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THE BIOCHEMICAL PROFILE IN COWS WITH REPRODUCTIVE DISORDERS

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ABSTRACT - Studies have been conducted in the Dancu Research and Development Station for Cattle Breeding, Iaşi County, dairy farm, on Romanian Frisean (BNR) cows. Investigations on the biochemical profile were made in cows with reproductive disorders and in clinically healthy cows at different stages of lactation. There were made groups of 10 cows: four experimental groups of cows with puerperal genital infections (E_1), cows with chronic genital infections (E_2), postpartum anestrus cows (E_3), cows with repeated matings (E_4) and three control groups of cows in lactation stage: early, 0-2 months (M_1), advanced, 4-6 months, (M_2) and late, 6-7 months (M_3). Results showed some biochemical changes in relation to the type of reproductive disorders and the stage of lactation: in cows with puerperal genital infections (group E_1), compared with M_1 group, have been found elevated mean values of serum globulin (62.70 %) and serum enzymes - ALT (45.50 ± 0.2 U / l) and values below the species inferior limit of serum enzymes - AP (7.19 ± 2.2 U / l) and of phosphatemia. In cows with chronic genital infections (group E_2), compared with M_2 group, the biochemical prophile showed low levels of total serum protein (6.30 ± 0.64 to 9.14 ± 0.5 g / dl) ($p < 0.05$), of serum urea (16.00 ± 0.3 mg / dl), alkaline reserve, calcium (8.9 ± 0.10, respectively, 11.42 ± 2.10 mg / dl) and of serum enzymes - AST, GGT and AP, indicating some liver and calcium-phosphorus metabolism disorders, and elevated values to the species upper limit, in terms of cholesterol and serum enzymes – ALT. In cows with postpartum anestrus (E_3 group), compared with cows in M_2 group were found slightly higher average values of serum albumin (45.55 ± 0.4 to 40.0 ± 1.5), mean values that are above the species upper limit for the serum enzymes - ALT and low average values to the lower limit for serum urea, alkaline reserve, alkalin phosphatase and Ca/P ratio. In cows with repeated matings (E_4 group), compared with M_2 and M_3 groups have been revealed decreased mean values of serum total protein (g/dl), (6,7±0,6 compared to 8,3±0,6, respectively 9,14±0,5), and increased values to the upper limit for serum albumin (%), (53,73±0,6 compared to 40,0±1,5, respectively 45,40±0,4), low values for serum ureea (7,3±0,2 mg/dl), blood glucose, alkaline reserve, alkaline phosphatase, calcemia, phosphatemia and

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increased values above the higher limit for serum enzymes – ALT (U/l) (67,4±3,6).

Key words: Dairy cows; Reproductive disorders; Lactation stage; Biochemical profile.

