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Water Consumption and Time Budgets of Stabled Pony (*Equus caballus*) Geldings

MARTHA P. SWEETING[1] and KATHERINE A. HOUPT[2]

Department of Physiology, New York State College of Veterinary Medicine, Cornell University, Ithaca, NY 14853 (U.S.A.)

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ABSTRACT

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A detailed description of the mechanics of drinking and a daylight time budget were obtained by observing 4 Shetland-type pony geldings that were housed in box stalls between 08.45 and 16.45 h during the spring. The ponies drank 3 ± 1 times h^{-1}, consuming 1.6 ± 0.3 kg h^{-1}. The ponies swallowed a mean of 15 times during each drinking bout and consumed 72 ± 13 g of water per swallow. The inter-swallow interval was 2.1 ± 0.8 s.

Using 4030 instantaneous samples, the following time budget was determined. The ponies spent $57 \pm 6\%$ of their time eating hay, $27 \pm 7\%$ standing, $8 \pm 4\%$ eating shavings, $2 \pm 1\%$ moving, $3 \pm 2\%$ resting, $2 \pm 3\%$ grooming and less than 1% eliminating.

INTRODUCTION

The water economy of horses has been of particular interest both in feral horses for whom water may be the limiting factor in the summer environment, and in stabled horses for whom limited water intake may predispose to impaction colics. Time spent drinking has been recorded by Berger (1977) and Boyd (1980). Fonnesbeck (1968) has recorded water intake, and the subject has been reviewed by Hinton (1978). Fonnesbeck (1968) measured intake of horses on two diets and found that water intake was greater on a hay diet than on a hay and grain diet.

The previous studies measured intake or time spent drinking, but not both. Only from time and intake measurements can rate of drinking be calculated. The purpose of this study was to determine the patterns of intake and to deter-

[1]Present address: Ontario Veterinary College, University of Guelph, Guelph, Ont. N1G 2W1, Canada.

[2]Author to whom correspondence should be addressed.

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mine drinking rate. There are circumstances in which it is not possible to measure water intake directly. These circumstances include studies of free-ranging horses drinking from natural water sources, some zoo environments, horses drinking from automatic waterers and experiments in which time spent drinking as measured by a photoelectric cell (Sufit et al., 1985) is used to quantify water intake. It would be useful under those circumstances to be able to calculate intake from time spent drinking. In this study, the grams ingested per second and per swallow were calculated. In addition, a time budget of pony geldings housed in box stalls and fed a limited amount of hay was determined in order to compare it with time budgets collected in different environments.

MATERIALS AND METHODS

Four adult Shetland-type pony (*Equus caballus*) geldings, weighing 185–220 kg, were observed from 29 March to 7 May 1982, between 08.45 and 16.45 h.

The ponies were housed in 1.2 m $\times$ 1.6 m box stalls constructed of pipe rails. Two of the ponies, Pony 182 and Pony 25, were housed in adjacent stalls. Two stalls separated these ponies from Pony 416. Pony 45 was stabled directly across the aisle from Pony 416. All ponies were in visual contact with other ponies.

The pony geldings were fed approximately 1.5 kg of mixed grass hay twice a day, at approximately 08.00 and 16.00 h. Water was always available in 11.4-l buckets.

Each pony was observed for 15-min intervals for a total of 9 h per pony. The ponies were observed in rotation. For example, Pony 182 was watched first, followed by Pony 25, Pony 416 and finally, Pony 45. The following observation day, Pony 25 was watched first, followed by Pony 416, Pony 45 and Pony 182.

Water consumption during the observation period was determined by weighing the water bucket at the beginning and end of each observation period. The duration of time spent drinking and the number of swallows were recorded. The mean amount ingested per swallow was determined by dividing the number of swallows by the total consumption.

An instantaneous sample was taken every 30 s (Altmann, 1974). The mutually exclusive specific behaviors were eating hay (E), eating shavings or feces (ES/EF), moving (M), standing (S), resting (R), self-grooming (SG), urinating (U) and defecating (DE). Eating hay was recorded each time a pony took hay into his mouth or chewed it. Nibbling the sawdust bedding and eating feces were both included in the category of eating shavings or feces. If a pony was eating and walking at the same time, it was recorded as eating. Walking, stamping, pawing and stretching, which all required the movement of at least one leg, were recorded as moving. Standing consisted of any behavior that did not involve any leg movements, and was not one of the other recorded behaviors eating hay, eating shavings or feces, self-grooming, urinating, defecating or drinking. Only recumbent resting was recorded as resting. Self-grooming

