THE WELFARE OF HORSES IN A TRANSYLVANIAN FARM

SILVANA POPESCU, EVA ANDREA LAZAR, R. STEFAN, C. BORDA, MARINA SPINU, CARMEN DANA SANDRU

Faculty of Veterinary Medicine, University of Agricultural Sciences and Veterinary Medicine, 400372, Cluj-Napoca, 3-5 Manastur street, Romania
E-mail: popescusilvana@yahoo.com

Summary

Our aim was the horse's welfare assessment in a Transylvanian farm through the Five Freedoms. In addition, we ruled a clinical examination (cardiac and respiratory rates) and blood testing (hematology and biochemistry) in 10 trained and 8 untrained stallions, before and after physical exercise. The welfare requirements were fulfilled, except the poor drinking water quality. The results of the blood tests did not prove the training's negative role but indicated higher emotional stress in the untrained horses. The clinical examinations and the blood testing of the trained and untrained horses proved to be useful in monitoring the horses health and metabolic status, to prove the higher stress in the untrained animals, but not necessary relevant in assessing the welfare of the horses. Nevertheless, the results indicated the need for a standardized assessment tool, designed only for this species and raising category.

Key words: welfare assessment, five freedoms, stud farm, blood test, training.

The welfare of horses encompass nowadays an increasing interest and concern due the increasing value of the competition and pure bred horses but also due to the horse breeding conditions in some developing countries (13). The horse changed its status, becoming more and more an expensive and precious companion animal, instead the farm animal or work horse used to be. In these conditions the welfare assessment of stud farms become a real necessity, but while for other farm animals there are different welfare assessment systems, for horses there is no such tool. According to Broom (1) the farm animal welfare is provided especially by housing and breeding systems suitable for animal health and behavioral needs and by proper farming practices, as well. Considering the physical effort as the main production of horses, it is necessary to include the training induced changes among the parameters indicating the horse's health and welfare.

The aim of this study was to assess the horse's welfare in a Transylvanian stud farm. In the past the stud farm have no competition activity, but in the last decade they begun to participate and organize three day events and consequently they have now an increasing training program for more and more horses.

In absence of a specific welfare assessment guide elaborated for horses, we considered the degree of fulfilling the Five Freedoms promoted by The Farm Animal Welfare Council (14). In the same time, we performed a batch of clinical,

hematological and biochemical assays, to estimate the training induced changes and to assess if effort may constitute a negative influence upon horse' welfare.

Materials and methods

The research was made in May 2009 in a stud farm having 204 horses (stallions, mares, foals and a few geldings) of Lipizzaner and Romanian half-heavy breeds. In order to assess the welfare degree based on the requirement of the Five Freedoms we used qualitative and quantitative methods, corresponding to the animal hygiene principles. In order to determine the availability of proper and sufficient food and water we observed the horse's behaviour and space allowances on the pasture and when they receive food supplements. We determined also the indicator parameters and the chemical parameters in the water consumed by horses, using laboratory analysis (Hanna analyzer, the membrane filtration method). To assess the horse's environment we measured the level of the physical factors in the stables (temperature, relative humidity, air velocity, lighting), the concentration of gases (CO_2, NH_3, H_2S) and the values of the biological factors (bacteria and fungi). We made also measurements of space allowances inside the stables. The concentration of the gases was determined by air sampling with Dräger – Multiwarn II (Dräger Safety, Germany) device. Air temperature, relative humidity and air flow velocity in the stable's air were determined simultaneously, using a Testo 400 – GmbH & Co device. Air samples were taken using a MAS-100 air sampler (Merck, Germany) based on the principle of the Andersen air sampler. Bacteria and fungi were collected and grown in Petri dishes on different standard culture mediums: Columbia agar for mesophilic bacteria, Chapmann agar for staphylococci, Endo agar for Gram negative bacteria, blood agar for hemolytic bacteria and Sabouraud agar for fungi. Air was sampled in a volume of 10 L because preliminary studies showed it to be optimal for the subsequent plate analysis and type of agar. Plates with the usual bacterial nutrient Columbia agar and with selective culture mediums were then incubated for 24 h in an incubator at a working temperature of 37°C. The material sampled on Sabouraud agar was incubated for 5 days at 22°C. The grown colonies were calculated by a mechanical optic colony counter, and results were corrected by using the conversion formula devised by Feller (4). The average number of bacteria and fungi was calculated as colony-forming units in one cubic metre (cfu/m^3).

The obtained results were compared with the legal regulations. To determine the degree of fulfilling the other requirements of the animal's welfare we used the methods of inspection of the animals (body surface for injuries or wounds; gait for lameness; body position, cleanliness, hair-coat and mucous membranes for general health status, etc) and observation of their behaviour (social interactions, the mare's behaviour with their foals; curiosity and interest for the surrounding environment and for the external observer; the horse's behavioral reactions in the presence of the hostlers etc.).

