



## Case report

## Sleeping patterns of horses in selected local horse stables in Malaysia



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## ABSTRACT

Horses typically spend between from 4 to 15 hours a day in standing rest and anywhere from minutes to several hours lying down. Horses that have less sleep due to prolonged activities will result in health deterioration and poor welfare. From the literature search and from the authors' knowledge, the study on the sleeping patterns of domesticated horses in stable management in the tropics has not yet been explored. Thus, the aim of this study was to understand the sleeping patterns of selected local stabled horses in Malaysia. This study was conducted in 3 different stables around Klang Valley, Malaysia. Five healthy adult gelding Thoroughbred horses with body condition score of 3 out of 5 were selected randomly from each stable. The horses experienced the same daily activities and exercised for approximately 4 hours every day where they were used for riding activity. An observational cohort study method was used in this study. Each horse's sleeping patterns were observed for 72 hours. The time frame was divided into 12 hours a day for 6 days, continuously. In the present study, horses tended to sleep only during the night. The stable horses spent about  $57.00 \pm 25.00$  min/24 h in sternal recumbency;  $8.00 \pm 6.00$  min/24 hours in lateral recumbency; and  $3.40 \pm 0.70$  minutes in each stay apparatus position before shifting weight to the other hindlimb. The implication of these findings will allow equine practitioners to understand the different sleeping patterns of horses to maintain the horses' welfare and performance.

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## Introduction

All animal species from invertebrates to vertebrates demonstrate sleep. Sleep is a universal behavior. From the behavioral point of view, sleep is a condition of decreased awareness to environmental stimuli that is distinguished from states such as coma or hibernation. Sleep is particularly relevant to medicine because sleep disturbances occur in virtually all psychiatric illnesses and are frequently part of diagnostic criteria for a specific disorder, for example, stereotypic behavior in animals (Bertone, 2011). Sleep time is inversely related to the danger of predation for a given species. Prey animals such as

horses usually sleep less than predator animals, and large animals sleep more than small animals (Carson and Wood-Gush, 1982; McNamara et al., 2008). Horses typically spend anywhere from 4 to 15 hours a day in standing rest and anywhere from minutes to several hours lying down (Evans, 2000; McDonnell, 2000; Ransom and Cade, 2009).

In addition, horses can drowse and sleep while standing, by mean of the unique passive stay apparatus of the equine forelimbs and hindlimbs. These enable them to be on their feet for long periods with a minimum muscular effort (Dyce et al., 2002; Budras et al., 2009). On the other hand, Schuurman et al. (2003) had reported that horses spend much of their life standing, and they are believed to be able to keep their limbs straight with little muscular effort. However, some effort must be required because when the horse tires after a few minutes, it will shift its weight to the other hindlimb (Budras et al., 2009).

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Drowsiness and sleep are influenced by the hormone, melatonin. Melatonin is produced in the pineal gland and is present in higher quantities in the plasma during the night. Melatonin levels are associated with photoperiod and diurnal cycles of sleep and inactivity (Nagy et al., 2000). Day length influences the relative amounts of body serotonin, a precursor to melatonin. As a result, the buildup of serotonin will induce drowsiness and sleep that may influence animal's resting behavior (McNamara et al., 2008). In horses, elevated melatonin concentrations are strongly associated with the dark phase, where melatonin secretion increases as daylight fade and decreases rapidly at the end of the night. Melatonin is one of the key elements in the control of seasonal reproduction (Nagy et al., 2000). Besides box size, feeding frequency, and bedding, horses from different geographical area exhibited different total sleeping time due to different day length and environmental temperature (Raabymagle and Ladewig, 2006). Horses tend to be in recumbency position or sleep only during the night when the environment is dark and the temperature is cooler (Wohr et al., 2016; Fuchs et al., 2016).

Nonetheless, all research on horses' sleeping patterns has been conducted only in 4-season countries. From the literature search, no work had been done on the resting patterns of local horses in the tropical country, in particular, Malaysia. Furthermore, studies on the sleeping patterns of domesticated horses in stable management in the tropical climate have not yet been established. The objective of this study was to understand the sleeping patterns of local stabled horses in Malaysia.

## Materials and methods

### *Animal model and management*

This study was conducted in 3 different stables around Klang Valley, Malaysia. In this study, 5 horses from each stable were randomly selected. Healthy adult gelding Thoroughbred horses with body condition score of 3 out of 5 were selected from each stable. All horses received concentrate and alfalfa hay at a different frequency in different stable management (Stable A: fed 3 times daily; Stable B: fed 4 times daily; and Stable C: fed 2 times daily). All horses experienced the same daily activities and were let out into the paddock, groomed, and went for riding classes for approximately 4 hours every day from 08:00 to 12:00. No other stable activities were conducted after that period due to hot environment. The box stalls were cleaned and feces were removed once daily during exercise.

### *Boxes*

All 3 stables had different box sizes. The box sizes in Stable A, Stable B, and Stable C were 4.5 × 3.6 m, 4.2 × 3.5 m, and 3.2 × 3.2 m, respectively. All the 3 stables used sawdust as the bedding in the enclosure. After compaction, Stable A, Stable B, and Stable C had the thickness of 10 cm, 10 cm, and 4 cm, respectively.

### *Experimental design*

This study used body position as an indicator of sleeping state. The horses were considered stand resting when they are in the stay apparatus position with minimal body movement while flexing one hindlimb. Horses are considered to be engaging in slow-wave sleep if they are in sternal recumbency. Finally, rapid eye movement sleep in horses was achieved in the lateral recumbency position. An observational cohort study method was used in this study. Each horse was observed for 72 hours where the time frame was divided into 12 hours a day for 6 days. For the first 3 days, the horses were

observed only during the day (08:00 in the morning to 20:00 at night). After that, the horses were observed only during the night for the next 3 days (20:00 at night to 08:00 in the morning). During each observation period, 5 horses were observed simultaneously. The frequency and duration of the horse sleeping behavior were recorded. Five calibrated stopwatches were used throughout the research to standardize the duration of the horse being observed. Each stopwatch represented one horse. The stopwatches were used to record the length of sternal recumbency, lateral recumbency, and stand rest. The time started when the horse's thorax and abdomen region touched the ground and stopped when the horse was standing on all 4 legs. For lateral recumbency, horses exhibit a rolling behavior before getting up. For stand rest, the time started when the horse was flexing on one hindlimb and stopped when shifting weight to the other hindlimb.

### *Malaysia's climate*

The present study was conducted throughout the month of June 2017 during the southwest monsoon that occurs from early June and ends in September. The prevailing wind flow is generally southwesterly and light, below 15 knots. It is relatively a dry season with the mean temperature of 29°C and humidity of 79% during the time of the study. Besides, the day length was 12 hours, which is constant over the year.

### *Statistical analysis*

All the data were analyzed using JMP 11 software (SAS Institute Inc., Cary, NC). One-way analysis of variance and Tukey's honest significant difference were used to compare the normally distributed independent mean between experimental groups. The data were considered significant at  $P < 0.05$ .

## Results

### *Sleeping patterns*

Throughout the study period, all horses were observed to be resting when there were no stable activities and when the environment was quiet. Typically, the horses were observed resting 2 hours after every feeding. During the day, the horses tend to stand rest and forage in bedding materials. At night, the horses will drowse, forage in bedding materials, and exhibit recumbent position. The horses were considered to stand rest in the stay apparatus



**Figure 1.** Horse in the stay apparatus position or stand rest.

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