

THE HEMATOLOGIC PROFILE OF CATTLE WITH REPRODUCTIVE DISEASES*

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ABSTRACT - Investigations were conducted on the Bălțată Neagră Românească (BNR) breed dairy cows from the Dancu Research and Development Station for Cattle Breeding, Iași County. We have carried out hematologic profile investigations (red and white blood cells) in cattle having reproductive troubles and clinically healthy cattle, divided into groups of 10 animals: four experimental groups – cows with puerperal genital infections (E₁), cows with chronic genital infections (E₂), cows with postpartum anestrus (E₃) and cows with repeated inseminations (E₄), as well as three control groups, made of cows at different stages of lactation: early, 0-2 months (M₁), advanced, 4-6 months (M₂) and late, 6-7 months (M₃). Hematologic analyzes have shown variations according to the type of reproductive troubles and to the stage of lactation: in cows having puerperal

genital infections (E₁ Group), compared to the control group (M₁), lower values of red blood cells ($5.74 \pm 0.2 \times 10^6/\mu\text{l}$), hematocrit (Ht), ($28.40 \pm 0.47\%$) and haemoglobin (Hb) ($9.20 \pm 0.30 \text{ g/dl}$) were found and higher values of the total number of leucocytes ($9.0 \pm 0.50 \times 10^3$, compared to $7.7 \pm 0.30 \times 10^3$, $p < 0.05$), $7.7 \pm 0.30 \times 10^3$, $p < 0.05$), represented by neutrophils ($56.0 \pm 0.60 \%$, compared to $34.2 \pm 0.6\%$, $p < 0.05$). The cows with chronic genital infections (E₂ Group) in comparison to the M₂ Group had lower values of red blood cells, hematocrit and haemoglobin and higher values of the total number of leucocytes ($8.2 \pm 2.12 \times 10^3/\mu\text{l}$, vs. $7.26 \pm 1.04 \times 10^3/\mu\text{l}$), with a high neutrophil number ($39.5 \pm 0.67 \%$, vs. $35.66 \pm 1.66\%$). In cows having postpartum anestrus (E₃ Group), lower values of erythrocytes and haemoglobin and slightly higher values of leukocytes with a great

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proportion of neutrophils. In cows with repeated inseminations (E_4 Group), there were diminutions in the erythrocyte number and increased number of neutrophils. Once with the lactation curve from early stage (M_1 Group) to advanced stage (M_2) healthy cows have recorded variations of erythrocyte indices, determined by the increasing level of the milk production, marked by the diminution of the number of erythrocytes and hematocrit and the moderate increase of haemoglobin.

Key words: dairy cows, reproductive diseases, hematologic profile

REZUMAT – Profilul hematologic la vaci cu tulburări de reproducție. Studiile au fost efectuate la ferma de vaci pentru lapte, rasa BNR, în cadrul S.C.D.C.B Dancu, Iași, în cursul anului 2008. S-au efectuat investigații de profil hematologic, seria roșie și seria albă, la vaci cu diferite tulburări de reproducție și vaci sănătoase din punct de vedere clinic, constituite în loturi a câte 10 capete: patru loturi experimentale, vaci cu infecții genitale puerperale (E_1), vaci cu infecții genitale cronice (E_2), vaci cu anastru postpartum (E_3), vaci cu monte repetate (E_4), și trei loturi martor, alcătuite din vaci în stadii de lactație: timpurie, 0-2 luni (M_1), avansată, 4-6 luni (M_2) și târzie, 6-7 luni (M_3). Analizele hematologice au evidențiat unele variații, în funcție de tipul tulburărilor de reproducție studiate și de stadiul lactației: la vacile cu infecții genitale puerperale (lotul E_1), comparativ cu lotul M_1 - valori scăzute spre limita inferioară a speciei, în ceea ce privește numărul de eritrocite, ($\times 10^6/\mu\text{l}$), ($5,74 \pm 0,2$), hematocritul (Ht,%), ($28,40 \pm 0,47$) și hemoglobina (Hb,g/dl), ($9,20 \pm 0,30$) și valori crescute ale numărului total de leucocite ($\text{mil}/\mu\text{l}$), ($9,0 \pm 0,50$ față de $7,7 \pm 0,30$, $p < 0,05$), reprezentate de neutrofile (%), ($56,0 \pm 0,60$ față de $34,2 \pm 0,6$, $p < 0,05$); la vacile cu infecții genitale cronice (lotul E_2), comparativ cu lotul M_2 - valori scăzute, spre limita inferioară a speciei ale numărului de

