The Indian Journal of Veterinary Sciences & Biotechnology ***(2017) Volume 13, Issue 2, 12-15***

ISSN (Print) : 2394-0247 : ISSN (Print and online) : 2395-1176, abbreviated as IJVSBT

http://dx.doi.org/10.21887/ijvsbt.v13i2.10042

Submitted : 31-07-2017 ***Accepted : 21-08-2017*** ***Published : 15-11-2017***

Clinico-Haematological Alterations in Goats Affected with Ruminal Acidosis

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Abstract

Ruminal acidosis is one of the most important clinical emergencies in sheep and goats resulting into high mortality rate. In the present study, eight healthy farm goats and 24 goats presented to the TVCC of the college with clinical signs of ruminal acidosis like anorexia, tympany, increased pulse and respiratory rate, reduced body temperature, doughy rumen, enteritis, oliguria, grinding of teeth, purulent nasal discharge, muscle twitching, arched back, dehydration and recumbency with rumen liquor pH below 6 were examined for haematological alterations using autohaematoanalyzer. Among various haematological parameters evaluated from acidotic goats, the mean values of Hb (12.21±0.17 vs. 10.86±0.15 g/dl), TEC (14.28±0.16 vs. 12.04±0.36 $\times 10^6$/µl), TLC (13.43±0.11 vs. 11.11±0.27 $\times 10^3$/µl), PCV (36.91±0.53 vs. 29.88±0.55%), neutrophils (64.54±0.93 vs. 28.13±0.92%), MCV (23.38±0.37 vs. 19.38±1.34 fl) and MCH (7.03±0.08 vs. 6.31±0.25 pg) were found significantly increased, while the mean values of lymphocytes (28.00±0.82 vs. 65.38±0.80%) and MCHC (24.55 ±0.26 vs. 34.88±0.97 g/dl) were decreased significantly from the base values of healthy goats. It was concluded that ruminal acidosis induced due to accidental heavy ingestion of readily fermentable carbohydrate rich grains and food waste significantly altered the haematological profile concurrent with clinical manifestations in goats, and hence can be used to assess the severity of the disease.

Key words: Goats, Ruminal acidosis, Clinical signs, Haematological alterations, Haematoanalyzer.

Introduction

Ruminal acidosis is one of the most important clinical emergencies in small ruminants (sheep and goats) and results in high mortality (Radostits *et al*., 2007). Ruminal acidosis is caused mainly by the accidental or excessive ingestion of large quantities of feeds rich in highly fermentable carbohydrates without adaptation. Aleyas and Vijayan (1981) reported that the accidental ingestion of rice, paddy grains, payasam, jack fruit etc. were the important causes of ruminal acidosis in cattle and goats. Haematological changes in ruminal acidosis are important to assess the severity of the disease. Severe dehydration, cardiovascular impairments (Shihabudeen *et al*. 2003) and haemato-biochemical changes (Sarma and Nath, 2005; Darwin and Thangathurai, 2017) are common in this disorder. The induced acidotic sheep showed significant changes in haemato-biochemical and ruminal parameters, and these changes were more obvious at 24 hours after induction of acidosis (Zein-Eldin *et al*., 2014). The cases of ruminal acidosis are on increasing trend due to altered feeding

habits and accidental ingestion of large quantity of easily fermentable grains and kitchen wastes in the cities and town. Hence, the present study was designed to evaluate haematological changes in acidotic goats presented at the College Clinics in relation to healthy farm goats.

