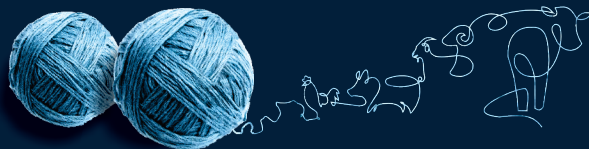


12th
INTERNATIONAL
SYMPOSIUM

MODERN
TRENDS
IN LIVESTOCK
PRODUCTION



P R O C E E D I N G S

9 -11 October 2019, Belgrade, Serbia

Institute for Animal Husbandry

Belgrade - Zemun, SERBIA

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INVITED PAPERS

EMOTIONAL STATE OF DAIRY COWS IN LOOSE AND TIED HOUSING SYSTEM - IS THERE A DIFFERENCE?

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Invited paper

Abstract: Modern society, over time, has accepted animals as sentient beings. From the welfare point of view, the emotions are a reflection of the whole permeation of the animal and its environment, which make them important and reliable indicators. In fact, they are cross-linked with other welfare indicators such as physiological and behavioural. Freedom of movement is crucial for the animals' naturalness, especially in terms of their normal behaviour expression. Regarding that, this study was conducted in order to investigate and compare the emotional state of cows in a loose (LHS) and tied housing systems (THS). The assessment was done according to Welfare Quality Protocol for Cattle (2009) on a total of 16 dairy farms (N=4,833 cows), seven with LHS and nine with THS. The emotional state was assessed by a qualitative behavioural assessment (QBA), a method based on the translation of "body language" into the numbers that can be statistically analysed and interpreted. Twenty reliable descriptors were used, among which, some were related to positive emotional state (e.g., active, relax, happy) and some to negative state (e.g., agitated, nervous, distressed). Result showed that tendencies toward positive descriptors were significantly higher ($p \leq 0.05$) in LHS, followed by lower expression of distress, frustration and apathy in animals. This resulted in better estimation of overall emotional state in LHS indicating its advantage and necessity of providing exercise in cows' daily routine.

Key words: dairy cows, emotional state, QBA, descriptors, welfare

Introduction

The welfare of animals is closely related to their emotional state, i.e. feelings they experience, which can be positive (happiness, curiosity, friendliness, etc.) or negative (fear, frustration, pain, etc.). Feelings motivate animals to express

their needs (e.g. the need for food and water is expressed by the feeling of hunger and thirst while loneliness is associated with a lack of social contact). This points to a strong and inseparable connection between feelings and welfare that is essentially based on meeting the needs of animals. However, in modern conditions of breeding and management of dairy cows, there are often situations in which their needs actually deviate from the feelings. Such is the case with highly productive cows, which, despite their abundant diet, often exhibit a sense of hunger (Roche, 2009). They can be in deep conflict because of the constant feeling of hunger and the need to feel full on the one hand and, on the other hand, the need to do something else, like chewing or relaxing. Such a cow Webster (2005) describes in the following way: "her feelings can be described with brutal precision as a constant hunger, fatigue, overflow and nausea". There are many examples where negative feelings of high intensity or long duration result in animal suffering. Such is the case with feelings of fear, illness, fatigue, anxieties, boredom, depression, sadness, paranoia, agony, etc. (Gregory, 2004). Every pathological state of the organism and the accompanying feelings reduces the production potential of an animal with a normal physiological status indicating that the feelings are also of influence to the productivity.

In the study by Duncan (2005), the assessment of positive and negative emotional states as a welfare indicator is of great importance. Possible indicators of positive emotional state include social forms of behaviour: licking, exploratory behaviour and play, while fear and anxiety are indicators of a negative emotional state.

In assessing the emotional state of animals, however, the question is how to quantify the feelings? It was noted by many authors (Boissy *et al.*, 2007; Wemelsfelder *et al.*, 2009) that the animal's body language represents a matter of fact its behavioural expression and can reveal important aspects of its physical and mental health, and therefore welfare. The methodological approach that translates body language into figures that can then be statistically processed and interpreted is called a qualitative behavioural assessment (QBA). By evaluating the QBA, we obtain information on the overall response of the animal to the conditions that are provided to it in certain environment, so the QBA measures the "outcomes" and contributes to the assessment of welfare, as it can include variations in the way animals react and deal with their environment at certain moment in time (Fleming *et al.*, 2016). The significance of the QBA assessment is also reflected in the fact that the research found its significant correlation with physiological welfare indicators (Hemsworth and Barnett, 2001; Stockman *et al.*, 2011, 2013). Animals assessed to be highly anxious, upset, or nervous had elevated neutrophil : lymphocyte ratio or higher plasma lactate concentration, which are typical stress markers (Jones and Allison, 2007).