eritrocite, hematocritului și hemoglobinei și niveluri crescute ale numărului total de leucocite ($\text{mil} / \mu\text{l}$), ($8,2 \pm 2,12$ față de $7,26 \pm 1,04$), cu pondere neutrofilică ($39,5 \pm 0,67$ față de $35,66 \pm 1,66$); la vacile cu anastru postpartum (lot E_3) - valori scăzute spre limita inferioară a speciei în ceea ce privește numărul de eritrocite și cantitatea de hemoglobină și valori ușor crescute ale numărului total de leucocite cu pondere neutrofilică, situate peste media datelor de referință; la vacile cu monte repetate (lot E_4) s-au remarcat scăderea numărului de eritrocite spre nivelul inferior și creșterea numărului total de leucocite spre limita superioară a valorilor speciei, reprezentate de neutrofile. Vacile sănătoase, în dinamică, pe curba lactației, de la faza timpurie (lot M_1) la faza avansată (lot M_2), au înregistrat variații ale constantelor eritrocitare, determinate de nivelul ascendent al producției de lapte, manifestate prin scăderea numărului mediu de eritrocite și a hematocritului și creșterea moderată a hemoglobinei.

Cuvinte cheie: vaci pentru lapte, tulburări de reproducție, profil hematologic

INTRODUCTION

The nutrition management has an important role between the factors of variation of production and reproduction parameters in a dairy cow farms (Barnouin and Chassagne, 1990; Baudet, 1990; Bogdan *et al.*, 1984; Fabry, 1993; Ferguson, 1991; Georgescu *et al.*, 1990).

Intensive cow exploitation, for obtaining high milk production, which is sometimes uncompensated by assuring the best cattle feeding and shelter conditions, may lead to various diseases, called technopathies (Bogdan *et al.*, 1984; Dumitru, 1996;

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Georgescu *et al.*, 1990; Ghergariu *et al.*, 1990; Părvu *et al.*, 1996).

Studies carried out in this field have shown that metabolic diseases had sometimes a subclinical evolution, resulting in the diminution of the productive output and of the economic efficiency in dairy cow farms.

Because of the high frequency and great economic damages caused by these pathologic entities, the specialists have been always concerned with the prevention of these diseases by early diagnosis, permanent evaluation of the metabolic nutritional integrity of each animal stock and rapid adoption of some measures for cattle feed adjustment.

The goal of this paperwork was to study the hematologic profile of the cows having reproductive troubles, compared to the healthy cows found at different stages of lactation.

MATERIALS AND METHODS

Investigations were carried out on the BNR cattle breed at the dairy cow farm from the Research and Development Station for Cattle Breeding of Dancu, Iași County.

We carried out hematology investigations (red blood cells: number of erythrocytes, haemoglobin, hematocrit and erythrocyte indices - VHEM, HEM and CHEM and white blood cells: total number of leukocytes and percentage of leukocyte fractions: lymphocytes, neutrophils, eosinophils, monocytes and basophiles. 4 experimental groups, each of them having 10 cows having different reproductive troubles were organized: genital and puerperal infections (E₁),

chronic genital infections (E₂), postpartum anestrus (E₃) or repeated inseminations (E₄) and three control groups made of clinically healthy cows at different stages of lactation: early, 0-2 months (M₁), advanced, 4-6 months (M₂) and late, 6-7 months (M₃).

