

WELFARE OF DAIRY COWS - GUARANTEE OF QUALITY MILK IN A PROFESSIONAL HOLDING

BUNĂSTAREA VACILOR DE LAPTE – GARANȚIA LAPTELUI DE CALITATE ÎNTR-O EXPLOATAȚIE PROFESIONALĂ

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ABSTRACT | REZUMAT

In order to substantiate the principles and to extend the cattle breeding systems to ensure the welfare of the herds and the profit of the breeders, numerous research programs have been carried out, which have scientifically demonstrated that the animals must be healthy and feel comfortable, to live in conditions. safe, well fed, able to express natural behaviour and not be threatened. The study carried out on a dairy farm in the southern part of the country looked at: the health status of the acropodium through the walk score (Gait Score), the condition of the animals (BCS - Body Condition Score), body hygiene (body hygiene index) and the determination in the laboratory of blood serum from 12 Holstein breed cows in different gestation periods of 13 biochemical parameters (BUN, PHOS, URIC, Ca, TP, ALB, GLOB, ALT, AST, GGT, TRIG, GLU and LDH). Milk samples were also collected from the study cows from which the physicochemical (fat, protein, NCS, urea, lactose, conductivity and dry matter) and microbiological (NTG) parameters were determined. Blood biochemical parameters were determined with WetTest 8008 - dry biochemistry analyzer, and milk quality parameters were determined with EKOMILK TOTAL and Bentley (for NCS), and for NTG the standardized method of serial dilutions with rate 10 was used. Correlating the results of the indicators for assessing the welfare of cows in the general needs grid with the results of laboratory tests on blood biochemical parameters and milk quality, it is found that the welfare of the cows studied is average.

Key words: milk cows, welfare, biochemical parameters, milk

Pentru fundamentarea principiilor și extinderea sistemelor de creștere a bovinelor care să asigure bunăstarea efectivelor și profitul crescătorilor, s-au derulat numeroase programe de cercetare, prin care s-a demonstrat științific faptul că animalele trebuie să fie sănătoase și să se simtă confortabil, să trăiască în condiții de siguranță, bine hrănite, capabile să exprime comportamentul natural și să nu fie amenințate. Studiul efectuat într-o fermă de vaci de lapte din zona de sud a țării a urmărit: starea de sănătate a acropodiului prin intermediul scorului mersului (Gait Score) starea de întreținere a animalelor (BCS – Body Condition Score), igiena corporală (indicele igienei corporale) și determinarea în laborator din serul sanguin provenit de la 12 vaci din rasa Holstein, aflate în perioade diferite de gestație, a 13 parametrii biochimici (BUN, PHOS, URIC, Ca, TP, ALB, GLOB, ALT, AST, GGT, TRIG, GLU și LDH). Au fost recoltate de asemenea probe de lapte de la vacile luate în studiu din care s-au determinat parametrii fizico-chimici (grăsime, proteine, NCS, uree, lactoză, conductivitate și substanță uscată) și microbiologici (NTG). Parametrii biochimici sangvini au fost determinați cu WetTest 8008 – analizor de biochimie uscată, iar parametrii de calitate ai laptelui au fost determinați cu EKOMILK TOTAL și Bentley (pentru NCS), iar pentru NTG a fost utilizată metoda standardizată a diluțiilor seriate cu rata 10. Corelând rezultatele indicatorilor de evaluare a bunăstării vacilor din cadrul grilei generale a necesităților cu rezultatele examenelor de laborator privind parametrii biochimici sangvini și calitate laptelui se constată că bunăstarea vacilor luate în studiu este medie.

Cuvinte cheie: vaci de lapte, bunăstare, parametri biochimici, lapte

Animal welfare is lately not only a theoretical problem but it materializes in the attention given to animals, regarding living conditions, how they are fed, how they are exploited, how they develop in order to

obtain high quality products. As several researchers argue, animals must be exploited in such a way that their biological functions and natural behaviour are not affected and no effort is made to adapt (2, 6, 11) in breeding shelter. Animal welfare assessment means determining the welfare level of an animal or a herd of animals, which makes it possible to compare scientifically between different individuals, different types of shelters, breeding and exploitation systems, be-

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tween different categories of farms and even between different countries (1, 10, 11). The evaluation of the welfare of dairy cows has been imposed for ethical and economic reasons and can be done both on farms and in laboratories (7, 9, 11). The evaluation of the welfare of dairy cows on the farm is done periodically at certain intervals using interactive numerical methods, based on management practices, based on the HACCP System, and in the laboratory is based on the results of tests performed on blood samples, urine, faeces and milk (2, 6, 9). Obtaining hygienic milk is a wish of all dairy farmers. The surveillance of the healthiness of this food considered as a reservoir of nutritional factors is performed by examining the quality of the finished product but also by evaluating a series of indicators regarding the assessment of the welfare of dairy cows at the farm level. These indicators take into account a number of general and specific critical control points (cows with pododermatitis, poor maintenance, poor hygiene, minimum usable area provided, NH_3 concentration in the shelter) (1, 3, 10, 13).

