



Short communication

Stringhalt in Brazilian horses caused by *Hypochaeris radicata*J.A.S. Araújo^a, B. Curcio^b, J. Alda^b, R.M.T. Medeiros^a, F. Riet-Correa^{a,*}^a Hospital Veterinário, CSTR, Universidade Federal de Campina Grande, Centro de Saude e Tecnologia Rural, Campus de Patos, 58700-000 Patos, Paraíba, Brazil^b SOMEVE-PR, Caixa Postal 120 – CEP 83190-000 – Tijucas do Sul/PR, Brazil

ARTICLE INFO

Article history:

Received 18 March 2008

Received in revised form 5 April 2008

Accepted 7 April 2008

Available online 29 May 2008

Keywords:

Australian stringhalt

Hypochaeris radicata

Horses

Distal axonopathy

ABSTRACT

Two outbreaks of *Hypochaeris radicata*-induced Australian stringhalt involving two farms and seven horses from southern Brazil are reported here. Subsequently, the disease was experimentally reproduced in a feeding trial with one colt fed *H. radicata* from the suspect paddocks. Fresh *H. radicata* was fed to the experimental animal for 50 days at an average daily dosage of 9.8 kg. Initially, the plant was collected from the paddock where the clinical disease occurred and was fed for 19 consecutive days producing mild clinical signs. However, on days 20–23 fresh plant was collected from a neighboring farm where the disease had not been reported and fed to the colt at which time the colt appeared to recover. Therefore, plant collections from the original suspect paddock resumed and feeding trials continued with clinical signs reoccurring by day 36, and increasing in intensity from days 43–50 after which plant administration was stopped. Within 15 days after ending the feeding trial with *H. radicata*, the colt appeared to have recovered. This experimental reproduction of stringhalt in a single colt fed *H. radicata* demonstrated that the two outbreaks of the disease resulted from this plant. Interestingly, the change in location for collection of plant material 19 days into the treatment, and the subsequent recovery of the colt, would suggest that plant material may differ in toxicity depending on location.

© 2008 Elsevier Ltd. All rights reserved.

1. Introduction

Stringhalt (high stepping with hyperflexion of the hind limb) is an ancient disease of horses first reported by Kendall in 1884 in Australia (Huntington et al., 1991; Slocombe et al., 1992). In Australia (Huntington et al., 1989), New Zealand (Cahill et al., 1985) and USA (Galey et al., 1991; Gay et al., 1993; Gardner et al., 2005) stringhalt has been associated with the ingestion of *Hypochaeris radicata*. The disease is reported also in Chile, but not associated with *H. radicata* (Araya et al., 1998). In Brazil it was reported from the state of Rio Grande do Sul where *H. radicata* was observed in the pastures of three out of five farms (Rodrigues et al., 2008). The illness occurs mainly in late summer and autumn, generally in horses on poor quality pastures and has been also associated with other plants,

including *Taraxacum officinale* and *Malva parviflora* (Huntington et al., 1989; Cahill and Goulden, 1992; Araya et al., 1998). Clinical signs are characterized by abnormal gait with involuntary hyperflexion of the hock of one or both hind limbs. In some horses the hyperflexion is so marked that the abdomen is kicked when walking. Affected horses have difficulty in stepping backward or circling; ambulation is impaired, and some animals show a bunny hop-type of gait (Cahill and Goulden, 1992; Araya et al., 1998; Rodrigues et al., 2008). Left laryngeal hemiplegia (roaring) has also been associated with stringhalt. Muscular atrophy is common in the hind limbs (Slocombe et al., 1992; Cahill et al., 1986), and involvement of the forelimbs is also seen occasionally, taking the form of stumbling, toes cuffing, and knuckling at the carpus (Cahill and Goulden, 1992). The disease is described as distal axonopathy characterized histologically by axonal degeneration in peripheral nerves and muscular neurogenic atrophy (Cahill et al., 1986; Slocombe et al., 1992; Rodrigues et al., 2008).

* Corresponding author. Tel.: +55 8334233409; fax: +55 8334214659.
E-mail address: franklin.riet@pq.cnpq.br (F. Riet-Correa).

Ultrastructural findings include demyelination, regeneration and remyelination of peripheral nerves (Rodrigues et al., 2008). When moved from infested pastures most animals recover without treatment within a few weeks to a year or more depending on severity (Pemberton and Caple, 1980; Galey et al., 1991; Cahill and Goulden, 1992; Rodrigues et al., 2008).

The disease associated with *H. radicata* or other plants, named Australian stringhalt, is different from classical stringhalt. Australian stringhalt is more severe, usually bilateral, occurs in outbreaks, is seasonal, and most animals recover spontaneously. Classical stringhalt is a sporadic disease of unknown etiology and recovery is not spontaneous, but the disease can be treated surgically (Cahill and Goulden, 1992).

The purpose of this field investigation is to report two outbreaks of Australian stringhalt in horses in the state of Paraná, in a region near the city of Curitiba, southern Brazil and to report experimental confirmation in one colt fed fresh *H. radicata* from the implicated farms.

