

## Effects of trailer transport duration on body weight and blood biochemical variables of horses

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### Summary

Six horses were randomly assigned to one of four treatments: trailering 240 km, trailering 480 km, trailering 720 km and no trailering. Before the beginning of each treatment and at the end of it horses were weighed and blood was drawn from the jugular vein. In addition, horses were weighed the morning after treatment. Sodium, potassium, chloride, total protein and creatine-phosphokinase was analysed in blood serum.

Horses in all treatment groups lost weight. The weight loss increased significantly as trailering distance increased (1.5, 2.7, 3.0, and 3.0% for 240, 480, 720 km, and no trailering respectively). The body weight of the horses did not return to pretransport values by the morning after. There was no difference between treatments (on average body weight was 1.5% lower than before treatment). There was no significant effect of trailering on creatinphosphokinase activities, total protein, sodium, potassium, and chloride concentration in blood serum.

**Keywords:** transport, body weight, electrolyte, enzyme, horse

### Einfluß der Transportdauer auf das Körpergewicht und biochemische Blutvariablen von Pferden

Sechs Pferde wurden in randomisierter Reihenfolge an verschiedenen Tagen einer der vier Behandlungen unterzogen: Transport über eine Strecke von 240 km, Transport über 480 km, Transport über 720 km oder Aufenthalt im Auslauf für den der Transportstrecke von 720 km entsprechenden Zeitraum (Kontrollgruppe). Für die Dauer des Transports und der Zeit im Auslauf erhielten die Pferde weder Wasser noch Heu. Die Außentemperatur betrug im Mittel 24°C, im Transporter wurden Temperaturen von 21–27°C erreicht. Zu Beginn, am Ende und am Tag nach der Transportstrecke bzw. der Zeit im Auslauf wurden die Pferde gewogen und Blut aus einer Vena jugularis externa entnommen. Im Blutplasma wurden die Konzentrationen von Natrium, Kalium, Chlorid und Gesamteiweiß sowie die Aktivität des Enzyms Creatin-Phosphokinase gemessen.

Nach allen Behandlungsarten verloren die Pferde Gewicht. Der Gewichtsverlust vergrößerte sich mit zunehmender Länge der Transportstrecke (1,5%, 2,7% und 3,0% bei Transporten über 240, 480, 720 km) wobei ein signifikanter Unterschied zwischen dem Verlust nach 240 km und dem nach 720 km bestand. Die Pferde der Kontrollgruppe verloren 3% ihres Körpergewichts, dieser Verlust war signifikant verschieden von dem nach 240 km Transport.

Das Körpergewicht der Pferde war am Tag nach dem Transport und dem Aufenthalt im Auslauf nicht wieder auf den Ausgangswert zurückgekehrt, unabhängig von der Streckenlänge. Im Mittel lag es 1,5% unter dem Ausgangsgewicht. Keine der Transportstrecken sowie der Aufenthalt im Auslauf hatte einen signifikanten Einfluß auf die Gehalte von Natrium, Kalium, Chlorid und Gesamteiweiß sowie die Aktivität der Creatin-Phosphokinase.

**Schlüsselwörter:** Transport, Körpergewicht, Elektrolyte, Enzyme, Pferd

### Introduction

Transporting horses to competitive events often requires hundreds of kilometres of travel. It is not unusual for people to leave home after work, haul their horses all night long and then compete the horse the next day. Many horses arrive at competitions drinking poorly, and appearing gaunt and depressed, suggesting they are in a dehydrated condition. This may diminish performance and predispose horses to colic, exertional rhabdomyolysis and other metabolic problems.

Body weight reduction (Mars et al., 1992; Marlin et al., 1995), changes of biochemical variables in blood (Schmidt and Schmidt, 1980; Ferlazzo et al., 1984; Leadon et al., 1989; Ouragh et al., 1990; Mars et al., 1992; Ferlazzo et al., 1993), and of physiological variables (Slade, 1988; Mars et al., 1992; Clark et al., 1993; Smith et al., 1994) have been reported after transport of horses. However in all cases a control treatment without transport was not included in the studies, while in most cases different horses were used to determine effects of transport factors, and often,

more than one study parameter was varied. Therefore, what appears to be a substantial amount of data on horse transportation does not supply valid information, and thus the effects of transport on horses remains to be investigated.

This study was designed to identify the effect of transport of differing duration on body weight and some selected biochemical variables in the blood of horses in a cross over study with controls.

