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Research Article

CLINICAL AND HAEMATO-BIOCHEMICAL CHANGES IN ALKALINE INDIGESTION IN SOUTH DOWN BREED OF SHEEP IN KASHMIR VALLEY

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ABSTRACT

The present study was conducted with an objective to determine clinico-haemato- biochemical changes in alkaline indigestion affected South Down sheep (n=28) in Kashmir valley. Ruminal fluid, urine and blood were examined for microscopic examination, pH and other haemato-biochemical changes. There was a significant increase in heart rate, respiration rate, ruminal pH, urinary pH, sedimentation activity time, methylene blue reduction time while as the ruminal motility was found to be significantly decreased in alkaline indigestion affected sheep. The motility and iodophillic activity of the ruminal protozoa were -/+ (absent/slow) and – (absent), respectively in sheep affected with alkaline indigestion. Haemato-biochemical studies revealed that blood pH, packed cell volume, haemogloblin, total erythrocyte count and serum potassium showed a significant increase in sheep affected with alkaline indigestion.

Key words: Alkaline indigestion, sheep, haemato-biochemical tests

Incidence of alkaline indigestion in ruminants is on rise due to use of urea as a fertilizer or feed additive (Hazarika *et al.,* 2002). Urea feeding is a common practice for replacement of protein in ruminants. Excessive consumption of this non protein nitrogen substance causes ruminal alkalosis, which may produce gastroenteritis, hepatic, renal, circulatory and nervous disturbances (Parkins *et al.,* 1973). Alkaline indigestion can also occur with the generation of excessive ammonia in the rumen associated with feeding of high-protein diets. More dramatic elevation in ammonia concentration with rumen fluid pH above 7.5, follow the overfeeding of non-protein nitrogen sources such as urea, biuret and ammonium phosphate. In this paper, the clinical and haemato-biochemical changes associated with alkaline indigestion in sheep in Srinagar region are presented.

MATERIALS AND METHODS

The study was conducted on South Down breed of sheep in Kashmir province from January 2012 to December 2012. Twenty eight sheep with alkaline indigestion were selected randomly at high land alpine pasture at Sonamarg, Zabarwan Sheep farm, Sheep Research Station (SRS) Shuhama and cases presented for treatment at the Teaching Veterinary Services Clinical Complex. Eight normal animals (n=8) were selected randomly at each of the above mentioned four places. Similarly seven animals (n=7) suffering from alkaline indigestion were selected randomly from each of the above mentioned four places. Clinical observations such as ruminal motility, temperature, pulse, respiration rate and heart rate were recorded in all animals. For accessing the degree of dehydration skin fold test was performed as per the method determined by Blood *et al*. (1983). Rumen fluid, blood and urine were collected from the animals for the ruminal fluid examination, haemato-biochemical parameters and urine analysis respectively. The rumen liquor was examined for ruminal pH, sedimentation activity (SAT) and methylene blue reduction test (MBRT). The motility and iodophillic activity of the rumen protozoa was performed as per standard technique determined by Das (1990).

Blood pH was measured by a blood pH meter on freshly collected blood samples. PCV, Hb, TEC were estimated in these samples by standard techniques (Jain, 1986). Serum calcium and phosphorus were estimated as

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per the protocol of Miller *et al.* (2010). Serum sodium and potassium was measured by Flame photometry method (Oser, 1965).

RESULTS AND DISCUSSION

Heart rate and respiration rate were found to be significantly increased while ruminal motility decreased significantly in animals with alkaline indigestion as compared to healthy sheep (Table 1). However, there was no significant difference in rectal temperature between two types of animals. The increased heart rate might be due to fall in plasma volume and effects of ammonia on central nervous system Randhawa *et al.* (1989a).The increase in respiration rate could be attributed to accelerated pulmonary ventilation to excrete excess amount of ammonia from blood through lungs or due to stimulation of ammonia in the brain (Sahu *et al*., 1993; Hazarika *et al.,* 2001). The decrease in ruminal motility may be attributed to increase in ruminal pH (Hazarika *et al.*, 2002). The toxic amides and amines including histamine produced as a result of putrefaction are known to produce ruminal atony (Prasad, 1977). Sheep with alkalosis showed mild (4-6%) dehydration as per skin turgor technique. This is in accordance with earlier reports by Hazarika *et al.* (2002).

