ASSESSMENT OF PHYSIOLOGICAL RESPONSE IN SPORT HORSES TO TRAINING INDUCED STRESS

Ioana Cristina ANDRONIE[1], V. ANDRONIE[1], Monica PÂRVU[1], Ş. CONSTANTIN[2], Ş. ZAMFIRESCU[3]

Abstract

Research monitored the induced response of some physiological welfare indicators in sport horses during training. We assessed the stress intensity during training by measuring the variations of heart rate, lactic acid, cortisol and creatinine levels. The horses included in the study were grouped in: untrained (A1 n: 15) and trained (A2 n: 22). Physiological responses differed between the two groups, even if the training programme they underwent was the same. The heart rate and cortisol values increased in untrained horses compared to the trained ones but we recorded an increase of their values in the latter when repeating the exercises during the monitored period (98-120 nmol/l). The plasma lactate levels recorded increased values in the case of the first group (10,2 mmol/l), only until the animals got used to that effort, after which they dropped (9,9 mmol/l). Creatinine concentration increased in the case of trained horses (1,5 mg/dl) compared to the untrained ones (1,2 mg/dl). Horse training may be regarded as stressful under certain circumstances thus leading to a depreciation of their welfare depending on the exercises taken, training intensity and animals' physical condition.

Key words: *horses, training, welfare*

Introduction

Horses are labor animals in many developing countries, used mostly for companionship, leisure and sport activities in the majority of the developed countries as well as meat source in many other countries. The interest fields related to horse welfare assessment were transport, veterinary care, faulty owner management and insufficient nutrition (Johnson, 1998).

Horse welfare may be assessed by monitoring the behavioural indicators and measuring the physiological ones (Schwean, K., 1999), and their responses may occur to a wide variety of stressors such as transport, foot illnesses, lack of exercise, or even training, thus affecting the animals' welfare. Foreman and Ferlazzo (1996) state that animal responses to stress are unique and differ from one animal to another in case of the same given situation.

The levels of physiological indicators show us the manner in which horses respond to training and the changes that appear following training, during relaxation period.

Materials and method

The present study monitored 37 horses of different breeds (n: 37) aged 3 to 10 years that were divided into two groups: A1 untrained horses (3-5 years old) and A2 trained horses (5-10 years old). When not in training, horses participant to the research were sheltered in individual boxes with optimal housing conditions for this category. All horses were subjected to the same light (walk), moderate (trot), and intense (canter) training programme. We monitored the indicators for 30 minutes of training/day and week, over 3 months (July, August and September).

[1] Faculty of Veterinary Medicine, *Spiru Haret* University.
[2] Student at Faculty of Veterinary Medicine, *Spiru Haret* University.
[3] Innovet, Bucharest.

Among the physiological indicators assessed to establish the quality level of their welfare we chose: heart rate, lactic acid, creatine and cortisol levels.

We measured the heart rate by means of a non-invasive method, using a Polar type of cardio-monitor. Its electrodes were placed under the girth on each side of the saddle, in close contact with the animal skin by means of a gel. The transmitter was horizontally placed on the withers and it was also fixed on the harness while the rider wore the recording device on his/her hand. The data recorded throughout the training period were downloaded on a computer by means of an infrared device.

Blood samples were collected by puncture of the jugular 2h prior and after training. The blood was collected in 1.3 ml lithium-heparin vacutainers (Vacutainer System) (LH/1.3). Immediately after sampling, the blood was stored in ice before processing (centrifugal action at 2000 rpm, 15 minutes) according to the working protocol. The plasma samples obtained were stored at -20^{0}C until they were analyzed in the laboratory.

The plasmatic cortisol levels were obtained by radioimunoassey RIA (IDEXX SNAP* READER), the lactic acid and creatinine levels by chemical analysis with commercial reagents in a biochemical analyser (IDEXX Vet Test 8008).

The statistical data analysis included the T student test in order to compare the biochemical and haematological parameters of the two horse groups whereas for the heart rate recorded, data were processed by means of the Polar Equine SW programme installed.

Results and discussions

The recorded heart rate (fig. 1) during training shows a significant increase in untrained horses in the first month of their training as compared to the ones used to training.

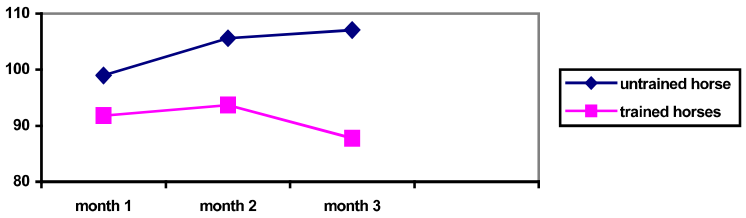

Fig. 1. Heart rate (bpm) recorded during research

This increase is present also in the third month of their training depending on the intensity of their exercise. In trained horses the heart rate decreases in the third month of training, which indicates the fact that the animals are getting used to the exercise. Repetitive training may be considered a chronic stress factor for trained horses.

