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SOME BIOCHEMICAL BLOOD CONSTANTS EVOLUTION IN REPORT TO THE TRAINING SCHEDULE STAGE IN SPORT HORSES

EVOLUȚIA UNOR CONSTANTE BIOCHIMICE SANGVINE LA CAII DE SPORT ÎN RAPORT CU STADIUL ANTRENAMENTULUI

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To determine whether a clinical examination was adequate to assess the fitness of horses in a fence course riding, and to characterize the relationship between a clinical assessment of the horse's fitness, training schedule stage and its blood biochemistry, 22 horses were monitored before (S_1), during training, immediately after warming-up (S_2) and after an E level fence obstacle course ride (S_3). The blood samples were taken from the jugular vein in the above three mentioned phases, for the determination of total protein (g/dl), nitrogen (mg/dl), glucose (mg/dl), lactic acid (nmol/l), calcium (mg/dl), cholesterol (mg/dl) and phosphorus (mg/dl). The intend of the paper is to present the obtained results as a reference study for the appropriate use by clinicians, sport horses owners and trainers in view to have a solid base in evaluation, for the adequate protection of health and welfare of the jumper horses competitors.

Key words: training schedule, jumping, blood biochemistry.

Introduction

Training schedules structure for the sport horses generally, and particularly for the jumpers, it is a high quality combination between a gradually work on specific elements in view to obtain a well-trained individual. The constant and correct work, develop the neurological and muscularly system and improve the horse behavior by modeling his character.

Materials and Methods

For the analysis of the blood biochemistry parameters, in report to the effort level spends in an obstacle fence course, a number of 22 horses (10 Thoroughbreds and 12 Romanian Sport Horses), all males between 5 to 15 years old were jumped in an E level (100 cm height and 120 cm large) typical course, after an afferent warming up session. The arena was a classic one, covered by grass, and the outside temperature measured 25–30^{0}C, a typical one for the

competitional season in Romania. The blood samples were taken from the jugular vein, in three different moments:

Before effort (S_1) – in the stable, before grooming and haltering;

After warming-up (S_2) – on the training arena, immediately after the warming-up session;

After the jumped course (S_3) – on the training arena, immediately after the finish of the jumped fence course;

According to the statistical protocol, all the obtained results for the three stages of effort level were computed for averages and dispersion indices, as well as for the statistical significance (Mann-Whitney test) of the differences between the three moments of the training schedule.

Results and Discussions

The obtained data's are shown in table 1, respectively the evolution of some biochemical blood constants changing in report to the effort spend in a warming up session and a jumped obstacle course. It can be see an expression of metabolic changing. This is a typical picture of the effort result in the metabolism of glucoses, proteins and lipids.

If the protein value was initially between 6.42 and 6.38 g/dl, in both after effort cases, it increased significantly. In this sense the obtained values were 6.93 to 9.94 g/dl, after the warming up phase ($p<0.05$), respectively 7.73, and 7.66 g/dl ($p<0.001$) after the finish of the fence course. The increased protein values obtained in the blood samples may be a result of the liquid changes in the vascular and extra – vascular space. When the effort schedule is a long term one, the increased values for the total proteins, may appear due some equilibrium disturbs of the protein synthesis in report to the catabolism. Normally, after effort, it was noticed a continue decrease of the proteins concentration, because of the liquid reflux, from the extra-vascular space in the intra-vascular one.

The nitrogen was in the reference intervals (20-40 mg/ dl) provided by (2). there were no established significant differences between the first determination in S_1 stage (36.31 and 35.71 mg/ dl) and the other two moments of the training schedule: S_2 with (35.43 and 35.08 mg/ dl), respectively S_3 with (35.,26 and 34.74 mg/ dl). It was not noticed here, but the increases upper than the normal limits, can be caused by an excess of the protein in the diet, even pathological variations with permanent or only transitory character.

