

Narcolepsy – or REM-deficient?

Christine Fuchs, Charlotte Kiefner, Michael Erhard, Anna-Caroline Wöhr
Lehrstuhl für Tierschutz, Verhaltenskunde, Tierhygiene und Tierhaltung
Veterinärwissenschaftliches Department der Tierärztlichen Fakultät
Ludwig-Maximilians-Universität München Veterinärstr. 13/R, 80539 München, Deutschland

Narcolepsy is a neurological sleep disorder characterized by excessive daytime sleepiness, cataplexy (loss of muscle tone), sleep paralysis and hypnagogic hallucinations, also called the „tetrad of narcolepsy“. Although the pathogenesis is not completely understood, the disorder is well described in humans and it has been shown that a lack of the hormone hypocretin (orexin) synthesized in the hypothalamus is crucial. Narcolepsy with cataplectic attacks has also been reported in dogs, horses, cattle (STRAIN et al., 1984) and a lamb (WHITE und DE LAHUNTA, 2001).

In dogs up to 17 breeds have been shown to be affected sporadically, while familial forms occur in dobermans, labrador retrievers and dachshounds (TONOKURA et al., 2007). In horses there appear to be two syndroms (HINES, 2005), the first in which animals are affected within a few days after birth (possibly a familial form, reported in Suffolk, Shetland ponies, Fell ponies, Warmbloods, Miniature Horse foals (MAYHEW, 2011), Lipizzaner (LUDVIKOVA et al., 2012) and Icelandic horses (BATHEN-NÖTHEN et al., 2009)) and the second in which animals are affected as adults (adult-onset narcolepsy).

It has been shown that both forms of canine narcolepsy are associated with a deficit in hypocretin/orexin neurotransmission (LIN et al., 1999). In the horse a similar etiology is suspected, but so far there are no studies to support this hypothesis.

The cataplectic attacks in humans and dogs occur during excitement or emotional stimulation such as laughing in humans or eating and playing in dogs. In contrast, the cataplectic or sleep attacks in adult horses happen almost exclusively while resting. The collapses observed in equines vary from drowsiness with hanging of the head, swaying, buckling at the knees or total collapse (see fig.1). Affected horses often show injuries and scars at the dorsal fetlocks, dorsal knees or at the face and the lips. ALEMAN et al. (2008) describe some of the suspected adult-

onset narcolepsy cases as possible examples of sporadic idiopathic hypersomnia instead of true narcolepsy.

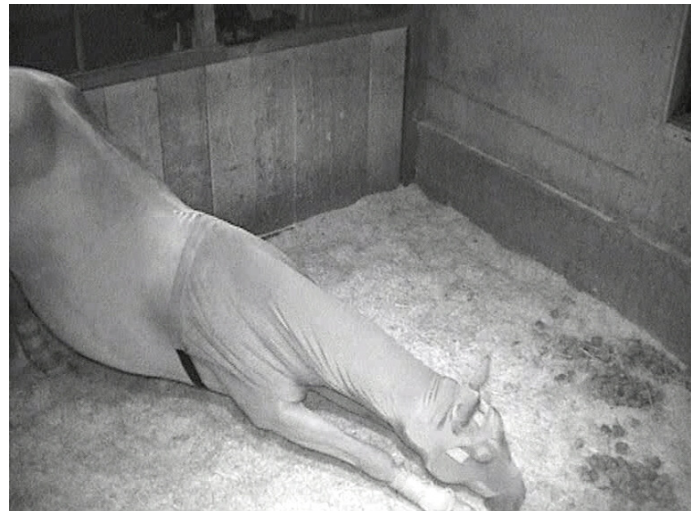


Figure 1: „Narcoleptic collapse“ with stretched forelimbs

Since there are not many studies about adult-onset narcolepsy in horses, the authors set themselves the challenge to examine horses with supposed narcolepsy, evaluate associated husbandry conditions and to create sleep profiles by polysomnographic examinations of the subjects.

For this purpose a call to owners who's horses were affected by narcolepsy in the German horse magazine Cavallo® was made, followed by the completion of a detailed online survey. 177 owners of horses with diagnosed narcolepsy completed the questionnaire. After a personal selection, 39 of these horses were visited. The horses were clinically examined and blood samples were taken. Video surveillance with infrared cameras and direct observation took place for a period of 24 hours and polysomnographic measurements were performed. Furthermore a closer look was taken at the stabling and management conditions and the medical history of the horses was documented.

So far the results of the study show that the affected horses suffer from up to more than 150

collapses a day. Collapses mainly took place during the night (see fig.2) and most of the horses refused to lie down during sleep time. Shortly before the collapses many horses showed typical REM (rapid eye movement) patterns in the polysomnography.

In a previous study about the sleeping behaviour of horses (KALUS, 2014), it has been shown that REM-sleep occurs every night and only while the equine is in a recumbent position, which can be explained by the characteristically decreased muscle tone during this sleep stage.

