



*Original Research*

## Clinico-Pathological Studies and Management of Ruminal Lactacidosis in Crossbred Cattle

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### Abstract

Jersey cross bred and Holstein Friesian cross bred cattle were reported with the history of carbohydrate engorgement. On clinical examination animals showed anorexia, diarrhoea, regurgitation, tachypnoea, tachycardia and recumbency. There was no significant alteration in haemato-biochemical parameters. Rumen fluid examination revealed milky grey, watery, sour with reduced pH, increased methylene blue reduction time, increased titratable acidity and absence of protozoa. On endoscopy yellowish to brown coloured fluid could be visualized upon entering through relaxed lower oesophageal sphincter. The rumen fluid was lavaged to facilitate the visualization of reticulo-rumen. Greyish to light brown coloured necrosed ruminal epithelium could be visualized. Animals were administered with intravenous sodium bicarbonate, along with normal saline, thiamin and yeast along with rumen lavage and cud transplantation. Out of 110 animals with ruminal lactacidosis, 92.72 per cent of animals become normal following treatment and were discharged on 2<sup>nd</sup> or 3<sup>rd</sup> day of treatment.

**Key words:** Cattle, Low pH, Ruminal Acidosis, Therapy

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### Introduction

Ruminal acidosis refers to a series of conditions that reflect a decrease in pH in the rumen of cattle. It is a pathological condition associated with the accumulation of acid or depletion of alkaline reserves in blood and body tissues and characterised by increased hydrogen ion concentrations (Blood and Studdert, 1988). Ruminant animals, such as cattle, are adapted to feed primarily on forage. However, in order to increase



milk production and growth rates, large amounts of grain are fed to them. In response to the demands for increased feed conversion, cattle, sheep and goat producers rely on rapidly fermentable (high - grain) diets to maximize energy intake. Ruminants fed high - grain diets are at a greater risk of developing ruminal or metabolic acidosis, which may severely compromise gastrointestinal function, feed conversion, and the health and welfare of the animal (Steele *et al.*, 2009). The present study was undertaken to study the clinical, haemato-biochemical and endoscopic changes and attempt therapeutic management of ruminal lactacidosis in cattle.

## Materials and Methods

The study includes seventy eight Jersey cross bred and thirty two Holstein Friesian cross bred cattle (110 cattle) which were brought to Teaching Veterinary Clinical Complex (TVCC), Veterinary College and Research Institute, Namakkal with the history of carbohydrate engorgement during the study period of 2015-16. Among these 110 animals 3 were male and 107 were female. The animals between 2 – 8 years old and weighed 200 to 350 kg alone were selected for the study. Animals brought for routine checkup and deworming during this period served as a control group for all clinico-diagnostic studies. A thorough clinical examination was undertaken as per standard methods (Rosenberger, 1979). Venous blood samples were collected for routine haematological and biochemical examination. All the animals under study were restrained in the chute and rumen fluid was collected by using rumen fluid extraction pump. The samples were analysed as described by Rosenberger (1979) and (Constable *et al.*, 2017). The pH strips were used for the instant/on spot analysis of the pH of the rumen fluid collected. Rumenoscopy was performed using (Olympus™ GIF V70; Olympus Corporation, Japan) flexible video endoscope. Endoscopic procedure of passing the endoscope up to oesophagus as described by Franz and Baumgartner (2002) and up to reticulum as described by Sasikala *et al.* (2017) was followed. All quantitative data were compared between apparently healthy and diseased groups by using Student's *t*-test as described by Snedecor and Cochran (1994).

## Results

### Clinical Manifestations

The predominant clinical findings in the present study were reduced rumen pH, dehydration and tachycardia (100 % each), distended rumen (89.09 %), diarrhoea (74.54 %) and fluid splashing sounds on auscultation (74.54 %). Similar findings were reported by Maruta *et al.* (2008), Golder *et al.* (2014) and Bashir *et al.* (2015).

### Haemato-biochemistry

Haemato-biochemical values are given in Table 1.

**Table 1:** Haemato-biochemistry in apparently healthy cattle and cattle with ruminal acidosis

S. No.	Parameters	Apparently Healthy Cattle (n=20)	Ruminal acidosis (n=20)
		Mean $\pm$ SE	Mean $\pm$ SE
1	Haemoglobin (g/dl)	11.20 $\pm$ 0.09	10.9 $\pm$ 0.20
2	Packed cell volume (%)	34.35 $\pm$ 0.46	32.70 $\pm$ 0.61
3	Red Blood cell count ( $10^6$ /cumm)	6.47 $\pm$ 0.08	6.50 $\pm$ 0.09
4	White blood cell count ( $10^3$ /cumm)	6.58 $\pm$ 0.11	5.70 $\pm$ 0.12
5	Neutrophils ( $10^3$ /cumm)	2.24 $\pm$ 0.05	1.99 $\pm$ 0.05
6	Lymphocytes ( $10^3$ /cumm)	4.31 $\pm$ 0.07	3.72 $\pm$ 0.08
7	Monocytes ( $10^3$ /cumm)	0.13 $\pm$ 0.06	0.08 $\pm$ 0.04
8	Eosinophils ( $10^3$ /cumm)	0.07 $\pm$ 0.04	0.05 $\pm$ 0.03
9	Aspartate amino transferase (AST) (units/L)	100.45 $\pm$ 2.85	91.70 $\pm$ 3.41
10	Total protein (g/dL)	6.28 $\pm$ 0.23	6.62 $\pm$ 0.04
11	Albumin (g/dL)	2.98 $\pm$ 0.05	3.04 $\pm$ 0.06
12	Globulin (g/dL)	3.30 $\pm$ 0.22	3.57 $\pm$ 0.06

Mahmood *et al.* (2013) reported marked increase in packed cell volume, mean corpuscular volume and leukocytosis in goats with lactic acidosis. But no such alterations were noticed in this study.