Milk is one of the staple foods for all age groups, is easily digested, promotes growth and development, increases the body's ability to defend against disease, accelerates somatic processes, etc. (12).

MATERIALS AND METHODS

The researches regarding the evaluation of the welfare of dairy cows were carried out in a farm from the southern part of Romania, on a number of 12 lactating cows of Holstein breed, with different ages and different gestation periods (Table 1).

The indicators used to assess the welfare of the cows were: acropod health assessed by Gait-Score, maintenance status assessed by Body Condition Score (BCS), body hygiene and laboratory examinations. Milk samples were also collected from the studied cows from which the physico-chemical parameters (percen-

tage of fat, percentage of protein, urea, lactose, conductivity, percentage of dry matter) were determined using the EKOMILK TOTAL analyzer and somatic cell number and total number of germs by the standardized method of serial dilutions at the rate of 10 and growing in PCA. The gait score was achieved by observing the conformation characteristics (dorsal body line and limb position), both in the resort and in walking. Thus, the following points were awarded: 1 point for animals without pododermatitis, respectively those that do not show any changes in static or moving position; 2 points in animals with low gravity pododermatitis, respectively those who have a dorsal body line in a static position and a slight kyphosis during walking; 3 points in animals with medium severity pododermatitis, respectively those with kyphosis both in static position and in movement, abnormal trampling; 4 points in animals with severe pododermatitis, respectively those with kyphosis both in static and moving position and total lack of support on certain limbs; 5 points in animals with very severe pododermatitis, respectively those with a pronounced kyphosis and refusal to move or lift from supine position. The maintenance status of cows (BCS) was evaluated on a grid with a score from 1 to 5 depending on the degree of highlighting of the lumbar vertebrae, the degree of highlighting of the iliac tuberosities, the position of the line iliac tuberosity - sciatic tuberosity, the cavity formed between the region anal and coccygeal lateral or posterior view. On this grid were awarded: 1 point for very poorly maintained animals, 2 points for poorly maintained animals, 3 points for well-maintained animals, 4 points for very well-maintained animals, 5 points in obese animals.

The body hygiene of the animals was evaluated based on the body hygiene index, which consists in the examination of 3 body areas, namely: the lower part of the limbs; retro-mammary region, flank and upper limbs. 1-4 points scoring of each area was used. For the evaluation of body hygiene, all the animals in the herd were

Biological material and dairy cows studied

Table 1

No.	Rattlesnake number (identification)	Date of artificial insemination	Gestation / No. of days
1	83371	16.06.2018	281
2	8082	13.06.2018	278
3	2892	10.06.2018	275
4	8128	12.01.2019	56
5	74388	15.12.2018	84
6	44625	13.01.2019	55
7	59250	01.11.2018	159
8	28898	05.10.2018	155
9	5654	10.10.2018	150
10	60380	12.10.2018	148
11	75521	06.12.2018	93
12	85704	28.12.2018	71

evaluated, the score was given and then the animals marked with 3 – 4 points (those with poor hygiene) were counted, after which the weight in the herd was established. When the weight was less than 20 % it was considered that the body hygiene of the animals is good, when the weight was between 20 and 40 % it was considered that the body hygiene of the animals is average, and when the weight was over 40% it was considered that the body hygiene of the animals is poor.

To determine the blood biochemical parameters, 12 blood samples were collected. These were left to rest and after serum expression were determined, using the Vettes 8008 analyzer, the following parameters: BUN, PHOS, URIC, Ca, TP, ALB, GLOB, ALT, AST, GGT, TRIG, GLU and LDH. The obtained results were compared with normal values for dairy cows.

RESULTS AND DISCUSSIONS

The health status of the acropodium was assessed by Gait Score, following the clinical examination of the cows studied, it was assessed as average. The percentage of cows with pododermatitis on the farm is 30 % of the herd and is characterized by low severity lesions (dorsal line of the body in a horizontal static position with a slight kyphosis while walking) and injuries of medium severity (kyphosis both while walking as well as stationary or tweezers).

The maintenance status of cows (BCS) was a-

ssessed with grades of 3 (normal maintenance status with well-covered bone areas) and grades of 4 (very good maintenance status, with bone rays difficult to highlight) in the proportion of 50-70 % of staff; grades of 2 (animals with poor maintenance and poorly covered areas of muscle) were given a score of 30–50 %. Depending on the grades given, the maintenance condition of the evaluated dairy cows is good.

