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## Haematological studies in cattle with foreign body syndrome

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#### Abstract

A comparative evaluation was carried out to study the alterations in haematological profile in cattle with foreign body syndrome (N=30) in four phases. Phase-1 was the pre-rumenotomy phase while phase-2 (after 24 hour of rumenotomy), phase-3 (at 7<sup>th</sup> day of rumenotomy) and phase-4 (at 14<sup>th</sup> day of rumenotomy) were included under post-rumenotomy phases, respectively. Total erythrocyte count (TEC), total platelet count, lymphocytes percent, monocytes percent, eosinophil percent and PCV showed a highly significant decrease ( $P<0.01$ ) whereas; total leucocytes count (TLC) showed a highly significant increase ( $P<0.01$ ) with neutrophilia in pre-rumenotomy phase (phase-1). Haemoglobin was decreased significantly ( $P<0.05$ ) while basophil percent showed a non-significant ( $P>0.05$ ) variation in pre-rumenotomy phase (Phase-1).

**Keywords:** Cattle, foreign body syndrome, rumenotomy, haematological studies

#### Introduction

Foreign body syndrome (FBS) is a fairly common disease of cattle and buffaloes, especially in the developing countries. This disease is caused by ingestion of indigestible metallic and non-metallic foreign objects. The foreign body syndrome produces overwhelming economic losses due to severe reduction in milk and meat production, treatment costs, potential fatalities and foetal losses in affected pregnant animals (Nugusu *et al.*, 2013) [29]. This syndrome is more common in bovine than in small ruminants because they do not use their lips for prehension and are more likely to eat chopped feed (Misk and Semieka, 2001; Ashfaq *et al.*, 2015) [27, 6]. Moreover, indiscriminate feeding habits, feed scarcity, industrialization and mechanization of agriculture are predisposing factors for FBS (Semieka, 2010) [38]. The presence of foreign bodies in the rumen and reticulum hampers the absorption of volatile fatty acids, consequently leading to reduction in the rate of animal fattening (Igbokwe *et al.*, 2003) [18]. It may prove lethal because the bacteria and protozoa can contaminate the body cavity resulting in peritonitis and the heart and diaphragm may be punctured by the ingested object, causing their failure (Abu-Seida and Al-Abadi, 2016) [2]. Most of the area of Rajasthan is drought affected, as well as urbanization is also taking place on a large scale, due to which the availability of feed and fodder for the animals is not enough and there are the chances of increase in consumption of non feeding materials. Due to these reasons, the chances of finding of the foreign body in animals are increases. So, in this study, we aim to assess and compare the important physiological and haematological parameters attributing adaptable characters in foreign body syndrome in cattle with pre-rumenotomy and post-rumenotomy phases.

#### Materials and Methods

The present study was carried out on foreign body syndrome affected cattle (N=30) presented to Rural Veterinary polyclinic (Cow Rehabilitation Centre) Hingonia, Jaipur (Rajasthan). Blood samples were collected from jugular vein of cattle in the plasma separating tubes (PST) in four phases, Phase-1 was the pre-rumenotomy phase while phase-2 (after 24 hour of rumenotomy), and phase-3 (at 7<sup>th</sup> day of rumenotomy) and phase-4 (at 14<sup>th</sup> day of rumenotomy) were included under post-rumenotomy phases, respectively. The haematological parameters i.e. white blood cell count, Lymphocyte percent, Monocytes percent, Neutrophil percent, Eosinophil percent, Basophil percent, Red blood cell count, Haemoglobin, Packed cell volume and Total platelet count were determined from the collected whole blood samples (EDTA vial) in all four phases by using Vet Spincell 5 Compact automated blood/haematology analyzer (Vet Mode).

## Results and Discussion

**Table 1:** Details of various Haematological parameters recorded at different intervals in thirty cattle with foreign body syndrome

