

Determination of hematological and important blood biochemical parameters in cross jersey cattle at lactating stage: reference value

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Abstract: Profile of blood metabolites have widely been used to identify problems and to indicate dietary causes of diseases or cause of low production. The objective of this study was to set up baseline hematological and serum biochemical values. The study was carried out in 50 lactating cross bred Jersey cattle of Kaski district ranging from 3-7 years old which were regularly dewormed and vaccinated against common viral diseases (FMD, HS & BQ). Non-pregnant, lactating, apparently healthy and stall-fed cattle were selected for sampling. All the hematological parameters were determined on the same day of collection using auto analyzer. The samples were also tested for blood protozoans (*Anaplasma*, *Babesia*, *Theileria* and *Trypanosoma*), using thin and thick smears. The serum samples were collected in a sterile vial for serum biochemical analysis and preserved at -20°C until analysis. All the hematological parameters were within the normal range except for the *Theileria* (2% of the total examined animals) positive. Eosinophil and basophils were within the normal range suggesting that the deworming was effective and there was no allergic reaction. Mineral profile particularly Glucose (11.75±0.87) was found significantly ($P<0.05$) low. This suggests that cross Jersey cattle were prone to hypoglycemia related metabolic disorders and corrective measures should be employed for better production. The values obtained in this study within the range can be used cautiously as reference value at lactating stage of cross Jersey cattle. Further detail study is needed to exacting the standard reference value for this breed of cattle.

Keywords: Hematology, Serum biochemical, Reference value and Cross Jersey cattle.

1. INTRODUCTION:

Hematological and blood serum biochemical profile testing is a pre-symptomatic diagnostic tool to assess the dairy herd's nutritional status and other productive and reproductive disorders[1]. The peri-parturient period of three weeks is associated with multiple changes including hormonal changes, moving from non-lactating to lactating state as well as a major drop in feed intake and switching of the diet from a roughage-based diet (i.e. hay and grass) into a diet rich in rapidly fermentable carbohydrates (i.e. high-grain diets)[2]. One in two dairy cows in a herd is affected by one or multiple metabolic disorders. The profile may vary according to factors such as origin, climate, management practice, geographical distribution, season, stage of animals([3],[4],[5],[6]). So, it is important to determine the hematological and blood biochemical profile for the clinical interpretation of laboratory findings especially in the post parturient stage in which the cattle are more likely to suffer from metabolic disorders due to the draining of minerals like calcium, phosphorus in the milk which may lead to hypocalcaemia, hypomagnesaemia, milk fever[3]. The metabolic diseases are highly associated with each other like cows affected by milk fever are more prone to mastitis, retained placenta, metritis, LDA, distocia, udder edema and ketosis[2]. (Pal and Acharya, 2013) have documented the hematological and serum biochemical parameters in post-parturient stage of Holstein cross cattle at the central part of Nepal[3] but no report has been documented in the Jersey cross cattle at the western part of Nepal although the Jersey cross breed are the major cattle bred rearing in Nepal. 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[7].

2. MATERIALS AND METHODS:

A questionnaire survey was conducted in the commercial cattle farm of Pokhara sub-metropolitan and Lekhnath metropolitan of Kaski district. The record of Identification, Breed, age, lactation, parity, vaccination, deworming, medication, feeds, feeding methods, reproductive or any other disorder was taken. Pregnancy was confirmed through history and rectal palpation. This cross sectional study was conducted from Nov, 2015-Feb, 2016. Clinical examination was also performed to select the healthy animals. The blood sample from 50 apparently healthy Jersey cross cattle having same feeding method, vaccinated against common diseases (FMD, HS and BQ) and regularly dewormed in the period of 6 months, ranging from 3 to 7 years of age were taken. The blood sample was collected from jugular vein using vacutainer tubes. Blood Parasites (*Babesia*, *Anaplasma*, *Theileria* and *Trypanosoma*) were confirmed by making thin and thick smear and staining with Giemsa stain. The sample found positive for Blood protozoans are not used for determining the reference range. Hematological parameters were determined on the same

day of collection using automated analyzer and the serum samples were collected in a sterile vial for biochemical analysis and preserved at -20° C until analysis. Important serum Biochemical (Calcium, Phosphorus, Magnesium, Total protein, Glucose, Albumin) was estimated using Spectrophotometer. Ca: P, A: G is also calculated. Globulin concentration is determined by subtracting albumin from total protein. The statistical data was interpreted by descriptive statistical tool (computer software Microsoft Excel 2010, beta) and expressed at 95% level of confidence as Mean, Standard Error and Standard Deviation.

