



# No effect of drinking water temperature (ambient vs. chilled) on consumption of water during hot summer weather in ponies

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## Abstract

Consumption of ambient warm (17°–31°C) vs. ice-chilled (0°–1°C) drinking water was compared in a within-subjects cross-over trial using nine mature pony stallions housed in tie-stalls during hot summer weather (15°–29°C). Ponies drank similar quantities whether provided warm water or chilled water. This is in contrast to earlier reported findings that during cold winter ponies drank more if provided warm water than if provided cold water. There were no qualitative differences in drinking behaviour owing to water temperature.

*Keywords:* drinking water; water consumption; horses

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## 1. Introduction

We recently reported (Kristula and McDonnell, 1994) that ponies drink approximately 40% more warm water (50°C) than ambient near-freezing water during cold winter weather. Those trials were conducted with environmental temperatures ranging from -7° to 5°C.

The present study was conducted to similarly compare water consumption rates and drinking behaviour of ponies given ambient warm water or ice-chilled cold water during hot summer weather, with housing, exercise, feeding and water schedules comparable to the winter study.

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## **2. Materials and methods**

### *2.1. General design*

Ad libitum consumption of ambient warm water (WARM) and ice-chilled cold (ICY) water was compared using a within-subjects cross-over trial. Nine ponies were randomly assigned to either WARM ( $n = 5$ ) or ICY ( $n = 4$ ). For a period of 5 consecutive days, volume of water consumed was measured twice daily. The first day was for acclimation only; the volume of water consumed was compared for the subsequent 4 days. Each pony was then switched to the alternate water condition and the 5 day (1 day) acclimation + 4 day trial) pattern was repeated. The total volume of water consumed for each of the nine ponies for each condition was compared using paired t-test procedures.

### *2.2. Animals*

Nine mature pony stallions (ranging in age from 2 to 15 years and weighing 100-280 kg) were used. Prior to the trial the ponies had been kept on pasture with supplemental hay. During the trial the ponies were stabled together in a barn in individual tie-stalls (approximately 1 m X 3 m). They were maintained on mixed grass hay fed twice daily (07:00h and 16:00h), approximately 5 kg total per pony per day. All ponies remained healthy throughout the trials with normal appetite and stools.

### *2.3. Ambient environmental temperatures*

The trials were conducted during June of 1994, with daily barn temperatures ranging from 15° to 29°C.

### *2.3. Water*

All water was obtained from the same tap source. During the trial, water was continuously available in 20 l flat back water buckets (Fortex, San Juan, PR 00936). Buckets were refilled with water twice daily (08:00h and 17:00h) to 12 l. At no time were the buckets empty. WARM water was obtained by holding tap water in plastic containers at ambient barn temperature for the 9-15 h between each refill. The temperature at refill for the WARM water ranged from 17° to 31°C with a mean of 23°C. ICY water was prepared by adding ice (made from the same tap water) to tap water similarly held for 9-15 h, with one 3 l ice chunk included in the 12 l volume in each pony bucket. The temperature of ICY water ranged from 0° to 1°C at refill. At each refill time, all remaining water was discarded and replaced with fresh water.

### *2.5. Drinking behaviour*

To evaluate drinking behaviour one 9 h videotaped sample of behaviour was obtained for each pony once during each condition on day 3 or 4. Videotaping started

Table 1

Total volume (l) of water consumed in 4 day trial

Animal	WARM	ICY	WARM as % of ICY	P <sup>a</sup>
1	37.5	30.3	1.24	
2	21.6	32.4	0.06	
3	36.4	25.7	1.42	
4	24.0	30.7	0.78	
5	45.3	41.7	1.09	
6	25.7	31.9	0.81	
7	30.2	30.8	0.98	
8	32.9	39.4	0.83	
9	21.7	26.0	0.87	
X (SE)	30.6 (2.7)	32.1 (1.8)	0.97	0.54
Vol/animal/day	7.6 (0.68)	8.0 (0.45)		

<sup>a</sup> Paired-t-test procedures.

immediately after morning refill of water buckets and ended at the time of evening refill. Tapes were viewed by an experienced technician who was blind to the water assignments. Behavioural measures included the time of day and duration of each drink as well as a qualitative assessment of the associated behaviour.

### 3. Results

Water consumption results are summarized in Table 1. The nine ponies consumed a mean of 8.01 day<sup>-1</sup> of ICY water and 7.71 day<sup>-1</sup> of WARM water (Paired-*t* = 0.63, 8 dof, *P* > 0.10).

All drinking occurred within 2.5 h after feeding and water refill, and 90% occurred within 2 h. The mean numbers of drinks for the ICY and WARM water were 9 (SE = 3.7) and 7 (SE = 2.1), respectively. The mean duration of drinks for the ICY and WARM conditions were 13.2 s and 14.0 s, respectively. No qualitative difference in drinking behaviour was observed between drinking water conditions.

### 4. Discussion

Under summer hot weather conditions, ponies drank similar quantities of ICY and WARM water. This is in contrast to our findings that in winter ponies drink approximately 40% more warm water than cold water (Kristula and McDonnell, 1994). Water temperatures for most drinks were 0–1°C for ICY and 17°–31°C for WARM water conditions. These water temperature ranges were comparable to the warm and cold water temperature conditions of the winter time study.

It is interesting that daily water consumption per animal was similar to that of the winter study, despite higher environmental temperatures. Data apparently are not available on effects of environmental variables on water consumption in equids. Crowell-Davis and coworkers (Crowell-Davis et al. 1985) observed that ponies at pasture with free access to water exhibited a higher frequency of drinking associated with higher environmental temperatures (seasonally and diurnally). The barn temperatures in the present study were not extremely hot compared with some climates in which horses are kept. Similarly, exercise was minimal. These and other factors such as degree of humidity, type of forage, and availability of salt may interact with drinking water temperature to affect consumption.

Apparently, little is known about effects of drinking water temperature on consumption rates of mammals or on the interaction of ambient temperature with these effects. In cattle, limited work has addressed drinking water temperature as it relates to feed intake and milk production. Milk production increases when warm water is provided in winter with the assumption that cows consume more warm than ambient cold water in winter (Grzegorzak et al. 1976). Cattle in summer also consume more water if warm rather than cold water is provided (Wilks et al., 1990).

As in our previous study (Kristula and McDonnell, 1994), most drinking occurred within 2–3 h after feeding and water refill. Observations of similarly housed ponies and horses (McDonnell, unpublished) indicate that most drinks occur within 3 h after feeding of hay, whether or not fresh water is provided at the time of feeding. Periprandial drinking has been reported in other studies of stabled ponies (Sufit et al., 1985) as well as in housed domestic pigs (Houpt et al., 1983) and rats (Kisseleff, 1969).

Our present and previous (Kristula and McDonnell, 1994) findings suggest that, in ponies, the effect of water temperature on consumption rates varies with environmental temperature. While ponies drink significantly greater amounts when provided warm water versus when provided cold water during cold winter, they drink similar amounts of warm and cold water during hot summer weather. An important distinction is that these studies did not test preference for warm or cold water, in that warm and cold were not offered simultaneously. Evaluation of a greater variety of water temperatures during various environmental temperatures (including moderate environmental temperatures) may refine our understanding.

## Acknowledgements

This was a Dorothy Russell Havemeyer Foundation Project conducted at the Georgia and Phillip Hofmann Research Center for Animal Reproduction. Diana Gerardi, Samantha Murray, and Wade Tenney provided technical assistance.

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