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Research Paper

DETERMINATION OF BLOOD METABOLITES IN CROSS HF CATTLE AT PRE-PARTURIENT STAGE: REFERENCE VALUE

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Profiles of blood metabolites have widely been used as part of a multidisciplinary approach to identify metabolic disorders in dairy herds. Our goal was to identify constraints on productivity of cross bred HF herds and set up baseline hematologic and serum biochemical values. The values were determined in pre-parturient cross bred Holstein Friesen (HF) cattle of Nepal. The study was carried out in 50 pre-parturient cross bred HF Cattle in Central part of Nepal. Animals ranging 5-8 years old running in the last trimester of pregnancy were selected for this purpose. A complete blood count, assays associated to liver and kidney function and macro minerals were estimated. The blood samples were drawn from juglar vein using vacutainer tubes. All the hematologic and biochemical variables were determined using automated analyzers and routine laboratory techniques. Glucose, BUN, Creatinine, AST, ALT, total serum Protein and albumin level were found very close to standard reference values recorded in the literature for similar breeds. Similarly hematologic indices associated with RBC series i.e. Hb, PCV, Platelet counts, MCV, MCH, and MCHC were also found within normal limits. WBC counts along with differential counts were corresponded well within the reference range but, eiosinophil and monocyte counts were significantly ($p<0.05$) increased suggesting parasitic infestation. However, Mineral profiles particularly Calcium (6.76±0.20mg/dl) and Phosphorus (3.03±0.18) levels were found significantly ($p<0.05$) low. This suggests that cross HF cattle were at high risk to calcium metabolic disorders and corrective measures should be employed for better production. All the estimated values of hematologic indices and serum biochemical components are recommended as a baseline value except the values which are significantly outside the common normal range.

Keywords: Blood metabolites, Hematology, Serum-biochemical, reference value and cross-bred HF cattle

INTRODUCTION

Metabolic profile (Complete hematological and biochemical) test is a pre-symptomatic diagnostic aid capable of giving early warning of certain types of metabolic derangement in dairy animals (Canfield *et al.*, 1988). It has recently been proved

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that the metabolic profile testing as a best tool for the assessment of dairy herd's nutritional status with simple blood test (Hasanpour *et al.*, 2008). But these indices may vary depending on factors such as origin, climate, management practice, geographical distribution and stage of animals (Ali, *et al.,* 2008). Therefore, determination of normal hematological and blood biochemical values is important for the clinical interpretation of laboratory data especially in the pregnant animals which require adequate balanced nutrition in the periparturient period to maintain homeostasis for onset of parturition and lactation (Ali, 2008).

Cattle are more susceptible to metabolic derangements during peri –partum stage (Awodu, *et al.*, 2008), and pre-partum period is more critical phase of an animal during which the cattle is most likely to render the metabolic disorders and also has sequel in postpartum like milk fever, hypomagnesaemia, retained placentas, downer cow syndrome, mastitis, udder edema, ketosis, hepatic lipidosis, and displaced abomasum (Birchard, 2006).

In Nepal, very limited work has been done in this field. Singh *et al.* (2002) have documented some hematological and blood biochemical parameters in buffaloes in Central and Eastern regions of Nepal respectively. The reference values obtained from their study are irrelevant to cross bred HF cattle due to breed difference. In absence of original reference values generated from local cross HF cattle, all stake holders are forced to employing non-exact reference values to manage the pre-parturient disorders. As a result of using unspecific reference values, dairy practitioners, entrepreneurs and farmers have been experiencing higher rates of misdiagnosis, mistreatment, and mismanagement of metabolic disorders in the herd.

Therefore, the present study was aimed to determine the standard reference values for hematological and biochemical parameters for pre-parturient cross HF cattle in central part of Nepal.

OBJECTIVES

The general objective of this study was to establish the reference values of hematologic indices and important serum biochemical parameters in pre-parturient crossbred HF cattle in Central part of Nepal.

MATERIALS AND METHODS

Blood sample from 50 apparently healthy pregnant cattle running in last trimester ranging from 5 years to 8 years old were taken. The blood samples were collected from jugular vein using vacutainer tubes. Haematological parameter were determined on the same day using automated analyzer and Serum samples were collected in a sterile vial for biochemical analysis and preserved at -20^{o}C until analysis. All the biochemical parameters were estimated using auto Analyzer. The statistical data was done by descriptive statistical tool (computer software Microsoft Excel 2010, beta) and expressed at 95% level of confidence as Mean, Standard Error and Standard Deviation.

RESULTS

Out of 13 hematoloigc variables analyzed, eiosinophil and monocyte counts were significantly ($p<0.05$) increased (Table 1). Rest of the values was found within the normal assortment. Similarly, out of 10 serum bio-chemical examined, calcium and phosphorus levels were recorded significantly reduced ($p<0.05$) (Table 2).