REZUMAT – Profilul biochimic la vaci cu tulburări de reproducţie. Studiile au fost efectuate în ferma de vaci pentru lapte, rasa Bălţată cu Negru Românească (BNR), în cadrul S.C.D.C.B Dancu, Iaşi. S-au efectuat investigaţii privind profilul biochimic la vaci cu tulburări de reproducţie şi la vaci sănătoase clinic în diferite stadii de lactaţie. S-au constituit loturi a câte 10 animale: patru loturi experimentale din vaci cu infecţii genitale puerperale (E_1), vaci cu infecţii genitale cronice (E_2), vaci cu anestru postpartum(E_3), vaci cu monte repetate (E_4), precum şi trei loturi martor din vaci în stadiul de lactaţie: timpurie, 0-2 luni (M_1), avansată, 4-6 luni, (M_2) şi târzie, 6-7 luni, (M_3). Rezultatele au evidenţiat unele variaţii ale constantelor biochimice în raport cu tipul tulburărilor de reproducţie studiate şi stadiul lactaţiei: *la vacile cu infecţii genitale puerperale (lot E_1), comparativ cu lotul M_1,* s-au constatat valori medii crescute ale globulinelor serice (62,70%) şi enzimelor serice ALT (45,50±0,2 U/l) şi valori sub limita inferioară a speciei ale enzimelor serice FA (7,19±2,2 U/l) şi fosforemiei. *La vacile cu infecţii genitale cronice (lot E_2), comparativ cu lotul M_2* constantele biochimice au prezentat niveluri scăzute ale proteinelor serice totale (6,30±0,64 faţă de 9,14±0,5 g/dl), ($p<0,05$), ale ureei serice (16,00±0,3 mg/dl), ale rezervei alkaline, ale calciului (8,9±0,10 şi, respectiv, 11,42±2,10 mg/dl) şi ale enzimelor serice AST, GGT şi FA, indicând unele tulburări hepatice şi ale metabolismului fosfo-calcic, şi niveluri crescute spre limita superioară ale specie, în ceea ce priveşte colesterolul şi enzimele serice ALT. *La vacile cu anestru postpartum (lot E_3), comparativ cu vacile din lotul M_2,* s-au constatat valori medii uşor crescute ale albuminelor serice (45,55±0,4 faţă de 40,0 ±1,5), valori medii crescute peste limita superioară a enzimelor serice ALT şi valori medii scăzute spre limita inferioară a speciei pentru ureea serică, rezerva alcalină, fosfataza alcalină şi raportul Ca/P. La *vacile cu monte repetate (lot E_4), comparativ cu loturile martor M_2 şi M_3,* s-au constatat valori medii scăzute ale proteinelor serice totale (g/dl), (6,7±0,6 faţă de 8,3±0,6 şi, respectiv, 9,14 ±0,5), cu niveluri crescute spre limita superioară a albuminelor serice (%), (53,73±0,6 faţă de 40,0±1,5 şi, respective, 45,40±0,4), valori scăzute pentru ureea serică (7,3±0,2 mg/dl), glicemie, rezerva alcalină, fosfataza alcalină, calcemia, fosforemia şi valori crescute peste limita superioară a enzimelor serice *ALT (U/l)* (67,4±3,6).

Cuvinte cheie: vaci pentru lapte; tulburări de reproducţie; stadii de lactaţie; profil biochimic.

INTRODUCTION

The normal development of metabolic processes depends on the exogenous contribution of the major nutrients, energy, protein, vitamins and minerals, their absence causing serious metabolic disorders, with negative implications for animal health in general and also on the reproductive function, in particular (Cotruţ *et al*., 1990; Dumitru, 1996; Fabry, 1993; Ferguson, 1991; Ghergariu, 1990; Pârvu, 1992).

A dietary deficiency causes metabolic, endocrine and nervous disorders, disturbing the activity of hypothalamic-pituitary-ovarian system, with negative effects on the process of breeding, ovogenesis and folliculogenesis, extending the postpartum anestrus period and decreasing fertility indices in cows

(Baudet,1990; Bogdan *et al*.,1994; Fabry, 1993; Ferguson, 1991; Ghergariu, 1990; Johnson and Evans, 1992).

This paper aims to analyze the biochemical profile in dairy cows with various reproductive disorders, compared with clinically healthy cows at different stages of lactation.

MATERIALS AND METHODS

Studies have been conducted in the Dancu Research and Development Station for Cattle Breeding, Iași County, dairy farm, on Romanian Frisean (BNR) cows, during 2008. Biochemical investigations were carried out by determining the following parameters: total serum protein, protein fractions (albumin, globulins) , urea, glucose, cholesterol, alkaline reserve, enzymatic (ALT, AST, GGT, AP) and mineral profile (Ca, P, Mg).

Determinations were made by an automatic biochemical analyzer, Accent 200, from blood serum samples obtained from the collection of blood without anticoagulant with serum expression in two hours at laboratory temperature, using specific reagents.

There were groups consisting of 10 heads of cows: four different experimental groups of cows with reproductive disorders caused by puerperal genital infection (E_1), chronic genital infections (E_2), postpartum anestrus (E_3) or repeated matings (E_4) and three control groups of clinically healthy cows, in different lactation stages: early, 0-2 months (M_1), advanced, 4-6 months, (M_2), late, 6-7 months (M_3).

The recorded biochemical parameters were compared to those obtained in healthy and with reproductive disorders cows and in relation to the indicated literature.

RESULTS AND DISCUSSION

The analysis of the results obtained on biochemical serological indices in cows with reproductive disorders have revealed different variations, depending on the type of reproductive disorders, and also the stage of lactation.

The values of blood biochemical constants in cows with puerperal genital infections (E_1 group), compared with clinically healthy cows (M_1 group), are presented suggestive in tables.