Although, QBA assesses the whole animal and QBA scores are correlated with physiological condition and behaviour it is not known yet for sure if it could be taken as a stand-alone tool in welfare assessment. In support of this suspicion goes recent study of *Andreason et al., 2013* who did not find correlations between QBA and other welfare indicators estimated by *Welfare Quality® Protocol (2009)*.

However, taking into account all mentioned, it is clear that the emotional status of animals plays an important role in assessing the state of welfare and that it probably best reflects the degree of its vulnerability. Starting from the concept of naturalness (the ability for an animal to live a reasonably natural life), freedom of movement can be considered one of the most important preconditions for ensuring a positive emotional state (*Boogaard et al., 2011*). The cows that are kept tied are, among other things, deprived of the opportunity to investigate their environment and have natural social contacts. In addition, numerous studies have shown that disorders and diseases occur more frequently in tied systems, and are also considered to be the source of animal suffering (*Regula et al., 2004; EFSA, 2009; Ostojić Andrić et al., 2011*). Therefore, the aim of this work was to determine and compare the emotional state of the cows in the loose and tied housing system using the QBA assessment.

Materials and Methods

The study was conducted on 16 selected commercial dairy farms (Mean \pm SEM, 301 \pm 71.6 lactating cows), 9 with tie-stall housing systems -THS (Mean \pm SEM, 266 \pm 99.6 lactating cows) and 7 with loose housing system-LHS (Mean \pm SEM, 348 \pm 104.7 lactating cows), in Serbia. The cows had access to outdoor loafing area in 4 of 9 tie-stall farms and pasture only on one farm (24 hours a day for 60 days a year). Each farm in this study was visited twice a year, in the winter and summer season, and the average value of each welfare measure was calculated. Three trained assessors evaluated the cows on each farm. Prior to each farm assessment, the agreement with animal unit's manager was made in order to avoid disturbing of usual farm activities.

The QBA was made using the method described by the *Welfare Quality® Assessment Protocol for Cattle (2009)* where detailed information about the methodology can be found. QBA relies on observer assessments of the body language of animals using a set of twenty descriptive terms - descriptors: active, frustrated, irritable, relaxed, friendly, uneasy, fearful, bored, sociable, agitated, playful, apathetic, calm, positively occupied, content, lively, distressed, indifferent, inquisitive and happy. These terms were estimated (0 - 125 mm) according to Visual analogue scale (VAS) and by specific weight coefficients and I-spline

functions translated into score (0-100 points) by Welfare Quality® Scoring System Software Program (2016) resulting in the final estimate of the emotional state of cows in the loose and tied system.

Statistical analyses were performed using Statistica for Windows version 8.0 (StatSoft, Inc. 2010, data analysis software system). The statistical significance of the effect of housing system on cows' emotional state was determined by the t-test or the Mann-Whitney test, depending on the normal or abnormal distribution of the data, established with the Kolmogorov-Smirnov test. P values less than 0.05 were considered as significant.

Results and Discussion

The results of the research presented in Table 1 show that the emotional state of cows is significantly better assessed in the loose housing system ($p \leq 0.05$). On the basis of the obtained score of 60.4 points, the emotional state of cows on LHS farms can be described as enhanced while for the THS farms it belongs to a lower, acceptable category (43.2 points). For the positive descriptors of QBA, happy and positively occupied, the average score was significantly higher ($p \leq 0.05$) in LHS, while for negative descriptors such as frustrated, apathetic and distressed the value was significantly higher ($p \leq 0.05$) in THS.

Similar results can be found in studies by other authors who however, have found statistical differences in a number of descriptors. Thus, study of *Vučemilo et al. (2012)* shows that cows in tied systems with occasional mobility also have higher values of positive descriptors (happy, positively occupied, active, relaxed and sociable) than those who are continuously tied. In line with this, *Popescu et al. (2014)* lists statistically significantly higher values of negative descriptors (agitated, distressed, frustrated, indifferent, bored, irritable, uneasy, etc.) in cows kept tied.