For the evaluation of physical effort – welfare relationship a group of 18 horses was investigated; 8 of these were untrained and the remainder trained for three day events type competitions. The exercise test consisted of a 5 minutes walk, 10 minutes trot followed by a 5 minutes gallop on a long lunge. Clinical checks such as cardiac and respiratory rates as well as blood sample collection were performed before exercise, immediately after the exercise and following a resting period of 90 minutes of. The blood tests included the red blood cells' parameters (RBC count, hemoglobin, PCV, mean corpuscular volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration and platelets) and the white blood cell counts (total WBC count and absolute numbers and percentages of lymphocytes, monocytes and granulocytes); among the biochemical parameters the blood sugar, the total plasma protein levels and the lactate dehydrogenase (LDH) value were verified. Blood tests were done by use of Counter-Coulter Abacus Vet and Ciba Corning 550 Express devices. The results were compared to control physiological values listed in the Merck Veterinary Manual (8) for horses and between the two groups.

Results and discussions

Regarding the freedom from thirst, hunger and malnutrition our observations showed that in the pasture there is sufficient food of good quality and sufficient space allocated for each group of horses. When they receive food supplement the fodder front is adequate for horses not to develop aggressiveness to each other. The determined indicator parameters and chemical parameters showing the horses' drinking water quality are presented in table 1.

Table 1

The indicator and chemical parameters determined in the water consumed by horses

Indicator parameters		
Parameter	Obtained value	Maximal admitted value
Smell	0	Acceptable for the consumer
Color	Colorless	Acceptable for the consumer
Turbidity (NTU)	Clear	5
pH	7.2	6.5 – 9.5
Ammonia (mg/L)	0	0.5
Sulphate (mg/L)	10 – 100	250
Chloride (mg/L)	56	250
Iron (µg/L)	0	200
Hardness (German degree)	14.56	Minimum 5
Oxidability (mg O_2/L)	11.2	5
Total Number of mesophilic bacteria (cfu/L)	340	0
Coliform Bacteria	130	0

(cfu/100 mL)		
Chemical parameters		
Parameter	Obtained value	Maximal admitted value
Nitrites (mg/L)	0.5	0.5
Nitrates (mg/L)	45	50

Our analysis showed qualitatively improper water for drinking purposes, irrespective that it is consumed by humans or animals. The high oxidability prove a raised content in organic matter, exceeding the admitted limit value. Also, the total number of germs and the number of coliform bacteria exceeded the provisions of the drinking water standards. Our results are in accordance with those obtained in other studies, proving that the drinking water provided for the animals is often of a poor quality, especially from the microbiological point of view, with a number of coliform bacteria and *E. coli* of about 10^5 and 10^4 cfu/l, respectively (6).The consumption of qualitatively improper water can affect the animal's health and production (7, 12). In the light of our results we can say that the consumption of the water of this quality represents a risk for the horses' health and a continuous source of microbial stress.

Concerning the freedom from discomfort due to environment we found positive aspects such as the proper space allowances in the paddocks and shelters for all horse categories, the presence of proper bedding in the stalls. The level of the physical factors (temperature, humidity, air velocity, illumination, noise); the concentration of gases (CO_2, NH_3, H_2S) and the values of the biological factors (mesophilic bacteria, staphylococci, streptococci, gram-negatives, fungi) in the stables were in conformity with the hygienic standard regulations.

As regards to the freedom from pain, injury and diseases, inspecting the horses in the farm, we noted the absence of lameness, wounds, malformations or other clinical signs of disease. We inspected the aspect of the mucous membranes in randomly selected horses from each breeding category and they were without alterations. Skin lesions were insignificant, no lesion above 2 cm in diameter. The conformation and body development of horses was good, in conformity with the breed characteristics.

With reference to the freedom to express normal, species characteristic behaviour for the species, we observed the game in foals, the maternal behaviour of the mares with the foals, the existence of the social hierarchy, the absence of stereotype manifestations and so one.

With respect to the freedom from fear and distress the followed behavioral patterns were the interest for surrounding environment, the curiosity for the external observer, the lack of fear at the approach of the handler, the absence of aggressiveness. The general breeding conditions at the farm were resembled the natural ones.

As negative aspects relative to the general welfare we noted the insufficiencies of equipments, the little number of handlers, the presence of improvisations in the stables and the use of pitch brand for horse individualization.

The mean values for the clinical examination results of the two groups of horses are showed in table 2.