### Rumen Fluid Examination

Rumen fluid examination results are given in the Table 2.

**Table 2:** Rumen fluid analysis in apparently healthy cattle and cattle with ruminal acidosis

S. No.	Parameters	Apparently Healthy Cattle (n=20)	Ruminal acidosis (n=20)
1	Colour	Yellowish to brown	Milky white
2	Consistency	Slightly viscus	Watery
3	Odour	Aromatic	Sour
4	SAT (min)	4.33 $\pm$ 0.21	4.12 $\pm$ 0.22
5	pH	6.48 $\pm$ 0.11	4.38 $\pm$ 0.11**
6	MBRT (min)	2.50 $\pm$ 0.22	12.50 $\pm$ 0.67**
7	Titratable acidity (units)	17.50 $\pm$ 1.11	82.50 $\pm$ 4.95**
8	Protozoa	Size	Large and Medium
		Density	++++
9	Iodophilic activity	+++	Nil

\*\* - Highly significant ( $p \leq 0.01$ )

Rumen fluid examination revealed milky grey, watery, sour, with reduced pH, increased methylene blue reduction time, increased titratable acidity and absence of protozoa. Similar changes were reported by Rosenberger (1979) and Constable *et al.* (2017).

## Endoscopy

Endoscope was used for assessing the damage to rumen and reticulum. On endoscopy yellowish to brown coloured fluid could be visualized upon entering through relaxed lower oesophageal sphincter. The rumen fluid was lavaged to facilitate the visualization of reticulo-rumen. Greyish to light brown coloured necrosed ruminal epithelium (Fig. 1) could be visualized, although no such changes were noticed in the reticulum.



**Fig. 1:** Sloughing of necrosed epithelium left haemorrhagic surface – Rumen (R)

In the present study, lavage and / or irrigation with water and subsequent siphoning were needed for visualization of reticulum on endoscopy. Although the compound stomach of the cattle cannot be compared with the stomachs of monogastric animals, withholding feed and flushing of the stomach were widely used in horses, small animals and pigs before gastroscopy (Franz *et al.*, 2004; Kraft, 1993; Mackin *et al.*, 1997; Vatistas *et al.*, 1997). Breitner *et al.* (1998) and Franz *et al.* (2006) advocated flushing of rumen before endoscopy via the artificial rumen fistula or by using an orally introduced stomach tube. Another important aspect of the endoscopy was the opportunity to visualize the mucosal surface directly, enabling colour, smoothness and brightness in addition to pathological mucosal alterations to be evaluated (Franz *et al.*, 2000).

## Treatment

Cattle were administered with intravenous sodium bicarbonate (7.5 %  $\approx$  1 mmol/Kg B.Wt), along with normal saline (@ 10 ml/kg IV), thiamin (10 ml IM) (50 mg/ml) and *Saccharomyces cerevisiae* ( $25 \times 10^9$  CFU) (4 Provisacc boli PO) along with rumen lavage and cud transplantation. For cud transplantation rumen fluid was collected from the healthy animals brought for pregnancy diagnosis / artificial insemination using rumen fluid extraction pump. The filtered cud fluid was transfused orally to the affected animals. Out of 110 animals with ruminal lactacidosis, 92.72 per cent of animals become normal following treatment and were discharged on 2<sup>nd</sup> or 3<sup>rd</sup> day of treatment.

Constable *et al.* (2017) had advocated use of intravenous sodium bicarbonate, fluid therapy, and rumen lavage, intra ruminal alkalizing agents, thiamin / brewer's yeast and administration of penicillin / tetracycline for the management of ruminal lactacidosis. In the present study, the cattle with ruminal lactacidosis were administered with intravenous sodium bicarbonate with saline, thiamin, yeast (orally) along with rumen lavage and cud transplantation. Following treatment, 92.72 per cent of animals recovered and were discharged on 2<sup>nd</sup> / 3<sup>rd</sup> day of treatment and the rest of the animals were sold by the owner owing to minimal clinical improvement. Thiamin is normally synthesized by the rumen microbes (bacteria, protozoa etc). In lactic acidosis, the acidic rumen pH results in decrease in the population of rumen microbes; this leads to decline in biosynthesis of thiamin. The oral administration of thiamin not only restores the function of the cells and tissues by replenishing thiamin deficiency but also promotes metabolism of excess lactic acid thereby reducing acidosis (Wilson *et al.*, 1991).

### Conclusion

Clinical signs, haemato-biochemistry, rumen fluid examination and endoscopic findings were documented in this research study. All the owners were educated not to feed carbohydrates like hotel, kitchen, festival and ceremonial wastes to ruminants to prevent ruminal acidosis.

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### Conflict of Interest

None of the authors have any conflict of interest to declare.

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