Hematology determinations were done with the automatic hematology analyser (ABC Vet.) from blood samples collected with EDTA vacutainers. The results obtained in cows having reproductive troubles were compared to hematology parameters recorded in healthy cows found at the same stages of lactation and according to data from the literature.

RESULTS AND DISCUSSION

Our results have shown different variations of the main hematology indices recorded in cows having reproductive troubles and in healthy cows found at different stages of lactation.

In cows having puerperal genital infections (E₁ Group), the values of erythrocyte constants had lower values, compared to the values of cows from M₁ Group found at the early lactation period, 0-2 months postpartum (*Table 1*).

Number of erythrocytes (E, $\times 10^6/\mu\text{l}$) has shown variations between 5.74 ± 0.20 (E₁ Group) and 6.40 ± 0.35 (M₁ Group), situated between the lower limit in the cows with puerperal genital infections (E₁ Group) and the average reference values ($5-10 \times 10^6/\mu\text{l}$) in the cows of the control group (M₁ Group).

Table 1 - Average values and statistical parameters of the number of erythrocytes (E), hematocrit (Ht), haemoglobin (Hb) and derived erythrocyte constants (VEM, HEM and CHEM) in E₁ and M₁ groups

Specification	M.U.	Cow groups						Reference values
		E ₁			M ₁			
		\bar{X}	±Sx	Variation limits	\bar{X}	±Sx	Variation limits	
Erythrocytes, E	n x 10 ⁶ /μl	5.74	0.20	5.1 - 5.80	6.40	0.35	5.80 - 6.80	5 - 10
Hematocrit, Ht	%	28.40	0.47	26.5 - 34.10	34.2	0.30	32.60 - 36.40	24 - 46
Haemoglobin, Hb	g/dl	9.20	0.30	9.0 - 10.00	10.6	0.20	9.30 - 12.70	8 - 15
VEM	μ ³	49.50	1.35	45.6 - 50.50	53.4	5.80	46.70 - 60.00	40 - 60
HEM	pg	16.02	0.50	14.5 - 24.30	16.6	0.30	13.40 - 18.00	11 - 18
CHEM	g/dl	32.40	1.10	28.0 - 34.00	31.0	0.30	30.00 - 34.00	26 - 34
Leukocytes	x 10 ³ /μl	9.00*	0.50	8.6 - 10.30	7.7	0.30	7.60 - 8.10	4 - 12
Lymphocytes	%	35.80*	0.50	42.6 - 45.00	56.2	0.50	50.80 - 60.50	40 - 60
Neutrophils	%	56.00*	0.60	51.2 - 60.80	34.2	0.60	32.60 - 36.00	15 - 47
Eosinophils	%	3.70	0.20	3.4 - 4.00	1.3	0.66	1.20 - 1.60	2 - 10
Basophiles	%	2.80	0.30	1.6 - 3.20	0.3	0.02	0.20 - 0.50	0 - 4
Monocytes	%	1.70	0.20	1.2 - 2.40	2.8	0.43	1.40 - 2.80	2 - 6

\bar{X} -average

* *p*<0.05- significant difference

E₁ – cows with genital puerperal infection

M₁ – healthy cows at the early stage of lactation, 0-2 months

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Hematocrit (Ht, %) has shown variations between 28.40 ± 0.47 (E₁ Group) and 34.20 ± 0.30 (M₁ Group).

Haemoglobin (Hb, g/dl) has shown in the cows belonging to the E₁ Group an average value of 9.20 ± 0.30 , compared to the cows of the M₁ control group that recorded a value of 10.6 ± 0.20 .