Parameters	Pre-rumenotomy Phase (Phase-1)	Post-rumenotomy Phase		
		Phase-2 (24 hour of rumenotomy)	Phase-3 (7 <sup>th</sup> day of rumenotomy)	Phase-4 (14 <sup>th</sup> day of rumenotomy)
TLC ( $10^3/\mu\text{l}$ )	24.19±0.53 <sup>b</sup>	25.60±0.42 <sup>a</sup>	18.82±0.47 <sup>c</sup>	12.44±0.51 <sup>d</sup>
TEC ( $10^6/\mu\text{l}$ )	6.15±0.41 <sup>a</sup>	6.03±0.44 <sup>a</sup>	8.70±0.58 <sup>b</sup>	9.12±0.69 <sup>b</sup>
Hb (g/dl)	7.82±0.43 <sup>ab</sup>	7.13±0.26 <sup>a</sup>	8.99±0.61 <sup>bc</sup>	9.89±0.60 <sup>d</sup>
N (%)	53.53±0.69 <sup>b</sup>	55.69±0.79 <sup>a</sup>	41.39±0.70 <sup>c</sup>	36.06±0.73 <sup>d</sup>
L (%)	42.35±0.66 <sup>b</sup>	40.00±0.66 <sup>a</sup>	53.42±0.83 <sup>c</sup>	57.61±0.71 <sup>d</sup>
M (%)	1.52±0.15 <sup>a</sup>	1.59±0.13 <sup>a</sup>	2.14±0.26 <sup>b</sup>	2.60±0.16 <sup>b</sup>
E (%)	2.26±0.16 <sup>a</sup>	2.37±0.15 <sup>a</sup>	2.63±0.16 <sup>a</sup>	3.30±0.14 <sup>b</sup>
B (%)	0.34±0.08 <sup>a</sup>	0.35±0.01 <sup>a</sup>	0.42±0.03 <sup>a</sup>	0.43±0.03 <sup>a</sup>
PCV (%)	26.98±0.86 <sup>a</sup>	26.21±0.35 <sup>a</sup>	31.31±0.75 <sup>b</sup>	36.21±0.46 <sup>c</sup>
Platelet ( $10^3/\mu\text{l}$ )	163.30±0.99 <sup>a</sup>	161.60±0.92 <sup>a</sup>	184.06±1.17 <sup>b</sup>	227.66±0.73 <sup>c</sup>

Note: Mean comparison have been made within different phases.

Mean super scripted with different letters differ significantly ( $P \leq 0.05$ ) from each other.

### 1. Total Leucocyte count (TLC)

The Mean±SE values of total leucocytes count ( $10^3/\mu\text{l}$ ) were measured as 24.19±0.53, 25.60±0.42, 18.82±0.47 and 12.44±0.51 in Phase-1, Phase-2, Phase-3 and Phase-4, respectively. Marked leucocytosis was observed in all cases in pre-rumenotomy phase (phase-1), which became more severe on phase-2 (24 hour of rumenotomy) ascribed to the inflammation and stress caused by surgery. The mean total leucocyte count was recorded with high-significant ( $P < 0.01$ ) difference before the rumenotomy in Phase-1, It could be in response to stress by inflammation and infections. The leucocytes cell distribution is affected by breed, temperature, environmental as well as body's demand and health status (Mbassa and Poulsen, 1993) [26]. These findings was well in accordance with Fani *et al.* (2019) [13] in cattle, Dodia *et al.* (2014) [12] in cattle with plastic foreign body, Gokce *et al.* (2007) [14] in cattle with TRP, Reddy *et al.* (2014) [34] in cattle, Singh *et al.* (2008) [40] in buffaloes with foreign body syndrome, Hussein *et al.* (2021) [17] in cow, Akraiem and Abd Al-Galil (2016) [5] in cattle with plastic impaction. The result of our study was contradicted with Vanitha *et al.* (2010) [44] in cattle, Suthar *et al.* (2019) [41] in Kuchchhi camel with foreign body syndrome and Otsyina *et al.* (2018) [30] in sheep and goat with ruminal plastic bag impaction. According to Otsyina *et al.* (2018) [30], there was no infection or invasion by infective agent hence no physiological need for leucocyte production.

### 2. Total Erythrocyte Count (TEC)

The Mean±SE values of total erythrocyte count ( $\times 10^6/\text{cu.mm}$ ) were measured as 6.15±0.41, 6.03±0.44, 8.70±0.58 and 9.12±0.69 in Phase-1, Phase-2, Phase-3 and Phase-4, respectively. All the values of total erythrocyte count (RBC) were found within normal physiological limits during all the four phases of our study. The mean total erythrocyte count was recorded with highly-significant ( $P < 0.01$ ) difference before the rumenotomy in Phase-1, which was well in accordance with Gokce *et al.* (2007) [14] in cattle with traumatic reticuloperitonitis and Vanitha *et al.* (2010) [44] in cattle with indigestible foreign body. It may be due to dietary deficiency, presence of foreign bodies and sloughing, stunting, erosions, inflammatory response and the hyperplasia due to the pressure on the wall of rumen caused by the foreign bodies (Hailat *et al.*, 1996) [15]. However majority of authors reported mild erythrocytopenia or anaemia throughout the study period with ruminal foreign body *viz.*, Kamalakar *et al.* (2021) [20] in cattle, Akinrinmade and Akinrinde (2012b) [4] in

cattle, Akinrinmade and Akinrinde *et al.* (2012a) [3] in West African dwarf goat, Kumar and Dhar (2013) [23] in captive Sambar, Singh *et al.* (2008) [40] in buffaloes, Lakhpati *et al.* (2019) [24] in cattle, Dodia *et al.* (2014) [12] in cattle, Sadan *et al.* (2020) [37] in camels, Bakhiet (2008) [9] in sheep, Mozaffari *et al.* (2009) [28] in goat kid.

