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Profiles of some blood biochemical constituents during reticuloruminal impaction in buffaloes

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In rural areas, the buffaloes are exclusively maintained on wheat straw or paddy straw during the period of non-availability of green fodder. In wheat/paddy straw due to high lignification the digestibility of most of the nutrient is low. Continuous feeding of low-grade roughages is one of the major causes of reticuloruminal impaction (RRI). Liver is the major organ involved in the endogenous synthesis of proteins. Therefore hepatic dysfunction during RRI may lead to alterations in plasma protein profile, particularly acute phase protein like fibrinogen while renal dysfunction can result in electrolyte imbalance. This study reports such biochemical changes along with blood glucose and lactic acid concentrations in buffaloes affected by RRI.

Normal buffaloes (12; group 1 control) and buffaloes with RRI (12; group 2) were selected from the dairy farm and from the cases presented at Veterinary Clinical Services Complex, PAU, Ludhiana, respectively. Blood samples were collected in 5 ml vials containing potassium oxalate as an anticoagulant for fibrinogen estimation and in 30 ml heparinized vials for the other estimations. Protein free filtrate was immediately prepared for estimating blood glucose and lactic acid concentrations. The rest of blood samples were centrifuged at 3 000 rpm for 15 min to separate plasma.

The concentrations of plasma total proteins and fibrinogen were estimated by the methods of Wooton (1964). Plasma albumin was determined by chemistry analyzer using commercial kit. Plasma globulin concentration was calculated by subtracting the concentration of plasma albumin and fibrinogen from the total plasma proteins. Plasma chloride was measured as per Whitehorn (1921). Sodium and potassium levels were determined by using flame photometer after diluting plasma 1 : 100. Blood glucose and lactic acid concentrations were estimated as per Folin and Wu (1920) and Barker and Summerson (1941), respectively. The data were subjected to student's t-test (Snedecor and Cochran 1994).

The results of the effect of RRI on blood biochemical constituents in buffaloes are presented in Table 1. The concentrations of plasma protein, albumin, globulins and A/G ratio remained almost similar in control and buffaloes with RRI. A nonsignificant decline in the A/G ratio in the diseased animals might be due to decrease in albumin and an increase in globulin levels in them. These findings were similar to those reported by Kanoc *et al.* (1979).

Table 1. Some blood biochemical constituents of buffaloes suffering from reticuloruminal impaction

Parameter	Group 1	Group 2
Total plasma protein (g/dL)	7.46±0.12	7.84±0.38
Albumin (g/dL)	3.99±0.22	3.58±0.79
Fibrinogen (mg/dL)	617.92±12.27	724.17±12.09**
Globulin (g/dL)	3.02±0.36	3.60±0.83
A/G ratio	1.39±0.47	1.05±0.27
Sodium (mEq/L)	118.17±5.62	92.72±7.05*
Potassium (mEq/L)	5.12±0.46	4.28±0.41
Chloride (mEq/L)	113.23±6.12	96.19±8.26
Blood glucose (mg/dL)	50.40±2.80	50.40±2.80
Lactic acid (mg/dL)	6.88±0.43	8.35±0.52

Group 1, Normal buffaloes; group 2, buffaloes with reticuloruminal impaction; **P<0.01; *P<0.05.

There was a significant (P<0.01) increase in the fibrinogen level in the buffaloes suffering from RRI when compared to levels in group 1. Fibrinogen is an acute phase protein and its synthesis and turnover rate can be markedly accelerated during the acute phase response induced by tissue damage (Dodds 1997). Plasma fibrinogen level can be used as a valuable aid to detect inflammatory and traumatic stress to liver (Liberg 1978). Significant rise in plasma fibrinogen, therefore, pointed towards inflammation of liver during RRI.

The plasma electrolytes sodium, potassium and chloride were lower in buffaloes with RRI as compared to control group. The difference in plasma sodium was statistically

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significant ($P<0.05$) which was also observed by Cakala *et al.* (1974) during their study on ruminal derangement. Further our result of plasma potassium were in agreement with Bhatti (1995). They observed lower levels of potassium in cattle and buffaloes during ruminal derangement and starvation.

Hypokalemia may occur due to reduced dietary intake, increased renal excretion, abomasal stasis, intestinal obstruction and enteritis. A nonsignificant decline in potassium level in the present study might be due to long standing anorexia and poor absorption of nutrients during RRI. The decline in plasma chloride might be due to the retention of chloride in the ruminal contents (Kuipar and Breukink 1986). Long standing anorectic status of animals might also be the cause of decrease in chloride levels in plasma.

There was a nonsignificant decline in blood glucose concentration in buffaloes suffering from RRI. This was in accordance with the findings of Joshi and Misra (1975) who observed little variations in the biochemical patterns of glucose metabolism in spontaneous rumen dysfunctions in buffaloes. However, Singh *et al.* (1989) reported hyperglycemia in buffaloes suffering from various digestive disorders like bloat and impaction.

In the present study this nonsignificant decline in blood glucose could be because of gluconeogenesis and glycogenolysis by which ruminants tried to maintain basal blood glucose level. Rowland (1980) also reported that glucose concentration in the blood of cattle sometimes decreased with the reduced energy intake but the change was not consistent. Sahoo *et al.* (2000) also observed that any shortage of energy availability led to decreased blood glucose within 24 h of feed restriction and thereafter nonsignificant changes occurred because animals tried to maintain blood glucose by gluconeogenesis.

There was a nonsignificant increase in the lactic acid level in group 2 animals. In ruminants, degradation of starch leads to production of volatile fatty acids along with small amounts of lactic acid. The latter is metabolized to pyruvate by liver. However, due to hepatic dysfunction during RRI, capacity of liver to metabolize lactic acid is compromised and its concentration is increased in the blood. This could be the reason of increased, though nonsignificant, lactic acid in blood.

SUMMARY

RRI led to a significant rise in plasma fibrinogen, an acute phase protein, which indicated inflammatory changes in hepatic tissue while decreased plasma Na^+ level pointed towards electrolyte imbalance due to poor absorption from intestine or poor reabsorption due to renal dysfunction.

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