

HEALTH AND PRODUCTIVE CHARACTERISTICS OF COWS ON FARMS WITH DIFFERENT WELFARE SCORE*

MARKO R. CINCOVIĆ, BRANISLAVA BELIĆ, MILENKO STEVANČEVIĆ,
BOJAN TOHOLJ, MIHAJLO ERDELJAN, JOVAN SPASOJEVIĆ¹

SUMMARY: Measuring the welfare of cows on farms was carried out according to the protocol of Welfare Quality® scoring system. On farms with lower level of welfare as well as the poorer implementation of principles of good nutrition, significantly lower milk production was found, as well as a greater percentage of cows with a long service period, lameness and a higher percentage of very thin cows. Providing good accommodation principles will significantly improve milk production, reduce the number of cows with a long service period as well as the ones with lameness, and it is particularly interesting that obliging this principle will provide less subclinical mastitis on a farm and less cows with dystocia and skin lesions. The most important principle, which has demonstrated a significant effect on the values of all parameters, is the principle of good health. Providing the implementation of this principle on farms will result in significant improvement of all parameters of production and health. In addition to medical syndromes such as lameness or dystocia, the score of good health depends on the occurrence of ocular, nasal and vaginal discharge, which supports the infection of the corresponding organs. Ultimately, changes in the behavior of the cows do not show significant effects on the health and productive characteristics. Poor interaction with people and other animals, poor response to food or fear and aggressive behavior can be correlated with the occurrence of higher rate of lameness and increased number of skin lesions on farms. The link between the tested criteria of welfare and health and productive characteristics of cows indicate that there is the strongest correlation with the criterion of good health on farms, then with the criterion of good nutrition and at the end with the criterion of good housing. Productive characteristics such as milk production and length

Original scientific paper / Originalni naučni rad

¹Marko R. Cincović, MSc, teaching assistant; Branislava Belić, MD, PhD, associate professor; Milenko Stevančević, DVM, PhD, Full Professor; Bojan Toholj, DVM, PhD, assistant professor, Mihajlo Erdeljan, DVM, MSc, teaching assistant; Jovan Spasojević, DVM, MSc, research assistant. Faculty of Agriculture Novi Sad, Department of Veterinary Medicine, D.Obradovića 8, 21000 Novi Sad, Serbia.

Corresponding author: Marko Cincović, e-mail: cin_vet@yahoo.com, phone: +381 21 485 3516.

*This paper is a part of Project number TR31062, supported by Ministry of education and science, R.Serbia.

of service period significantly correlate with the factors of health, food and accommodation. Ensuring good health of farm animals is the most important task in the process of securing the welfare and sustainable production on cow farms.

Key words: cows, welfare, productivity, health.

INTRODUCTION

Animal welfare is a degree of its adaptation to environmental conditions. The environment should have such characteristics that provide quality of life in terms of nutrition and supply, accommodation, physical, mental and thermal comfort, safety, expressing basic forms of behavior, social contact with animals of the same species, absence of unpleasant emotional and physical experiences such as pain, suffering, fear, stress, boredom, illness, injury, etc. (Vučinić, 2006). Testing welfare was, at first, based on an analysis of living conditions which should correspond to the type, race, gender, age category and other characteristics of animals. Modern research in the area of animal welfare includes an analysis of parameters obtained from the animals themselves on farms (Whayet al., 2003b). Thus, the benefit may be classified as: functional (clinical examination and determination of the medical status of animals), behavioral (testing the presence of physiological forms of behavior and means of satisfying the innate basic needs) and emotional (testing the presence of positive emotions and the absence of negative emotions in animals) (Hristov et al., 2007). To provide all criteria of animal welfare as well as to eliminate stressors on farms means to enable the sustainable production and stability (Belić and Cincović, 2010).

The aim of this study was to investigate the effect of the levels of animal welfare on milk production, reproductive efficiency and the emergence of major medical disorders of cows on farms.

