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EFFECT OF MASTITIS ON HAEMATO-BIOCHEMICAL AND PLASMA MINERAL PROFILE IN CROSSBRED CATTLE

R. Singh, R.K. Bhardwaj, M.S. Azad and S.A. Beigh

Division of Veterinary Medicine, Faculty of Veterinary Science and Animal Husbandry
(SKUAST-J) R.S. Pura, Jammu-181 102, India

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ABSTRACT

To study the effect of subclinical and clinical mastitis on haematological, biochemical and mineral profile of crossbred cattle an investigation was carried. Haematology of animals revealed significantly (P< 0.05) higher average values of TLC in sub-clinically (9.20x 10^3/µl) and clinically (9.31x 10^3/µl) infected animals than healthy animals (6.87x 10^3/µl). Differential leucocytic count revealed neutrophilia and lymphopenia in clinical as well as sub-clinical mastitis (SCM). Biochemical estimations of plasma samples from sub-clinically and clinically infected animals revealed higher average values of TPP (8.44 g/dl and 823 g/dl), albumin (2.447 g/dl and 2.31 g/dl), globulin (5.82 g/dl and 5.93 g/dl) and fibrinogen (0.74 g/dl and 1.21 g/dl) compared with control group (7.44 g/dl, 2.94 g/dl and 4.41 g/dl and 0.60 g/dl, respectively). Mineral estimation revealed significant (P< 0.05) increase in calcium level in sub-clinical (13.45mg/dl) and clinical mastitis (13.149mg/dl) as compared to healthy control (9.44 mg/dl), however, no significant (P> 0.05) change was observed in inorganic phosphorus, Mg, Na and K levels.

Key words: Biochemical, Fibrinogen, Haematology, Mastitis, Mineral, Subclinical.

INTRODUCTION

Mastitis continues to be a major problem concerning dairy industries. The diseases manifests in two forms, clinical and subclinical. Most of the dairy farmers in India are hardly aware of subclinical mastitis and as such attracts no importance to it. In mastitis, there is a break in the blood-milk-barrier, along with impaired synthesis and secretary activity of udder epithelial cells, which alters the level of most components. The present study was undertaken to evaluate the haemato-biochemical and mineral alterations in dairy cows affected with mastitis.

MATERIALS AND METHODS

Blood samples were collected from 10 healthy, 30 sub-clinical and 18 clinical cases of mastitis in cattle in heparinised mineral free (15-20ml) and in disodium EDTA (2-3ml) vials. The blood samples were analyzed for Hb, PCV and DLC within 5-10 hrs. of collection using the methods described by Jain (1986). Total plasma proteins (TPP) were analysed by Biuret method and plasma albumin by Bromocresol green method employing Autopak kits supplied by Bayer Diagnostics India Ltd., Baroda using Spectrophotometer (Model-108, Systronics, Ahmedabad). The concentration of plasma globulin was arrived at by subtracting plasma albumin concentration from total plasma proteins concentration and A/ G ratio was derived. Plasma fibrinogen was estimated using heat total precipitation refractometer method as described by Jain (1986). Estimation of Ca was done as per cresolphthalein complexone method using Autopak kits supplied by Bayer Diagnostics India Ltd. Mg was estimated using Kits supplied by AGAPPE Diagnostics. Inorganic fraction of phosphorus (Pi) was determined by employing method of Taussky and Shorr (1953). Sodium and potassium were measured using Flame Photometer (Mediflame 127, Systronics, Ahmedabad-382 330). Statistical comparison of data was done as per Snedecor and Cochran (1989).

RESULTS AND DISCUSSION

Evaluation of hematological parameters revealed a significant (P< 0.05) increase in neutrophil and total leukocyte count (TLC) along with significant (P< 0.05) decrease in the lymphocyte count in crossbred cattle affected with subclinical and clinical mastitis (Table 1). Haemoglobin and

PCV level of mastitic cows showed non significant decrease compared with healthy animals. Finding corroborates with the observation of Sischo *et al.* (1997) who observed that PCV and Hb did not exhibit any specific trend in the animals suffering from mastitis however, Zaki *et al.* (2010) reported that anaemia in mastitic cows was due to decrease in Hb, RBC, and PCV levels. Increased TLC with increase in absolute number of monocytes, eosinophils and neutrophils in mastitis were reported by Zaki *et al.* (2008) and Khan *et al.* (1997).

Albumin level of the sub-clinically (2.44g/dl) and clinically (2.31g/dl) infected animals was significantly ($P< 0.05$) lower than the control group animals as shown in Table 1. The hypo-albuminaemia indicates stress condition that enhances protein catabolism as happens in various infections and trauma**.** Albumin has been widely acknowledged as a negative acute phase protein (Heinrich *et al.*, 1990). The finding of present experiment were in agreement with Bertoni *et al.* (1994) who reported lower level of albumin in mastitic animals however, Dwivedi *et al.* (2004) reported a non-significant increase in the average values of albumin in mastitic cows. Significant increase in TPP level of SCM cases compared with control group was observed however, non-significant rise was observed in clinically infected animals (Table 1). Dwivedi *et al.* (2004) reported significantly ($P< 0.05$) higher level of TPP (6.81g/dl) and globulin (3.98g/dl) in serum samples of mastitic cows compared with 6.11g/dl and 3.25g/dl in healthy animals, respectively. Contrary to present findings, a significant decrease in TPP was reported by Zaki *et al.* (2008). Globulin level of sub-clinically and clinically infected animals was 5.82g/dl and 5.93g/dl, respectively which was significantly ($P< 0.05$) higher than control group animals (4.41g/dl) thus, suggesting hyper-globulinaemia in infected animals. The increase in globulin level could be due to the presence of some infectious agents in cattle suffering from mastitis (Magesh and Danapalan, 2002).