TABLE I

Drinking behaviors and water consumption by stabled ponies

Pony	No. of drinking bouts per 15 min	Duration of drinking bout (s)	Water consumed per 15 min (kg)	Water consumed per swallow (g)	Inter-swallow interval (s)	Drinking rate ($g\ s^{-1}$)
25	1.47 ± 1.30	24.4 ± 2.7	0.60 ± 0.13	71.7 ± 23	3.2 ± 1.4	14 ± 3
45	0.72 ± 0.94	16.2 ± 2.9	0.61 ± 0.19	77.4 ± 39	1.7 ± 0.7	68 ± 11
182	0.58 ± 0.97	12.2 ± 1.4	0.42 ± 0.22	85.3 ± 39	1.4 ± 0.8	73 ± 9
416	0.39 ± 0.84	12.8 ± 1.1	0.12 ± 0.04	55.6 ± 11	2.1 ± 0.8	50 ± 9
$\bar{x}$ ± SE	0.79 ± 0.47	16.4 ± 2.8	0.43 ± 0.11	72.6 ± 12	2.1 ± 0.8	51 ± 13

was defined as rubbing any part of the body against an inanimate object, or scratching any part of the body using a hind-hoof or teeth. Urinating and defecating are self-explanatory. A drinking bout was recorded from the time the ponies' lips touched the water until they were withdrawn from the water.

RESULTS

Table I shows the mean water consumption per observation period, the duration of drinking bouts, the mean number of swallows per drinking bout, and the mean inter-swallow interval per pony. The mean of all 4 ponies for all of the above is also shown. The ponies drank 0.8 times per 15 min, consuming 0.4 kg/15 min; not every pony drank during each observation period. In those bouts in which they drank, the ponies consumed 1.1 ± 0.4 kg/15 min in 15 swallows in which an average of 70 g were ingested per swallow. They drank at an average rate of 51 ± 13 $g\ s^{-1}$. Two seconds separated each swallow within a drinking bout.

Table II shows the frequency of non-drinking behaviors for each pony. The ponies spent 70 of the 120 observations per hour eating hay, 10 eating other materials, 32 standing, 2 moving, 4 resting and 2 grooming. Elimination occurred less than once per hour.

DISCUSSION

The ponies in this study had easy access to water and drank frequently; an average of 3 times per hour. Other studies have shown that when water is readily available, horses drink small amounts several times a day. However, as water becomes less available, the frequency decreases (Waring, 1983). Horses may drink as infrequently as once per day, but then large quantities of water are consumed (Fraser, 1980). More than 4 l of water may be consumed within one drinking bout.

TABLE II

Percentage occurrence of behaviors in stabled ponies[1]

Pony	Eating hay	Eating shavings or feces	Move	Stand	Rest	Self-groom	Urinate	Defecate	Drink
25[2]	61	5.5	5.4	22	0	2.0	0.3	0.3	3.7
45[2]	61.9	17.6	4	10.8	3.1	1.5	0.2	0	0.8
182[3]	65	0	3.6	29	0.1	1.7	0.2	0.7	0.9
416[3]	40.6	7.6	0.2	45.2	3	0.6	0.1	0	0.7
$\bar{x}$SEM	57.1±5.6	7.7±3.7	3.3±2.2	26.8±7.2	1.6±0.9	1.5±0.3	0.2±0.1	0.1±0.1	1.5±0.7

[1]Point samples of behavior were taken every 30 s.
[2]Based on 992 point samples.
[3]Based on 1023 point samples.

No references to the amount any equid consumes per swallow could be found. The ponies in this study consumed 70 g of water per swallow and 51 g s^{-1}, or 3 l min^{-1}. An earlier study from this laboratory estimated intake as 500–800 ml min^{-1}. Time could not be measured in units smaller than 1 min (Sufit et al., 1985). Rate of intake as well as volume of intake may increase with increasing roughage content of the diet (Fonnesbeck, 1968; Sufit et al., 1985). The information on the rate of water intake can be used to calculate intake under circumstances where it cannot be measured directly. For example, the water consumption of wild horses could be estimated by measuring the time spent drinking and multiplying the time by the drinking rate. This observation could also find practical application in determining how many swallows of medicated water a horse should consume or how many swallows should be allowed to a thirsty horse on an endurance ride without a risk of gastrointestinal disturbance.

These stabled ponies, fed a limited amount of hay, spent 57% of their time eating hay, which was similar to pastured and feral horses and ponies that have easy access to food. Table III summarizes the time budgets of stabled horses and ponies under various conditions. The ponies in this study spent 8% of their time eating shavings and/or feces, whereas ponies in the same stalls, but with ad libitum access to hay, did not eat shavings (Sweeting et al., 1985). Apparently this also indicates that when hay is not available, stabled ponies will engage in eating non-food items.