The body hygiene of the evaluated cows, based on the 3 body areas, was established with a weight of grades 3 and 4 in proportion of 20–40 %, which reflects an average body hygiene. The Gait - Score, Body Condition Score and body hygiene are indicators of well-being that are part of the HACCP system, a system that has a number of advantages such as: guaranteed objectivity in the case of certification audits of the HACCP system implemented on farms, the possibility of developing plans specific characteristics of the critical control points, but also disadvantages, respectively the small number of parameters related to animal welfare, the weight of quantification of the parameters (behavioural deviations, significant influence of the evaluation period, differences between the critical control points and the critical limits adopted by animal breeders, transporters, processors, lack of substantiated scientific data for setting critical limits) (1).

For a more accurate assessment of animal welfare on a farm, the data obtained in the assessment of the main critical points must be correlated with the results

Results of blood biochemical parameters

Table 2

Parameter	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Limits
BUN (mg/dl)	6	6	12	16	24	16	10 - 25
PHOS (mg/dl)	6.5	6.5	6.2	7.5	8.1	7.2	4.0 - 8.6
URIC (mg/dl)	1.1	0.6	0.9	0.8	1.4	0.7	-
Ca (mg/dl)	9.4	1.1	9.6	9.7	8.3	8.8	8.0 - 12.0
TP (g/dl)	7.9	8.3	7.5	8.9	8.4	8.0	6.2 - 8.0
ALB (g/dl)	2.8	2.5	2.6	2.6	2.9	2.7	2.5 - 3.5
GLOB (g/dl)	5.0	5.8	4.9	6.3	5.5	5.3	3.0 - 4.9
ALT (U/L)	19	21	27	37	57	32	7 - 35
AST (U/L)	51	42	90	107	256	139	50 - 150
GGT (U/L)	35	38	63	48	41	121	0 - 87
TRIG (mg/dl)	0	12	7	0	0	0	0 - 8
GLU (mg/dl)	66	57	56	62	55	59	56 - 88
LDH	>2800	1898	>2800	>2800	>2800	>2800	-

Results of blood biochemical parameters

Table 3

Parameter	Sample 7	Sample 8	Sample 9	Sample 10	Sample 11	Sample 12	Limits
BUN (mg/dl)	28	25	25	20	26	24	10 - 25
PHOS (mg/dl)	9.2	8.0	7.2	6.0	6.5	5.7	4.0 - 8.6
URIC (mg/dl)	1.4	1.4	1.1	1.2	1.3	1.1	-
Ca (mg/dl)	8.3	9.8	9.2	8.3	8.8	9.1	8.0 - 12.0
TP (g/dl)	8.2	8.0	7.6	7.5	7.9	7.8	6.2 - 8.0
ALB (g/dl)	2.7	2.8	2.7	2.7	2.7	2.7	2.5 - 3.5
GLOB (g/dl)	5.5	5.2	4.8	4.9	5.2	5.1	3.0 - 4.9
ALT (U/L)	55	50	35	43	47	54	7 - 35
AST (U/L)	80	96	108	147	122	88	50 - 150
GGT (U/L)	40	58	66	54	43	42	0 - 87
TRIG (mg/dl)	0	0	0	0	0	0	0 - 8
GLU (mg/dl)	50	47	62	43	57	45	56 - 88
LDH	>2800	1898	>2800	>2800	>2800	>2800	-

of some laboratory parameters. The results of the blood biochemical parameters on the analysed samples are presented in tables 2 and 3.

Analysing the presented results, it is found that urea (BUN) is increased by 1 - 3 units in 2 cows and lower by up to 4 units in another 2 cows. Phosphorus (PHOS) was within normal limits in most samples with one exception where the increase was 0.6 units, and calcium (Ca) was within normal values in all samples. Urea and uric nitrogen reflect the ability of the liver to metabolize ammonia into urea (12). Total proteins (TP) are increased by 0.2-0.9 units compared to the maximum limit at 33% of the samples. Globulins (GLOB) had higher values by 0.1-1.4 units in 75% of the samples, and albumin (ALB) were normal in all samples. According to bibliographic data, blood serum contains several hundred distinct chemical species of proteins, of which albumin and globulin have clinical significance. The liver is responsible for the biosynthesis of albumin, coagulation protein factors, enzymes and globulins (6-8). The Aspartate-amino-transferase (AST) in 90% of the samples was within normal values. Gamma-globulin transferase (GGT) increased by 34 units, compared to the maximum allowed limit, in a single sample. According to the bibliographic data (4, 6, 7) both AST and GGT are the enzymes frequently used in highlighting liver diseases in cattle. Increased AST correlated with increased GGT reflects acute liver dysfunction such as intoxication or infectious hepatis.