Plasma fibrinogen level of dairy animals with SCM (0.74g/dl) was non-significantly ($P> 0.05$) and that of clinically infected animals (1.21g/dl) was significantly ($P< 0.05$) higher than control group animals (0.60g/dl). Similar observations were reported by Mills *et al.* (1998). Following inflammatory stimulation in the body of cattle, the level of acute phase proteins like haptoglobin, Serum Amyloid A, C reactive protein, ceruloplasmin, $á_1$ antitrypsin and fibrinogen increases and albumin decreases (Singh, 2000). Prathaban and Gnanaprakasam (1990) suggested that increased fibrinogen level in blood samples from mastitic animals can be used as non-specific marker of tissue damage and inflammation.

TABLE 1: Haemato-biochemical and plasma mineral profile of healthy and mastitic crossbred cows.

(mean± S.E.)

Parameter	Healthy	Mastitis	
		Sub clinical	Clinical
Hb (g/dl)	10.72± 0.26	10.01 ± 0.35	9.67± 0.30
PCV (%)	28.12± 0.48	25.67± 0.63	25.38± 1.25
TLC (x 10^3/µl)	6.87± 0.12[a]	9.20± 0.16[b]	9.81± 0.21[b]
Neutrophils (%)	30.10± 2.34[a]	66.88± 0.96[b]	71.62± 1.14[c]
Lypmphocytes (%)	52.50± 2.80[a]	29.44± 0.88[b]	25.59± 1.05[c]
Monocytes (%)	1.40± 0.02	1.33± 0.19	1.12± 0.39
Eosinphils (%)	1.35± 0.23[a]	2.27± 0.15[b]	1.75± 0.36[ab]
Total protein (g/dl)	7.44± 0.13[a]	8.44± 0.14[b]	8.23± 0.28[ab]
Albumin (g/dl)	2.94± 0.06[a]	2.44± 0.07[b]	2.31± 0.14[b]
Globulin (g/dl)	4.41± 0.05[a]	5.28± 0.16[b]	5.93± 0.30[b]
A:G ratio	1.50± 0.06[a]	0.41± 0.02[b]	0.43± 0.04[b]
Fibrinogen (g/dl)	0.60± 0.06[a]	0.74± 0.04[a]	1.21± 0.14[b]
Calcium (mg/dl)	9.44± 0.43[a]	13.45± 0.46[b]	13.14± 0.59[b]
Pi (mg/dl)	6.24± 0.33	5.19 ± 0.36	4.94± 0.69
Magnesium (mg/dl)	2.31± 0.02	2.26 ± 0.02	2.36± 0.06
Sodium (mmol/l)	135.66± 5.66	152.44± 4.04	154.10± 9.28
Potassium (mmol/l)	4.11 ± 0.34	4.84 ± 0.33	5.23± 0.53

[*]Means marked with different superscript a,b,c differ significantly ($P< 0.05$) in a row.

Plasma calcium level of the sub-clinically and clinically infected animals was significantly ($P < 0.05$) higher than the control group animals (Table 1). This could be due to the decline in the milk yield in infected animals, thus less of total calcium was excreted in the milk (Wegner and Stull 1978). The finding of this study were in agreement with Singh (1999) who reported significantly ($P < 0.05$) increased levels of plasma calcium in buffaloes suffering from mastitis. Contrary to present findings Zaki *et al*. (2010) reported significant decrease in the average values of calcium in serum of mastitic cows from that of healthy cows. Average value of plasma inorganic phosphorous (Pi) of the control group animals was non-significantly ($P > 0.05$) higher than the sub-clinically (5.19mg/dl) and clinically (4.94mg/dl) infected animals which could be attributed to its more secretion in milk, due to injury to the udder wall, thus more loss in milk. Finding corroborates with the observation of Dwivedi *et al*. (2004). Magnesium level of the plasma samples showed no significant effect of mastitis. Dwivedi *et al*. (2004) and Yildiz and Kaygusuzoðlu (2005) also reported no significant variation in the plasma level of Mg in mastitic and healthy animals. Compared with present study Singh (1999) reported significantly ($P < 0.05$) higher average values of Mg in acute mastitic buffaloes.

Non-significant changes in the plasma levels of sodium and potassium were observed in subclinical and clinical mastitis although mean values were higher in infected animals. Atroshi *et al*. (1996) also reported higher serum Na and K levels in animals suffering from mastitis. This could be due to the decline in the milk yield in animals suffering from mastitis, thereby minimizing the loss of sodium from body and elevating the level of Na in the blood. Increased levels of plasma K in buffaloes suffering from mastitis was also reported by Singh (1999).

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