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Comparative hematological and biochemical parameter study on normal and Metritic cows

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Abstract

The present investigation was undertaken to evaluate the blood biochemical and hematological metabolites of cross bred cow suffering from metritis. A total of 72 crossbred cows comprising 18 normal cyclic and 54 metritic cows were used in the present study. In both normal cyclic and metritic cows, five ml of blood was collected from the jugular vein of each cow. Statistical analysis revealed that there was highly significant difference in the total granulocytes, lymphocyte and monocyte count in normal and metritic cows. Statistical analysis indicated that there was significant difference ($P < 0.05$) in the mean values between normal and metritic cows in respect of TEC and MCH and highly significant difference in respect of Hb. Total granulocytes and total leukocyte count (TLC) recorded in the metritic cows under the present study were higher than that in normal cows. Percentage of lymphocyte in metritic cows reduced significantly. There was no significant difference in the mean total protein concentration of normal and metritic cows. Statistical analysis revealed that there was highly significant difference ($P < 0.01$) in the mean acid phosphatase level between normal and metritic cows. There was no significant difference in the mean alkaline phosphatase level between normal and metritic cows.

Keywords: Hematological, biochemical, parameters, normal, Metritic, Cow

1. Introduction

Reproduction is the basis of economic production. Dairy animals suffer from many reproductive disorders which adversely affect their production performance thereby influencing the economic returns of dairy industry. Uterine infection is the most common reproductive disorder in dairy cows. Annual losses incurred due to uterine infection of dairy cattle under Indian condition may be as high as Rs. 2,902.32 to Rs. 3,101.70 per animal (Jeyakumari *et al.*, 2003) [6]. Prevention and treatment of uterine infection is essential for ensuring the profit of the dairy industry. Metritis is a severe inflammatory reaction involving all layers of the uterus *viz.*, endometrium, submucosa, muscularis and serosa. It generally occurs soon after calving difficulty which often leads to trauma of the uterus and its bacterial infection. Abnormal parturition, puerperal complications, insemination with unsterilized equipments and contaminated semen may lead to uterine infection (Steffan *et al.*, 1984) [22]. Although there are serious economic losses caused by metritis in ruminants a very little information regarding the status of blood profile in cows suffering from metritis is available. Keeping this in mind, this study was conducted with the objective to investigate the changes in biochemical metabolites of the cows diagnosed with metritis that reflect the effects of the disease on animals' health and performances.

2. Materials and Methods

The present study was conducted on crossbred cows maintained in the Instructional Livestock Farm, College of Veterinary Science, Assam Agricultural University, Khanapara and Private Cattle farms around the college campus. A total of 72 crossbred cows comprising 18 normal cyclic and 54 metritic cows were used in the present study. The metritis was diagnosed based on clinical findings, pH of uterine discharge and white side test. For this study 6 normal (Group A) and 6 metritic (Group B) cows at oestrus were used. In both normal cyclic and metritic cows, five ml of blood was collected from the jugular vein of each cow in glass vial containing EDTA by aseptic venipuncture and used for different haematological studies. The differential leukocyte count (DLC), total leucocyte count (TLC), total erythrocyte count (TEC), haemoglobin (Hb), packed cell volume (PCV), mean corpuscular haemoglobin count (MCHC), mean corpuscular volume (MCV) and mean corpuscular haemoglobin (MCH) in

blood were estimated with the help of automated haematology cell counter model MS4e (Melet Schloesing Laboratories-9 Chaussee Jules Cesar- Porte 402-95520 OSNY, France). Blood biochemical parameters studied were of total protein, acid phosphatase and alkaline phosphatase in the serum obtained from the experimental cows. Total Protein and Alkaline phosphatase level in the serum were estimated as per the method of Henry (1974) [4] and Klin and Chem (1972) respectively using specific diagnostic kits (Siemens Ltd., 589, Sayajpura, Ajwa Road Vadodara-390019). Acid phosphatase level in serum was estimated as per the method of Hilman (1971) [5] using specific diagnostic kit (Crest Biosystems, a division of coral clinical systems, Gitanjali, Dr. Antonio Do Rego Bagh, Alto Santacruz Bambolim Complex, Goa-403202, India).

Statistical analysis of the data was performed as per the methods of Snedecor and Cochran (1967) [21].