Looking to the glucose determination, the average values for the resting phase, were 73.59 and 73.61 mg/ dl. After the warming-up stage they decrease significantly ($p<0,001$) to 63.43 and 62.25 mg/dl. The same situation was coming out after the jumped obstacle course, when glucose's decrease again significantly ($p<0.001$) to 57.40 and 58.26 mg/ dl. As a result, the S_3 phase values registered a statistically significant difference in report to the S_1 stage. All results were normal (1), considering that in a short time, the horse had been made an intense effort, characteristic for this kind of riding discipline.

Table 1

Evolution of sport horses' biochemical blood profile reported to training

Train. Stage/ Breed		X ± Sx	CV%	Statistical signification		
				RSH/ Th. H	RSH	Th. H
Proteins (g/dl)						
S_1	RSH	6.42 ± 0,09	5.27	0.843	S_1 - S_2 0.002*	S_1 - S_2 0.019*
	Th. H	6.38 ± 0,16	8.13			
S_2	RSH	6.94 ± 0,07	3.79	0.843	S_2 - S_3 0.000***	S_2 - S_3 0.000***
	Th. H	6.93 ± 0,08	3.58			
S_3	RSH	7.73 ± 0,11	5.00	0.716	S_3 - S_1 0.000***	S_3 - S_1 0.000***
	Th. H	7.66 ± 0,14	6.06			
Nitrogen (mg/dl)						
S_1	RSH	36.31 ± 0,31	3.01	0.306	S_1 - S_2 0.214	S_1 - S_2 0.384
	Th. H	35.71 ± 0,38	3.39			
S_2	RSH	35.43 ± 0,39	3.82	0.448	S_2 - S_3 0.750	S_2 - S_3 0.791
	Th. H	35.08 ± 0,28	2.51			
S_3	RSH	35.26 ± 0,42	4.10	0.620	S_3 - S_1 0.060	S_3 - S_1 0.344
	Th. H	34.74 ± 0.65	5.88			
Glucose (mg/dl)						
S_1	RSH	73.59 ± 0.63	2.99	0.766	S_1 - S_2 0.000***	S_1 - S_2 0.000***
	Th. H	73.61 ± 1.48	6.38			
S_2	RSH	63.43 ± 0.55	3.02	0.129	S_2 - S_3 0.000***	S_2 - S_3 0.000***
	Th. H	62.25 ± 0.42	2.15			
S_3	RSH	57.40 ± 0.87	5.25	0.716	S_3 - S_1 0.000***	S_3 - S_1 0.000***
	Th. H	58.26 ± 0.59	3.22			
Lactic acid (nmol/l)						
S_1	RSH	2.48 ± 0.15	21.89	0.644	S_1 - S_2 0.000***	S_1 - S_2 0.000***
	Th. H	2.61 ± 0.16	19.07			
S_2	RSH	6.53 ± 0.17	8.93	0.861	S_2 - S_3 0.000***	S_2 - S_3 0.000***
	Th. H	6.45 ± 0.21	10.45			
S_3	RSH	9.00 ± 0.15	6.03	0.447	S_3 - S_1 0.000***	S_3 - S_1 0.000***
	Th. H	9.23 ± 0.13	4.42			
Calcium (mg/dl)						
S_1	RSH	9.13 ± 0,14	5.41	0.092	S_1 - S_2 0.000***	S_1 - S_2 0.064
	Th. H	9.83 ± 0,32	10.33			
S_2	RSH	8.61 ± 0,10	4.16	0.080	S_2 - S_3 0.005**	S_2 - S_3 0.011
	Th. H	8.99 ± 0,17	6.29			
S_3	RSH	8.19 ± 0,07	3.19	0.842	S_3 - S_1 0.000***	S_3 - S_1 0.001**
	Th. H	8.34 ± 0,16	6.01			