### Materials and methods

Six horses ranging in age from two years to sixteen years were used in the study (initial mean body weight of 524±49 kg). Five Thoroughbreds and one Appaloosa (two geldings and four mares) were randomly assigned to one of four treatments: 240 km, 480 km, 720 km and no trailering. One treatment was applied to each horse every second day. Thus the whole study was done within 7

days. Trailing started between 7:30 and 9:45 a.m.. Horses were fed the same amounts of hay and grain each morning at 5:30 a.m.. The treatment protocol consisted of loading four horses into a four-horse, slant load, forward standing, bumper pulled, totally enclosed Circle J trailer, and then hauling these horses predetermined distances on a summer day. No stops were made for food or water, but the horses were unloaded and allowed the opportunity to urinate every 240 km. On transport days control horses were placed in paddocks without food or water until the 720 km treatment was completed. All horses were hauled on the same course. The route was a four-lane interstate freeway with a maximum elevation change of 80 meters. The travelling speed was 100 km per hour. The horses were checked frequently, and the temperature inside the trailer was recorded every 120 km. The 240 km trip was done by hauling to a town 120 km from the originating farm and back. A 480 km trip was done by driving on the same freeway to a point 240 km from the farm and then returning on the same route. A 720 km trip included both of the previous routes.

The weather fluctuated mildly during the study period. Mean daily air temperature was 24°C (± 2; SD). The range of the air temperature inside the trailer was 21 to 27°C.

All horses were weighed, and two 5 ml blood samples were taken from the jugular vein with vacuum tubes before the horses were loaded into the trailer. One sample was drawn into a clot tube, and the other sample was drawn into an EDTA tube. At the end of each treatment this procedure was repeated. The horses were then put into their stalls where they were provided free access to their regular diet of grass, hay and water. The horses were weighed the next morning. Serum samples were sent to a commercial laboratory and were evaluated for sodium, potassium, chloride, total protein and creatine-phosphokinase.

Data analysis

Data described are arithmetic means and standard deviations. Analysis of variance for repeated measures was applied to examine the effect of treatment on all variables. When significant effects of treatment were found, multiple comparison between

treatments of the mean of the variable were done with Scheffe test.  $p < 0.05$  was accepted as the level of significance.

Results

Horses in all treatment groups, including the control group, lost weight. The weight loss increased as trailing distance increased (Fig. 1). There was a significant effect of treatment on body weight change ( $p < 0.01$ ). The effect was significant between horses trailered 240 km and 720 km (Scheffe test,  $p < 0.05$ ), and between horses trailered 240 km and the controls (Scheffe test,  $p < 0.05$ ). Horses transported 720 km were weighed after 240 km. After 240 of 720 km the horses had already lost 65% of the total body weight loss measured (-10.2 kg and -15.6 kg after 240 km and 720 km respectively). The body weight of the horses did not return to pretransport values by the morning after regardless of the type of treatment (Fig. 2), and there was no difference between treatments ( $p > 0.05$ ).

There was no significant effect of trailing on creatinphosphokinase activities, total protein, sodium, potassium, and chloride concentration in blood serum (Tab. 1;  $p > 0.05$ ).

Discussion

The results of this study demonstrate that trailing per se may have only a small effect (if any) on body weight loss of horses. In some studies body weight reduction because of transport has been measured and it was attributed to transport effects (Mars et al., 1992; Marlin et al., 1995). However, in these studies controls submitted to the same procedures as the transported horses were not available. Therefore it has to be postulated that the body weight reduction measured during transport may be mainly due to lack or insufficient supply of water and food during transport. Additionally the stress induced by trailing could affect the appetite of the horses, reducing water and food intake. Commer-

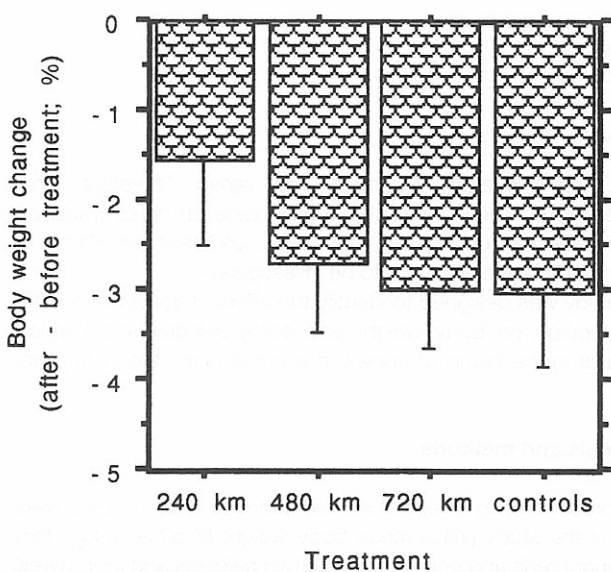


Fig. 1: Body weight changes of horses submitted to trailer transport over different distances or kept on paddock (= controls; 6 horses; Mean ± standard deviation).