Erythrocyte indices (VEM, HEM and CHEM) have recorded variations, compared to erythrocyte constants. The values of VEM varied between 49.50 ± 1.35 (E₁ Group) and 53.40 ± 5.80 (M₁ Group), being situated between the lower limit (E₁ Group) and the upper limit (M₁ Group) of reference data ($40-60 \mu^3$). The HEM values varied between 16.02 ± 0.50 (E₁ Group) and 16.60 ± 0.30 (M₁ Group), being situated to the upper limit of reference data ($11-17 \text{ pg}$), while the CHEM values, between 31.0 ± 1.72 (E₁ Group) and 32.40 ± 1.10 (M₁ Group) were situated between the lower limit and the average of reference data ($30-36 \text{ g/dl}$). The differences were significant.

The total number of white blood cells ($\times 10^3 / \mu\text{l}$) has recorded high values in the cows having puerperal genital infections (E₁ Group) (9.0 ± 0.50), compared to the healthy cows (M₁ Group) (7.7 ± 0.30). The differences between groups were significant ($p < 0.05$). The analysis of leukocyte fractions pointed out significant differences between the experimental and the control group. In cows from E₁ Group, neutrophils had an average value of $56.0 \pm 0.60\%$, compared to the M₁ control group

($34.2 \pm 0.60\%$), showing the presence of an inflammatory process. Lymphocytes had lower values in cows of the E₁ Group, compared to the cows of the E₁ Group, while eosinophils (3.7 ± 0.20), basophils (2.8 ± 0.30) and monocytes (1.7 ± 0.20) have shown higher values compared to the control group. The differences were insignificant (Table 1).

In cows with chronic genital infections (E₂ Group), erythrocyte constants have shown variations within the physiological limits of the species (reference values), compared to the cows of the M₂ Group, determined by the chronic inflammatory process of the genital apparatus and by the advanced stage of lactation.

Number of erythrocytes (E, $\times 10^6 / \mu\text{l}$) varied between 5.32 ± 0.35 (E₂ Group) and 5.70 ± 0.89 (M₂ Group). The decreasing of the values was noticed while the lactation advanced, showing anaemia in the animals of both groups, especially in animals with chronic genital infections.

Hematocrit (Ht, %) has shown variations between 31.8 ± 1.58 (E₂ Group) and 32.2 ± 0.30 (M₂ Group), which were situated on the average of reference values ($24-46\%$).

Haemoglobin (Hb, g/dl) has shown in the cows of the E₂ Group an average value of 9.20 ± 0.30 , near the lower limit of reference data, compared to the cows of the M₂ control group that recorded the value of 10.6 ± 0.20 .

Table 2 – Average values and statistical parameters for the number of erythrocytes (E), hematocrit (Ht), hemoglobin (Hb) and derived erythrocyte constants (VEM, HEM and CHEM) in E₂ and M₂ groups

Specification	M.U.	Cow groups						Reference values
		E ₁			M ₁			
		\bar{X}	$\pm Sx$	Variation limits	\bar{X}	$\pm Sx$	Variation limits	
Erythrocytes, E	x 10 ⁶ /μl	5.32	0.35	4.90 - 5.60	5.70	0.89	5.20 - 6.50	5 - 10
Hematocrit, Ht	%	31.80	1.58	28.50 - 32.00	32.20	0.30	30.60 - 35.00	24 - 46
Hemoglobin, Hb	g/dl	12.50	0.76	9.00 - 13.50	12.60	0.35	10.30 - 13.70	8 - 15
VEM	μ ³	59.20	6.30	49.60 - 60.50	57.40	4.60	45.00 - 58.80	40 - 60
HEM	pg	23.50	2.30	16.50 - 24.30	22.10	3.20	19.80 - 24.00	11 - 18
CHEM	g/dl	39.30	1.21	31.50 - 42.00	39.10	2.30	33.60 - 40.00	26 - 34
Leucocytes	x 10 ³ / μl	8.20	2.12	8.00 - 8.40	7.26	1.04	7.20 - 7.30	4 - 12
Lymphocytes	%	51.00	1.85	50.00 - 64.00	58.66	2.80	56.00 - 60.00	40 - 60
Neutrophils	%	39.50	0.67	35.00 - 42.00	35.66	1.60	32.00 - 38.00	15 - 47
Eosinophils	%	5.50	0.33	4.00 - 6.90	2.00	1.00	1.80 - 2.20	2 - 10
Basophiles	%	1.33	0.81	1.00 - 1.70	1.66	0.33	1.00 - 2.30	0 - 4
Monocytes	%	1.00	0.40	0.80 - 1.20	2.10	1.00	1.20 - 3.00	2 - 6