Table 1. shows that in both housing systems, the medium to high value of positive descriptors has been determined, especially for terms active, relaxed, calm, content, friendly, lively, sociable (≥ 50 mm) which corresponds to an acceptable assessment of the emotional state in the investigated farms. In a research by *Popescu et al. (2013)*, negative descriptors were prevalent in both examined hold systems, which affected the poor QBA values as determined here. However, as in our research, the value of QBA was better evaluated in a housing system that provided greater mobility.

Table 1. Estimation of overall emotional state, QBA and descriptors (VAS) in LHS and THS

| Housing system | LHS | | | | | THS | | | | | F |
|-----------------------------------|-----------|-------|----------------|-------|--------|-----------|-------|----------------|-------|--------|----|
| | \bar{x} | SD | S ² | Min | Max | \bar{x} | SD | S ² | Min | Max | |
| Score for emotional state, points | 60.40 | 13.43 | 180.40 | 32.30 | 89.30 | 43.23 | 22.85 | 522.05 | 10.20 | 92.70 | * |
| Descriptors, VAS (0-125mm) | | | | | | | | | | | |
| Active | 78.69 | 19.09 | 0364.26 | 48.68 | 118.00 | 64.99 | 24.28 | 589.68 | 36.41 | 109.00 | ns |
| Relaxed | 82.47 | 12.07 | 145.75 | 63.11 | 105.00 | 73.45 | 17.25 | 297.43 | 30.34 | 113.50 | ns |
| Fearful | 2.22 | 2.67 | 7.14 | 0.00 | 8.72 | 1.46 | 2.81 | 7.88 | 0.00 | 11.97 | ns |
| Agitated | 2.13 | 2.91 | 8.45 | 0.00 | 8.15 | 5.47 | 9.12 | 83.18 | 0.00 | 37.23 | ns |
| Calm | 75.96 | 12.34 | 152.27 | 59.47 | 98.50 | 67.43 | 18.70 | 349.63 | 24.27 | 102.10 | ns |
| Content | 71.80 | 15.55 | 241.90 | 50.97 | 110.00 | 66.40 | 21.06 | 443.40 | 31.55 | 115.80 | ns |
| Indifferent | 13.91 | 11.04 | 121.82 | 0.00 | 42.11 | 8.03 | 7.55 | 57.03 | 0.00 | 25.00 | ns |
| Frustrated | 13.28 | 10.69 | 114.19 | 0.00 | 31.50 | 38.80 | 28.98 | 839.91 | 0.00 | 78.95 | ** |
| Friendly | 66.33 | 22.55 | 508.72 | 29.07 | 102.63 | 75.10 | 16.00 | 255.88 | 51.32 | 101.90 | ns |
| Bored | 34.96 | 20.99 | 440.55 | 2.70 | 67.11 | 43.00 | 25.31 | 640.68 | 6.58 | 84.21 | ns |
| Playful | 42.81 | 17.11 | 292.59 | 12.10 | 71.30 | 32.64 | 17.40 | 302.78 | 5.26 | 77.45 | ns |
| Positively occupied | 78.46 | 16.77 | 281.22 | 41.60 | 110.40 | 60.46 | 21.62 | 467.53 | 37.62 | 110.70 | * |
| Lively | 58.75 | 19.33 | 373.78 | 6.25 | 85.30 | 56.35 | 19.00 | 360.86 | 28.95 | 96.47 | ns |
| Inquisitive | 72.35 | 25.28 | 638.89 | 23.26 | 98.68 | 89.34 | 14.74 | 217.26 | 55.26 | 107.89 | * |
| Irritable | 9.57 | 12.06 | 145.44 | 0.00 | 48.54 | 11.59 | 12.74 | 162.42 | 0.00 | 43.69 | ns |
| Uneasy | 2.74 | 4.51 | 20.32 | 0.00 | 17.44 | 5.71 | 7.69 | 59.13 | 0.00 | 26.60 | ns |
| Sociable | 68.87 | 22.24 | 494.42 | 31.20 | 119.10 | 68.98 | 18.70 | 349.74 | 40.50 | 97.10 | ns |
| Apathetic | 2.58 | 5.04 | 25.40 | 0.00 | 18.20 | 15.25 | 22.65 | 513.03 | 0.00 | 78.30 | * |
| Happy | 59.05 | 11.70 | 136.94 | 41.80 | 85.60 | 47.11 | 16.90 | 285.71 | 22.50 | 91.40 | * |
| Distressed | 27.62 | 11.31 | 127.81 | 5.30 | 43.69 | 59.95 | 26.74 | 715.08 | 2.50 | 93.45 | ** |
| QBA | 0.95 | 1.44 | 2.08 | -2.20 | 4.21 | -1.07 | 2.74 | 7.53 | -5.72 | 4.72 | * |

