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## Prevalence, diagnosis and therapeutic management of ruminal acidosis in goats

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### Abstract

In peri-urban and rural areas, the majority of health problems are rumen related in goats. The ruminal acidosis is a life threatening problem in goats due to large quantity of carbohydrate rich grain feeding which is related to ruminal problem. In the present investigation, 112 clinical cases of ruminal acidosis of goats recorded at Veterinary Clinical Complex, Post Graduate Institute of Veterinary Education & Research, Jaipur (Raj.) during April, 2022 to July, 2023. Prevalence of ruminal acidosis in goat was recorded 17.17 percent (112) out of total goats cases (652 cases) presented. In Goats, higher occurrence of acidosis was observed in lower than 2 years of age (83.03 percent), followed by goats between 2 year to 5 year (12.05 percent) and lower occurrence of acidosis was observed greater than 5 years (4.46 percent). It was of higher occurrence in males 58.92 percent than females 41.07 percent. It was found that highest incidence of ruminal acidosis was recorded in the Monsoon season (45.53 percent) followed by Summer season (34.82 percent) and lower incidence in Winter season (17.85 percent) in goats. Higher incidence of ruminal acidosis was observed in non-descript native goats. Clinical signs were subnormal temperature, tachycardia, polypnea, anorexia or inappetence, decreased pH of rumen liquor, pasty to watery faeces and enlarged abdomen with fluid splashing sound in rumen in affected goats. The cases were diagnosed on the basis of history, clinical findings, laboratory investigation and ruminal liquor pH examination. Treatment with combination therapy of fluid therapy (Ringer lactate @ 20-25 ml/Kg body weight and Normal saline @ 20 ml/Kg body weight, intravenously); Oxytetracycline @ 5-10 mg/Kg body weight, intravenously; Meloxicam @ 0.2 mg/Kg body weight, intramuscularly; Thiamine+ Pyridoxine + Cynocobalamine @ 2-5 ml in small animal, intramuscularly or intravenously; Phenramine maleate @ 0.5 mg/Kg body weight, intravenously; Sodium bicarbonate @ 1gm/Kg body weight, intravenously; Buffkind @ 25gm, orally and Feedex forte bolus @ 1 bolus, orally were found effective against ruminal acidosis. 112 cases of ruminal acidosis were recovered uneventfully within 3rd days in goats and 2 cases of ruminal acidosis died during treatment.

**Keywords:** Ruminal acidosis, life threatening, goat, sodium bicarbonate, buffkind

### Introduction

In peri-urban and rural areas, the majority of health problems are rumen related in goats. Diarrhoea, overeating, ruminal acidosis, bloat etc. are the common conditions affecting rumen. Ruminal acidosis is increasingly recognized as a major disorder of ruminants. This condition increases the morbidity and mortality in small ruminant (Goats and Sheep). Ruminal acidosis (also known as acidosis, lactic acidosis or grain overload) is due to accidental and rapid ingestion of excessive amounts of highly fermentable carbohydrate rich grains like wheat, corn, barley and rice etc., poor management practices etc. (Choudhary *et al.*, 2011) [2]. It is one of the most important clinical emergencies in small ruminants (goats and sheep) resulting in high mortality (Radostits *et al.*, 2000) [15]. In rural and peri-urban areas, people living here rear goats in semi-intensive method. The feed offered is vegetable waste from their household or vegetable markets (Padmaja and Praveena, 2011) [12] or serve excessive amount of carbohydrate rich grain to the goats for enhance weight then after consumption, ruminal acidosis occurred in which lactic acid is increased in the rumen from 1-1500 mg/ 100 ml (Walker, 1968) [24] and in blood from 4.5-90 mg/100 ml (Dunlop and Hammond, 1965) [4] and also decreased pH of rumen liquor. Severe dehydration and cardiovascular involvement are common (Shihabuddin *et al.*, 2003) [19] in addition to

biochemical changes (Sharma and Nath, 2005) [18] in ruminal acidosis. Acidosis is a major disorder that varies in degrees of seriousness from a slight drop in feed intake to death in goats. The intensity of ruminal acidosis depends on acid quantities, which in turn depend on the amount of starch consumed and the ability of microorganisms to metabolize the acids. In severe acute cases of grain overloaded, animals can become extremely sick and the mortality rate is high. Lactic acidosis can also cause ruminitis, metabolic acidosis, hepatic abscessation, pneumonia, lameness, and death (Lean *et al.*, 2001) [9].