In cows with puerperal genital infections (E_1 group), total serum protein (g/dl) had average values of 6.74±0.15 which were located to the species lower limit (7 to 8.5 g/dl) levels lower than those in M_1 group (7.64±0.18), with values of 62.70% of the serum globulin located above the upper limit of reference data (58-60%), specific situation to the acute inflammation process in the uterus *(Table 1)*.

However, in the E_1 group, there was a slight decrease in blood glucose levels (50.7±1.9 mg/dl), a decrease to the lower limit for the alkaline reserve (21±1.9 mEq/l), and increased ALT levels to 45.5±0.2 IU/l, suggesting hepatic dysfunction (Ghergariu, 1990; Pârvu, 1992).

Table 1 - Biochemical values in cows with puerperal genital infections (E_1 group) and in healthy cows, early lactation, 0-2 months (M_1 group)

No.	Parameter	MU	Groups of cows						Reference data
			E_1			M_1			
			$\bar{X}$	±Sx	Variation limits	$\bar{X}$	±Sx	Variation limits	
1	**Serum total protein**	g/dl	6.74	0.15	5.9 - 7.2	7.64	0.18	6.5 - 7.9	7.0 - 8.5
2	**Albumin**	%	38.30	0.70	40.0 - 45.0	41.00	1.20	38.0 - 44.0	40.0
3	**Globulin**	%	62.70	0.50	45.0 - 60.0	59.00	1.20	52.0 - 56.0	60.0
4	**Ureea**	mg/dl	28.50	1.40	20.0 - 30.0	23.35	1.90	20.0 - 26.0	20.0 - 40.0
5	**Glucose**	mg/dl	50.70	1.90	48.6 - 58.0	54.00	1.60	50.0 - 58.0	45.0 - 80.0
6	**Cholesterol**	mg/dl	163.5	15.00	146.0 - 173.0	215.8	6.70	170.0 - 260.0	100.0 - 200.0
7	**Alkaline reserve**	mEq/l	21.00	1.90	16.0 - 26.0	17.66	1.70	16.0 - 20.0	20.0 - 28.0
8	**ALT**	U/l	45.50	0.20	30.5 - 59.5	35.50	0.50	25.0 - 45.0	6.9 - 35.3
9	**AST**	U/l	30.10	1.50	25.0 - 35.0	50.10	1.90	45.0 - 65.2	45.3 - 110.2
10	**GGT**	U/l	2.82	0.40	2.5 - 3.1	12.82	0.30	10.5 - 15.1	4.9 - 25.7
11	**AP**	U/l	7.19	2.20	6.2 - 8.2	12.90	3.40	10.0 - 15.8	20.0 - 26.0
12	**Ca**	mg/dl	8.40	0.26	7.5 - 9.3	10.09	1.10	9.0 - 12.5	8.0 - 11.0
13	**P**	mg/dl	5.46	0.16	5.2 - 5.7	5.88	3.60	5.5 - 6.3	5.5 - 10.0
14	**Mg**	mg/dl	2.42	0.05	2.0 - 2.8	2.26	0.20	2.0 - 2.4	1.9 - 2.5
15	**Ca/P**		1.5		1.4 - 1.6	1.70		1.6 - 1.9	

Table 2 - Biochemical values in cows with chronic genital infections (E_2 group) and in healthy cows (M_2 group)