Materials and Methods

The study was undertaken with the approval of the Institutional Animal Ethics Committee (IAEC) during the period of six months in the year 2016-17 at the Department of Veterinary Medicine College of Veterinary Science and AH Anand. Eight healthy goats from the University farm were taken as control. Clinical cases of rumen indigestion in goats brought to the TVCC, Anand were screened for detection of rumen acidosis. The cases having the history of ingestion of large quantity of highly fermentable carbohydrate rich diet were selected, although the diet varied between goats, which mostly included rice, wheat, pearl millet and chapaties or other cooked human food. The clinical examination was carried out and rumen liquor samples were collected by aspiration from such cases for immediate estimation of pH. Those cases having rumen pH below 6.0 were included in this study. Blood samples (2 ml) were withdrawn from jugular veins in sterile plastic K_3EDTA vaccutainers from all the healthy and diseased goats for haematological analysis on autohaematoanalyzer. The data obtained were compared between healthy and acidotic goats using student's 't' test.

Results and Discussion

Clinical Signs and Blood pH

The clinical findings of 24 acidotic goats presented at TVCC were recorded and were compared with 8 healthy goats of farm. The mean values of rectal temperature (°F), heart rate (beats/min) and respiration rate (breaths/min) in healthy goats were 101.78±00.17, 76.13±01.17 and 26.00±01.09, respectively. The corresponding mean values in acidotic goats were 100.71±00.25, 98.79±01.03 and 38.71±00.74, respectively. The mean values of heart rate and respiration rate in acidotic goats were increased highly significantly ($P<0.01$), while there was significant decrease in the rectal temperature in affected goats when compared with healthy goats.

The clinical manifestations observed in the present study in affected goats included anorexia, tympany, doughy rumen, enteritis, oliguria, grinding of teeth, purulent nasal discharge, muscle twitching, arched back, dehydration and recumbency. These signs were in accordance with the findings of Braun *et al.* (1992), Ismail *et al.* (2010), Sharma *et al.* (2010), Ullah *et al.* (2013), and Darwin and Thangathurai (2017). The increased heart rate and respiratory rate in acidotic goats could be due to increase in readily available energy in the diet or to compensate the rise in hydrogen ion concentration in blood by removing excess carbon dioxide (Braun *et al.,* 1992).

The mean blood pH value was found significantly ($P<0.01$) decreased in acidotic goats as compared to healthy goats (7.49±0.01 vs. 7.24±0.02) and agreed with the observations of Braun *et al.* (1992), Ismail *et al.* (2010), Ullah *et al.* (2013), and Shah *et al.* (2013). The decrease in the blood pH may be due to over-distention of rumen which impedes venous return to heart. This factor impairs hepatic perfusion with poorer lactic utilization, which in turn leads to systemic lactic acidosis, manifesting decrease in blood pH.

Haematological Alterations

The observations on haematological parameters of healthy and acidotic goats are presented in Table 1.

Haemoglobin: The mean value of Hb was found to be increased significantly ($P<0.01$) in acidotic goats when compared with healthy goats (12.21±0.17 vs. 10.86±0.15 g/dl). This was in agreement with the reports of Sarma and Nath (2005), Sharma *et al.* (2010), Shah *et al.* (2013), and Zein-Eldin *et al.* (2014). The rise in haemoglobin levels could be due to haemoconcentration caused by dehydration and drawing of systemic fluid in the rumen, which was evident from clinical signs and elevated PCV per cent as observed by Shihabudeen *et al.* (2003) and Sarma and Nath (2005).

Packed cell volume (PCV %): The mean packed cell volume of blood in healthy goats was 29.88±0.55 % and in acidotic goats 36.91±0.53 %. This highly significant (P<0.01) increase in PCV observed in acidotic goats compared well with the reports of Sarma and Nath (2005), Ismail *et al*. (2010), Sharma *et al*. (2010), Mahmood *et al.* (2013), Shah *et al*. (2013), and Darwin and Thangathuria (2017) in goats and/or sheep.