### 3. Haemoglobin

The Mean±SE values of haemoglobin (g/dl) were measured as 7.82±0.43, 7.13±0.26, 8.99±0.61 and 9.89±0.60 in Phase-1, Phase-2, Phase-3 and Phase-4, respectively. Haemoglobin concentration was recorded with significant ( $P < 0.05$ ) difference during the various periodic intervals of foreign body syndrome, which was well in agreements with Reddy *et al.* (2014) [34] in cattle, Akinrinmade and Akinrinde (2012b) [4] in cow, Khalphallah *et al.* (2017) [22] in buffaloes, Akinrinmade and Akinrinde (2012a) [3] in West African dwarf goats, Kumar and Dhar (2013) [23] in captive Sambar, Abdelaal and El-Maghawry (2014) [1] in goat, Khalil *et al.* (2020) [21] in buffaloes and Kamalakar *et al.* (2021) [20] in cattle. It may be due to the poor nutrition, prolonged off feeding and gastrointestinal diseases (Radostits *et al.*, 2006) [32]. Some other authors were also reported mild anaemia or lower haemoglobin concentration during the course of study with foreign body syndrome *viz.*, Fani *et al.* (2019) [13], Vanitha *et al.* (2010) [44], Singh *et al.* (2008) [40] in buffaloes, Lakhpati *et al.* (2019) [24], Dodia *et al.* (2014) [12], Rouabah *et al.* (2017) [36] and Singh *et al.* (2015) [39]. The haemoglobin concentration was found within normal reference range in their study after the removal of foreign body by rumenotomy.

### 4. Neutrophil percent

The Mean±SE values of neutrophil% were observed as 53.53±0.69, 55.69±0.79, 41.39±0.70 and 36.06±0.73 in Phase-1, Phase-2, Phase-3 and Phase-4, respectively. Neutrophil percentage was recorded with high-significant ( $P < 0.01$ ) difference before the rumenotomy (Phase-1) which was well in accordance with Fani *et al.* (2019) [13], Lakhpati *et al.* (2019) [24] in cattle, Vanitha *et al.* (2010) [44] in cattle, Suthar *et al.* (2019) [41] in Kuchchhi camel, Singh *et al.* (2008) [40] in buffaloes and Raoofi *et al.* (2012) [33] in goat. The neutrophilia which was observed in all cases might be due to chronic irritation of the fore stomach wall (ruminal epithelium) by impacted indigestible foreign materials, leaving the wall exposed to secondary infection which resulted in infection (Hailat *et al.* 1996) [15].

### 5. Lymphocyte percent

The Mean±SE values of Lymphocyte% were measured as 42.35±0.66, 40.00±0.66, 53.42±0.83 and 57.61±0.71 in Phase-1, Phase-2, Phase-3 and Phase-4, respectively. Lymphocyte percent was recorded with high-significant ( $P<0.01$ ) difference before the rumenotomy (Phase-1), which was well in accordance with Lakhpati *et al.* (2019) [24] in cattle, Singh *et al.* (2008) [40] in buffaloes, Hussain and uppal (2012) [16] in buffaloes with rumen impaction, Vanitha *et al.* (2010) in cattle, Kamalakar *et al.* (2021) in cattle and Dodia *et al.* (2014) [12] in cattle. Decrease of lymphocyte in case of foreign body syndrome might be due to release of corticosteroid as a result of stress. However, Athar *et al.* (2010) [8] in bovines and Boodur *et al.* (2008) [11] in bovines found normal lymphocyte count even before rumenotomy. Post-operative antibiotic and anti-inflammatory therapy made the values reach to near normal by the end of study period.

### 6. Monocyte percent

The Mean±SE values of monocyte% were measured as 1.52±0.15, 1.59±0.13, 2.14±0.26 and 2.60±0.16 in Phase-1, Phase-2, Phase-3 and Phase-4, respectively. Monocyte percentage was recorded with highly-significant ( $P<0.01$ ) difference before the rumenotomy (Phase-1), which was well in accordance with Fani *et al.* (2019) [13] in cattle with foreign body syndrome and Vanitha *et al.* (2010) [44] in cattle with indigestible foreign body. Monocyte percentage and count founds within normal physiological limits in their study including pre-operative and post-operative stages. The result of our study was opposite to Kamalakar *et al.* (2021) [20] in cattle with plastic impaction. At the end of the study periods, he had recorded severe monocytosis and the values had increased to high levels. He assured that pre-surgical monocytosis could be accredited to chronicity of the inflammation formed by the presence of plastics in rumen. Generally, monocytes appear late in an inflammatory response and persist at increased levels until the response subsides (Vegad JL, 2008) [45].