At the same time, the increase in the values of the two enzymes can be correlated with hepatic lipidosis, passive venous congestion or diseases that cause distension of the stomach and clot. Increased GGT alone may correlate with fibrosis, and increased GGT with alkaline phosphatase (ALKP) may suggest cholelithiasis or fasciolosis. The triglycerides (TRIG) had values above the maximum limit of 4 units in a single sample, and glucose (GLU) had low values in 5 samples. Blood glucose levels in ruminants are lower than in other species because they are not able to absorb glucose directly from food. Blood glucose levels are also lower in adults than in calves, as well as in ketosis cows. Hyperglycaemia in cattle may occur under stress, milk fever or after administration of substances such as dextrose, xylazine or corticosteroids (5, 9). The results of the physico-chemical and microbiological examination of the milk are presented in tables 4 and 5.

Analysing the obtained results, it is found that the number of somatic cells (NCS), dry matter, fat, protein and lactose are normal in all samples. Urea recorded values above the normal limit in four samples analysed. According to bibliographic data, the intake of nitrogen in the ration increases milk production, but has consequences on metabolism. A nitrogen-rich ration causes the excess to pass into the blood being detoxified by the liver in the form of urea. Some of the urea is recycled in saliva or crosses the rumen wall and is re-used by microorganisms in the rumen. Much of the

Table 4
The results of the physico-chemical and microbiological examination of the milk samples

Parameter	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Limits
Fat (%)	3.16	3.18	3.22	3.09	4.24	3.94	3 - 6
Protein (%)	3.52	3.32	3.1	3.32	3.91	3.75	3 - 4
NCS / ml x 1000	21	158	91	40	81	49	<200000/ml
Urea (mg/dl)	22.5	33.7	32.4	46.5	24.4	27	22 - 35
Lactose (%)	4.57	4.67	4.89	4.81	4.7	4.55	2,28 - 7,62
Conductivity	643.7	710.3	587.5	627.2	585.9	601.6	-
Dry substance (%)	12.18	12.08	12.03	12.1	12.5	12.46	<12,5

Table 5
The results of the physico-chemical and microbiological examination of the milk samples

Parameter	Sample 7	Sample 8	Sample 9	Sample 10	Sample 11	Sample 12	Limits
Fat (%)	4.21	3.43	3.95	3.84	3.51	4.53	3 - 6
Protein (%)	3.55	3.71	3.68	3.56	3.24	3.51	3 - 4
NCS / ml x 1000	64	161	98	18	49	71	<200000/ml
Urea (mg/dl)	38.4	16.9	36.1	26.3	41.9	292.2	22 - 35
Lactose (%)	4.71	4.66	4.79	4.97	5.06	4.64	2,28 - 7,62
Conductivity	567.6	628.8	550.7	531.1	534.4	577.7	-
Dry substance (%)	12.02	11.63	12.3	12.5	12.61	11.9	<12,5

urea is excreted in the kidneys and excreted in the urine. Before urea is excreted, it diffuses into all body fluids. Urea will then be present in milk, which is considered a sign of excess nitrogen in the ration, as well as a dietary imbalance between protein and energy (12). The elevated urea levels can lead to metabolic alkalosis, decreased follicle maturation (absence of ovulation and prolonged anoestrus), decreased uterine pH, decreased immunity in the breast, decreased progesterone secretion by the corpuscles (embryonic mortality) (9). From a microbiological point of view, all the samples fall within the limits provided by the standards and regulations in force.

CONCLUSIONS

The health status of the acropodium assessed by Gait Score showed a percentage of 30 % cows with

pododermatitis in the whole herd. Body Condition Score showed in proportions of 50–70 % very good condition and 30–50 % poor condition. The body hygiene of dairy cows is "average" with a weight of grades 3 and 4 in a proportion of 30–40 %.

Laboratory analyses showed an increase in globulins in 83% of samples, ALT in 58% of samples, TP in 33% of samples, urea in 17% of samples and a decrease in GLU in 42 % of the total number of samples. Most of the physico-chemical and microbiological parameters of milk (fat, protein, conductivity, lactose, dry matter, NCS, NTG) were within normal parameters except for urea which recorded values above the maximum allowed limit of 50% of the total number of samples. Correlating the research data on the evaluation of cows' welfare at farm level (BCS, GS, body hygiene) with blood biochemical parameters and the physical-chemical and microbiological examination of milk, it is

found that the welfare of dairy cows, from the farm where the evaluation was performed, is as "average".

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