Willard et al. (1973) found that the amount of time spent standing and eating varied according to the diet. Horses fed high-concentrate diets spent 62% of their time standing and 4% eating, whereas horses fed an all-hay diet spent 45% of the time standing and 40% eating. In Willard's study, standing was defined as time other than that spent eating, drinking, licking salt or engaged in stable vices such as wood-chewing, coprophagia and searching. Searching and coprophagia correspond with eating shavings and totaled 8%

TABLE III

Time budgets of stabled horses and ponies

Time observed	Reference	Environment	Diet	Feeding	Standing	Moving	Drinking	Lying
Day (horse)	Willard et al., 1973	Metabolism cages	Limited hay	50[1]	45	0	1	4
			Concentrate	32[1]	62	0	1	5
Night (horse)	Shaw, 1985	Box stall	Limited hay and grain	27	67	61	—	6
Night (pony)	Houpt et al., 1986	Box stalls	Limited hay	15	71	1	—	13
Day (pony)	Sweeting et al., 1985	Box stalls	Ad libitum hay	76	19	3	2	1
24 h (pony)	Laut et al., 1985	Pen	Ad libitum grain	17	—	—	2	—
	Sufit et al., 1985	Pen	Ad libitum grain					
24 h (pony)	Ralston et al., 1979	Pen	Ad libitum pellets	31	—	—	—	—

[1]Including coprophagia, wood chewing and searching.

when the horses in Willard's study were fed hay, a figure exactly equal to the time spent eating shavings in this study.

The time spent eating pellets (Ralston et al., 1979) is intermediate between the time spent eating grain (Laut et al., 1985) and the time spent eating hay (Sweeting et al., 1985) when the diet was available ad libitum.

The ponies in this study were observed standing 23% of the time. The percentage of time seen standing varies from study to study. Much of the variation is apparently due to the various criteria used for standing. In an earlier study (Sweeting et al., 1985), it was found that ponies given ad libitum access to hay stood 19% of the time. In a study of nocturnal behavior (Houpt et al., 1986), pregnant pony mares spent more time standing than the ponies in this study.

The ponies in this study were seen in the recumbent position 1% of the time. Other observers have reported consistently higher values for time spent recumbent in stabled horses. Percentages varied from 8.2 to 20.8% over a 24-h period (Littlejohn and Munro, 1972; Dallaire and Ruckebusch, 1974). Presumably, more time is spent in recumbency during the nocturnal period than during the daylight hours, as Ruckebusch (1972) found that horses were recumbent for 19.9% of the nocturnal period and only 8.2% of the whole 24-h period. One explanation for the low percentage of time these pony geldings were observed recumbent is that they were watched for a limited time period; between 08.45 and 16.45 h. Evidence for this is provided by the study conducted by Sweeting et al. (1985), which reports that stabled pregnant pony mares spent 0.1% of their time lying down during the morning hours of 10.00–12.00 h and 1.1% in the afternoon between 13.00 and 16.00 h, but ponies observed from 18.00 to 06.00 h spent 13% of their time lying (Houpt et al., 1986).

Self-grooming has been observed in feral and pastured horses and ponies (Tyler, 1972; Blakeslee, 1974; Clutton-Brock et al., 1976; Crowell-Davis, 1983).

These gelding ponies groomed themselves slightly more frequently than the 1.8 times per hour reported to occur in Welsh pony foals (Crowell-Davis, 1983). This slight difference may be due to the effects of age, sex, environment or sampling time.

In contrast to what has been reported by other observers (Tyler, 1972; Fraser, 1980; Crowell-Davis, 1983), these stabled gelding ponies were observed to urinate more often than they defecated. Fraser (1980) reported that horses urinate as infrequently as 3 times a day during daylight hours. New Forest pony mares were observed to urinate once every 4–4.5 h (Tyler, 1972). The stabled gelding ponies in this study urinated more frequently than mares; once every 3 h while they were being observed. This may be the result of a gender difference. It may also be due to the difference in the accessibility of the water supplies and in the drinking rates.

The stabled gelding ponies were observed to defecate, on average, 0.1 times per hour. This is much less frequent than what has been reported for other groups of horses and ponies that have been studied. Fraser (1980) reported that adult horses defecate 6–12 times per day, depending on their diet. Tyler (1972) observed that, on average, adult pony mares defecate once in a period of just over 2 h. Because mares in Tyler's study were consuming a fiber-rich diet, the observed difference in rate of defecation may be due to diet. In this study limited quantities of hay were fed, whereas the free-ranging horses were consuming a more varied diet of grass and browse.

CONCLUSION

The ponies in this study drank frequently; 3 times per hour. They consumed less than 100 ml per swallow, and drank at a rate of 50 g s^{-1}.

The percentage of time spent eating, moving and self-grooming were similar to that observed in other studies of both free-ranging and stabled ponies. The differences observed in the other activities or behaviors (standing, recumbency, urination and defecation) may be the result of the environment and feeding.

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