\bar{X} - average

E₂ – cows with chronic genital infections

M₂ – healthy cows found at advanced lactation, 3-6 months

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Analyzing in dynamics the erythrocyte constants in healthy cows, from early stage of lactation (M_1 Group) to advanced stage (M_2 Group), we have found variations determined by increasing milk production, on the curve of lactation: the diminution in the average number of erythrocytes from 6.40 ± 0.35 to 5.70 ± 0.89 and of hematocrit from 34.2 ± 0.30 to 32.2 ± 0.30 , as well as the increase of hemoglobin from 10.6 ± 0.20 to 12.6 ± 0.35 .

Erythrocyte derivatives (VEM, HEM and CHEM) increased in both groups, in correlation with the values of erythrocyte constants, found to the upper limit of reference data. The variations of erythrocyte derivatives varied between the following average values: VEM between 57.40 ± 4.60 (M_2 Group) and 59.20 ± 6.30 (E_2 Group), HEM between 22.1 ± 3.20 (M_2 Group) and 23.5 ± 2.30 (E_2 Group), CHEM between 39.1 ± 2.3 (M_2 Group) and 39.3 ± 2.3 (E_2 Group).

Total number of leukocytes ($\times 10^3/\mu\text{l}$) recorded higher values in the cows with chronic genital infections (E_2 Group) (8.2 ± 2.12), compared to the values of healthy cows (M_2 Group) (7.26 ± 1.04). The differences between groups were insignificant.

The analysis of leukocyte fractions pointed out some variations between the experimental and the control group. The variations were not significant. In cows from E_2 Group, neutrophils had an average value of 39.5 ± 0.67 , and the M_2 control had 35.66 ± 1.66 . Lymphocytes have

shown lower values in cows of the E_2 Group, while eosinophils (3.70 ± 0.20), basophiles (2.80 ± 0.30) and monocytes (1.70 ± 0.20) had slightly increased values, compared to the control. Differences were insignificant (*Table 2*).

In cows with reproduction troubles shown by postpartum anestrus (E_3 Group), the values of erythrocytes indices had some variations, compared to the cows of the M_2 Group found at the advanced stage of lactation.

Number of erythrocyte ($E, \times 10^6/\mu\text{l}$) has shown the average values between 5.22 ± 0.3 (E_3 Group) and 5.70 ± 0.89 (M_2 Group). The decrease of values was noticed while lactation advanced, showing anaemia.

Hematocrit (Ht, %) had variations between 31.8 ± 1.58 (E_2 Group) and 32.2 ± 0.30 (M_2 Group).

Haemoglobin (Hb, g/dl) had in the cows of the E_2 Group a mean value (9.20 ± 0.30), while the M_2 control that recorded a value of 10.6 ± 0.20 .

From the early lactation to the advanced stage, we have found some variations determined by the increasing level of milk production on the lactation curve: the decrease of the mean number of erythrocytes from 6.40 ± 0.35 to 5.70 ± 0.89 and of hematocrit from 34.2 ± 0.30 to 32.2 ± 0.30 , as well as the increase of hemoglobin from 10.6 ± 0.20 to 12.6 ± 0.35 .