2. Field outbreaks

2.1. Farm 1

The first outbreak involved 4 of 29 thoroughbred mares on a farm in May 2004 during the dry season. The mares

were grazed during the day in a paddock containing *Digitaria decumbens* and *Lolium multiflorum* but severely infested with *H. radicata* (Fig. 1). *T. officinale* was also found in the pasture, but in lesser amounts. At night the mares were kept indoors and supplemented with concentrated feeds. Three mares recovered spontaneously within 2–3 months after being removed from the infested pasture and the fourth mare appeared fully recovered by 7 months. In January 2007 a fifth mare on the same farm exhibited clinical signs of severe Australian stringhalt including extensive hyperflexion of the hind limbs described as kicking of the abdomen when walking (Fig. 2). At the end of the flexion, the hoof was momentarily held and then stamped hard to the ground.

2.2. Farm 2

On a second farm, in January 2007, two, two-year-old thoroughbred colts showed signs of Australian stringhalt. Both animals had been introduced one month earlier into a 2 ha paddock containing *L. multiflorum* and native grasses, but severely infested with *H. radicata*. The colts were also supplemented with oat grain. Both animals were severely affected when moved from the pastures. In June 2007 one colt had no signs of stringhalt, but had atrophy of the muscles of the thigh. This colt was apparently fully recovered in



Fig. 1. *Hypochaeris radicata*. Municipality of Tijucas do Sul, State of Paraná, Brazil. Inset: flowers (A), fruitheads (B) and leaves (C).



Fig. 2. Mare with severe stringhalt. The left hind limb is kicking the abdomen when walking.

September 2007, but after a short period of training showed laryngeal dysfunction (roaring). Laryngeal hemiplegia was diagnosed by endoscopy, and the colt was culled. The other colt was submitted to tenectomy of the lateral digital extensor tendon, but did not recover and was culled in October 2007.

3. Experimental reproduction

For the experimental reproduction of the disease leaves, flowers, fruiting heads and stems of *H. radicata* were fed to a six-month-old crossbred colt (thoroughbred × Brazilian crioulo). The experiment was conducted on Farm 2 where one of the disease outbreaks occurred. The plant was collected in the paddock where the disease occurred and in an adjacent paddock (Paddocks 1 and 2, respectively). The plant collected in another farm was administered 1–2 days after collection. The experiment started on July 22, and the animal ingested a mean daily amount of 9.8 kg of fresh *H. radicata* during 50 days, with a total consumption of 490 kg of plant (Table 1). The colt also received 1–2 kg of alfalfa hay, and 390 g of oat grain daily.

The experimental horse was submitted to a complete examination of the nervous system once a week, and also on day 19 when it showed the first clinical signs. Blood was also collected once a week for the determination of serum concentrations of urea and creatinine, and serum activities of aspartate-aminotransferase (ALT), aspartate-aminotransferase (AST), gamma-glutamyltransferase (GGT), and alkaline phosphatase (FA). Feces were also collected for parasitological analysis. All analyses were performed in a private laboratory (Laboratório de Análises Clínicas – LANAC) in the city of Curitiba.

Upon clinical examination, first clinical signs, characterized by reluctance to stepping backward or circling, hypermetria, and abduction of the hind limbs were observed on day 19. On clinical examination on day 22, the signs were

Table 1

Experimental feeding of *Hypochaeris radicata* to a horse: paddocks of plant collection, administration period, day of clinical examination and presence of clinical signs

Paddock(s) of plant collection	Period of administration (days)	Clinical examination (day)	Presence of clinical signs
Other paddocks of Farm 1	1–8	8th	Absent
Paddock 1 ^a	9–15	15th	Absent
Paddock 2	16–22	19th	Mild
Paddock 2	16–22	22nd	Moderate
Paddocks from a neighboring farm ^b	23–29	29th	Absent
Paddock 1	30–36	36th	Mild
Paddock 1	37–42	43rd	Moderate
Paddock 1	43–50	50th	Moderate

^a Spontaneous cases occurred in Paddock 1; Paddock 2 was adjacent to Paddock 1.

^b The disease had not been reported in this farm.

more marked and the animal showed a bunny-hopping gait when forced to run. During circling one pelvic limb contacted the other. The animal dragged its hind limbs during gait and when walking on a slope the hind limbs were abducted. Weakness of the hind limbs was also evident when the tail was pulled while walking. No alterations were found in the central nervous system examination, but the panniculus reflex was apparently diminished. When running free in the paddock, stringhalt of the hind limbs and a bunny-hopping type of gait were observed. After the examination on day 22 the animal was fed during one week with *H. radicata* collected in paddocks from another farm. The colt appeared to recover on day 23 and returned to consume *H. radicata* collected on Paddock 1. Mild signs were observed again on day 36, which were increased on day 43 and remained consistent until day 50 when the plant administration was stopped (Table 1). Fifteen days after the end of the plant consumption the horse appeared to have recovered. No alterations were observed in serum activities of AST, ALT and FA, and in serum concentrations of creatinine, but serum levels of urea were slightly increased (53–59 mg/dL) on days 8, 15, 36, and 43. On days 22, 29 and 50 they were within normal values.