No.	Parameter	MU	Groups of cows						Reference data
			E_2			M_2			
			$\bar{X}$	±Sx	Variation limits	$\bar{X}$	±Sx	Variation limits	
1	**Serum total protein**	g/dl	6.30	0.64	4.0 - 8.6	9.14	0.50	8.2 - 10.1	7.0 - 8.5
2	**Albumin**	%	40.00	2.40	35.0 - 42.0	37.00	1.50	38.0 - 42.0	40.0
3	**Globulin**	%	60.00	3.20	58.0 - 65.0	63.00	2.10	58.0 - 62.0	60.0
4	**Ureea**	mg/dl	16.00	0.30	14.0 - 30.0	18.31	1.20	11.0 - 26.0	20.0 - 40.0
5	**Glucose**	mg/dl	52.80	0.40	47.0 - 57.0	58.00	1.60	45.0 - 71.0	45.0 - 80.0
6	**Cholesterol**	mg/dl	228.00	17.70	188.0 - 268.0	227.00	5.40	149.0 - 245.0	100.0 - 200.0
7	**Alkaline reserve**	mEq/l	13.00	5.71	12.0 - 14.0	16.66	3.60	15.0 - 18.0	20.0 - 28.0
8	**ALT**	U/l	61.20	6.58	42.0 - 80.0	33.09	2.50	11.2 - 64.5	6.9 - 35.3
9	**AST**	U/l	33.80	2.63	32.0 - 36.0	35.30	3.10	30.0 - 45.0	45.3 - 110.2
10	**GGT**	U/l	5.13	0.79	5.0 - 5.3	3.99	0.60	3.5 - 4.4	4.9 - 25.7
11	**AP**	U/l	20.89	2.90	18.0 - 23.9	4.11	2.30	8.0 - 9.5	20.0 - 26.0
12	**Ca**	mg/dl	8.90	0.10	8.3 - 10.0	11.42	2.10	10.5 - 12.3	8.0 - 11.0
13	**P**	mg/dl	6.36	2.70	6.0 - 6.8	8.92	3.30	7.2 - 8.2	5.5 - 10.0
14	**Mg**	mg/dl	2.26	0.13	2.0 - 2.6	2.43	0.20	2.0 - 2.8	1.9 - 2.5
15	**Ca/P**		1.4		1.3 - 1.5	1.3		1.4 - 1.5	

Mineral profile showed the following: serum calcium, with a mean value of 8.40 ±0.26 (E_1 group) to the species lower limit (8-11 mg/dl), lower than those obtained in group M_1 cows (10,09±1.10); phosphatemia, to the species lower limit (5.5 to 10 mg/dl), with oscillations between 5.46±0.16 (E_1 group) and 5.8±3.4 (M_1 group), a Ca/P ratio of 1.5 (E_1 group), located to the lower limit of variation, and 1.7 (M_1 group), located at the average reference data (1.5 - 2).

In cows with chronic genital infection (E_2 group), total serum protein (g/dl) had a mean value of 6.30±0.64, which was located to the species lower limit (7 to 8.5 g/dl) level lower than that obtained in M_2 group of cows (9.14±0.5) ($p<0.05$), accounting for 60.00% of the serum globulin *(Table 2)*.

However, in E_2 group, there was a slight decrease in blood glucose (51.8±0.4 mg/dl), increased ALT (61.20±6.58 IU / l) and decreased alkaline reserve (13±5.71 mEq/l), suggesting an association of liver dysfunction and latent metabolic acidosis.

The mineral profile in cows with chronic genital infection revealed a slight decrease in serum calcium (8.9±0.10 to 11.42±2.10 mg/dl in M_2 group) and a fall in the Ca/P ratio of 1.3 to 1.4, suggesting phosphocalcic metabolic disturbance.

In cows with postpartum anestrus (E_3 group), total serum protein (g / dl) had a mean value of 7.4 ± 0.6, located to the species lower level (7 to 8.5 g / dl), revealing a lower level compared to cows in M_3 group (9.14 ± 0.5) who had their values to the species upper limit, due to the advanced stage of lactation *(Table 3)*.

Serum proteins have been slightly elevated in cows in E_3 group (45.55± 0.4) compared to control group (40.0 ± 1.5), and serum globulin values were within normal limits, the oscillations being between 53.0 (M_3 group) - 54.45 (E_3 group).

Urea, glucose and cholesterol values were located in the physiological limits.

Alkaline reserve (mEq / l) showed in both groups decreased values below the species lower limit of variation, but lower in cows with postpartum anestrous (E_3 group), compared with cows in M_2 group (14.66 ± 2.6, respectively, 16.66 ± 3.6), indicating a latent state of metabolic acidosis.

Of the serum enzymes in cows with postpartum anestrous (E_3 group), ALT recorded values above the species upper limit, 54.4 ± 7.1 IU / l, indicating liver disorders. AST had an average value of 30.0 ± 4.5 IU / l within physiological limits, and GGT averaged 20.5 ± 3.5 IU / l, located at the upper limit and significantly increased compared to M_3 group.

Alkaline phosphatase, AP (U / l) in cows with postpartum anestrous had an average value of 21.0 ± 2.9 located at the lower level of variation (20.0-26U / l), indicating phospho-calcium metabolism disorders.

