HEMATOLOGIC INDICATORS INFLUENCED BY THE DOWNER SYNDROME IN DAIRY COWS

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Abstract

Cows that cannot stand on their feet for more than 24 hours are treated as cows with "downer" syndrome. Usually such cows are serious clinical cases because majority fail to stand up few days after medical treatment and often for them should be applied forced slaughtering. In them also occur changes on hematologic indicators, which might be clinically used for the patient's prognosis. The study aims to assess the influence of the downer syndrome in dairy cows in some hematologic indicators.

The study was carried in the period January 2014 - March 2016. In 28 cows of different ages and breeds, clinically diagnosed with the downer syndrome, blood samples were taken from the jugular vein and indicators of the total of white cells (WBC), red cells (RBC), hemoglobin (HB), hematocrit (HCT), average corpuscular volume (MCV), corpuscular hemoglobin (MCH), the ratio between red and white blood cells (RDV), the total of platelets (PLT) and indicators of the leukocyte formula (neutrophils, lymphocytes, monocytes, eosinophil and basophiles) were studied. Blood samples were analyzed using hematology analyzer, which is used in laboratory for standard procedures of blood check in cattle. Obtained data were statistically analyzed with method ANOVA (homogeneity of variances and normality) and compared with values of the reference according to Radostits [8], and with the average hematological indicators of clinically healthy cattle in our country.

Results indicated that cattle affected by the downer syndrome manifested significant changes in several hematological indicators. Major changes appear in the total amount of white cells (WBC, respectively 9.37 $\pm$ 1.21 from 5.58 $\pm$ 1.67), in hematocrit (HCT, respectively 28.63 $\pm$ 1.24 from 29.57 $\pm$ 2.8), in the number of granulocytes (4.401 $\pm$ 0.27 from 3.87 $\pm$ 0.42), lymphocytes (4.67 $\pm$ 0.78 from 4.52 $\pm$ 0.48) and of platelets (332.4 $\pm$ 47.3 from 388.3 $\pm$ 25.5) Found hematological differences are statistically confirmed ($p < 0.05$).

Our information are close also with differences of hematological indicators in cows with downer syndrome, reported by other authors as well. Changes in hematological indicators can be used for prognostic purposes.

Key words: *Downer syndrome, WBC, RBC, HB, HTC.*

1. Introduction

Cows that cannot stand on their feet for more than 24 hours are treated as cows with "downer" syndrome. Usually such cows are serious clinical cases because majority fail to stand up few days after medical treatment and often for them should be applied forced slaughtering.

Downer syndrome in cows is one of the most difficult clinical problems in dairy cows' farms, able to cause considerable direct and indirect economic damages. Determining an exact diagnosis for the downer syndrome in case is complex process, and is supported as well with hematological analysis. Current studies are focused in finding connections between clinical diagnosis and hematological changes.

Our study, which is dealing with searching and finding links between clinical diagnosis and hematological changes, aims towards this direction. Hematological changes occurring in cows with downer syndrome can be clinically used for the patients' diagnosis.

2. Materials and Methods

The study was carried in the period January 2014 - March 2016. In 28 cows of different ages and breeds, clinically diagnosed with the downer syndrome, blood samples were taken from the jugular vein and indicators of: white cells (WBC), red cells (RBC), hemoglobin (HB), hematocrit (HCT), average corpuscular volume (MCV), corpuscular hemoglobin (MCH), ratio between red and white blood cells (RDV), total of platelets (PLT) and indicators of the leukocyte formula (neutrophils, granulocytes, monocytes, eosinophil and basophiles) were studied.

Blood samples were analyzed with hematology analyzer that is used in laboratory for standard procedures of checking blood in cattle. The obtained data were statistically analyzed with ANOVA method (homogeneity of variances and normality) and compared with values of the reference according to Radostits [8], and with the averages of hematological indicators of clinically healthy cattle in our country.

3. Results and Discussion

3.1 Results

Hematological indicators in the cattle diagnosed with the downer syndrome are given in Table 1. In the table are given for comparison data of the rate indicators according to Radostits [8].

In Table 2 are given information for changes in leukocytes of the cows with downer syndrome by groups of clinical diagnosis. The values of cellular indicators in the leukocytes formula are given with the statistical average and compared with the reference values according to Radostits [8].

From our data it appears that the amount of red blood cells (RBC), haemoglobin (HGB), relation between red and white cells (RDW) and average corpuscular volume (MCV), had differences between cattle that were diagnosed with downer syndrome.

The total of white cells seems to face biggest increase (13.0 x 10^3/μL against the norm 4 - 12) in cases of cows diagnosed with severe mastitis. In our study most significant changes were noted in indicators of leukocytes formula. Findings of haematological changes are statistically confirmed ($p < 0.05$). Our data are adjacent also with changes of haematological indicators in downer cow syndrome that are reported by other authors, as Ceroni et al., [1], and Mazreku et al., [2]

The number of neutrophils increases (up to 56.12 ± 5.16 x 10^3/μL against 15.0 - 47.0) in the blood of cows diagnosed with sever mastitis. The number of lymphocytes changes according to causes (66.59 ± 5.91 x 10^3/μL in cows with bone damages, against 45.0 - 75.0). Less visible changes has the number of basophiles (0.67 ± 0.37 in cows with severe mastitis, against 0.0 - 0.2). The number of monocytes and eosinophils remains in unaffected quotes.