Table 3 – Average values and statistical parameters for the number of erythrocytes (E), hematocrit (Ht), haemoglobin (Hb) and derived erythrocyte constants (VEM, HEM and CHEM) in E₃ and M₂ groups

Specification	M.U.	Cow groups						Reference values
		E ₃			M ₂			
		\bar{X}	$\pm Sx$	Variation limits	\bar{X}	$\pm Sx$	Variation limits	
Erythrocytes, E	x 10 ⁹ /μl	5.22	0.3	5.90 - 6.80	5.70	0.89	5.20 - 6.50	5 - 10
Hematocrit, Ht	%	26.30	0.5	25.00 - 34.00	32.20	0.30	30.60 - 35.00	24 - 46
Haemoglobin, Hb	g/dl	8.80	0.4	8.20 - 10.40	12.60	0.35	10.30 - 13.70	8 - 15
VEM	μ ³	50.38	3.8	42.00 - 50.00	57.40	4.60	45.00 - 58.80	40 - 60
HEM	pg	16.85	2.8	13.90 - 15.30	22.10	3.20	19.80 - 24.00	11 - 18
CHEM	g/dl	33.08	2.4	32.80 - 34.00	39.10	2.30	33.60 - 40.00	26 - 34
Total number of leukocytes	x 10 ³ / μl	9.35	0.7	8.80 - 11.70	7.26	1.04	7.20 - 7.30	4 - 12
Lymphocytes	%	54.95	3.5	50.00 - 58.00	58.66	2.80	56.00 - 60.00	40 - 60
Neutrophils	%	34.25	2.2	33.00 - 36.00	35.66	1.60	32.00 - 38.00	15 - 47
Eosinophils	%	4.30	0.3	4.20 - 4.50	2.00	1.00	1.80 - 2.20	2 - 10
Basophiles	%	2.30	0.3	2.00 - 2.60	1.66	0.33	1.00 - 2.30	0 - 4
Monocytes	%	4.20	0.3	2.00 - 6.40	2.10	1.00	1.20 - 3.00	2 - 6

\bar{X} - average

E₃ - cows with *postpartum anestrus*

M₂ - healthy cows found at advanced lactation, 3-6 months

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Derivatives of erythrocytes (VEM, HEM and CHEM) have recorded increased values in both groups, correlated to the erythrocyte number. The variations of erythrocyte derivatives varied between the following mean values: VEM between 50.38 ± 6.30 (E_2 Group) and 57.40 ± 4.60 (M_2 Group), HEM between 22.1 ± 3.20 (M_2 Group) and 23.5 ± 2.30 (E_2 Group), CHEM between 33.08 ± 2.3 (E_2 Group) and 39.1 ± 2.3 (M_2 Group).

Total number of leukocytes ($\times 10^3/\mu\text{l}$) has recorded slightly increased values in cows with chronic genital infections (E_2 Group) (8.20 ± 2.12), compared to healthy cows (M_2 Group) (7.26 ± 1.04). The differences between groups were insignificant.

The analysis of leukocyte fractions pointed out some variations between the experimental and the control group, which were insignificant. In cows from the E_2 Group, neutrophils had an average value of 39.5 ± 0.67 , while the M_2 control had 35.66 ± 1.66 .

Lymphocytes had lower values in cows from the E_2 Group, while eosinophils (3.70 ± 0.20), basophiles (2.80 ± 0.30) and monocytes (1.70 ± 0.20) had slightly increased values, compared to the control group. The differences were insignificant (*Table 3*).

In cows with reproduction troubles shown by repeated inseminations (E_4 Group), the values of erythrocyte indices had some variations, compared to the cows from

the M_2 Group, found at advanced lactation, determined by the stage of lactation.

Number of erythrocytes (E , $\times 10^6/\mu\text{l}$) in cows from E_4 Group had lower average values (5.21 ± 0.85), compared to the cows of the control group, found at advanced or late stages of lactation, with variations between 5.32 ± 0.45 (M_3 Group) and 5.70 ± 0.89 (M_2 Group). The values were situated to the lower limit of reference data ($5-10 \times 10^6/\mu\text{l}$), proving anaemia while lactation advanced.

