ENTHEROPATHIES IN BOVINE YOUTH

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Abstract

Gastroenteropathies in bovine youth has a large incidence in households. These disorders are characterized by loss of appetite, diarrhea, weight loss, dehydration of the body leading to disorders of the body's homeostasis.

The pathogenesis of these disorders is explained by a series of disturbances in the intestine, metabolic acidosis, dehydration of the body due to the loss of. electrolytes. The blood may be affected by hemoconcentration, hematocrit increase and false polyglobulum. Leukopenia followed by leukocytosis is observed in the first phase of the disease. The leukocyte formula has a neutrophilic character especially when the first symptoms appear and then, in the convalescence phase, lymphocytes are produced.

The research was carried out on a 3-9-month-old bovine youth group grown in a farm in northern Moldavia region. The total number of erythrocytes, the hemoglobin concentration, hematocrit, total white blood cells and blood levels were determined. Blood samples were drawn from the jugular vein into vacutainer tubes on EDTA support.

Based on the obtained results we may say that the bovine youth suffering from gastroenteritis presents a microcytic and hypochromic anaemia.

Keywords: calves, hemoleucogram (CBC), enteropathies

INTRODUCTION

The digestive tract is one of the main gateways for microorganisms, parasites, toxic substances and generally for pathogens that produce local injuries or who use this access path to produce systemic damage. [1] Thus, it is directly involved in the dissemination of microroganisms, in parasitic migration or in the absorption of toxic substances [2].

Depending on the localization of the lesions, a number of physiological mechanisms involved in the digestive tract or triggering of immune reactions are disrupted in the digestive tube, resulting in whole body hypotrophication or the occurrence of disturbances of the immune response [3].

MATERIAL AND METHOD

The digestive tract is one of the main gateways for microorganisms, parasites, toxic substances and generally for pathogens that produce local injuries or who use this access path to produce systemic damage. [1] Thus, it is directly involved in the dissemination of microroganisms, in parasitic migration or in the absorption of toxic substances [2].

Depending on the localization of the lesions, a number of physiological mechanisms involved in the digestive tract or triggering of immune reactions are disrupted in the digestive tube, resulting in whole body hypotrophication or the occurrence of disturbances of the immune response [3].

The research was done on 10 young cattle aged 3 to 9 month diagnosed with gastroenteritis (LG), raised on a farm in Northern Moldova and 10 healthy individuals (LM) from the same region and age.

The calves had hyperthermia 39.5 - 40.5^{0}C, depression, loss of appetite, colic, flatulence, abdominal hypersensitivity, yellowish-brown diarrhea, foamy, bad smelling. (Photo 1) In some individuals parasite bundles were observed in the feces, perhaps ascarids. (Photo 2).

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Foto 1 Calves aged between 3 and 7 months

Foto 2 Calves with diarrhea and parasites

Evaluated haematological indices included total red blood cell count (RBC, T/l), haemoglobin concentration (Hb, g/dl), total white blood cell count (WBC, G/l), packed cell volume (PCV, l/l), and mean corpuscular volume (MCV, f/l). The indicators of haematological profile were analysed by an automatic haematological analyser ABC-vet (Horiba ABX, France), as well as the leukocyte formula. Blood samples were drawn from the jugular vein into vacutainer tubes on EDTA.

RESULTS AND DISCUSSIONS

The erythrocyte dynamics in cattle youngsters in the gastroenteritis affected group shows quantitative variations in the sense of a numerical increase from the control group (Table 1). Thus, in this batch, the number of erythrocytes averaged 8.91 X 106 / mm^3 blood. Differences from the control group are statistically significant. Our observations are in line with those found by a number of authors on the increase in erythrocyte counts in the gastrointestinal disturbances of young cattle.

Table 1 The significance of the statistical differences of the red blood cells between the control and the gastroenteritis affected group