The disease reported here is similar to Australian stringhalt reported in other countries and also in Brazil (Huntington et al., 1989; Cahill et al., 1985; Galey et al., 1991; Araya et al., 1998; Rodrigues et al., 2008). The experimental reproduction of clinical signs in the experimental colt with large amounts of *H. radicata* demonstrated that the disease is caused by this plant. Previous reports associated Australian stringhalt with the presence of *H. radicata* in the pastures (Pemberton and Caple, 1980; Cahill et al., 1985; Huntington et al., 1989; Gardner et al., 2005), but attempts to reproduce the disease by feeding pasture material on which affected horses had grazed, were not successful (Cahill and Goulden, 1992). The regression of clinical signs when the experimental animal was fed with plant from another farm, and the recurrence of signs after the restart of feeding the plant from the original farm, suggest that there are variations in the toxicity of *H. radicata*. These variations can be responsible for the failures to reproduce the disease.

H. radicata (flat weed, catsear), Asteraceae family, is a perennial native weed in Europe and now prevalent in many areas of southern Brazil. It has multiple basally clustered, irregularly lobed, 7.5–30 cm, hairy leaves. Multiple branched flower stalks up to 0.5 m in height, each bearing a single yellow dandelion-like flower, are produced each season. Seeds are long-beaked, roughened, and tipped by a circle of bristles (Knight and Walter, 2001). All cases reported in this paper occurred during summer or autumn in pastures severely invaded by *H. radicata*, but the disease was reproduced in winter during the raining period, suggesting that the intoxication can occur in different times of the year. The higher frequency of the disease during summer and autumn is probably associated with shortage of forage, as it occurs in other countries (Pemberton and Caple, 1980; Huntington et al., 1989; Cahill and Goulden, 1992; Rodrigues et al., 2008).

Acknowledgements

This work was financially supported by Institutos do Milênio, National Council of Scientific and Technologic Development (CNPq), grant no. 420012/2005-2 and by the Programa de Apoio a Núcleos de Excelência (PRONEX), grant no. 001/04, CNPq, FAPESQ, MCT.

References

- Araya, O., Krause, A., Solis de Ovando, M., 1998. Outbreaks of stringhalt in southern Chile. *Vet. Rec.* 142, 462–463.
- Cahill, J.I., Goulden, B.E., 1992. Stringhalt – current thoughts on aetiology and pathogenesis. *Equine Vet. J.* 24, 161–162.
- Cahill, J.I., Goulden, B.E., Pearce, H.G., 1985. A review and some observations on stringhalt. *N.Z. Vet. J.* 33, 101–104.
- Cahill, J.I., Goulden, B.E., Jolly, R.D., 1986. Stringhalt in horses: a distal axonopathy. *Neuropathol. Appl. Neurobiol.* 12, 459–475.
- Galey, F.D., Hullinger, P.J., McCaskill, J., 1991. Outbreaks of stringhalt in northern California. *Vet. Hum. Toxicol.* 33, 176–177.
- Gardner, S.Y., Cook, A.G., Jortner, B.S., Troan, B.V., Sharp, N.J.H., Campbell, N.B., Brownie, C.F., 2005. Stringhalt associated with a pasture infested with *Hypochaeris radicata*. *Eq. Vet. Ed.* 7, 154–158.
- Gay, C.C., Fransen, S., Richards, J., Holler, S., 1993. *Hypochaeris*-associated stringhalt in North America. *Equine Vet. J.* 25, 456–457.
- Huntington, P.J., Jeffcott, L.B., Friend, S.C.E., Luff, A.R., Finkelstein, D.I., Flynn, R.J., 1989. Australian stringhalt – epidemiological, clinical and neurological investigations. *Equine Vet. J.* 21, 266–273.
- Huntington, P.J., Seneque, S., Slocombe, R.E., Jeffcott, L.B., McLean, A., Luff, A.R., 1991. Use of phenytoin to treat horses with Australian stringhalt. *Aust. Vet. J.* 68, 221–224.
- Knight, A.P., Walter, R.G., 2001. A Guide to Plant Poisoning of Animals in North America. Teton New Media, Wyoming, 367 pp.
- Pemberton, O.H., Caple, I.W., 1980. Australian stringhalt in horses. *Vet. Ann.* 20, 167–171.
- Rodrigues, A., De La Corte, F.D., Graça, D.L., Rissi, D.R., Schild, A.L., Kommers, G.D., Barros, C.S.L., 2008. Harpejamento em equinos no Rio Grande do Sul. *Pes. Vet. Bras.* 48, 23–28.
- Slocombe, R.E., Huntington, P.J., Friend, S.C.E., Jeffcott, L.B., Luff, A.R., Finkelstein, O.K., 1992. Pathological aspects of Australian stringhalt. *Equine Vet. J.* 24, 174–183.