The heart rate varied with training intensity (fig. 2) within relatively the same increase rate in untrained horses over the entire research period. Hyperpnoea combined with a decrease in the neurovegetative system control over the heart rate during intense training may result into a prevalence of its highly frequent variability (HRV) (Evans et al., 1995).

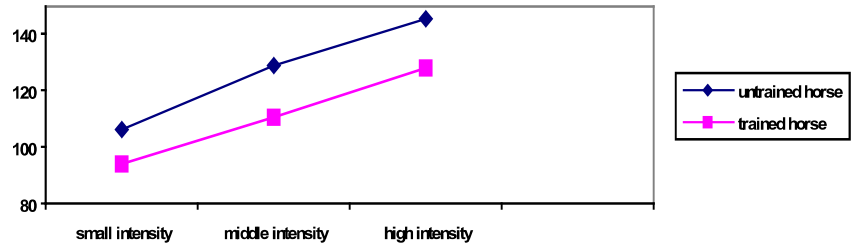

Fig. 2. Heart rate (bpm) recorded depending on the training intensity

Besides other physiological parameters, which respond to horse training, the heart rate modifications are useful in training assessment (Art and Lekeux, 1993).

The plasmatic cortisol levels (fig. 3) measured during training shows a concentration increase in untrained horses as opposed to trained horses; its values are different according to the exercise's intensity. This aspect is due especially to the horses' effort to adapt to training.

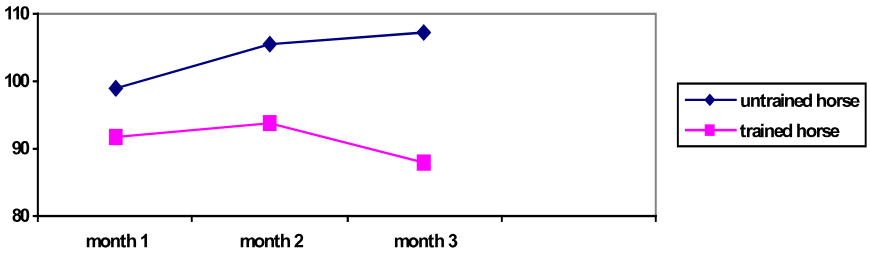

Fig. 3. Plasmatic cortisol level (nmol/l) recorded during research

Plasmatic lactate shows a decrease in trained horses compared to untrained horses (table 1), probably due to exercises thus testifying for a good athletic condition.

Measuring the seric enzymes may assess muscular activity and cellular metabolites resulted during training. The muscular cells produce lactate during anaerobic glycolyse (Sciliano et al., 1995). Its concentration level may be used as horse performance (Evans et al., 1995) as well as the animals' welfare level indicator.

Table 1

Level variations in biochemical indicators monitored during research

Biochemical indicators	**Trained horse**			**Untrained horse**		
	month 1	**month 2**	**month 3**	**month 1**	**month 2**	**month 3**
Plasmatic lactate mmol/l	6,8	9,6	8,3	7,8	10,2	9,9
Plasmatic creatine mg/dl	1,42	1,48	1,52	1,18	122	1,39

Plasmatic creatine recorded an increase in trained horses (table 1) as opposed to untrained horses, which indicates a normal renal activity of the animals. Exercise intensity leads to an increase in muscular mass and implicitly in plasmatic creatine levels, which is a by-product of creatine decomposition, a nitrogenic compound

used by muscular cells to stock up energy. Seric creatine concentration varies with creatine synthesis and the animal muscular tissue (Stockman, 1995).

In 2005, Martins et al. suggested the hemato-biochemical profile in sport horses as physiological and training status marker.

Conclusions

Heart rate may be an efficient method to monitor horse training, whose variations indicate horses' response to duration, type and intensity of training. It may also be suggested as marker of horse welfare during training.

The plasmatic cortisol records different levels in trained horses as compared to untrained horses as well as depending on exercise intensity.

Plasmatic lactate shows a decrease in trained horses which is indicative of the fact that, correlated to cortisol levels, it does not make for a major stimulus to the animal during training.

Seric creatinine levels are high in trained horses, especially when considering a higher intensity of exercises, as a result of muscular mass growth, which indicates significant horse athletic capacity.

The haematological and biochemical indicators can be used in assessing the welfare quality level of sport horses during training.

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