### 7. Eosinophil percent

The Mean±SE values of eosinophil% were measured as 2.26±0.16, 2.37±0.15, 2.63±0.16 and 3.30±0.14 in Phase-1, Phase-2, Phase-3 and Phase-4, respectively. Eosinophil percentage was recorded with high-significant ( $P<0.01$ ) difference before the rumenotomy (Phase-1), which was well in accordance with Vanitha *et al.* (2010) [44] in cattle and Fani *et al.* (2019) [13] in cattle. The result of our study showed disagreement with Kamalakar *et al.* (2021) [20] in cattle with plastic impaction. He recorded eosinophils before surgery and on the 3<sup>rd</sup> day of surgery was significantly higher than those of end of the study, although all values were within physiological range. It might be due to rumenitis and or concurrent parasitism (Thorat, 1999) [43]. Exotoxin is a specific chemokine derived from leukocytes or epithelial cells that recruits eosinophils would have been the reason for eosinophilia initially (Vegad, 2008) [45].

### 8. Basophil percent

The Mean±SE values of basophil% were measured as 0.34±0.08, 0.35±0.01, 0.42±0.03 and 0.43±0.03 in Phase-1, Phase-2, Phase-3 and Phase-4, respectively. As per the analysis of variance (ANOVA), basophil percent was recorded with non-significant ( $P>0.05$ ) difference before the rumenotomy in Phase-1, which was well in accordance with

Fani *et al.* (2019) [13] in cattle, Vanitha *et al.* (2010) [44] in cattle, Singh *et al.* (2008) [40] in buffaloes and Lakhpati *et al.* (2019) [24] in cattle. The mean values for basophils percent was within normal physiological limits in all groups and statistically, they were non-significant ( $p>0.05$ ) suggesting that the basophil count is unaltered by ruminal foreign bodies and other non-penetrating foreign bodies. However, mainstream of authors reported no basophil percent throughout the study period with foreign body rumen impaction *viz.*, Kamalakar *et al.* (2021) [20] in cattle, Otsyina *et al.* (2018) [30] in sheep and goat with plastic foreign body, Akinrinmade and Akinrinde (2012a) [3] in West African dwarf goat with foreign body impaction and Kumar and Dhar (2013) [23] in captive Sambar.

### 9. Packed Cell Volume (PCV)

The Mean±SE values of PCV (%) were measured as 26.98±0.86, 26.21±0.35, 31.31±0.75 and 36.21±0.46 in Phase-1, Phase-2, Phase-3 and Phase-4, respectively. All values of PCV were found within normal physiological limit in all four phases. The mean PCV was recorded with highly-significant ( $P<0.01$ ) difference before the rumenotomy in Phase-1, which was well in harmony with Fani *et al.* (2019) [13] in cattle, Singh *et al.* (2008) [40] in bovines, Vanitha *et al.* (2010) [44] in cattle and Tandia *et al.* (2021) [42] in bovines. It could be due to inadequate dietary intake and dietary deficiency as a result of presence of foreign materials in rumen, anaemia, hampered digestion process and reduced feed conversion ratio. The result of our study was contradicted to Hussain and Uppal (2012) [16] in buffaloes, Otsyina *et al.* (2018) [30] in sheep and goat, Asopa *et al.* (2019) [7] in camel, Gokce *et al.* (2007) [14] in cow, Akraiem and Abd Al-Galil (2016) [5] in cattle, Behera *et al.* (2013) [10] in cow, Lotlikar *et al.* (2020) [25] in Dogs, and Reddy *et al.* (2014) [34] in cattle. The increased PCV might be due to dehydration associated with fluid loss due to reduction of food and water intake (Rosenberger, 1979) [35] and it also may be due to contraction of spleen resulting from increased level of circulating catecholamine's (Jain, 1986) [19].

### 10. Total Platelet Count

The Mean±SE values of total platelet count ( $10^3/\mu\text{l}$ ) were measured as 163.30±0.99, 161.60±0.92, 184.06±1.17 and 227.06±0.73 in Phase-1, Phase-2, Phase-3 and Phase-4, respectively. The mean total platelet count was recorded with highly-significant ( $P<0.01$ ) difference before the rumenotomy in Phase-1, which was well in accordance with Gokce *et al.* (2007) [14] in cattle with traumatic reticuloperitonitis, Otsyina *et al.* (2018) [30] in sheep and goats with ruminal plastic impaction and Singh *et al.* (2015) [39] in buffaloes with foreign body syndrome. It could be due to viral and bacterial septicaemia and in chronic inflammatory diseases (Radostits *et al.*, 1994) [31].

### Conclusion

Based on obtained findings in pre-rumenotomy and post-rumenotomy phases, it can be concluded that foreign body syndrome affects haematological parameters in cattle. It has a profound impact on health status of cattle. This study can serve as a diagnostic means for the detection of foreign bodies in field conditions when correlated with the history and clinical signs.

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