MATERIAL AND METHODS

Measuring the welfare on cow farms was conducted according to the protocol of Welfare Quality® scoring system. This system provides the assessment of the welfare of cows on the basis of four principles alongside the associated criteria, the principle of good housing, good nutrition principle, the principle of good health and the principle of good behavior of cows. Evaluation of farms was performed based on four principles of welfare. We used statistical software that has been formed based on standards set out in the Welfare Quality® Assessment Protocol for Cattle, 2009, ISBN/EAN978-90-78240-04-4. According to the scores of welfare, farms were divided into three groups: a group of cows with low scores (score 0-30), a group of cows with medium scores (30.1-70) and a group of cows with good scores (70.1-100). Score was calculated for each of the four principles. 19 dairy farm on the territory of AP Vojvodina participated in this experiment. The amount of milk produced per cow, the percentage of cows with a service period of over a hundred days, % of cows with laminitis, mastitis, % cows with vaginal, ocular or nasal discharge, % of cows with dystocia, % of cows with skin lesions and percentage of very thin cows was examined on each farm. ANOVA analysis was used

for studying the influence of welfare scores on the value of examined characteristics of cows. The correlation coefficient was calculated among the scores of the welfare and the studied parameters along with the testing of significance of the correlation coefficient.

RESULTS AND DISCUSSION

Results of the research presented in Tables 1 to 4 indicate that providing factors that encourage the higher score of welfare could significantly influence on the improvement of health and productive performance of dairy cows. Thus, on farms with lower score of animal welfare and poorer implementation of good nutrition principle, there is a significantly lower milk production, a greater percentage of cows with a long service period, a greater percentage of cows with lameness and a higher percentage of lean cows. Providing good housing principle will significantly improve milk production, reduce the number of cows with a long service period and lameness, less subclinical mastitis in cows will be recorded as well as fewer animals with dystocia and skin lesions. The most important principle, which has demonstrated a significant effect on the values of all studied parameters, is the principle of good health. Providing a high score of this principle on farms will result in significant improvement of all parameters of production and health. In addition to medical syndromes such as lameness or dystocia, the score of good health depends on the occurrence of ocular, nasal and vaginal discharge, which supports the infection of related organs. Ultimately, changes in the behavior of the cows do not show significant effects on the health and productivity-boosting features. Poor interaction with people and other animals, poor response to food or fear and aggressive behavior can be correlated with the emergence of greater share of lameness and increased number of skin lesions on farms.

The connection between the examined welfare criteria and health and productive characteristics of cows (Table 5) shows that there is the strongest correlation with the criterion of good health on the farm, then the criterion of good nutrition and at the end with the criterion of good housing. Productive characteristics such as milk production and length of service period significantly correlate with the factors of health, food and accommodation.

The frequency of cows with various health and other problems are consistent with previous results by Ostojić-Andrić et al. (2011). Milk production and reproductive efficiency are polygenic characteristics (Vidović, 1993). This means that more minor genes influence the expression of these characteristics. In order for these genes to fully express their effects, appropriate environmental conditions and care are required. Therefore, providing the principles of good nutrition, good housing and health is important for maintaining these features. Another important issue on farms is the unevenness of body weight as well as the percentage of very lean cows. Thinness in cows is the result of negative energy balance and expressed catabolism. Physiologically, catabolic axis in cows dominates in the period around calving, when a large number of metabolic changes occur (Cincović et al., 2011). Prolonged negative energy balance, with a loss of body depots, the increased accumulation of ketones in cows adversely affects milk production and reproduction (Cincović et al., 2011). The significant presence of lean cows shows a negative impact on the welfare and health of cattle (Popescu et al., 2010). In addition to the thinness and metabolic disorders, the next major problem, which can be influenced on by providing the principles of welfare, is lameness in cows. The level of lameness in