Urinary pH, ruminal pH, SAT, MBRT of sheep suffering from alkaline indigestion were found to be significantly increased as compared to healthy controls (Table 1). The increase in the urine pH may possibly be due to increased excretion of ammonia in the urine (Randhawa *et al*., 1989b), while the increase in ruminal pH might be due to poor buffering capacity of ruminal fluid against production of large quantity of ammonia (Ahuja *et al*., 1989). The significant increase in SAT and MBRT could be ascribed to the destruction of normal rumen micro flora due to disturbed pH and accumulation of toxic levels of ammonia and other amines (Somayajulu, 1988; Sahu *et al* 1993).

The motility and the iodophillic nature of rumen protozoa of healthy control sheep were observed as + + + (graded as vigorous) and + +/+ + + (graded as moderate to high) while in animals suffering from alkaline indigestion the ruminal motility was- /+(graded as absent or slow) while as the iodophillic activity was- (graded as absent). Guha and Sinha (1989) recorded similar findings in goats with accidental ingestion of urea. The decrease in protozoal motility in alkaline indigestion-affected sheep could be ascribed to increase in ruminal pH, and accumulation of toxic levels of ammonia and amides in the rumen (Sahu *et al.*, 1993). Iodophillic activity of the rumen protozoa was totally absent in alkaline indigestion affected sheep which might be ascribed to improper utilization and storage of glycogen by rumen protozoa affected by toxic levels of ammonia.

The PCV, Hb and TEC were found to be significantly increased in alkaline indigestion affected sheep as compared to healthy control (Table 2) which was in accordance with the findings of Lloyd (1970) and Davidovich *et al*. (1977). These hematological changes might be due to stress associated with increase in blood ammonia resulting in release of stored erythrocytes into the peripheral circulation probably due to splenic contractions (Turner and Hodgetts, 1959). Blood pH did

Table 1
Clinical and ruminal values in South Down breed of sheep suffering from alkaline indigestion

Parameter	Healthy control (n= 32)	Alkaline indigestion (n= 28)
Heart rate/min	63.33±2.51^{a}	69.33±0.88^{b}
Respiratory rate/min	63.33±2.51^{a}	29.83±0.83^{b}
Rectal temperature (ºF)	102.03±0.17^{a}	101.83±0.09^{a}
Ruminal motility/5 min.	6.16±0.60^{a}	1.66±0.49^{b}
pH of urine	7.78±1.0^{a}	7.88±0.07^{a}
SAT/min.	5.50±0.42^{a}.	16.33±1.25^{b}
MBRT/min.	4.50±0.42^{a}.	24.66±1.54^{b}
pH of rumen liquor	6.70±0.09^{a}	5.18±0.27^{b}
Motility of rumen protozoa	+ + +	-/+
Iodophillic activity	++ / ++	-

The values bearing different superscripts in a row differ significantly (P<0.05)

Table 2
Haemato-biochemical values in South Down breed of sheep suffering from alkaline indigestion

Parameter	Healthy control (n= 32)	Alkaline indigestion (n= 28)
Blood Ph	7.43±0.04^{a}	7.26±0.08^{a}
PCV (%)	37.16±2.45^{a}	44.16±0.87^{b}
Hb (g/100 ml)	12.60±0.88^{a}	14.05±0.56^{b}
TEC (10^6/mm^3)	12.88±0.97^{a}	13.40±01.13^{b}
Serum calcium (mg/100 ml)	10.49±0.21^{a}	10.45±0.45^{a}
Phosphorus (mg/100ml)	5.14±0.16^{a}	5.34±0.22^{a}
Sodium (mEq/lt)	147.76±0.20^{a}	146.95±2.05^{a}
Potassium (mEq/lt)	4.33±0.20^{a}	5.00±0.23^{b}

The values bearing different superscripts in a row differ significantly (P<0.05).

not differ significantly in both the groups. Stabilization in the blood pH despite ruminal alkalosis could be attributed to buffering action of blood and different compensatory mechanisms such as pulmonary hyperventilation (Kirkpatric *et al.*, 1973; Randhawa *et al.*, 1989a).

Serum calcium, inorganic phosphorus and sodium of sheep with alkaline indigestion did not differ significantly from the healthy control (Table 2) .This was in agreement with the findings of Hazarika *et al.* (2002). Mean serum potassium concentration was significantly higher in alkaline indigestion affected sheep as compared to the healthy control as also reported by Roller *et al.* (1982). Increase in serum potassium might be due to the accumulation of ammonia within the cells as cation causing potassium ion efflux (Roller *et al*., 1982).