Table 1: Haematological parameters (Mean±SE) in healthy and acidotic goats

Sr. No.	Parameter	Healthy goats (n=8)	Acidotic goats (n=24)
1	Hb (g/dl)	10.86±0.15	12.21±0.17**
2	PCV (%)	29.88±0.55	36.91±0.53**
3	TEC ($\times10^6$/µl)	12.04±0.36	14.28±0.16**
4	TLC ($\times10^3$/ µl)	11.11±0.27	13.43±0.11**
5	Neutrophils (%)	28.13±0.92	64.54±0.93**
6	Lymphocytes (%)	65.38±0.80	28.00±0.82**
7	Monocytes (%)	03.63±0.26	03.96±0.18
8	Eosinophils (%)	02.50±0.19	02.92±0.15
9	Basophils (%)	00.36±0.18	00.58±0.10
10	Platelet count ($\times10^5$/ µl)	03.85±0.12	03.55±0.09
11	MCV (fl)	19.38±1.34	23.38±0.37**
12	MCH (pg)	06.31±0.25	07.03±0.08**
13	MCHC (g/dl)	34.88±0.97	24.55±0.26**

** P<0.01.

Total erythrocyte count: The mean erythrocyte count recorded was 12.04±0.36×10^6/µl in the healthy goats and 14.28±0.16×10^6/µl in acidotic goats. This significant (P<0.01) increase in TEC observed in acidotic goats over healthy control goats was in accordance with the observations made by Sarma and Nath (2005), Radostits *et al.* (2007), Shah *et al*. (2013), and Zein-Eldin *et al.* (2014). The rise in erythrocyte count may be attributed to dehydration or because of release of blood cell from spleen due to stress (Das and Mishra, 1991).

Total leukocyte count: The mean total leukocyte counts observed in healthy and acidotic goats were 11.11±0.27×10^3/µl and 13.43±0.11×10^3/µl, respectively. It was significantly higher in acidotic goats as compared to the healthy goats. Similar findings were reported by Ismail *et al.* (2010), Sharma *et al*. (2010), Mahmood *et al*. (2013) and Zein-Eldin *et al.* (2014). This change could be due to the endotoxins of ruminal origin (Dunlop, 1972).

Differential leukocyte count: The mean values of differential leucocyte counts (DLC), viz., neutrophils, lymphocytes, monocytes, eosinophils and basophils in healthy goats were 28.13±0.92, 65.38±0.80, 03.63±0.26, 02.50±0.19 and 00.36±0.18%, respectively, while the corresponding values in acidotic goats were 64.54±0.93, 28.00±0.82, 03.96±0.18, 02.92±0.15 and 00.58±0.10 % (Table 1). It could be inferred from the DLC result that, neutrophils were found to be increased and lymphocytes were decreased significantly (P<0.01) in acidotic goats when compared with healthy goats. However, the differences in values of eosinophils, monocytes and basophils between acidotic and healthy goats were statistically non-significant. These findings were in agreement with Ismail *et al*. (2010), and Darwin and Thangathuria (2017).

Platelet count and erythrocytic indices: The mean platelet count in healthy goats was observed to be 03.85±0.12×10^5/µl, while it was 3.55±0.09×10^5/µl in acidotic goats. It was found to be decreased non-significantly in acidotic goats. Further, among various RBC indices, the mean values

of MCV, MCH and MCHC in healthy goats were 19.38±1.34 fl, 06.31±0.25 pg and 34.88±0.97 g/dl, with the corresponding values in acidotic goats were 23.38±0.37 fl, 07.03±0.08 pg and 24.55±0.26 g/dl, respectively. The differences between acidotic goats and healthy goats were statistically significant (P<0.01). Similar findings were reported by Shihabudeen *et al.* (2003) and Mahmood *et al*. (2013).

The study concluded that ruminal acidosis induced due to accidental heavy ingestion of readily fermentable carbohydrate rich grains and food waste significantly altered the haematological profile concurrent with clinical manifestations in goats, and hence can be used to assess the severity of the disease.

Acknowledgments

The authors are highly thankful to the Dean, College of Veterinary Science and AH, Anand for the facilities provided and Professor & Head, TVCC for the cooperation extended to conduct this study.

Conflict of Interest: All authors declare no conflict of interest.

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