Journal of Equine Veterinary Science 33 (2013) 1136–1141

Contents lists available at SciVerse ScienceDirect

Journal of Equine Veterinary Science

journal homepage: www.j-evs.com

Original Research

Variability of Selected Biochemical Parameters in Young Stallions During the 100-day Performance Test

Bogdan Janicki PhD [a,*], Anna Kochowicz PhD [a], Mateusz Buzała MSc [a], Wiesław Krumrych MSc, PhD, ScD [b]

[a] Department of Biochemistry and Environmental Toxicology, University of Technology and Life Sciences, Bydgoszcz, Poland
[b] Department of Pathophysiology of Reproduction and Mammary Gland, National Veterinary Research Institute, Bydgoszcz, Poland

ARTICLE INFO

Article history:
Received 24 January 2013
Received in revised form 12 April 2013
Accepted 24 April 2013
Available online 22 June 2013

Keywords:
Horse
Physical effort
Biochemical parameters
Blood

ABSTRACT

The aim of the study was to evaluate variations in biochemical blood parameters of stallions during a 100-day performance test. The study was carried out with 20 clinically healthy stallions aged 3-4 years. The degree of adaptation to exercise loads during a 100-day performance test was assessed three times: (I) on the first day of training, (II) on the 46th day of training, and (III) on the 97th day of training. Sample collection and basic clinical tests were performed before training (1), directly after training (2), and after a 30-minute rest (3). Venous blood samples were analyzed for the concentration of total protein, glucose (GLU), and lactate, the activity of lactate dehydrogenase (LDH), and creatine kinase (CK), and total antioxidant status (TAS). Postexercise changes in the analyzed parameters showed that the loads were of moderate intensity. As a result of the 100-day training, postexercise variation in GLU concentration and CK and LDH activity was lower than at the beginning, which indicates that the body was stimulated to adapt to performing exercise tasks. The resting level of TAS was also found to increase. The results obtained suggest that the stallions are well prepared for increasing exercise loads.

© 2013 Elsevier Inc. All rights reserved.

1. Introduction

Recent studies of equine exercise physiology have focused mainly on determining the usefulness of biochemical parameters for evaluating physiological capacity and adaptation to increasing loads [1,2]. These studies are most often concerned with endurance and race horses [3,4]. The commonly used performance tests involve genetic evaluation [5], behavioral observations [6], and determination of movement and biometric parameters [7]. Biochemical blood parameters of stallions during a 100-day performance test have not been investigated, and only clinical and hematological tests were performed [8,9]. The main purpose of the stallion performance test is to select animals characterized by strength, endurance, good health, and the traits most sought after in sport horses. However, many studies [10-12] suggest that biochemical blood determinations give a more complete picture of the horse's response to loads and its adaptation to training program.

The aim of the study was to evaluate the effect of a 100-day performance test on some biochemical blood parameters of young stallions.

2. Material and Methods

2.1. Horses and Management

The study was conducted with 20 horses of various breeds (7 half-breeds, 5 Wielkopolskas, 4 Hanoverian, 2 Holstein, and 2 Oldenburgs) at the ages of 3-4 years, subjected to a 100-day performance test. Horses from the

* Corresponding author at: Bogdan Janicki, PhD, Professor, Department of Biochemistry and Environmental Toxicology, University of Technology and Life Sciences, Mazowiecka 28, 85-084 Bydgoszcz, Poland.
E-mail address: janicki@utp.edu.pl (B. Janicki).

0737-0806/$ – see front matter © 2013 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.jevs.2013.04.017

Training Station were the property of the State Horse Studs (4 stallions) and private breeders (16 stallions). The choice and number of horses used in the study were determined by consent of the owners and organizational aspects. Data from interviews conducted before the testing procedure, the clinical tests, and ex post results of laboratory blood tests confirmed that the animals were in good health. The horses were given regular prophylactic treatments consisting of deworming and influenza and tetanus vaccinations over 60 days before the events. Prophylactic treatments were carried out in accordance with Fédération Equestre Internationale (FEI) regulations.

Diets were formulated to meet the energy, protein, mineral, and vitamin needs stated in horse feeding standards [13]. Diets were based on hay (6 kg), crushed oat grain (4.5 kg), and Marstall Haferfrei muesli mix (1.5 kg), which met the horses' requirement for major minerals, trace minerals, and vitamins, and supplemented the diet with protein and energy. Animals were kept in stables that met welfare standards and had continuous access to mineral blocks and water.

The general characteristics of exercise in horses during a 100-day test have been described previously [8].

The response of stallions to exercise loads used during the entire training program was assessed three times: (I) on the first day of training (4 days after preliminary ranking of stallions); (II) on the 46th day of training (halfway through the training program); and (III) on the 97th day of training (2 days before the test completing the training program).

Stallions were trained from June to September. The average values of ambient temperature and air humidity during the three assessments were 28°C, 25°C, and 24°C and 44%, 58%, 73%, respectively.