Table 2

The mean values of the clinical examination for the two groups of horses

Parameter	Normal values	Untrained			Regularly trained		
		Before exercise	After exercise	After 90 min of rest	Before exercise	After exercise	After 90 min of rest
Heart rate (Bpm)	28–40	36	90	34.5	40	88	42
Respiratory rate (Breaths/min)	10–14	14.5	82	19	12	76	15

The heart rates increased immediately after the exercise but there were normal values after 90 minutes of rest, except two trained stallions in which the cardiac frequency was 60 and 62 bpm before the physical effort and after the resting period, also. These results are congruent with the findings of other researches showing that there is a negative influence upon the horse's performance and post-exercise recovery if the pre-exercise heart rate exceeds 60 bpm (10). Then again we proved, as other specialists do (11, 3) that heart rate measurements appeared to be a reliable indicator of the metabolic status of endurance horses. The heart and respiratory rate variation before and after exercise was higher in the untrained horses than in the trained ones, showing an additional effect of emotional stress facing unusual stimulations.

The mean values for the hematological and biochemical assay performed for the two groups of horses are presented in tables 3 and 4.

Table 3

The mean values of the biochemical assay performed in the two groups of horses

Parameter	Normal values	Untrained			Regularly trained		
		Before exercise	After exercise	After 90 min of rest	Before exercise	After exercise	After 90 min of rest
LDH (u/L)	102–341	305	323.5	287.5	325.8	305	304.5
Plasma proteins (g/dL)	6–8.5	8.13	8.62	8.15	8.44	7.99	8.33
Glucose (mg/dL)	62–114	88.78	92.75	94.79	81.55	93.88	90.86

Table 4

The mean results of the hematological assay performed in the two groups of horses

Parameter	Measure unit	Normal values	Untrained			Regularly trained		
			Before exercise	After exercise	After 90 min of rest	Before exercise	After exercise	After 90 min of rest
RBC	$x10^6/\mu L$	6 – 12	8.2	9.2	8.5	8.6	9.1	8.5
Hgb	g/dL	10 – 18	13.1	14	13.4	13	13.8	12.8
PCV	%	32 – 48	37.3	40.2	39.8	37.6	39.2	34.4
MCV	fL	34 – 58	45.5	45.5	45.5	44.0	43.0	43.0
MCH	pg	13 – 19	15.8	15.8	15.3	15.1	15.2	14.7
MCHC	g/dL	31 – 37	34.3	34.8	33.7	34.5	35.3	34.2
PLT	$x10^5/\mu L$	1 – 6	1.8	1.7	1.9	1.6	1.8	2.0
WBC	$x10^3/\mu L$	6 – 12	10.7	12.9	11.6	9.6	11.8	9.6
LYM	$x10^3/\mu L$	1.5 – 5	2.6	3.1	2.8	3.8	4.0	3.5
MID	$x10^3/\mu L$	0 – 1.7	1.4	1.5	1.5	1.4	1.6	1.5
GRA	$x10^3/\mu L$	3 – 6.1	6.7	8.3	7.3	4.4	6.2	4.6
LYM	%	25 – 60	24.2	24.1	24.1	39.6	33.9	36.4
MID	%	2 – 20	13	11.6	12.9	14.6	13.5	15.6
GRA	%	30 – 75	62.6	64.3	62.9	45.8	52.5	47.9

The blood biochemistry showed elevated lactic dehydrogenase (LDH) values immediately after exercise which lowered below initial values after a 90 minute rest. Deldar et. al. (2) showed similar LDH variations but they also found a decrease in blood glucose concentrations, which wasn't our result. In our study the glucose concentrations may raise within a stress response, but to confirm this hypothesis we should have determine the serum cortisol levels also. The plasma protein values presented the same variation, but only in the untrained horses. In correlation with the changes in the hematocrit, these values can show a moderate dehydration caused by the effort, obviously not in case of the trained horses.

The results of the RBC count showed the well-known effect of the spleen contraction in horses, to release more red blood cells in the peripheral circulation, augmenting the pulmonary function and oxygen transport to vital organs. The stabile values of the mean cell volume (MCV) confirm that the released blood cells are mature, with similar dimensions.

The post-exercise elevation in granulocytes, exceeding the normal values in the untrained horses, and raising the global WBC counts is probable mostly caused by the elevation of neutrophils. As several authors showed (5, 9), exercise promotes the release of neutrophils in circulation, leucocytosis being a response to exercise induced stress, together with the serum cortisol elevation. According to Korhonen et. al. (5), in trained horse the neutrophils:lymphocyte ratio is a sensitive indicator of stress of short duration, maybe more sensitive than the changes in cortisol concentration, and an attenuated neutrophils:lymphocyte response can be taken as an indicator of adaptation to exercise stress.

Conclusions

Our results showed the discrepancies between each requirement of The Five Freedoms of Animal Welfare and the real conditions, but still we do not have a global vision of the importance of these separate elements within the general welfare of the horses. The clinical examinations and the blood testing of the trained and untrained horses proved to be useful in monitoring the horses health and metabolic status, to prove the higher stress in the untrained animals, but not necessary relevant in assessing the welfare of the horses. In this regard there is a need for a standardized assessment tool, designed exclusively for this species and raising category.

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