cows depends on the disease that was diagnosed on the hoofs, so there is the maximum lameness in case of the hoof ulcer, interdigital dermatitis and arthritis, which is consistent with our previously obtained results (Stevančević et al., 2009). Lameness in cows is the result of poor environmental factors, poor hoof care and poor conditions of nutrition (Stevančević et al., 2011). Reproductive disorders of cows with dystocia and vaginal discharge occur as a consequence of different diseases and the most common are placental retention and endometritis (60%) (Stančić et al., 2011). Mastitis occurs as a consequence of environmental factors, local immunity of the mammary gland and altered health status of cows (Blowey and Edmondson, 2010). Ocular and nasal discharges in cows occur as a consequence of poor microclimatic conditions, and as a consequence of serious infections in the body. Respiratory illness with nasal and eye discharge proved to be significant, especially in younger categories, and the isolated causes were BHV-1, Pi-3, BRSV and BVDV, and the bacteria *Pasteurella multocida*, *Mannhemia haemolytica*, *Arcanobacterium pyogenes*, *Haemophilus Somnus* and *Mycoplasma hyopneumoniae*. Younger categories of cows as well as calves experienced signs of enterotoxaemia from *Clostridium* sp. (Bojkovski et al., 2011). Skin lesions occur as a result of inadequate accommodation (negative coefficient of correlation). So there is a higher incidence of lesions in cows kept in tied up housing (Ostojić-Andrić et al., 2011), but the standard deviation is very high. Appropriate behavior was analyzed by detection and percent calculation of cows in function of: tendency to be connect, tendency to be indifferent, tendency to be friendly, tendency to be irritable, tendency to be uneasy, tendency to be sociable, tendency to be distressed and so on. There were rather inconsistent results, which varied significantly depending on whether the cows were kept tied up or in the free system. Cows in the free housing system express better behavioral characteristics and strategies. These results are consistent with the results of Hristov et al. (2010) who found that the behavioral welfare is evaluated the best in cows bred in the free system with outlet and the worst in tied up cows in a facility without outlets. The same author (Hristov et al., 2011) based on the same methodology that we applied in this study, concluded that there are many forms of unsatisfactory behavior of cows on farms.

Ensuring a high level of welfare on farms is an important goal of farmers, technologists and veterinarians in particular (because everything depends on the health). The significance is even greater because when choosing products of animal origin, consumers pay much more attention to the welfare on farms (Prickett et al., 2010).

Table 1: Influence of principle of good feeding to health and productive characteristic of cows

Interval of welfare quality score	0-30	30.1-70	70.1-100	p	LSD
Milk production /cow/day (L)	22.25±2.54	25.55±2.81	29.95±3.1	0.01	1:2, 1:3, 2:3
% cows service period > 100days	38±5.1	34.4±3.9	30.12±4.6	0.01	1:2, 1:3, 2:3
% cows with lameness	7.55±2.06	5.99±3.5	5.48±1.82	0.05	1:3
% cows with mastitis	2.05±0.43	1.92±0.52	1.93±0.31	NS	/
% cows with vulvar discharge	2.55±1.02	3.01±0.87	3±1.11	NS	/
% cows with ocular discharge	6.03±2.02	5.2±1.66	6.5±2.2	NS	/
% cows with nasal discharge	8.1±0.45	8±0.9	8±0.74	NS	/
% dystocia	13.22±2.5	12.12±2.44	14.3±1.87	NS	/
% of thin cows	11.1±2.65	5.11±2.2	3.67±1.79	0.01	1:2, 1:3, 2:3
% of cows with skin lesion	6.8±1.11	5.42±1.49	4.44±1.5	NS	/

Table 2: Influence of principle of good housing to health and productive characteristic of cows

Interval of welfare quality score	0-30	30.1-70	70.1-100	p	LSD
Milk production /cow/day (L)	24.45±3.01	26.89±3.2	28.18±2.25	0.05	1:3
% cows service period > 100days	30.77±4.9	24.45±5.5	22.98±3.91	0.05	1:3, 1:2
% cows with lameness	8.11±3.5	7.45±3.05	5.2±2.11	0.01	1:3, 2:3
% cows with mastitis	3.02±0.84	2.4±0.96	1.88±0.9	0.01	1:3, 2:3
% cows with vulvar discharge	2.05±1.14	3.4 1±1.12	3.2±1.11	NS	/
% cows with ocular discharge	5.99±2.14	5.8±1.99	6.4±2.3	NS	/
% cows with nasal discharge	8.1±1.87	8.14±2.82	7.72±3.74	NS	/
% dystocia	12±1.99	11±2.2	9±2.21	0.05	1:3, 2:3
% of thin cows	5.12±2.25	4.91±1.9	4.23±2.14	NS	/
% of cows with skin lesion	7.12±1.79	4.99±2.05	5.02±2.13	0.01	1:3, 1:2