ns = p>0.05; * = p<0.05 ; ** = p<0.01

Table 1 shows that in both housing systems, the medium to high value of positive descriptors has been determined, especially for terms active, relaxed, calm, content, friendly, lively, sociable (≥ 50 mm) which corresponds to the acceptable assessment of the emotional state in the investigated farms. In a research by *Popescu et al. (2013)*, negative descriptors were prevalent in both examined housing systems, which affected the poor QBA values than values obtained in the present study. However, as in our research, the value of QBA was better evaluated in the housing system that provided greater mobility.

It is interesting that in mentioned studies, including the present one, the descriptor inquisitive was significantly higher in tied cows. Explaining this, we can refer to the findings of *Krohn (1994)* who states that increased expression of exploratory behavior in THS has a character of curiosity that can be explained by insufficiently stimulating environmental conditions and lack of social contact.

Conclusion

Animal welfare includes both physical and mental aspects of an animal's experience, and therefore both physiological and behavioural indicators are useful in assessment. The emotional state of an animal is a comprehensive outcome that probably best reflects the endanger of its welfare. Although it is recommended to include other welfare indicators in assessment, QBA can potentially be used as a quick, 'first pass' screening method to identify farms in risk and take the further in-depth assessment. Given this, the results of our study have shown that the emotional state of cows in LHS is characterized as enhanced, unlike THS in which the emotional needs of cows were provided at a minimal level, with special concern to distress and apathy.

In general, it can be concluded that in order to provide a positive emotional state in cows, their daily routine must be enriched by exercising in paddock, pasture or any other movement in the environment that enables expression of natural forms of behavior.

Emocionalno stanje mlečnih krava u slobodnom i vezanom sistemu držanja – postoji li razlika?

Dušica Ostojić Andrić, Slavča Hristov, Radica Đedović, Teodora Popova, Vlada Pantelić, Dragan Nikšić, Nenad Mičić

Rezime

Savremeno društvo vremenom je prihvatilo životinje kao osećajna bića. Sa stanovišta dobrobiti, emocije su odraz celokupnog prožimanja životinje i njene sredine, što ih čini važnim i pouzdanim pokazateljima. One su, zapravo povezane sa drugim pokazateljima dobrobiti kao što su fiziološki i bihevioralni. Sloboda kretanja je ključna za prirodni život životinja, posebno u smislu mogućnosti

izražavanja prirodnih oblika ponašanja. Sa obzirom na to, ova studija sprovedena je da bi se istražilo i uporedilo emocionalno stanje krava u slobodnom (LHS) i vezanom sistemu držanja (THS). Procena je obavljena prema Welfare Quality Protocol for Cattle (2009) na ukupno 16 mlečnih farmi (N=4,833 krava), sedam sa slobodnim i devet sa vezanim sistemom držanja. Emocionalno stanje procenjeno je kvalitativnom ocenom ponašanja (QBA), metodom koja se zasniva na prevođenju “govora tela” u brojeve koji se mogu statistički analizirati i interpretirati. Korišćeno je dvadeset pouzdanih deskriptora, od kojih se neki odnose na pozitivno (npr. aktivnost, opuštenost, sreća), a neki na negativno emocionalno stanje (npr. uznemirenost, nervoza, distres). Rezultati su pokazali da su tendencije prema pozitivnim deskriptorima bile značajno veće ($p \leq 0,05$) u LHS-u, pri manjoj ekspresiji distresa, frustracije i apatije kod životinja. To je rezultovalo boljom procenom ukupnog emocionalnog stanja u LHS-u, ukazujući na njegovu prednost kao i potrebu da se kravama omogući svakodnevno kretanje pri gajenju.

Ključne riječi: mlečne krave, emocionalno stanje, QBA, deskriptori, dobrobit

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