**Case History**

In present investigation, out of 652 cases of Goats, 112 goats (1.5 month to 10 years of old age) diagnosed with ruminal acidosis at Veterinary Clinical Complex, Post Graduate Institute of Veterinary Education & Research, Jaipur (Raj.) during April, 2022 to July, 2023. The all information pertaining to age, sex, breed, season and other parameters was recorded and clinical manifestation observed and examined in respect of duration of illness, body temperature, pulse rate, respiration rate and color of mucous membrane, body condition were critically examined. Based upon the history and clinical examination, goats were diagnosed as affected with ruminal acidosis.



**Fig 1:** Enlarged abdomen due to excessive intake of grain (in arrow)



**Fig 2:** Collection of rumen liquor from paralumber fossa (Location)

**Results and Discussion**

In the present investigation, out of total 652 goats reared by private owners in Jaipur district of Rajasthan, 112 goats were diagnosed as affected with ruminal acidosis during April, 2018 to July 2019. The overall prevalence of ruminal acidosis in goats was found to be 17.17 percent. These findings are agreement with Ashok Kumar *et al.*, (2005) [1] who also reported 18, 20, 13.09, 18, 9.67 and 11.12 percent prevalence of ruminal acidosis in goats in organized farm. In the present investigation, out of the 112 goats, 110 (98.21

Percent) goats completely recovered after 3 days of therapy and 2 (1.78 Percent) cases of goats died during treatment in ruminal acidosis.

**Age**

In Goats, higher incidence of acidosis was observed in lower than 2 years of age (83.03 percent), followed by goats between 2 year to 5 year (12.05percent)) and lower incidence of acidosis was observed between greater than 5 years (4.46 percent). These findings are agreement with Darwin *et al.*, (2007) [3], Kasaralika *et al.*, (2012) [8], Panchasheel (2013) [14] and Ningadalli *et al.*, (2017) [10]. Higher incidence of ruminal acidosis in the growing age could be due to their not or less selectivity in feed and high basal metabolic rate as compared to older goats.

Sr. No..	Age Group			Total
	< 2years	2-5 Years	>5 Years	
	93	14	5	112

**Sex**

In the present study, the incidence of ruminal acidosis was found higher in male goats (58.92 Percent) than female goats (41.07 percent). In the present investigation, sex had a significant increase on incidence of ruminal acidosis. This may be attributed to the fact that population of male is more and also due to early slaughter for meat purposes.

**Season**

It was found that highest incidence of ruminal acidosis was recorded in the Monsoon season (45.53 percent) followed by Summer season (34.82 percent) and lower incidence in Winter season (17.85 percent) in goats which is in agreement with findings of Darwin *et al.*, (2007) [3]. These findings are agreement with Ningadalli *et al.*, (2017) [10] which concluded that the higher incidence of ruminal acidosis in Monsoon and Winter seson could be due to consumption of waste food that is available in plenty at the time of festivals and marriage seasons.

Case no. of ruminal acidosis in respect to season (April, 2018- July, 2019)

Sr. No.	Summer Season	Monsoon Season	Winter Season	Total
1	39	51	20	112

**Breed**

Higher incidence of ruminal acidosis was observed in nondescript native goats due to non-reporting of pure breed goats to Veterinary clinical complex of PGIVER, Jaipur and lower incidence of ruminal acidosis was observed in Sirohi breed of goats. This could be attributed to the maximum population of non-descript and Sirohi breed of goats in the area of present study.

**Clinical Signs**

The clinical diagnosis was established by the presence of subnormal temperature, increase respiration and pulse rate, anorexia or in appetite, grinding of teeth, anuria, pasty to watery diarrhea, distended abdomen with and auscultation and percussion revealed fluid splashing sound in left paralumber fossa. In present investigation, the first visible sign observed was subnormal body temperature (Nour *et al.*, 1998) [11], increased respiration (Huber, 1976) [7] and heart

