choice for human trigeminal neuralgia,\(^19\) the pharmacokinetics of this drug in horses is unknown, which may explain its lack of effect. Additionally, recent trigeminal electrophysiological data suggests the etiopathogenesis of equine headshaking and human trigeminal neuralgia may differ.\(^7\) NSAIDs were also poorly efficacious (22%; 4/22) as would be expected in the treatment of a neuropathic condition. The noted response in 4 horses may be due to the aforementioned biases.

Melatonin reduced headshaking in almost half (47%; 8/17) of horses in this study. The hypothesis for melatonin treatment of headshaking is that a late afternoon (5 PM) dose of melatonin artificially manipulates photoperiod such that, biologically, the horse remains in winter. Approximately 40% of treated horses did not shed their coat due to this phenomenon. Therapy is proposed to be most successful when melatonin is started before the onset of spring for seasonal headshakers and, therefore, initiation of therapy when the horse was already headshaking may have reduced efficacy. A positive outcome in the two horses given melatonin inappropriately and the fact that suppression of the vernal increase in gonadotropins did not reduce headshaking\(^20\) may question the proposed rationale. However, melatonin is also able to modulate pain, including neuropathic pain, via various antinociceptive effects including activation of opioid receptors, inhibition of pro-inflammatory cytokine production, modulation of GABA\(_A\) receptor function and acting as a free radical scavenger.\(^21\) Melatonin receptors have been identified in the trigeminal ganglion and trigeminal nucleus of mammals\(^22\) and interestingly,
Melatonin has been shown to attenuate an inducible model of trigeminovascular nociception in rats. Melatonin might, therefore, act to reduce headshaking by mechanisms other than photoperiod manipulation. Only 13% of owners had used melatonin treatment, and all except one of these were based in North America, where the drug is cheaply available as an “over the counter” product. Whereas melatonin can be purchased with a veterinary prescription in other countries such as the UK, this does not appear to be occurring, most likely due to veterinarians being currently unaware of the protocol. Melatonin, as an endogenous hormone, also has the advantage of having no restrictions for use in competition horses. Given that almost half of headshakers improved with melatonin therapy, with only winter coat retention as an adverse effect, this treatment warrants further attention.

Magnesium supplementation had been used by almost 50% of owners, with just under half of these (25/58) reporting an improvement in their horse’s headshaking. Magnesium increases the activation threshold of nerves such that a greater stimulus is required for depolarization. Magnesium, therefore, appears a rational therapy given the reduced activation threshold of the trigeminal nerve in headshaking horses. Formulations of magnesium vary in their oral bioavailability with that of magnesium oxide (the most frequently administered in this study) reported to be questionable in the horse. Generally availability of magnesium in horses is high and feeding high percentages of roughage enhances its absorption from the gastrointestinal tract. From this study, toxicity from daily magnesium supplementation of up to 40 g appears to be rare, although it may be advisable to periodically measure ionized magnesium concentrations. Magnesium may be another useful treatment for competing headshaking horses. Combining magnesium and melatonin therapy appeared to be beneficial, resulting in an improved outcome than use of either treatment alone (55%; 6/11). Indeed, combined therapy had the highest overall positive outcome; however, this should be interpreted with caution, as only 11 owners had used this treatment.

This study can be used to guide owners in the management of idiopathic headshaking. Owner-reported responses to treatment in 130 headshaking horses suggest that nose nets, face masks, and magnesium supplementation are the most efficacious nonmedical therapeutic options. Adverse effects such as facial irritation were reported in 1/5 of horses with nose nets. Cyproheptadine, corticosteroids, and melatonin were the most successful pharmaceutical treatments in this study; however, the number of horses using these therapies was low and, therefore, these results should be interpreted with caution. Of these pharmaceutical drugs, only melatonin is without significant adverse effects or allowed in competition horses. Veterinary diagnosis of idiopathic headshaking is advised before commencing any treatments. Further investigation of the pathophysiological mechanism underlying the aberrant trigeminal nerve activity in headshaking horses is warranted in order to develop more successful therapeutic options.

Acknowledgments

Conflict of Interest

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References and Footnotes


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