Hematocrit (Ht, %) in cows from E_4 Group has shown a mean value of 31.6 ± 1.10 , while in cows of the control group, variations were between 30.8 ± 0.50 (M_3 Group) and 32.2 ± 0.30 (M_2 Group).

Haemoglobin (Hb, g/dl) in cows from E_4 Group had an average value of 10.4 ± 0.42 , lower than in control groups, where the values varied between 11.5 ± 0.66 (M_3 Group) and 12.6 ± 0.35 (M_2 Group).

Analysing the erythrocyte constants in dynamics, from early to advanced stage of lactation (M_1 Group) and late stage of lactation (M_3 Group), we have found a progressive decrease of the mean number of erythrocytes from 6.40 ± 0.35 (M_1 Group) til 5.70 ± 0.89 (M_2 Group) and, 5.21 ± 0.85 respectively (M_3 Group), of the hematocrit from 34.2 ± 0.30 (M_1 Group) to 32.2 ± 0.30 (M_2 Group) and, 30.8 ± 0.50 (M_3 Group), as well as the increase of hemoglobin from 10.6 ± 0.20 (M_1 Group) to 12.6 ± 0.35 (M_2 Group), then a slight diminution until 11.5 ± 0.66 (M_3 Group).

Table 4 – Mean values and statistical parameters for the number of erythrocytes (E), hematocrit (Ht), haemoglobin (Hb) and derived erythrocyte constants (VEM, HEM, CHEM) in E₄, M₂, M₃ groups

Specification	Cow groups								
	E ₄			M ₂			M ₃		
	\bar{X}	±Sx	Variation limits	\bar{X}	±Sx	Variation limits	\bar{X}	±Sx	Variation limits
E (x 10 ⁹ /μl)	5.21	0.85	4.90- 7.50	5.70	0.89	5.20- 6.50	5.32	0.45	4.75- 5.80
Ht (%)	31.60	1.10	24.90-45.50	32.20	0.30	30.60-35.00	30.80	0.50	29.00-34.50
Hb (g/dl)	10.40	0.42	8.30-14.30	12.60	0.35	10.30-13.70	11.50	0.66	10.50-14.00
VEM (μ ³)	60.60	5.24	58.00-62.00	57.40	4.60	45.00-58.80	58.11	6.27	57.00-61.70
HEM (pg)	19.90	1.83	18.00-21.00	22.10	3.20	19.80-24.00	21.60	2.30	22.10-24.10
CHEM (g/dl)	32.90	1.49	30.20-34.80	39.10	2.30	33.60-40.00	37.30	1.72	36.20-40.60
Leucocytes x 10 ³ /μl	11.70*	0.30	10.30-13.10	7.26	1.04	7.20- 7.30	7.13	1.12	6.50- 7.70
Lymphocytes %	43.40*	1.51	43.00-51.00	58.66	2.80	56.00-60.00	56.30	1.85	54.00-58.00
Neutrophils %	46.40*	0.31	45.00-56.00	35.66	1.60	32.00-38.00	35.00	0.67	34.00-36.00
Eosinophils %	4.50*	0.52	4.00- 5.00	2.00	0.10	1.80- 2.20	4.00	0.81	3.80- 4.20
Basophiles %	1.60	0.34	1.20- 2.10	1.66	0.33	1.00- 2.30	2.00	0.40	1.80- 2.00
Monocytes %	4.10*	0.32	3.80- 4.40	2.10	0.15	1.20- 3.00	2.66	0.33	2.40- 2.70

E₄– repeated inseminated cows

M₂– healthy cows at advanced lactation, 3-6 months

M₃ – healthy cows at early lactation, 6- 7 months

* (p<0.05)

THE HEMATOLOGIC PROFILE IN CATTLE WITH REPRODUCTIVE DISEASES

The erythrocyte derivatives (VEM, HEM, CHEM) have recorded average values situated to the upper limit of reference data, in the cows of the E₄ Group being slightly increased, compared to the cows of the control group.