2.2. Blood Sampling and Analytical Methods

Blood sampling and clinical examination on test days I, II, and III were performed three times: (1) prior to exercise (in the stable, before saddling); (2) immediately after exercise; and (3) after a 30-minute rest. The clinical examination included rectal measurement of temperature (T) and auscultation of heart rate (HR) and respiratory rate (RR).

Blood for laboratory testing was collected from the external jugular vein into vacuum tubes containing lithium heparin and silica (without anticoagulant) using Vacuette (Greiner Labortechnik GMBH, Austria) closed system. To minimize the effect of circadian rhythm, first blood samples were drawn at the same hour (8:00 AM ± 30 min). The material obtained was stored at +4°C for no longer than 24 h. Serum was analyzed for the concentration of total protein (TP), glucose (GLU) and lactate (LAC), and the activity of lactate dehydrogenase (LDH) and creatine kinase (CK) using a semiautomatic biochemistry analyzer (Ektachem DT60; Eastman Kodak Co., Rochester, NY). Heparinized blood plasma was assayed for total antioxidant status (TAS) with a Randox kit for total antioxidant status (catalog no. NX 2332; Randox Laboratories Ltd., UK) using an EPOLL-20 spectrophotometer (POLL Ltd., Poland) according to the kit manufacturer's instructions. The quality of TAS determinations was evaluated on an ongoing basis relative to total antioxidant status control serum (catalog no. NX 2331; Randox).

2.3. Statistical Analysis

Results were presented as arithmetic means ($\overline{X}$) and standard deviations (SD) and expressed as percentages of increase or decrease in the analyzed variable (+Δ%; −Δ%). Statistical analysis used one-way analysis of variance, and the means were partitioned into homogenous groups using the Tukey test. Relationships between variables were investigated using Pearson coefficients of correlation (r). All analyses were performed using Statistica version 6.0 software (StatSoft).

3. Results

The mean values of the basic clinical parameters of the investigated horses were presented in an earlier publication [8]. The results of determinations for the content of TP, GLU, and LAC, the activity of the enzymes LDH and CK, and TAS are shown in Table 1.

The results show relatively little variation in resting values of TP, GLU, and LAC over successive tests. Physical

Table 1
Mean biochemical blood parameters during the physical effort of stallions

Study Design	TP (g/L)	GLU (mmol/L)	LAC (mmol/L)	LDH (U/L)	CK (U/L)	TAS (mmol/L)
I						
1	$58.10^{aA} \pm 4.38$	$4.23^{aA} \pm 0.85$	$1.21^{aA} \pm 0.38$	$693.40^{aA} \pm 89.29$	$186.10^{aA} \pm 27.50$	$0.52^{A} \pm 0.18$
2	$61.90^{b} \pm 3.02$	$5.38^{b} \pm 1.09$	$1.94^{b} \pm 0.37$	$797.05^{b} \pm 94.08$	$231.45^{b} \pm 37.26$	0.61 ± 0.32
3	$60.45^{ab} \pm 2.96$	$4.82^{ab} \pm 1.05$	$1.58^{ab} \pm 0.36$	$776.30^{ab} \pm 102.20$	$222.70^{b} \pm 38.26$	0.58 ± 0.26
II						
1	$60.95^{A} \pm 3.28$	$4.50^{aA} \pm 0.66$	$0.98^{aA} \pm 0.40$	$717.60^{A} \pm 95.03$	$193.35^{aA} \pm 24.18$	$0.64^{AB} \pm 0.22$
2	63.50 ± 4.19	$5.44^{b} \pm 0.87$	$1.67^{b} \pm 0.37$	799.35 ± 91.81	$229.25^{b} \pm 38.45$	0.76 ± 0.30
3	61.00 ± 4.38	$5.04^{ab} \pm 0.76$	$1.41^{b} \pm 0.34$	783.60 ± 105.53	$221.15^{ab} \pm 47.54$	0.75 ± 0.28
III						
1	$60.85^{A} \pm 3.82$	$4.69^{A} \pm 0.78$	$1.33^{aA} \pm 0.44$	$729.40^{A} \pm 113.93$	$214.25^{A} \pm 30.08$	$0.82^{B} \pm 0.25$
2	62.50 ± 3.55	5.38 ± 0.78	$1.98^{b} \pm 0.46$	778.95 ± 113.22	247.80 ± 39.81	0.86 ± 0.25
3	62.90 ± 4.04	5.11 ± 0.76	$1.71^{ab} \pm 0.42$	759.50 ± 110.42	239.45 ± 39.25	0.84 ± 0.22

1, 2, 3, time of blood sampling (before exercise, immediately after exercise, after 30-minute rest, respectively); I, II, III, test days (first, 46th, and 97th day of training, respectively); CK, creatine kinase; GLU, glucose; LAC, lactate; LDH, lactate dehydrogenase; TAS, total antioxidant status; TP, total protein.

[a,b,c] Means with different letters differ significantly at $P < .05$ (differences between 1, 2, and 3) over successive tests.

[A,B] Means with different letters differ significantly at $P < .05$ (differences between mean resting values) ± SD.

Download English Version:

https://daneshyari.com/en/article/10961216

Download Persian Version:

https://daneshyari.com/article/10961216

Daneshyari.com