Polysonographic studies, about sleeping behaviour of horses

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Objective: In the context of the ongoing discussion about keeping horses in individual stable boxes vs. in herds the lack of relaxation of the horse as a flight animal is an argument often put forward against individual housing. The long-term objective of our investigations is to determine the sleep phases in various housing systems in order to find a substantiated answer to that issue. For that purpose, the sleep waves measured by EEG have to be defined beforehand and allocated to the individual stages of sleep. The experiments described here are intended to support this effort. The objective is to establish a method which by means of a portable polysomnograph allows to capture the sleeping behaviour of horses for the purpose of defining the individual stages of sleep. It was investigated which stages of sleep horses undergo, and to what extent they may be comparable to those of humans.

Animals/materials/methods: Given the high technical effort involved, somnographic examination of large animals has so far been difficult and mostly required the animals to be sedated. Meanwhile, however, instruments such as the Somnoscreen™ by Somnomedics have become available. This is a completely portable polysomnograph with up to 28 channels and wireless online signal transmission and synchronous video transmission to a PC.
Using this instrument, the sleep profile of 5 Icelandic ponies and 10 horses (different race) aged 5-10 years was recorded and evaluated for 4 or 5 nights per horse. The following parameters were assessed: EEG (electroencephalogram), EOG (electrooculogram), EMG (electromyogram), ECG (electrocardiogram), thoracic and abdominal breathing motions as well as identification of the body posture. Synchronous video recordings were made. EEG recordings were obtained through gold-coated disk electrodes with long flexible cables, applied and secured to the scalp.

Results: As with humans, various stages of sleep can also be defined for horses using the above methods of recording. The waking condition is characterised by alpha waves, which just like in humans are within a range of 8-12 Hz. Typical REM phases as in humans were also detected, although not only when stretched completely on their side, as has hitherto always been described, but also when lying on their chest. Phases of deep sleep (stage 4) can also be measured, with the animals mostly in a standing position. The multi-stage human sleeping pattern, which is made up of 4-6 repeat phases of sleep (waking stage eyes open – waking stage eyes closed – REM phase – stage 1 – stage 2 – stage 3 – stage 4 – return to REM phase etc.) was found to be similar in horses in individual sequences. However, the sleep phases are shorter and more frequently interrupted by waking phases.

Conclusions: Horses are flight animals, which is why they have to be „on eye" in every situation so as to be able to flee in the face of danger. In a natural herd lying positions are only assumed if one or more members watch over the herd. In some publications the REM phase is treated as equivalent to the deep sleep phase. Although the REM phase is a phase of total muscle relaxation it is at the same time the dream phase and due to the high frequencies and the low amplitudes in the EOG resembles Stage I. This means that the sleeping horse can be awakened very quickly from this REM phase so as to be able to react to any dangerous situation. It therefore makes sense for the horses to assume a lying position during REM phases as the muscles are relaxed, yet a waking condition can be reached very quickly. A standing position seems to be preferred during deep sleep phases, where waking takes rather long, so that at least the position will not have to be changed. Whether the sleeping behaviour changes depending on age and race has yet to be investigated.

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