Specification			n	Calculated statistical indicators				Meaning of differences in batch averages (FISHER test)
				$\bar{X} \pm s_{\bar{x}}$	V%	Min.	Max.	
RBC (X10^6/mm^3)		LM	10	7.3±0.31	13.51	5.9	8.8	$\hat{F}_{11.02} > F_{0.01\%}(8.28) \rightarrow **$
		LG		8.91±0.37	13.17	7.2	10.7	
Hb (g/dL)		LM	10	9.30±0.38	12.92	7.9	11.6	$\hat{F}_{0.18} < F_{0.05\%}(4.41) \rightarrow n.s$
		LG		9.50±0.26	8.76	8.7	11.2	
Ht (%)		LM	10	35.49±1.09	9.75	29.1	40.2	$\hat{F}_{14.14} > F_{0.01\%}(8.28) \rightarrow **$
		LG		39.91±0.42	3.38	38.2	42.3	
Red blood cells	VEM (μ^3)	LM	10	49.02±1.45	9.37	44.5	57.1	$\hat{F}_{2.98} < F_{0.05\%}(4.41) \rightarrow n.s$
		LG		44.89±1.89	13.35	34.6	53.7	
	HEM μm/g/E	LM	10	12.81±0.51	12.81	10.4	15.3	$\hat{F}_{6.85} > F_{0.05\%}(4.41) \rightarrow *$
		LG		10.88±0.52	15.20	8.8	10.7	
	CHEM g/dl	LM	10	26.29±1.10	13.29	22.1	32.6	$\hat{F}_{4.07} < F_{0.05\%}(4.41) \rightarrow n.s$
		LG		23.76±0.59	7.88	21.2	22.2	

LM = the young bovines in the witness lot; LG = young bovines in the gastroenteritis affected group

Most researchers believe that in gastroenteritis a dehydration of the body occurs, followed by a hemoconcentration and at the same time, relative increase in the number of erythrocytes. Due to the limited possibilities of compensating the hydro-mineral metabolism, the installation of acidosis is favored. This explains the severity of the dehydration seen in younglings. During the enteropathy, multiple metabolic disorders dominated by hydric alterations fully explain the serious evolution of the disease and the death of the animals. Large losses of water, minerals, proteins and enzymes lead to reduction of extracellular fluid, hypovolemia, decreased blood pressure and neuro-endocrine system disorders with immediate consequences on the regulation mechanisms. Reducing the blood volume can lead to sudden shock and blood pressure collapse, as the possibilities of interstitial water migration in blood vessels and vasoconstriction of less important areas for maintaining physiological balance are overcome.

Hemoconcentration largely contributes to altering the values of blood-vessel constants. Amongst the main blood functions, immunobiological protection and maintenance of hydro-electrolytic, acid-base and metabolic homeostasis are of great importance. In the course of gastroenteritis, these functions are disturbed.

At the basis of homeostatic functions there are certain mechanisms by which the body rejects the environmental factors with which it contradicts or adapts to the new conditions when there is no possibility to reject them. The homeostatic general responses are coordinated by the neuroendocrine mechanisms between which the diencephalo-pituitary and adrenocortical area play a special role. All the body's reactive systems are directed towards the neurovegetative and endocrine pathways. The encephalo-pituitary area is considered to be the true "coordinating center of vegetative life". In the young cattle, this area is incompletely developed as well and in this category there is a lesser activity of the adrenal gland, which leads to a decrease in the reactivity of the organism.

Thus, in young cattle with gastroenteritis the hemoglobin values are 9.5g%. The increase in hemoglobin can occur in polyglobulinemia, diarrhea, hemoconcentration, thus in dehydration states. Changes in the amount of hemoglobin in dehydration states in bovine youth are differentiated depending on the clinical form of enteropathy (mild or severe).

In young cattle with gastroenteritis, the average hematocrit was 39.9. This value is higher than the control group, the difference being statistically significant. Increased hematocrit is due to hemoconcentration that accompanies dehydration. During the evolution of the enteropathy in young cattle, there are metabolic disturbances with severe water changes and thus exicosis occurs.

Analyzing H.E.M. in the young cattle group affected by gastroenteritis, values of 10.8 picograms were recorded. These are lower than the values recorded in the control group, the differences being statistically significant.

In general, H.E.M. levels change in parallel with those of V.E.M.; elevated values of H.E.M. are due to a V.E.M. level higher than normal, while lower values are due either to a lower V.E.M. either to low hemoglobin content. H.E.M. indicates the amount of hemoglobin that is inside an erythrocyte.

In the cattle youth group affected with gastroenteritis the value of C.H.E.M. was 23.7%. This is lower than the control group, the differences being statistically insignificant.

C.H.E.M. representing the average concentration of hemoglobin on red blood cells, has great clinical significance as it expresses the functional capacity of erythrocytes.

Thus, according to the obtained results, we can assume that the morphological and chronic type of anemia in juvenile bovines with gastroenteritis was a microcytary and hypochromic anemia (V.E.M., H.E.M. and C.H.E.M. have lower values than the ones obtained for the control group).