REFERENCES

Ahuja, A.K., Randhawa, S.S. and Rathor, S.S. (1989). Effect of acute ruminal alkalosis on microbial and biochemical changes in rumen liquor of buffalo calves. *Indian J. Vet. Med.* **9**: 86-91.

Blood, D.C., Radostits, O.M., Henderson, J.A., Arundel, J.H. and Gay, C.C. (1983). Veterinary Medicine. (6th edn.), The English Language Books Society.Bailliere, Tindall.

Das, S. (1990). Studies on experimental rumen acidosis in goats with special reference to liver functions and therapy. M.V.Sc. thesis submitted to Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal.

Davidovich, A., Bartley, E.E., Chapman, T.E., Bartley, R.M., Dayton, A.D. and Faray, R.A. (1977). Ammonia toxicity in cattle-Changes in carotid and jugular blood components associated with toxicity. *J. Anim. Sci*. **44**: 702-709.

Guha, P. and Sinha, B.P. (1989). Ruminal alkalosis in goats. *Indian J. Vet. Med.* **9**: 127-128.

Hazarika, T., Hazarika, G.C. and Rajkhowa, S. (2001). Clinico-haematobiochemical studies in experimentally induced alkaline indigestion in goats. *Indian J. Vet. Med.* **25**: 279-280.

Hazarika, T., Kazarika, G.C., Rajkhowa, S. and Phukan, A. (2002). Biochemical changes in induced alkaline indigestion in goats. *Indian J. Vet. Med.* **22**: 25-27.

Jain, N.C. (1986). Schalm's Veternary Haematology. (4th edn.), Lea and Febiger, Philadelphia, USA.

Kirkpatric, W.C., Roller, M.H. and Swanson, R.N. (1973). Haemogram of sheep acutely intoxicated with ammonia. *Am. J. Vet. Res*. **34**: 587-589.

Lloyd, W.E. (1970). Chemical and metabolic aspects of urea-ammonia toxicosis in cattle and sheep. Ph.D. dissertation, Iowa University Ames, Iowa.

Miller, D.B. and O'Callaghan, J.P. (2003). Effect of aging and stress on hippocampal structure and function. *Metabolism Clin. Exptl.* **52**: 17-21.

Miller, M., Weber, M. Valdes, E.V., Neiffer, D., Fontenot, D., Fleming, G. and Stetter, M. (2010). Changes in serum calcium, phosphorus and magnesium levels in captive ruminants affected by diet manipulaion. *J. Zoo. Wildl. Med*. **41**: 404-408.

Oser, B.L. (1965). Hawk's Physiological Chemistry. (14th edn.), McGraw-Hill Book Co., New York.

Parkins, J.J., Hemingway, R.G. and Brown, N.A. (1973). The increasing susceptibility of sheep to dietary urea toxicity associated with progressive liver dysfunction. *Res. Vet. Sci.* **14**: 130-132.

Prasad, J. (1977). Studies on corelation between ruminal pH, total volatile fatty acids and ammonia and ammonia nitrogen in clinical and experimental indigestion in cattle and buffaloes. *Indian Vet. J.* **54** : 922-925.

Randhawa, S.S., Ahuja, A.K. and Hathor, S.S. (1989a). Effect of lactic acidosis on microbial and biochemical changes in rumen liquor of buffalo calves. *Indian J. Vet. Med*. **9**: 1-7.

Randhawa, S.S., Dhaliwal, P.S., Gupta, P.P., Ahuja, A.K. and Rathor, S.S. (1989b). Studies of clinico-biochemical and pathological changes in the urea-induced acute rumen alkalosis in buffalo calves. *Indian J. Vet Med*. **9**: 86-91.

Roller, M.H., Riedemann, M.S., Romkema, G.E. and Swanson, R.N. (1982). Ovine blood chemistry values measured during ammonia toxicosis. *Am. J. Vet. Res*. **43**: 1068-1071.

Sahu, S., Chakarbharti, A., Pan, S., Basak, D.N. and Mukherjee, B.N. (1993). Physio-biochemical changes in rumen liqour in urea induced ruminal alkalosis in goats. *Indian J. Vet. Med.* **13**: 61-63.

Somajajulu, S. (1988). Studies on experimental alkaline indigestion in goats with particular reference to clinicobiochemical and therapeutic studies. M.V.Sc. thesis, Andhra Pradesh Agricultural University, Hyderabad.

Turner, A.W. and Hodgets, V.E. (1959). The dynamic red cell storage function of the spleen in sheep. Relationship to fluctuations of jugular haematocrit. *Aust. J. Exp. Biol. Med. Sci.* **37**: 399-420.