Table 1: Estimated Values for Hematologic Indices

Variables	Unit	Mean± Standard Error	Standard Deviation	Confidence Level (95.0%)	RR (Jain)
Hb	gm/dl	11.03±0.21	1.15	0.43	10-15
PCV	%	33.83±0.51	02.81	1.05	33-48
Platelets	×1000/mm	566.33±20.24	10.85	21.39	300-800
MCV	fl	53.37±0.29	1.61	0.60	40-60
MCH	Pg	15.33±0.15	0.84	0.32	11-17
MCHC	%	30.90±0.22	1.18	0.44	26-34
RBC	×106/mm3	6.33±0.10	0.45	0.21	6.32-11
WBC	×103 /mm3	8.33±20.36	11.71	28.19	8.2-13.8
Neutrophils	%	31.2±1.39	7.60	2.84	25-40
Lymphocytes	%	55.60±1.64	8.99	3.36	39-67
Eosinophil	%	17.83±.82*	4.48	1.67	10-14
Monocytes	%	4.4±0.53*	2.90	1.08	2-3
Basophils	%	0.27±0.13	0.73	0.27	0-2

Note: RR : Reference Range; * : Significant variation.

Table 2: Estimated Values for Serum Biochemical

Variables	Unit	Mean± Standard Error	Standard Deviation	Confidence Level (95.0%)	RR
Glucose	gm/dl	36.35±1.52	8.44	3.09	36-52
BUN	mg/dl	10.97±0.49	2.70	0.99	6-27
Creatinine	mg/dl	1.79±0.05	0.29	0.11	1.2-1.93
Ca	mg/dl	6.76±0.20m	1.12	0.41	8-11
P	mg/dl	3.03±0.18m	0.99	0.36	4-6
Mg	mg/dl	2.65±0.10	0.53	0.20	2.4-3
AST	U/L	138.13±6.47	36.03	13.22	56-165
ALT	U/L	70.68±2.90	16.13	5.92	29-74
TP	gm/dl	6.03±0.22	1.24	0.45	6-7
Albumin	gm/dl	0.63±0.03	0.18	0.07	0.52-1.5

Note: Significantly differed values m; RR : Reference Range

DISCUSSION

Hematology

Eosinophil count recorded in this study (17.83±.82), an increase in eosinophil. This change was previously reported and may result from the stress (cortisol mediation) associated

with pre-parturition stress (El-Ghoul *et al*., 2000). We assumed, some parasitic internal and external parasitic infestation might have played the role in increasing values for eosinophil. Other typical changes of acute stress in cows like neutropenia or lymphopenia (Jain *et al*., 1978) were not observed. Significant decrease in basophil (0.27±0.13) also suggests that there might be parasitic infections which have some potential of causing allergy.

Monocyte values (4.4±0.53) were equal to (Canfield *et al.*1984), higher than (Patil *et al.*1992). This finding was to some extent in contrast with results of previous studies. This extent of variation is affected by a variety of factors. The higher value suggests intestinal and/or liver parasite.

Rest components of blood were found within the normal range recorded for similar species of animal in different part of world. Flores *et al.* (1990) found non-significant difference in complete blood count (CBC) values during late gestation and early lactation. But, present study showed lowered range than that of (Canfield *et al.,* 1984). The results obtained in the present study are in agreement with the reports of several other researchers (Olotu *et al*., 1998, Bozdogan and Baysal, 2003). The values trending towards lowers range could be due to the dilution of blood which occurs as consequence of increase of plasma volume (Singh *et al*., 1991). Similar logic may apply in the present study. Although, the difference is insignificant the lowered trend is attributable to dietary supplements and management as well as study pattern.

Serum biochemical

There was significant drop in calcium level (6.76±0.20 mg/dl) than the normal values recorded for healthy cattle (8.19±0.83 mg/dl). The depressed trend in Ca^{++} levels could be a result of the impaired absorption of food metabolites from the gastrointestinal precursor, excessive losses through urine and more importantly overload of supplying mineral component to fetus. As the pregnancy advances the serum calcium level depletes which corroborates with the finding of Rowlands *et al*, (1975) and Nale (2003).Drop in Calcium intake of 100 to 125 g/day results in a higher incidence of milk fever than lesser amounts, (Jorgensen, 1970). Low calcium, high phosphorus diets increase mobilizable calcium to 60% of body total compared to 37% for high calcium, low phosphorus diets, (Wasserman, 1960).The incidence of milk fever can be reduced by prepartum feeding of diets low in calcium but more than adequate in phosphorus (McCullough, 1969).

The serum phosphorus level at last trimester of pregnancy in this study was recorded to be (4.03±0.18 mg/dl) which was significantly ($P<0.05$) lower than the values recorded in the literatures for normal healthy dairy cattle. Moderate depression in the levels of phosphorus might be due to its necessity for the colostrums synthesis (Roussel, 1982) and enhanced carbohydrate metabolism.

Mean value for rest of the serum biochemical tested in this study (Table 2) were found within the referential range reported by Kaneko (1989).

CONCLUSION

This is part of a broad study. The values obtained in this study can be used cautiously as reference value at pre-parturient stage of cross HF. The variables significantly different are not recommended as baseline value. Further, several other studies should be conducted in different stages and seasons to exacting the standard reference value for this species of animal. Finally, we thank university grants commission, Nepal for providing financial assistance.

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