HINES, M. T. (2005). Narcolepsy: more common than you think? Paper presented at the Proceedings of the North American Veterinary Conference, Orlando, Florida.

KALUS, M. (2014). Schlafverhalten und Physiologie des Schlafes beim Pferd auf der Basis polysomnographischer Untersuchungen. Ludwigs-Maximilians-Universität München.

LIN, L., FARACO, J., LI, R., KADOTANI, H., ROGERS, W., LIN, X., QIU, X., DE JONG, P. J., NISHINO, S., MIGNOT, E. (1999): The sleep disorder canine narcolepsy is caused by a mutation in the hypocretin (orexin) receptor 2 gene. *Cell* 98, 3, 365-376.

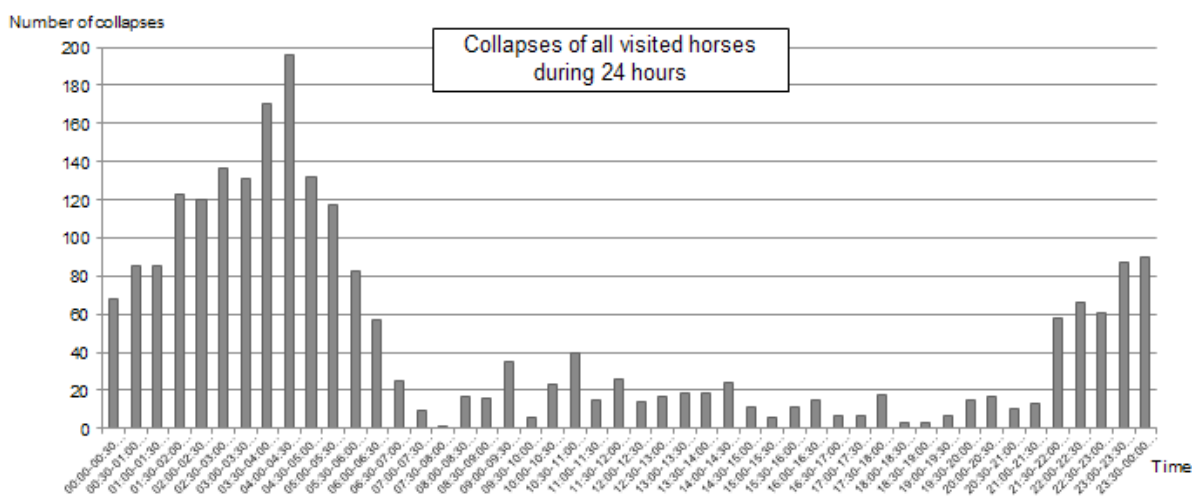


Figure 2: Total number of the „narcoleptic collapses“ per 30 min in a 24-hour-time period (n=37, 2 horses did not show any collapses); remarkable is the cumulative occurrence of the collapses in the early morning hours

The authors presume that the „narcolepsy“ of most adult horses is not a neurological disorder but a REM-sleep deficiency because of recumbent sleep deprivation caused by illness, ethological deficits or non animal-friendly husbandry.

Key words: narcolepsy, cataplexy, polysomnography, REM-sleep deficiency

ALEMAN, M., WILLIAMS, D. C., HOLLIDAY, T. (2008). Sleep and sleep disorders in horses. Paper presented at the Proceedings of the 54th annual convention of the AAEP, San Diego, USA.

BATHEN-NÖTHEN, A., HEIDER, C., FERNANDEZ, A. J., BEINEKE, A., SEWELL, A. C., OTTO, M., TIPOLD, A. (2009): Hypocretin measurement in an Icelandic foal with narcolepsy. *Journal of veterinary internal medicine* 23, 6, 1299-1302.

LUDVIKOVA, E., NISHINO, S., SAKAI, N., JAHN, P. (2012): Familial narcolepsy in the Lipizzaner horse: a report of three fillies born to the same sire. *Veterinary Quarterly* 32, 2, 99-102.

MAYHEW, J. (2011). Seizures, syncope and sleep attacks. Paper presented at the The equine head, Equine chapter meeting at the ACVSc science week, Gold Coast, Queensland, Australia.

STRAIN, G. M., OLCOTT, B. M., ARCHER, R. M., MCCLINTOCK, B. K. (1984): Narcolepsy in a Brahman bull. *Journal of the American Veterinary Medical Association* 185, 5, 538-541.

TONOKURA, M., FUJITA, K., NISHINO, S. (2007): Review of pathophysiology and clinical management of narcolepsy in dogs. *The Veterinary Record* 161, 11, 375-380.

WHITE, E. C., DE LAHUNTA, A. (2001): Narcolepsy in a ram lamb. *Vet Rec* 149, 5, 156-157.