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THE LEVEL OF CORTISOL IN THE SALIVA OF HORSES AS AN INDICATOR OF STRESS IN DIFFERENT WAYS OF USE

The aim of the study was to collect information on the impact of stress resulting from various forms of use of horses on the level of cortisol in their saliva. Cortisol production is carried out depending on the activity of ACTH, the rhythmic cycles of peak torque early in the morning and the lowest production at night. The natural circadian rhythms can however be disturbed by stress, both mental and physical. Following a stressful situation, a cortisol level can increase up to 10 times. An excessive stress or when it is too often repeated, is a potential threat to his health. It is particularly important therefore to determine the level of cortisol in the sports horse and those undergoing the appropriate tests for the breed's courage, for which the stress inherent in their use. Estimated based on the concentration of cortisol in saliva levels of stress may in the future to facilitate the development of methods, including training, the use of which would eliminate most of the stressors.

Key words: cortisol, saliva, stress, horses

Stress is referred to a specialist in the literature as a phenomenon resulting from increased activity in the axis hypothalamus-pituitary-adrenal (Ślebodziński, 1979). Stress response usually goes through three stages:

1. alarm stage: the body reaches the information about the problem, followed by mobilization of forces of the body. The first stage can be divided into two phases:

-shock phase,

-anti-shock phase.

In the shock phase, there are problems with the operation of stressor, while anti-shock phase there are typical symptoms of stress, followed by mobilization of forces, there are attempts to deal with the problem.

2. stage of resistance: the shock associated with the occurrence of the problem persists, psyche and the body begin to withstand stressor effect, however, are becoming less resistant to other, lesser threats that were not previously noticed.

3. stage of exhaustion: occurs when the body can not cope with the problem, too much stress affects or too long. At this stage there are also all the negative health effects of stress, and dysregulation of physiological functions (eg during transport), development of diseases associated with stress (Selye, 1960, Frindt et al., 2006).

Stress can also be described as an adaptive effort of the organism, whose goal is to adapt to functioning in the existing external conditions. Such adaptation may include both adapt to changes in the environment, as well as adjusting the body to function under constant conditions, if they diverge from the optimum, eg excessive noise. All the

changes occurring in the body under the influence of stressor help the body to survive in an emergency. Adaptation in response to stress is based on numerous physiological components, such as release of glucose from glycogen accumulated in the liver, strengthen heart and increase blood pressure and inhibition of reproductive activity. Resources are mobilized to defend the body, but this effort gradually consumes resources at the disposal of energy (Kaleta, 2003).

There was a significant difference in terms of consequences between short-term stress (acute stress) and chronic stress. During the stress response the same defenses used in the short term, give a positive result but in the long term can lead to serious disorders. It was observed that the permanent mobilization of the organism in stress response is in itself harmful consequences and causes of disease. The impact of stress on the cardiovascular system such as a short stimulates a type of defensive reaction, the long-term action can lead to hypertension. Due to the linking together of various physiological mechanisms of stress can negatively affect not only health, but also on fertility and resistance of organisms (Kaleta, 2009).

As a result of increased activity in the axis hypothalamus-pituitary-adrenal comes to the increased concentration of corticosteroids, which is the most active cortisol - called a stress hormone. Cortisol is synthesized from cholesterol and secreted into the blood by the adrenal cortex and has a broad and general metabolic activity, necessary to preserve life. The high content of glucocorticoids which continues for a long time in the blood can lead to loss as a consequence of the thymus, spleen and lymph nodes, the reduction of antibody level and thus the elimination of barriers to the immune (Antczak and Gralak, 2003, 2004).

Cortisol production is carried out depending on the activity of ACTH, in the rhythmic cycles of peak torque early in the morning (between 6:00 and 8:00) and the lowest production at night (between 23:00 and 4:00 am) (Lindner et al., 1990). The natural circadian rhythms can however be disturbed by stress, both mental and physical. Following a stressful situation, cortisol can increase up to 10 times. Remaining of the animal in a state of increased stress or when it is too often repeated, is a potential threat to his health. It may occur to the physical and mental disorders in the functioning of the body (Ślebodziński, 1979).