rate (Radostits *et al.*, 2000) <sup>[15]</sup>, anorexia or inappetence, grinding of teeth, anuria, pasty to watery diarrhea, distended abdomen with auscultation and percussion revealed fluid splashing sound in left para lumbar fossa. These findings are similar to Radostits *et al.*, (2000) <sup>[15]</sup>; Ram *et al.*, (2007) <sup>[17]</sup> Padmaja and Praveena (2011) <sup>[12]</sup>; Choudhary *et al.*, (2011) <sup>[2]</sup>; Thangathurai *et al.*, (2016) <sup>[22]</sup>; Singh *et al.*, (2017) <sup>[20]</sup>. Nour *et al.*, (1998) <sup>[11]</sup> stated that the sub-normal body temperature may be due to lactic acidosis in ruminal acidosis condition. Radostits *et al.*, (2000) <sup>[15]</sup> concluded that the increased heart rate might be due to toxic effect of lactic acid, reduced plasma volume and circulatory failure. Huber, (1976) <sup>[7]</sup> stated that increased respiration rate was also observed might be due to stimulation of respiratory centre by increased CO<sub>2</sub> tension of blood and decreased blood pH. Similar observation was reported by Ram *et al.*, (2007) <sup>[17]</sup>. Anorexia and inappetence observed in the present study might be due to accumulation of lactic acid in the rumen (Dunlop, 1972) <sup>[5]</sup>. The distended abdomen or rumen was observed in all cases of ruminal acidosis in goats. This might be due to increased fluidity of rumen contents. Increased production of lactic acid in rumen increases the osmolality, which draws water from the circulation and this might be a reason for distension, dehydration and haemoconcentration (Radostits *et al.*, 2000) <sup>[15]</sup>. Anuria might be due to reduced renal blood flow and dehydration. Grinding of teeth observed in affected with ruminal acidosis in goats was due to chemical rumenitis and due to stimulation of the free pain endings of autonomic nerves by distended rumen wall (Radostits *et al.*, 2000) <sup>[15]</sup>. Ruminal fluid analysis revealed dark brown colour to light yellowish colour, ruminal liquor pH decrease (3-5 pH) and protozoal activity was nil on microscopic examination and seen heavy carbohydrate rich grain in rumen liquor during gastric lavage in affected with ruminal acidosis cases. Ruminal fluid analysis revealed dark brown colour to light yellowish colour, ruminal liquor pH decrease (3-5 pH) and protozoal activity was nil on first day of microscopic examination but found intense protozoal activity present on 3rd day of microscopic examination after treatment. These findings are similar to Smith (2002) <sup>[21]</sup>; Radostits *et al.*, (2007) <sup>[16]</sup>; Singh *et al.*, (2017) <sup>[20]</sup> and Valmik *et al.*, (2017) <sup>[23]</sup>. Ruminal pH was observed lower in affected with ruminal acidosis in goats which might be due to excess accumulation of lactic acid in rumen (Radostits *et al.*, 2007) <sup>[16]</sup>.

### Clinical Management

In the clinical management of ruminal acidosis, neutralization of acidic pH of rumen is the primary consideration. A decrease in bicarbonate and increase in lactic acid concentration further decrease ruminal pH. Use of alkali or buffer as sodium bicarbonate or Potassium bicarbonate is recommended (Erdman *et al.*, 1988) <sup>[6]</sup> and Prasad and Rekiab, (1975) <sup>[13]</sup> also stated that parental or oral use of alkalinizer like sodium bicarbonate has been useful in correction of ruminal acidosis. All animals were treated with combination therapy of fluid therapy (Ringer Lactate @ 25 ml/Kg body weight and Normal Saline @ 20 ml/Kg body weight, intravenously); Oxytetracycline @ 5-10 mg/Kg body weight, intravenously; Thiamine+ Pyridoxine + Cynocobalamine @ 2-5 ml in small animal, intramuscularly or intravenously; Phenramine Maleate @ 0.5 mg/Kg body weight, intravenously; Sodium bicarbonate @ 1 gm/Kg body weight, intravenously; Buffkind @ 25gm orally; and

Blotinox @ 25 ml, orally were found effective against ruminal acidosis. 110 cases of ruminal acidosis were recovered uneventfully within 3rd days in goats and 2 cases of ruminal acidosis died during treatment. After the treatment schedule, 3rd day, body temperature, appetite, skin and hair coat, color of mucous membrane and respiration rate were restored to normal in 110 cases.

### Conclusion

In conclusion, acidosis is a managerial problem and caused by improper feeding practices. To prevent rumen acidosis in goats, creation of awareness among owners not to feed grain and grain products (bread, bun, biscuits, roti etc.) and do not store grain in areas where animals can access it easily. If ingested accidentally or large quantity, rumen buffers (Sodium bicarbonate) have to be given orally as a first aid. Due to ingested accidentally or large quantity grain and grain products, ruminal acidosis can be potentially fatal thus requires emergency treatment. In the present investigation, it is concluded that intravenous administration of 7.5 percent Sodium bicarbonate and oral administration of rumen buffer along with supportive therapy that is fluid therapy, antibiotic, antihistaminic, multivitamins and rumentorics is highly effective in 110 cases (95.58 percent) for therapeutic management of acidosis in goats.

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