Table 3 - Biochemical values in cows with postpartum anestrus (E_3 group) and in healthy cows, advanced lactation stage, 3-6 months (M_3 group)

No.	Parameter	MU	Groups of cows						Reference data
			E_3			M_3			
			$\bar{X}$	±Sx	Variation limits	$\bar{X}$	±Sx	Variation limits	
1	**Serum total protein**	g/dl	7.40	0.60	7.1 - 7.7	9.14	0.50	8.2 - 10.1	7.0 – 8.5
2	**Albumin**	%	45.55	0.40	40.0 - 45.0	40.00	1.50	38.0 - 42.0	40.0
3	**Globulin**	%	54.45	0.50	55.0 - 60.0	53.00	2.10	58.0 - 62.0	60.0
4	**Ureea**	mg/dl	23.50	0.80	20.0 - 26.0	18.31	1.20	11.0 - 26.0	20.0 - 40.0
5	**Glucose**	mg/dl	50.70	2.80	43.8 - 57.9	58.00	1.60	45.0 - 71.0	45.0 - 80.0
6	**Cholesterol**	mg/dl	142.06	12.00	125.0 - 159.0	172.00	5.40	149.0 - 245.0	100.0 - 200.0
7	**Alkaline reserve**	mEq/l	14.66	2.60	12.0 - 17.0	16.66	3.60	15.0 - 18.0	20.0 - 28.0
8	**ALT**	U/l	54.40	7.10	45.0 - 64.0	26.50	2.50	11.2 - 64.5	6.9 - 35.3
9	**AST**	U/l	30.00	4.50	25.0 - 35.0	35.30	3.10	30.0 - 45.0	45.3 - 110.2
10	**GGT**	U/l	20.50	3.50	15.0 - 26.0	3.99	0.60	3.5 - 4.4	4.9 - 25.7
11	**AP**	U/l	21.00	2.00	10.5 - 30.5	8.60	2.30	8.0 - 9.5	20.0 - 26.0
12	**Ca**	mg/dl	8.45	0.80	8.0 - 9.0	11.42	2.10	10.5 - 12.3	8.0 - 11.0
13	**P**	mg/dl	5.85	0.60	4.8 - 6.9	7.92	3.30	7.2 - 8.2	5.5 - 10.0
14	**Mg**	mg/dl	2.10	0.20	1.8 - 2.4	2.43	0.20	2.0 - 2.8	1.9 – 2.5
15	**Ca/P**		1.4		1.3 - 1.5	1.3		1.4 - 1.5	

Table 4 - Average values for serum proteins, urea, glucose, cholesterol and alkaline reserve in cows with repeated matings (E_4 group) and in healthy cows, advanced lactation stage (M_2 group) and late lactation (M_3 group)

No	Parameter	MU	Groups of cows								
			E_4			M_2			M_3		
			$\bar{X}$	±Sx	Variation limits	$\bar{X}$	±Sx	Variation limits	$\bar{X}$	±Sx	Variation limits
1	**Serum total protein**	g/dl	6.70	0.60	4.0 - 8.0	9.14	0.50	8.2 - 10.1	8.30	0.80	7.8 - 8.8
2	**Albumin**	%	53.73*	0.20	48.0 - 56.6	40.00	1.50	38.0 - 42.0	45.40	0.40	35.0 - 42.0
3	**Globulin**	%	46.24*	0.30	43.4 - 62.0	53.00	2.10	58.0 - 62.0	54.60	0.80	50.0 - 60.0
4	**Ureea**	mg/dl	7.30*	0.20	4.5 -10.9	18.31	1.20	11.0 - 26.0	25.00	1.60	20.0 - 30.0
5	**Glucose**	mg/dl	54.90	3.60	41.9 - 69.7	58.00	1.60	45.0 - 71.0	56.00	1.60	50.0 - 62.0
6	**Cholesterol**	mg/dl	172.00	10.60	122.0 - 222.0	172.0	5.40	149.0 – 245.0	228.0	17.0	180.0 - 280.0
7	**Alkaline reserve**	mEq/l	15.60	4.20	14.5 - 16.5	16.66	3.60	15.0 - 18.0	13.00	5.70	10.5 - 20.0

* $p<0.05$ - significant differences

Table 5 - Average enzymatic and mineral profile values in cows with repeated matings (E_4 group) and in healthy cows, advanced lactation stage, 3-6 months (M_2 group) and late lactation (M_3 group)