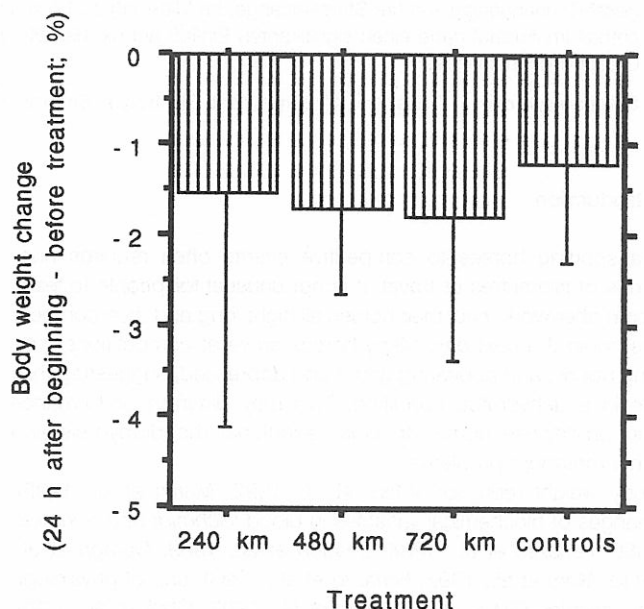


Fig. 2: Body weight changes of horses 24 hours after being submitted to trailer transport over different distances or kept on paddock (= controls; 6 horses; Mean ± standard deviation).

**Tab. 1:** Change of activity or concentration of blood serum variables of horses (value after – value before treatment; n = 6; mean  $\pm$  sd).

Variables	Treatment			
	240 km	480 km	720 km	controls
Creatine-phosphokinase (U/l)	3 $\pm$ 41	113 $\pm$ 202	217 $\pm$ 324	66 $\pm$ 164
Total Protein (g/l)	0.35 $\pm$ 0.42	0.17 $\pm$ 0.40	0.52 $\pm$ 0.39	0.05 $\pm$ 0.34
Sodium (mmol/l)	1.75 $\pm$ 2.22	2.25 $\pm$ 3.10	3.00 $\pm$ 5.35	-1.25 $\pm$ 4.03
Potassium (mmol/l)	0.30 $\pm$ 0.62	0.35 $\pm$ 0.55	-0.58 $\pm$ 0.48	0.50 $\pm$ 1.12
Chloride (mmol/l)	0.67 $\pm$ 1.53	-0.67 $\pm$ 4.04	0.67 $\pm$ 3.79	-1.33 $\pm$ 3.51

cial transporters as well as private people transporting horses state that they supply water and in some cases food to the horses at resting periods during transport (Lindner, 1995). However, this does not mean that the horses have sufficient time to ingest enough food or water to maintain body weight, especially in those cases where transport time is only a few hours.

The dimension of body weight reduction and especially the lack of recovery of the losses within 24 hours demonstrate that it is essential to feed and water the horses frequently during transport. Further studies will have to demonstrate how often horses have to be watered, maybe even fed, and how much time has to be allowed in the resting periods during transport to avoid body weight loss and therefore possible performance reduction and health impairment.

The lack of changes of sodium, potassium, chloride and total protein concentration in blood serum despite the body weight losses shows that these variables can not be used as indicators of the horses metabolic condition under these circumstances (Sloet van Oldruitenborgh-Oosterbaan, 1995).

The lack of increase of the total protein concentration in blood serum indicates that the body weight reduction may have been result of faecal loss as opposed to water loss from extracellular fluid. Or alternatively, equilibrium between intracellular and extracellular fluid spaces occurred.

It was only creatine-phosphokinase that had a tendency for higher activities in the serum with increasing distance. However, the large intraindividual and interindividual variation of this enzyme did not allow these changes to reach statistical significance. In addition, there was a creatine-phosphokinase increase in blood serum among horses on the control treatment. These results emphasise the importance of considering the large variability of this enzyme when drawing conclusions based on its measurement and demonstrate the importance of having control groups whenever possible.

## Conclusion

Peak performance at any competitive event requires that the athlete not be physiologically compromised in any way. This study suggests that even a couple of hours of transport can produce a weight loss which persists for more than twenty-four hours. It would appear that the major component of this weight loss is simply the restriction of food and water during transportation. This would suggest that taking time to feed, water and rest a horse while transporting it will help to maintain peak physiological condition.

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