It was found that cortisol is not only present in the serum, its level can also be tested in other body fluids including body excrements (Mostl and Palme, 2002). Determination of serum cortisol is associated with invasive blood sampling, which in turn can be counterproductive and could lead to a significant boost axis hypothalamic-pituitary-adrenal. In recent years modern biochemical methods to estimate the concentration of cortisol in saliva were developed (Aardal and Holm., 1995; Mostl and Palme, 2002). This methods seems to be the best for use with horses because of the relatively simple, non-invasive, painless, and inexpensive retrieval of material. Moreover, the rate of achieving a balance between the level of cortisol in the blood and saliva is very fast (takes about 5 minutes). Another advantage of this method is that the material can be downloaded in all conditions, without the need for specialized equipment (Strzelec et al., 2011). Simultaneously collected saliva does not require, such as blood,

maintenance, and can be stored at room temperature for up to 7 days. This is important especially for horses that starting in occupations frequently change location.

Determination of cortisol in the saliva of horses allows to specify the extent to which stress translates into the behavior of horses during exercise tests and different uses. This allows to examine the difference in the level of stress among horses that show their emotions and those that do not show relieving them internally. The estimated level of stress based on the concentration of cortisol in saliva may in the future facilitate the development of methods, including training, the use of which would eliminate most of the stressors. The essence of the investigations conducted in many centers of research is to analyze the effect of exercise and its intensity, associated with training and specific tests of courage on the level of stress in horses of various breeds, ages and sexes. This is closely related to animal welfare, which is the subject of not only scientific but also public debate (Strzelec et al., 2011).

There is little detailed research on sport horses, the taking-off in different disciplines, which are subject to multiple physical and mental strain. In studies conducted on horses manifesting abnormal behavior (crip biting, weaver, walking across a box) and in experiments relating to the limitation of freedom of the concentration of cortisol was reported to be higher than in the control groups (Mostl et al., 2002). Most authors claim that the concentration of stress hormone is largely conditioned by the duration of the effort. In studies conducted by Strzelec et al. (2011) the level of cortisol in the saliva of horses taking part in sports competitions, it was observed that the level of cortisol in the saliva of horses in control group averaged 0.28 nmol/dm³, whereas in horses competing in WKKW (Three day event) to the level of 8.39 nmol/dm³. Table 1 shows the concentration of cortisol in the saliva of horses tested.

Table 1.

Salivary cortisol concentration (nmol/dm³) in examined groups of horses (Strzelec et al., 2011).

Group	Number	Late evening		Early morning		After exercise	
		Mean	SD	Mean	SD	Mean	SD
Control	10	0,45	0,57	0,49	0,74	0,28	0,00
Show jumping	10	3,45	4,92	2,43	2,89	3,98	5,94
Three day events	10	0,77	1,58	0,81	1,71	8,39	4,36
Dressage	10	0,43	0,41	1,41	1,89	0,71	0,29

The main problem with stress is that no matter how the animal organism is exposed to stress, whether it was physical activity, inadequate treatment or too high or too low temperature stress response mechanism follows the same pattern and triggers the same defense mechanisms -adaptation (Stachurska, 2005; Skorupski, 2006, Długosz et al., 2010).

Obtained results may indicate the owners, trainers and riders of horses causes which cause stress and determine when it may become dangerous to their welfare. These tests (examination cortisol in saliva) allow to determine the adaptability of horses undergoing training and their individual circumstances in this area which could become a factor in predicting the effectiveness of the diagnostic utility of horses.

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Summary

Celem opracowania było zebranie informacji dotyczących wpływu stresu wynikającego z różnych form użytkowania koni na poziom kortyzolu w ich ślinie. Produkcja kortyzolu odbywa się w zależności od aktywności ACTH, w rytmicznych cyklach z momentem szczytowym wczesnie rano i najniższą produkcją w nocy. Naturalny rytm dobowy może jednak zostać zaburzony przez stres, zarówno psychiczny jak i fizyczny. W następstwie sytuacji stresowej wydzielanie kortyzolu może wzrosnąć nawet 10-krotnie. Zbyt długie pozostawianie zwierzęcia w stanie wzmożonego stresu lub gdy zbyt często się on powtarza, stanowi potencjalne zagrożenie dla jego zdrowia. Szczególnie istotne jest więc określenie poziomu kortyzolu u koni sportowych i tych poddawanych odpowiednim dla danej rasy próbom dzielności, dla których stres jest nieodłącznym elementem ich użytkowania. Oszacowany w oparciu o stężenie kortyzolu w ślinie poziom stresu może w przyszłości ułatwić opracowanie metod, także treningowych, których zastosowanie pozwoliłoby wyeliminować większość czynników stresogennych.