3. Result and Discussion

The mean percentage of total granulocytes, lymphocyte and monocyte was 37.98 ± 1.07 , 55.20 ± 0.77 and 5.67 ± 0.26 respectively in normal cows and 55.83 ± 1.19 , 40.25 ± 1.17 and 3.92 ± 0.08 respectively in metritic cows. Statistical analysis revealed that there was highly significant difference in the total granulocytes, lymphocyte and monocyte count in normal and metritic cows as shown in Table 1. The TLC was recorded as 9.17 ± 0.74 and $16.52 \pm 0.56 \times 10^3/\text{mm}^3$ on an average in normal and metritic cows respectively with highly significant difference between the two mean values as shown in Table 1. The mean values of TEC, Hb, PCV, MCHC, MCV and MCH in blood were recorded as $7.18 \pm 0.07 \times 10^6/\text{mm}^3$, 12.05 ± 0.42 g/dl, $24.17 \pm 0.46\%$, 31.12 ± 0.53 g/dl, 43.78 ± 0.74 fl and 15.42 ± 0.55 pg respectively in normal cows. The corresponding mean values were $5.73 \pm 0.33 \times 10^6/\text{mm}^3$, 8.53 ± 0.27 g/dl, $20.58 \pm 0.38\%$, 30.09 ± 0.57 g/dl, 42.42 ± 0.39 fl and 13.67 ± 0.33 pg in the metritic cows. Statistical analysis as revealed in Table 1 indicated significant difference ($P < 0.05$) in the mean values between normal and metritic cows in respect of TEC and MCH and highly significant difference in respect of Hb. In the present study all the haematological parameters recorded in normal cows were in normal range as given by Sastry (1985) [19] and similar to the findings of Muthukumar *et al.* (2004) [15], Kataria and Kataria (2006) [9] and Kumar *et al.* (2006) [12]. Total granulocytes and total leucocyte count (TLC) recorded in the metritic cows under the present study were higher than that in normal cows. Similar observations were also made by Sharma *et al.* (1983) [20], Kumar *et al.* (1985) [13] and Sarma (2007) [18], who recorded higher level of neutrophil and TLC in infected cows as compared to normal cows. This might be attributed to the inflammatory lesions in the uterine wall leading to neutrophilia through cytokines produced in the affected tissue. It had been reported that cytokines like IL-1, TNF and Leucocytosis inducing factor (LIF) stimulated bone marrow causing maximum production of neutrophil (Weiser, 2004). Percentage of lymphocyte in metritic cows reduced significantly. Similar observations were also made by Sharma *et al.* (1983) [20] and Sarma (2007) [18]. Lymphopaenia might be due to extravasation of lymphocyte from circulation to the site of infection or inflammation (Benjamin, 1985) [2]. Higher TLC level in metritic cows than in the normal cows were also reported by Ahmad *et al.* (2003) and Kekan *et al.* (2005) [10]. Total erythrocyte count (TEC) and Hemoglobin (Hb) recorded in the present study were within the normal range in both normal and metritic cows. However, the values were

significantly lower in metritic cows than in normal. This was in agreement with Kumar *et al.* (1985) [13], Muthukumar *et al.* (2004) [15], Kekan *et al.* (2005) [10], Kumar *et al.* (2006) [12] and Sarma (2007) [18]. The lower level of TEC in metritic cows might be due erythrocyte destruction by pathogen activated macrophages and impaired erythropoiesis (Thrall, 2004). Lower level of Hb in metritic cows as observed in the present study might be due to erythrocyte destruction due to uterine infection and disturbances of iron metabolism (Benjamin, 1985) [2]. In the present study the serum protein concentration in normal and metritic cows were recorded as 6.57 ± 0.13 and 6.88 ± 0.12 g/dl respectively as shown in Table 2. There was no significant difference in the mean total protein concentration of normal and metritic cows as revealed in the result of t test shown in Table 2. However, the mean values were within the normal range of 5.7 - 8.1 g/dl as given by Rodostitis *et al.* (2000) [16]. The present finding was also within the range given by Behera *et al.* (1993) [1], Tandle *et al.* (1997) [23], Kakati (2004) [7], Magnus and Lali (2009) [14], Dutta (2010) [3] and Ruginosu *et al.* (2011) [17] in normal cows. The mean serum acid phosphatase level in normal and metritic cows were recorded as 1.47 ± 0.04 and 2.22 ± 0.07 U/L respectively. Statistical analysis revealed that there was highly significant difference ($P < 0.01$) in the mean acid phosphatase level between normal and metritic cows as shown in Table 2. Higher level of acid phosphatase in metritic cows might be indicative of tissue damage due to uterine infection. The mean serum alkaline phosphatase level in normal and metritic cows were recorded as 116.49 ± 0.56 and 119 ± 0.76 U/L respectively. There was no significant difference in the mean alkaline phosphatase level between normal and metritic cows as revealed in the result of t test as shown in Table 2. It had been reported that alkaline phosphatase enzyme was elevated during tissue damage (Kaneko *et al.*, 1999).

Table 1: Haematological parameters of normal and metritic cows

Parameters	Normal cows (6)	Metritic cows (6)	‘t’ value
	Mean \pm S.E.	Mean \pm S.E.	
DLC			
Total Granulocytes (%)	37.98 ± 1.07	55.83 ± 1.19	10.95**
Lymphocyte (%)	55.20 ± 0.77	40.25 ± 1.17	10.53**
Monocyte (%)	5.67 ± 0.26	3.92 ± 0.08	8.39**
TLC ($10^3/\text{mm}^3$)	9.17 ± 0.74	16.52 ± 0.56	7.88**
TEC ($10^6/\text{mm}^3$)	7.18 ± 0.07	5.73 ± 0.33	4.39*
Hb (g/dl)	12.05 ± 0.42	8.53 ± 0.27	7.33**
PCV (%)	24.17 ± 0.46	20.58 ± 0.38	1.33 ^{NS}
MCHC (g/dl)	31.12 ± 0.53	30.09 ± 0.57	1.43 ^{NS}
MCV (fl)	43.78 ± 0.74	42.42 ± 0.39	0.17 ^{NS}
MCH (pg)	15.42 ± 0.55	13.67 ± 0.33	2.87*

Table 2: Blood biochemical parameters of normal and metritic cows

Parameters	Normal cows (6)	Metritic cows (6)	‘t’ value
	Mean \pm S.E.	Mean \pm S.E.	
Total protein (g/dl)	6.57 ± 0.13	6.88 ± 0.12	1.91 ^{NS}
Acid phosphatase (U/L)	1.47 ± 0.04	2.22 ± 0.07	15.00**
Alkaline phosphatase (U/L)	116.49 ± 0.56	119 ± 0.76	0.44 ^{NS}

Figure in the parentheses indicate No. of cows examined.

^{NS} Non- significant

** $P < 0.01$

4. Conclusion: The assaying of hematological as well as biochemical parameters in cattle may be helpful in elucidating the etio-pathogenesis of the adverse effect associated with metritis in cattle.

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