No.	Parameter	MU	Groups of cows								
			E_4			M_2			M_3		
			$\bar{X}$	±Sx	Variation limits	$\bar{X}$	±Sx	Variation limits	$\bar{X}$	±Sx	Variation limits
1	**ALT**	U/l	67.40	3.60	58.0 - 76.0	26.50	2.50	11.2 - 64.5	61.20	6.60	34.0 - 90.0
2	**AST**	U/l	32.50	3.42	30.0 - 35.0	35.30	3.10	30.0 - 45.0	33.80	2.60	23.0 - 45.0
3	**GGT**	U/l	4.23	0.45	4.0 - 4.5	3.99	0.60	3.5 - 4.4	5.13	0.79	4.2 - 6.5
4	**FA**	U/l	22.42	2.50	20.0 - 24.8	8.60	2.30	8.0 - 9.5	15.89	2.90	12.5 - 16.5
5	**Ca**	mg/dl	9.20	0.50	8.6 - 10.8	11.42	2.10	10.5 - 12.3	10.70	2.30	8.6 - 11.9
6	**P**	mg/dl	5.20	0.30	5.0 - 5.6	7.92	3.30	7.2 - 8.2	7.60	1.70	6.5 - 7.5
7	**Mg**	mg/dl	2.00	0.12	1.8 - 2.2	2.43	0.20	2.0 - 2.8	2.40	0.10	2.2 - 2.6
8	**Ca/P**		1.8		1.7 - 1.9	1.3		1.4 - 1.5	1.4		1.3 - 1.6

The mineral profile in cows with postpartum anestrus (E_3 group) revealed lower values for serum calcium level, 8.45 ± 0.8, and phosphatemia, from 5.85 ± 0.6, a Ca / P ratio of 1.4, located to the species lower limit, and normal magnesium values.

In cows with repeated matings (E_4 group), total serum protein had lower mean values of 6.7 ± 0.6, below the species lower limit (7 to 8.5 g / dl), this level being lower than that obtained in M_2 (8.3 ± 0.6) and M_3 control groups of cows (9.14 ± 0.5), differences between groups being significant ($p < 0.05$) *(Table 4)*.

Serum proteins in cows in E_4 group had increased up to 53.73 ± 0.6, located to the species upper limit, and in cows from control groups in normal range, with oscillations between 40.0 ±1.5 (M_2)- 45.40 ± 0.4 (M_3), ($p < 0.05$). Serum globulin values were 46.24 ± 0.3 (E_4 group) and 53.0 ± 2.1 (M_2 group) and 54.6 ± 0.8 (M_3 group), located in the normal range of the species.

Urea, glucose and cholesterol values were located in the physiological limits.

Alkaline reserve (mEq / l) showed decreased values below the species lower limit of variation in all groups of cows. Cows with repeated matings (E_4 group) had a mean value of 15.6 ± 4.2, and cows in the control groups, from 13.0 ± 5.7 (M_3 group) to16, 66 (M_2 group), indicating a latent state of metabolic acidosis.

Serum enzymes profile recorded some changes of ALT (U / l) in the E_4 group, compared with control groups. So, that in cows with repeated matings in E_4 group, and late lactation cows in M_3 group were found average values of 67.4 ± 3.6, respectively, 61.0 ± 6.6, located above the top of reference data, indicating liver disorders. AST, GGT and alkaline phosphatase showed normal values within the species limits *(Table 5)*.

The mineral profile in cows with repeated matings (E_4 group) indicated the following average values: serum calcium, 9.2 ± 0, a lower level than that obtained in the control groups, where oscillations were between 10.70 ± 2.3 (M_3 group) and 11.42 ± 2 (M_2 group); phosphatemia, 5.2 ± 0.3, located to the species lower limit level, also lower than that in the control groups, the variations being between 7 6 ± 1.7 (M_3 group) and 7.92 ± 3.3 (M_2 group) with a Ca / P ratio of 1.8 (E_4 group) and between 1 0.3 to 1.4 (M_2 and M_3 groups).

Studies have shown some changes in biochemical metabolic profile in cows with reproductive disorders, compared with clinically healthy cows that are in various stages of lactation.

