

CORRELATION BETWEEN THE VALUES OF SOME ERYTHROCYTE AND SIDEREMY PARAMETERS IN COWS DURING LATE PREGNANCY AND IN THEIR CALVES

**N. AVRAM¹, Cristina ȚOCA², D. CUCĂ¹, Cristina DINU¹,
Cristiana DIACONESCU¹, Monica PĂRVU¹, Carmen BERGHES¹**

Abstract

The investigation monitored some haematological and biochemical parameters that characterise iron metabolism in cows during the last month of pregnancy and in their calves during the first three days of life. Haemoglobin and hematocrit were 11.8% and 8.5%, respectively, lower and sideremy was 34.5% higher in the pregnant cows that were cared for improperly, with low protein diets, compared to the cows that received proper diets. The newborn calves from the cows maintained and fed properly had 5.6% and 7.9% values for haemoglobin and, respectively, hematocrit than the calves that resulted from improperly nourished cows. In both categories of calves sideremy had lower values, close to the lower physiological limit, which requires the preventive supplemental with iron of the newborn calves. At birth calves weight was positive correlated with their haemoglobin value and those of their mothers too.

Key words: haemoglobin, hematocrit, sideremy, pregnant cows, new born calves

Introduction

The major role iron plays in the organism consists of it transporting and preserving oxygen by means of haemoglobin and myoglobin. Nevertheless, being a mineral addicted enzyme, iron is responsible for the control of catalase and peroxidase, reactive oxygen species, involved in oxygen extraction from oxygenated water, while by means of citocromoxidasa, iron plays an essential role in reducing the intracellular oxygen (4, 6).

Iron deficiency is responsible for the presence of hypochrom microcitar anaemia in almost all the species, except ruminants in which case we deal with normochrom microcitar anaemia. Feripriva anaemia is frequent in young animals and it is the result of the insufficient iron level in maternal milk or milk substitutes used to feed suckling calves, which at birth are characterized by small iron stocks. Iron deficiency can be the secondary effect of an insufficient capitalization of the iron quantity provided (1, 3, 5, 7).

The present study consists of an investigation regarding the relation existing between iron metabolism disturbances in late pregnancy cows and their calves, in the purpose of establishing some prophylactic and early curative anti-iron anaemia measures.

Materials and methods

The research was carried out in two cow-farms (A, B), during the February-May period. The farms presented particularities at the level of their maintenance and food providing (quantity and quality) systems, as well as at the level of their sanitary-veterinary status. A 35 three-four weeks antepartum pregnant cows group was created at the level of each farm, following the criteria of clinical health. The

¹ Faculty of Veterinary Medicine, *Spiru Haret* University.

² The Institute of Diagnosis and Animal Health, Bucharest.

animals were randomly chosen. In the first three days of life, the resulted calves were clinically examined and individually weight. Blood samples were collected in syringes with heparin from both categories of animals and the following parametres were determined: haemoglobin (Hb), using cianhaemoglobin, photocolorimetric method; hematocrit (Ht), by means of micro-method; total seric protein (Pt), by biuret method; sideremy (Fe) by o-fenantroline method; the total iron binding capacity (TIBC) was established by means of the same method like the one used in case of seric iron after being treated initially with magnezium carbonat; transferina's saturation coefficient (CS) was determined according to the calculation formula. The mean corpuscular volume (MCV) and the mean corpuscular haemoglobin concentration (MCHC) was determined by means of consecrated formulae (2).

Results and discussions

In comparison with cows in farm B, cows in farm A presented a good sustenance state, balanced and qualitative feeding, and less cases of illness in new born calves. Late pregnant and nursing cows in farm B presented bad sustenance conditions and improperly feeding. The results of the laboratory examinations were recast by arithmetical mean and standard deviation and afterwards statistically interpreted by means of the Student test. Haemoglobin and hematocrit were 13% and 8,8% respectively higher in the cows in farm A than in the cows in farm B (table 1).

Table 1
Values of some haematological and biochemical parameters ($\bar{X} \pm S\bar{X}$)
in advanced pregnancy cows

Specifica tion	Hb g/dl	PCV %	Pt g/ml	Iron μ g/dl	TIBC μ g/dl	CS %	MCV μ^3	MCHC g/dl
A	9.85	33.8	8.20	110.35	318.96	35.94	40	29.80
	0.90	3.10	0.80	12.10	29.80	3.40	3.75	3.20
B	8.70	30.5	7.60	150.14	308.14	49.27	32	28.32
	0.80	3.10	0.72	16.12	26.42	5.20	2.87	2.60
Normal values	8-11	25-35	7-8.5	100-150	250-320	30-40	40-60	27-35

The higher value of proteins in lot A was positively correlated with the better protein quota in feeds. The value of sideremy (table 1) was 36% higher in the cows form the lot B, than in the cows form lot A. The values of seric iron in animals belonging to lot B were correlated with the comparatively lower levels of haemoglobin and hematocrit, indicating the presence of deficiencies in iron metabolism mainly as a result of the low protein content of the feeds. The TIBC of animals in lot A was insignificantly higher than in lot B. The saturation value of transferina in the animals form the lot A was 27% lower than in the animals belonging to lot B. Haemoglobin and hematocrit values in calves during their first three days of life were higher in lot A than in lot B (table 2).