Table 3: Influence of principle of good health to health and productive characteristic of cows

Interval of welfare quality score	0-30	30.1-70	70.1-100	p	LSD
Milk production /cow/day (L)	21.12±3.45	25.55±3.78	29.19±2.11	0.01	1:2, 1:3, 2:3
% cows service period > 100days	42.17±4.15	34.36±3.35	24.12±5.89	0.01	1:2, 1:3, 2:3
% cows with lameness	9.52±2.12	6.45±2.29	2.35±1.19	0.01	1:2, 1:3, 2:3
% cows with mastitis	2.99±0.54	2.05±0.57	1.78±0.66	0.05	1:3, 1:3
% cows with vulvar discharge	4.12±0.95	3.41±0.78	1.56±0.049	0.01	1:3, 2:3
% cows with ocular discharge	8.12±2.6	6.44±1.99	3.21±0.99	0.01	1:2, 1:3, 2:3
% cows with nasal discharge	10.09±2.14	8.73±2.22	6.54±1.71	0.01	1:2, 1:3, 2:3
% dystocia	14.49±2.82	9.13±3.01	5.42±2.11	0.01	1:2, 1:3, 2:3
% of thin cows	5.66±1.11	4.14±1.14	2.28±0.97	0.05	1:2, 1:3, 2:3
% of cows with skin lesion	6.89±1.11	5.12±1.79	4.71±2.01	0.05	1:3, 1:2

Table 4: Influence of principle of appropriate behaviour to health and productive characteristic of cows

Interval of welfare quality score	0-30	30.1-70	70.1-100	p	LSD
Milk production /cow/day (L)	25.11±3.78	24.16±4.05	26.66±3.11	NS	/
% cows service period > 100days	35.21±5.12	38.11±3.69	39.7±4.78	NS	/
% cows with lameness	5.71±1.15	5.14±1.11	3.28±2.02	0.05	1:3, 2:3
% cows with mastitis	2.5±1.1	3±0.79	2.1±0.99	NS	/
% cows with vulvar discharge	2.78±0.64	3.13±0.78	2.85±0.66	NS	/
% cows with ocular discharge	7.14±1.19	6.98±2.21	8.88±2.06	NS	/
% cows with nasal discharge	6.16±2.21	8.06±3.33	7.14±2.99	NS	/
% dystocia	80.6±2.11	8.91±1.71	8.12±1.46	NS	/
% of thin cows	4.14±0.99	3.72±1.26	3.79±1.68	NS	/
% of cows with skin lesion	8.18±1.48	6.55±2.16	6.39±1.79	0.05	1:2, 1:3

Table 5: Significance of coefficient correlation between value of welfare criteria and value of health and productivity in cows.

	Good feeding	Good housing	Good health	Appropriate behaviour
Milk production /cow/day (L)	0.86**	0.68*	0.9**	0.27
% cows service period > 100days	-0.78*	-0.65*	-0.76**	0.24
% cows with lameness	-0.71**	-0.55*	-0.62**	0.29
% cows with mastitis	-0.29	-0.71**	-0.84**	0.26
% cows with vulvar discharge	-0.36	-0.26	-0.85**	0.25
% cows with ocular discharge	-0.27	-0.14	-0.82**	0.23
% cows with nasal discharge	-0.2	-0.32	-0.73**	0.14
% dystocia	-0.11	-0.33	-0.84**	0.17
% of thin cows	-0.69*	-0.33	-0.74**	0.11
% of cows with skin lesion	-0.09	-0.85**	-0.79**	0.2

*p<0.05 **p<0.01

CONCLUSION

The health and productive characteristics of cows depend on providing the principle of welfare on farms. The most important principle, which significantly affects these characteristics, is the principle of good health. Milk production and reproductive characteristics depend on the principles of good nutrition, good housing and good health. Good production is determined by many factors on the farm, so ensuring a quality veterinary supervision (the principle of health) must be a priority.