Similar results were found by other authors, which showed that hypoglycaemia, which is established as a result of energy shortage, determine, in cows problems with hypothalamic-pituitary-ovarian axis, manifested through the reduction of hypothalamic releasing factors, the inhibition of anterior pituitary and gonadotropic hormone secretion and

the ovarian activity stagnation, with negative effects on the maturation of de Graaf follicles, extending the postpartum anestrus. Protein deficiency in cattle causes uterine subinvolution often complicated by lochial discharge and metritis, due to lack in defensive mechanisms and extended anestrus after birth. Excess protein increases the incidence of the retention of fetal annexes, genital infections and low fecundity. Disorders in mineral metabolism, also affects female reproductive function, directly or indirectly through related mechanisms. Although cattle have the most mineral efficient homeostatic mechanisms that ensure maintenance of optimal blood levels, however, in the industrial system conditions, intake regulating is sometimes less feasible, because severe and prolonged shortages of mineral salts cannot be corrected even by the mobilization of tissue reserves (Bogdan *et al*., 1984; Dumitru, 1996; Ferguson, 1991; Ghergariu, 1990; Johnson and Evans, 1992; Pârvu, 1992; Pârvu *et al*., 1996; Trif and Vior, 1996).

Economic damage of these nutritional metabolic disorders are high due to the often subclinical evolution, which determine reduced production efficiency, reproductive disorders and increased mortality in neonates.

In this context, ongoing assessment of nutritional metabolic integrity by determining the metabolic profile of each herd in different physiological states or stages of production, is a useful diagnostic method for early prediction of group diseases and for taking corrective measures to fodder ratio.

CONCLUSIONS

Biochemical parameters in cows with puerperal genital infections (E_1 group) recorded the following changes, compared with M_1 group: lower levels of total serum protein and increased values in serum globulin (62.70%); elevated serum enzymes: ALT (U / l) above the species upper limit (45.50 ± 0.2) and low values to the species lower limit in terms of alkaline reserve, serum enzymes AST, GGT, AP, serum calcium and phosphatemia indicating a state of metabolic acidosis, liver and some calcium-phosphorus metabolism disorders.

Biochemical constants in cows with chronic genital infection (E_2 group) had some changes compared to healthy cows in M_2 group: total serum protein (g / dl) - lower level (6.30 ± 0.64 to 9.14 ± 0.5), ($p < 0.05$), with higher proportion of serum globulin to the upper limit of the species; serum urea (mg / dl) - below the species limit; glucose (mg / dl), between 52 8 ± 0.4 (E_2 group) and 58.0 ± 1.6 (M_2 group); cholesterol, higher level than the species limit; alkaline reserve, below the lower limit of the species in both groups of cows, indicating a state of metabolic acidosis; serum enzymes, ALT (U / l), above the upper limit of the species, and AST (U / l), GGT (U / l) and FA (U / l) – to the lower limit of the species,

indicating some liver, calcium-phosphorus metabolism disorders; mineral profile: calcium (mg / dl), 8.9 ± 0.10 (E_2 group) to the lower limit of the species, lower than the level of the M_2 group (11.42 ± 2.10), phosphorus (mg / dl) 6.36 ± 2.70 (E_2 group), within the average reference values for M_2 group (8.92 ± 3.3) and magnesium within normal limits.

In cows with postpartum anestrous (E_3 group) the following variations were found compared to healthy cows in M_2 group: total serum protein (g / dl) - below the species lower limit, a lower level compared with cows in M_2 group (7.4 ± 0.6 to 9.14 ± 0.5); serum albumin - slightly elevated; serum urea (mg / dl) - towards the lower limit; alkaline reserve below the inferior limit in both groups; serum enzymes - ALT, above species upper limit, and alkaline phosphatase, AP, to the lower limit, indicating calcium-phosphorus metabolism disorders; mineral profile - lower values for serum calcium and phosphatemia with a Ca / P ratio of 1.4.

In cows with repeated matings (E_4 group) were found the following average values, compared with cows in the control groups M_2 and M_3: a lower level of total serum protein (g / dl), than that showed in control groups (6.7 ± 0.6 vs. 8.3 ± 0.6, respectively, 9.14 ± 0.5); serum albumin (%) was elevated to the upper limit of the species (53.73 ± 0.6 to 40.0 ± 1.5, respectively 45.40±0.4); serum urea (mg/dl) had average values below the species lower limit (7.3±0.2); alkaline reserve – below the species inferior limit in all groups of cows; serum enzymes, ALT, higher than the species upper level (U / l) (67.4 ± 3.6); lower values of serum calcium and phosphatemia than those observed in control groups and to the species lower level, indicating some liver and calcium-phosphorus metabolism disorders.

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