Table 2

Values of some haematological and biochemical values ($\bar{X} \pm S\bar{X}$)
in new born calves

	Hb g/dl	PCV %	Pt g/ml	Iron $\mu\text{g/dl}$	TIBC $\mu\text{g/dl}$	CS %	Weight (Kg)	MCV μ^3	MCHC g/dl
A	9.81	37.52	6.85	102.59	336.37	31.10	33.40	52	26.31
	1.10	3.84	0.68	10.90	25.32	2.90	3.74	4.35	2.50
B	9.28	34.78	6.00	96.47	332.71	29.18	29.60	42	26.86
	1.05	3.38	0.56	9.10	22.85	3.10	3.25	3.80	2.65
Normal values	9- 10.5	35.6- 38.5	5.8- 7.6	100- 150	250- 320	25-30	30-40	45-70	26-29.7

The values of sideremy in calves belonging to lot B was low – an average of 100 g/dl, value considered the normal low limit of reference (5). Consequently, calves in lot B presented an iron deficiency starting at birth, which triggers the necessity of oral or parenteral supplementing their food with this microelement, which is responsible for the genesis process of haemoglobin taking place in normal conditions. The medium body weight of the calves in lot A at birth was 14% higher than in lot B, which implies a positive correlation between it and haemoglobin level.

The strong variability of the haemoglobin and hematocrit values registered in calves belonging to both groups might be the result of collecting the majority of the blood samples 18 hours after the moment of birth, period of time during which some preclinical intestinal problems appeared that might had caused deshydration.

Positive correlations could be observed between the values of haemoglobin in pregnant cows and the weight of the calves at birth (table 3).

Table 3

Values of haemoglobin in last month pregnant cows
and the body-weight of the new born calves

Specification	Lot A		Lot B	
	< 10 g/dl	> 10 g/dl	< 10 g/dl	> 10 g/dl
Nr. new born calves	18	17	15	20
Kg. new born calves	35.8 \pm 3.65	30.5 \pm 3.15	31.2 \pm 3.29	28.0 \pm 2.72
Kg. diference	+5.3		+3.2	
„t” test	4.042		2.847	
p value	p < 0.001		p < 0.01	

The results pointed out the fact that anaemia is frequently found in pregnant cows, the main cause being the food administrated – low in proteins, minerals and vitamins, but also the presence of the factors of toxicity – vegetal, mineral, micotic – which make difficult or even block iron absorption at the level of the intestines. The prevention of iron deficiency anaemia in new-born calves becomes obligatory

as a consequence starting from the first days of life, but iron administration must be correlated with the body weight and the results of the paraclinical tests.

Conclusions

1. The value of sideremy higher in the group of cows that were given low protein food had as correspondents lower haemoglobin and hematocrit levels, indicating dysfunctions in haemoglobin synthesis iron based metabolism.

2. The study proved the existence of a positive correlation between haemoglobin values and body weight in calves, as well as between the values of haemoglobin and hematocrit values in pregnant cows and their calves weight at birth.

3. Iron administration in the case of new born calves starting from the first days of life represents an imperative measure of preventing iron deficiency anaemia.

References

1. Avram, N., 1985, *Etiopatogeneza, incidența și tipul anemiilor carentiale la viței*. Primul Simpozion Național de hematologie comparată, Constanța, pp. 18-21 oct. 1985.

2. Avram, N., D. Cucă, 2004, *Explorări paraclinice Lucrări aplicative*, Fundația România de Mâine Publishing House, Bucharest.

3. Blowey, R., D. Weaver, 1997, *Diseases and Disorders of Cattle*, Published by Mosby-Wolfe Ed.

4. Ghergariu, S., 1980, *Oligominerale și oligomineraloze*, Academiei Republicii Socialiste România Publishing House.

5. Manolescu, N. și colab., 1999, *Tratat de hematologie animală*, vol. II, Fundația România de Mâine Publishing House, Bucharest.

6. Owens, T.N., R.A. Zinn, 1988, *Protein Metabolism in Ruminant Animals*, Ruminant animal, digestive, physiology and nutrition, Prentice Hale, Englewood Cliffs Institut.

7. Pârvu, Gh., 1992, *Supravegherea nutrițională și metabolică a animalelor* Ceres Publishing House, Bucharest.