The erythrocyte derivatives varied between the following mean values: VEM 60.6±5.24 in cows from E₃ Group and between 57.40±4.60 (M₂ Group)- 58.11±6.27 (M₃ Group); HEM 19.9±1.83 in cows from E₃ Group and between 21.6±2.30 (M₃ Group)- 22.1±3.20 (M₂ Group), while CHEM 32.9±1.49 (E₃ Group) and between 37.3±1.72 (M₃ Group)- 39.1±2.30 (M₂ Group) in cows of the control groups.

The total number of leucocytes ($\times 10^3/\mu\text{l}$) has recorded slightly increased values in cows with repeated inseminations (E₄ Group) (11.7 ±0.3), compared to the cows of the control group, where oscillations varied between 7.13 ±1.12 (M₃ Group) and 7.26 ±1.04 (M₂ Group), the differences between groups being significant ($p<0.05$) (Table 4).

The analysis of leukocyte fractions (%) has shown in the cows with repeated inseminations (E₄ Group) the following aspects: the increase of neutrophils until the average value of 46.40±0.31, situated to the upper limit of reference data (15-47%), compared to the control groups where values were close, 35.0 ± 0.67 (M₃ Group) – 35.66 ± 1.60 (M₂ Group), showing a chronic inflammation of uterus that may cause the embryo mortality and repeated periods in cows; lower values of lymphocytes (43.40±1.51) to the

lower limit of reference data, compared to the control groups where variations were between 56.30±1.85 (M₃ Group) – 58.66±2.80 (M₂ Group), the differences between E₄ Group and M₂ and M₃ control groups being significant ($p<0.05$); high values of eosinophils (4.5±0.52) and monocytes (4.10± 0.32), with significant differences to the control groups $p<0.05$).

The obtained results pointed out that reproductive troubles in cows were produced by metabolic deficiencies causing hormonal and immune troubles, directly proportional to the changes of their metabolic nutrition condition. Many studies have shown that the vital functions had at their basis the metabolic phenomena and, therefore, all the pathological processes were linked to the quantitative or qualitative changes of the metabolism (Dumitru, 1996; Fabry, 1993; Ferguson, 1991).

Establishing the metabolic profile for each cow group, especially for those with high milk yields that have higher and complex nutritive requirements may be a useful test for preventing some troubles by the permanent evaluation of metabolic nutritional integrity, early diagnosis and immediate adjustment of the fodder ratio.

CONCLUSIONS

The cows with puerperal genital infections have shown variations of hematologic parameters, compared to the healthy cows at the early stage of lactation (M₁ Group), pointed out by

lower values of erythrocytes, hematocrit and hemoglobin and higher values of the total number of leukocytes represented by neutrophils.

The cows having chronic genital infections (E₂ Group) recorded some variations compared to the healthy cows found at the advanced stage of lactation (M₂ Group), shown by lower values of the number of erythrocytes, hematocrit and hemoglobin and higher levels number of leukocytes and neutrophils.

Healthy cows in dynamics from early stage (M₁ Group) to the advanced stage (M₂ Group) have recorded some variations of erythrocyte constants determined by the increasing level of milk production, shown by the diminution of the average number of erythrocytes and hematocrit and the moderate increase from 10.6 ± 0.20 until 12.6 ± 0.35 .

The cows with postpartum anestrus (E₃ Group) have variations compared to the healthy cows found at the stage of advanced lactation (M₂ Group), shown by low values to the lower limit of the species in both groups as concerns number of erythrocytes and quantity of hemoglobin and the total number of leukocytes with slightly increased values and neutrophil weight, situated over the average of reference data.

The cows with repeated services (E₄ Group) compared to the cows found at advanced lactation (M₂ Group) have shown that the number of erythrocytes was situated to the lower level of physiological data in both groups, hematocrit and haemoglobin at the level of the mean

values of the species, while the total number of leukocytes had slightly increased values to the upper limit of reference data, represented by neutrophils.

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