REFERENCES

- BELIĆ, B., CINCOVIĆ, M.R.: Održivi razvoj u mlečnom govedarstvu – definisanje indikatora. Zbornik Prvi naučni simpozijum agronoma sa međunarodnim učešćem, Jahorina, 155-159, 2010.
- BLOWEY, R., EDMONDSON P.: Mastitis Control in Dairy Herds, CAB International, 2010.
- BOJKOVSKI, J., SAVIĆ, B., PAVLOVIĆ, I., PETRUJKIĆ, T., RELIĆ, R., ROGOŽARSKI, D.: The most common pathogenic causes of disease in dairy breed cattle and pigs in farm breeding. Lucrări Științifice medicină veterinară Timișoara, XLIV(1): 149-156, 2011.
- CINCOVIĆ, M.R., BELIĆ, B., VIDOVIĆ B., KRČMAR, L.J.: Reference values and frequency distribution of metabolic parameters in cows during lactation and in pregnancy. Contemporary agriculture, 60(1-2): 175-182, 2011.
- CINCOVIĆ, M.R., BELIĆ, B.: Proizvodnja i kvalitet mleka i reproduktivni parametric u funkciji tipa ketogeneze na farmi krava. Veterinarski žurnal republike srpske, 9(2):181-185, 2011a.
- HRISTOV, S., VUČINIĆ, M., STANKOVIĆ, B.: Zašto nam je potrebna dobrobit životinja, u Dobrobit životinja i biosigurnost na farmama – Monografija, Beograd, 5-21, 2007.

- HRISTOV, S., ZLATANOVIĆ, Z., SKALICKI, Z., STANKOVIĆ, B., MAKSIMOVIĆ, N.: Procena dobrobiti krava na osnovu sistema ponašanja. Zbornik naučnih radova Instituta PKB, 16 (3-4): 79-86, 2010.
- HRISTOV, S., ZLATANOVIĆ, Z., STANKOVIĆ, B., OSTOJIĆ-ANDRIĆ, D., DAVIDOVIĆ, V., JOKSIMOVIĆ-TODOROVIĆ, M., PLAVIŠIĆ, B., DOKMANOVIĆ, M.: Procena dobrobiti krava u slobodnom sistemu držanja, Veterinarski glasnik, 65(5-6) 399–408, 2011.
- OSTOJIĆ-ANDRIĆ, D., HRISTOV, S., NOVAKOVIĆ, Ž., PANTELIĆ, V., PETROVIĆ, M.M., ZLATANOVIĆ, Z., NIKŠIĆ, D.: Dairy cows welfare quality in loose vs tie housing system. *Biotechnology in Animal Husbandry* 27 (3):975-984, 2011.
- POPESCU, S., BORDA, C., SANDRU, C.D., STEFAN, R., LAZAR, E.: The welfare assessment of tied dairy cows in 52 small farms in north-eastern Transylvania using animal-based measurements. *Slov.Vet.Res.* 47 (3): 77-82, 2010.
- PRICKETT, R.W., BAILEY NORWOOD, F., LUSK, J.L.: Consumer preferences for farm animal welfare: results from a telephone survey of US households. *Animal Welfare*, 19: 335-347, 2010.
- STANČIĆ, I., SAVOVIĆ, M., APIĆ, I., ERDELJAN, M., DRAGIN, S.: Stančić Effect of postpartal disorders on dairy cows reproduction. 22. International symposium Food safety production, Trebinje, Bosnia and Hercegovina, 19. –25. Jun, 2011: 70-72.
- STEVANČEVIĆ, M., TOHOLJ, B., BELIĆ, B., CINCOVIĆ, M.R.: Lameness at dairy cows-risk factors, prevention and control. Book of proceedings 12th Middle European Buiatric Congress Pula, Croatia, May 18-22. 2011a: 93-97.
- STEVANČEVIĆ, M., TOHOLJ, B., KUJAČA, V.: Dijagnostika hromosti kod krava u farmskim uslovima držanja-bodovni sistem dijagnostike. *Veterinarski žurnal Republike Srpske*, 9(1):89-95, 2009.
- VIDOVIĆ, V.: Principi i metodi oplemenjivanja životinja, Novi Sad, 1993.
- VUČINIĆ, M.: Ponašanje, dobrobit i zaštita životinja. Fakultet veterinarske medicine, Beograd, 2006.
- WELFARE QUALITY® (2009). Welfare Quality® Assesment Protocol for Cattle. Welfare Quality Consortium, Lelystad, Netherlands, 1-181.
- WHAY, H.R., MAIN, D.C.J. et al.: Assessment of the welfare of dairy cattle using animal-based measurements: direct observations and investigation of farm records. *Vet. Rec.*, 153:197-202, 2003b.