Table 2 The significance of the statistical differences of the leukocyte series between the control and the gastroenteritis affected group

Specification			n	Calculated statistical indicators				Meaning of differences in batch averages (FISHER test)
				$\overline{X} \pm s_{\overline{x}}$	V%	Min.	Max.	
WBC ($X10^6/mm^3$)		LM	10	6.86±0.30	14.10	5.6	8.9	$\hat{F}_{54.44} > F_{0.001\%}(15.38) \rightarrow ***$
		LG		11.08±0.48	13.79	8.4	13.4	
The leukocyte formula	N(%)	LM	10	34.90±0.84	7.69	31	39	$\hat{F}_{209.83} > F_{0.001\%}(15.38) \rightarrow ***$
		LG		50.90±0.70	4.38	48	54	
	E(%)	LM	10	4.2±0.29	21.87	3	6	$\hat{F}_{0.59} < F_{0.05\%}(4.41) \rightarrow n.s$
		LG		3.70±0.57	49.42	1	6	
	B(%)	LM	10	0.20±0.20	210.81	0	0	$\hat{F}_{0} < F_{0.05\%}(4.41) \rightarrow n.s$
		LG		0.20±0.13	210.81	1	1	
	M(%)	LM	10	3.60±0.45	39.71	2	6	$\hat{F}_{0.48} < F_{0.05\%}(4.41) \rightarrow n.s$
		LG		3.20±0.35	35.47	2	5	
	L(%)	LM	10	57.1±0.99	5.50	52	62	$\hat{F}_{129.14} > F_{0.001\%}(15.38) \rightarrow ***$
		LG		42.00±0.88	6.64	38	47	

LM = the young bull in the witness lot; LG = young bull in the gastroenteritis group

In the cattle youth group affected with gastroenteritis, the leukocyte values were 11.08 $x10^6$ / mm^3 bloody. These are higher than those recorded in the control group, which is explicable if we take into account that the animals had pronounced dehydration, followed by hemoconcentration. Neutrophils 50.9%; eosinophils 3.7%; basophil 0.2%; monocytes 3.2%; lymphocytes 42%. Compared to the calves from the control group, there is an increase in the number of significant neutrophils and a pronounced decrease in lymphocytes.

The leukocytosis we found in juveniles with gastroenteritis is mainly neutrophilic and we also see a concomitant decrease in lymphocytes. These changes are a consequence of the action of bacterial toxins on the body. In this regard, leukocytosis accompanied by neutrophilia is an expression of the body's defense against pathogens and is considered to be specific to the body's struggle. Neutrophilia is accompanied by the appearance of a large number of immature neutrophils that will participate in neutralizing bacterial toxins and phagocytosis of pathogens.

The lymphopenia seen in sick bulls is explained by the involution and hypofunction of lymphoid organs as a consequence of excess glucocorticoid hormones. The localized or generalized pathological state of the body will act to stimulate white blood cells and leucocyte forming organs, resulting in quantitative leukocytary reactions within the blood stream: leukocytosis in the case of mild or medium intensity stimuli; leucopenia if the pathological stimulation is very strong. In the bovine species, with all of the pathological conditions, leukocyte reactions are inconsistent, the leukocyte response to a harmful agent often representing a decrease in the number of circulating leukocytes. Bovine leukocytosis is usually neutrophilic, with lymphocytes and eosinophils rarely contributing to its development.

CONCLUSIONS

1. The number of erythrocytes is relatively increased in the diseased group, compared to the control group, but the differences are statistically insignificant.

2. The amount of hemoglobin is slightly increased compared to the control, the differences being statistically insignificant.

3. The value of the hematocrit is increased in the sick cattle group, the differences from the control group being significant for $P < 0.001$.

4. The average erythrocyte volume is lower than the control group, the differences being significant for $P < 0.01$.

5. The mean content in hemoglobin of the erythrocytes is lower than in the control group, the differences being significant for $P < 0.01$.

6. The mean red blood cell concentration in hemoglobin is lower, the differences from the control being significant for $P < 0.01$.

7. On the basis of the calculated indices and calculated red blood cell constants, it can be stated that cattle youngsters affected with gastroenteritis have a microcytary (V.E.M. is lower than normal) and hypochromic anemia (H.E.M. and C.H.E.M., lower than normal values).

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