Cholesterol (mg/dl)						
S_1	RSH	67.56 ± 1,11	5.69	0.000***	S_1 - S_2 0.506	S_1 - S_2 0.185
	Th. H	70.48 ± 1,19	5.34			
S_2	RSH	66.58 ± 0,71	3.70	0.276	S_2 - S_3 0.402	S_2 - S_3 0.272
	Th. H	67.99 ± 0,85	3.94			
S_3	RSH	65.43 ± 0,87	4.62	0.338	S_3 - S_1 0.193	S_3 - S_1 0.005**
	Th. H	66.70 ± 0,61	2.92			
Phosphorus (mg/dl)						
S_1	RSH	3.20 ± 0.10	10.97	0.176	S_1 - S_2 0.340	S_1 - S_2 0.017**
	Th. H	3.52 ± 0.17	15.94			
S_2	RSH	3.10 ± 0.12	14.32	0.619	S_2 - S_3 0.795	S_2 - S_3 0.820
	Th. H	2.99 ± 0.13	13.76			
S_3	RSH	3.05 ± 0.12	13.59	0.999	S_3 - S_1 0.184	S_3 - S_1 0.009**
	Th. H	2.93 ± 0.03	3.64			

The lactic acid, do not presented significant differences, indifferently the considered report was (S_1-S_2; S_2-S_3 or S_1- S_3). Within the values registered per stage, respectively between the Romanian Sport Horses and the Thoroughbreds there were noticed significant differences in all three phases at a level $p<0.001$. Entirely, the increases were about 255% after the warming-up stage and about 358% after the fence course running, both reported to the first determination. The increase of the lactate from S_2 to S_3 was about 140%. Nearest results were obtained by other references (3) indeed, but they underlined unknown sources when the lactic acid increased almost with 3000% in report to the stabbleing conditions

During the spend effort in the specific training schedule, the calcium values noticed a constant decrease. By comparing the two groups of horses, there were not registered any statistical significant differences in all stages of work. The initial average values were 9.13 mg/ dl for the RSH and 9.83 mg/ dl for the Th. H. in the RSH group, the differences between the resting stage and the warming-up phase, respectively the resting values reported to the after course running values, were assigned significantly al a $p<0.001$ level. For the same breed, reporting S_2 to S_3 obtained results, the statistical level was $p<0.01$. In spite of these, the Thoroughbreds, registered only a $p<0.01$ levels assured difference from the second to the third phase changed values.

In order to describe the cholesterol changes, there was assigned only a low absolute value difference, but statistically assured ($p<0.001$) between the RSH and the Th. H. The determined values for the Romanian jumpers varied from 67.56 to 65.43 mg/ dl, without any statistically notable differences in the three described stages of the training schedule. Registered cholesterol values for the Thoroughbreds had a larger interval from 70.48 to 65.43 mg/ dl. Generally, was found out a decrease with 5% for this blood constant, from the resting to the post jumping phase, statistically significant at a $p<0.01$ level.

Phosphorus, do not obtained essential changes during this standard exercise, even that in absolute values, were noticed some differences, but in low limits (from 3.20 to 3.05 mg/ dl for RSH and from 3.52 to 2.93 mg/ dl for the Th. H). Within the breed, significant differences ($p<0.01$) were found out, by reporting S_2 and S_3 values to the first stage for the Thoroughbreds group.

Conclusions

In order to assess the fitness of horses in a fence course riding, and to characterize the relationship between a clinical assessment of the horse's fitness, training schedule stage and its blood biochemistry, there were noticed some changes in the studied constants. This is a typical picture of the effort result in the metabolism of glucoses, proteins and lipids.

The significantly increased protein values obtained in the blood samples may be a result of the liquid changes in the vascular and extra – vascular space, or may appear due some equilibrium disturbs of the protein synthesis in report to the catabolism.

Due the presence of the aerobe metabolism, the lactate increased significantly after the specific standard exercised effort.

Fitting the jumper means to make a work in view to prepare him for a short and high muscularly consumption, as a result the glucose blood concentration registered normally a significantly high decrease.

In the same time, the calcium and phosphorus values noticed an easy decreasing, but the nitrogen and the cholesterol remained in the normal limits for this specie.

Based on this research, it is difficult to prove that the physiological analyzed parameters will be useful in the selection of the sport horses, but it brings a plus of information in this field.

In summary, a comprehensive clinical evaluation that focuses on the musculoskeletal, respiratory, and cardiovascular systems in combination with the blood biochemistry constants determinations, has greatly improved the data's base in jumping sport horses.

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