ZDRAVSTVENA I PRODUKTIVNA SVOJSTVA KRAVA NA FARMAMA SA RAZLIČITIM SKOROM DOBROBITI

MARKO R. CINCOVIĆ, BRANISLAVA BELIĆ, MILENKO STEVANČEVIĆ,
BOJAN TOHOLJ, MIHAJLO ERDELJAN, JOVAN SPASOJEVIĆ

Izvod

Merenje dobrobiti na farmama vršeno je na pomoću Welfare Quality ® scoring sistema, koji omogućuje procenu dobrobiti na osnovu principa i kriterijuma dobrog smeštaja, dobre ishrane, dobrog zdravlja i adekvatnog ponašanja krava na farmama. Na farmama sa nižom ocenom dobrobiti i slabijom ispunjenošću principa dobre ishrane postoji značajno niža proizvodnja mleka, veći procenat krava sa dugim servis periodom, veći procenat krava sa šepavošću i veći procenat vrlo mršavih krava. Obezbeđivanjem principa dobrog smeštaja značajno će se unaprediti proizvodnja mleka, smanjiti broj krava sa dugim servis periodom i šepavošću, a posebno je interesantno da će obezbeđivanjem ovog principa postojati manje subkliničkog mastitisa na farmi i manje krava sa distokijama i kožnim lezijama. Najznačajniji princip koji je pokazao značajan uticaj na sve ispitivane parametre je princip dobrog zdravlja. Obezbeđivanjem visokog skora ovog principa na farmama doći će do značajnog unapređenja svih produktivnih parametara i zdravlja. Pored zdravstvenih sindroma kao što su šepavost ili distokija, skor dobrog zdravlja zavisi i od pojave okularnog, nazalnog i vaginalnog iscetka, koji govori u prilog infekciji pripadajućih organa. I na posletku, izmene u ponašanju kod krava ne pokazuju signifikantno dejstvo na zdravstvene i produktivne karakteristike. Slaba interakcija sa ljudima i ostalim životinjama, slabo reagovanje na hranu ili prenaplašeno strah i agresivno delovanje može se dovesti u vezu sa pojavom većeg učešća šepavosti na farmama i povećanja broja kožnih lezija. Jačina veze između ispitanih kriterijuma dobrobiti i zdravstvenih i produktivnih svojstava krava pokazuje da postoji najjača korelacija sa kriterijumom dobrog zdravlja na farmi, potom kriterijumom dobre ishrane i na kraju kriterijumom dobrog smeštaja. Produktivne osobine kao što su proizvodnja mleka i dužina servis perioda značajno koreliraju sa faktorima zdravlja, ishrane i smeštaja. Obezbeđivanje dobrog zdravlja životinja na farmama predstavlja najznačajniji zadatak u postupku obezbeđivanja dobrobiti i održive proizvodnje na farmi krava.

Ključne reči: krave, dobrobit, produktivnost, zdravlje.

Received / *Primljen*: 14.05.2012.

Accepted / *Prihvaćen*: 29.05.2012.