Table 1.Average values of the hematological parameters according to clinical diagnosis, compared to rate values

Indicators	Rate values	Indicators by diagnosis			
		Hypocalcaemia	Bone damages	Nerve damages	Severe mastitis
WBC (10^3/μL)	4 - 12*	5.58 ± 1.67	5.55 ± 2.61	8.09 ± 1.56	13.0*
RBC (10^6/μL)	5 - 10*	5.91 ± 0.60	6.00 ± 0.78	6.29 ± 0.64	7.0*
HGB (g/dL)	8 - 15*	9.90 ± 0.86	10.07 ± 0.83*	9.71 ± 0.92	9.0
HCT (%)	24 - 46	29.57 ± 2.80	29.37 ± 2.64	29.07 ± 2.71	28.0
MCV (fl)	40 - 60*	49.81 ± 3.36	50.09 ± 3.85*	46.50 ± 2.80	46.0
RDW (%)	16.7 - 23.3*	20.15 ± 1.29*	20.11 ± 1.56*	19.93 ± 1.23	18.0

*Significant changes against reference group ($p < 0.05$). Reference values according to Radostits [8].

Table2.Average values of the indicators of leukocytes formula in cows according to clinical diagnosis

Parameters	Rate values	Indicators by diagnosis			
		Hypocalcaemia	Bone damages	Nerve damages	Severe mastitis
Neutrofile (10^3/μL)	15.0 - 47.0*	23.10 ± 5.29	20.63 ± 4.75	36.29 ± 4.22*	56.12 ± 5.16*
Limfocite (10^3/μL)	45.0 - 75.0*	63.46 ± 4.52	66.59 ± 5.91*	45.12 ± 5.16	25.21 ± 3.62*
Monocite (10^3/μL)	2.0 - 7.0*	6.84 ± 2.37	9.26 ± 3.39*	2.61 ± 3.55	6.12 ± 1.88
Eozinofile (10^3/μL)	0 - 20.0	6.07 ± 3.75	3.26 ± 2.93	1.67 ± 2.11	3.34 ± 0.34
Bazofile (10^3/μL)	0 - 2.0	0.53 ± 0.86	0.26 ± 0.62	1.11 ± 0.21	0.67 ± 0.37

*Significant changes against reference group ($p < 0.05$). Reference values according to Radostits [8].

3.2 Discussion

Cattle grouped by clinical diagnosis that are based on the symptoms manifested, showed changes pictures in haematological indicators. Study results suggest that depending on the clinical picture, there are also characteristics in changes of haematological picture and the latter can be beneficial in determining the prognosis for the dairy cows. Other researchers came to such conclusions as well (Doornenbal *et al.*, [4], Lumsden *et al.*, [6]).

Calculation of erythrocytes indicators showed that the obtained values for the number of erythrocytes (RBC), average corpuscular volume (MCV), and haemoglobin (HB), even though were within the rate limits, in the study showed a significant drop compared to the findings made by other authors, as: Meglia G. E. *et al.*, [3], Jain, [5], Peinado *et al.*, [7]. Although there are no considerable changes in the level of red cells (RBC), and average corpuscular volume (MCV), we think that the slight increase in the corpuscular haemoglobin values (MCH) that was noticed, is the compensatory respond of erythrocytes towards the slow decrease of haematocrit (HCT).

In our study, larges changes were noticed in the level of white cells, in the amount of neutrophils, lymphocytes and basophiles. In cows clinically diagnosed with sever mastitis, biggest changes were noticed in the increase of the number of white blood cells. White blood cells were significantly higher in cattle diagnosed with nerve damages and hypocalcaemia. Increase of the white cells amount is mainly due to increase of neutrophils and monocytes. These indictors is less linked with the increase of the number of basophiles. The total number of lymphocytes is very changeable depending by the clinical diagnose. The highest number of lymphocytes were found in cattle diagnosed with bone damages.

4. Conclusions

- Changes in some haematological parameters are present in cows with downer syndrome.

- Indicators mostly affected by the downer cow syndrome are: total of white cells, haematocrit, neutrophils, lymphocytes and basophiles.

- Most significant increase happens in the total of white cells, and the number of neutrophils and lymphocytes, whilst the values of haematocrit (HCT) dropped.

- The amount of red blood cells (RBC), haemoglobin (HGB), average corpuscular volume (MCV), monocytes and eosinophils are not affected by the downer cow syndrome.

- Haematological indicators can be used to clarify diagnosis and determine the prognosis for the dairy cows.

5. References

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