3. RESULTS:

Out of 50 samples tested for blood protozoans one was found positive for *Theileria* (2% of the total examined apparently healthy cattle) and rest samples were used for the determination of hematological and serum biochemical reference values. There were altogether 13 hematological variables analyzed and all the values were found within the normal range (Table 1). Similarly, out of 9 serum biochemical analyzed, Glucose level was recorded significantly ($p < 0.05$) lower than reference value (Table 2).

4. DISCUSSION:

Hematology

All the hematological parameters were found within the range. Increase in eosinophils [3] due to stress or some internal and external parasitic infestation was not found. This means that the cows are adapted to this climatic conditions and deworming is effective. Other typical changes of acute stress in cows like neutropenia or lymphopenia [8] were not observed. The decrease in basophils is not observed suggesting that no parasitic infection and allergic reaction. The result is in agreement with [3] for HF cross cattle in central part of Nepal except eosinophilia, monocytosis and basopenia, this may be due to different sampling method, season, climate, management system. The results obtained in the present study are in agreement with the reports of several other researches ([3], [9]).

Biochemistry

There was a marked decrease in calcium level 6.07 ± 0.17 mg/dl than the normal values recorded for healthy cattle 8.19 ± 0.83 mg/dl. The drop in calcium levels may be the result of the impaired absorption of food metabolites from the GI precursor, excessive losses through urine and more importantly overload of supplying mineral component into milk [10]. (Nehra, 2016) revealed a significant decrease in calcium during early lactation [11]. Drop in calcium intake of 100-125 gm./day results in a higher incidence of milk fever than lesser amounts [12]. Low calcium, high Phosphorus diets increase mobile calcium to 60 % of body total compared to 37 % for high Ca low P diets [4]. The incidence of milk fever can be reduced by prepartum feeding of diets low in Ca but more than adequate in P [13].

There was a significant decrease in serum Glucose level 11.75 ± 0.87 gm. / dl as compared to RR for healthy cattle 36.35 ± 1.52 [3]. Hypoglycemia may be due to large amount of blood glucose withdrawal by the mammary gland for the synthesis of milk lactose [10]. As highest DM intake doesn't occur until 8-10 weeks after calving but peak milk production is at 4-6 week and energy intake may not keep up with demand. These cows are more prone to ketosis due to lipolysis of fat to fulfill the NEB. Rest of the serum biochemical tested was found within the referential range.

5. RECOMMENDATION:

The values which are in normal range can be used as reference values at lactating stage of jersey cattle for similar climate and season. The variables significantly different are not recommended as baseline value. Further several studies are needed to exacting the standard reference value for this breed of animals.

Table 1: Estimated values for Hematologic Indices

Variables	Units	Mean \pm Standard Error	Standard Deviation	Confidence Level (95 %)	RR(Merck)
WBC	$\times 10^3/\text{mm}^3$	5.63 ± 0.29	2.04	0.59	4 – 12
RBC	$\times 10^6/\text{mm}^3$	5.48 ± 0.09	0.67	0.19	5 – 10
Platelets	$\times 10^3/\text{mm}$	277.45 ± 26.45	185.18	53.19	100–800
Hb	gm./dl	9.48 ± 0.21	1.47	0.42	8–15
PCV	%	31.18 ± 1.19	8.32	2.39	24 –46
Neutrophils	%	10.88 ± 0.96	6.7	1.92	15–45
Lymphocytes	%	77.78 ± 1.85	12.93	3.71	45–75
Eosinophils	%	5.27 ± 0.59	4.19	1.2	2–20
Monocytes	%	4.22 ± 0.49	3.04	0.87	2–7
Basophils	%	0.04 ± 0.03	0.19	0.06	0–2
MCV	Fl	54.18 ± 1.75	12.26	3.52	40–80
MCH	Pg	16.24 ± 0.29	2.03	0.58	11–17
MCHC	%	30.25 ± 0.36	2.52	0.72	30–36

Note: RR: Reference Range ; * Significant variation

Table 2: Estimated Values for serum Biochemical

Variables	Units	Mean \pm Standard Error	Standard Deviation	Confidence Level (95 %)	RR(Merck)
Glucose	gm./dl	11.75 \pm 0.87*	6.11	1.75	42.1–74.5
Total Protein	gm./dl	6.74 \pm 0.14	0.97	0.28	6.2–8.2
Calcium	mg/dl	6.07 \pm 0.17	1.18	0.34	8.4–11
Phosphorus	mg/dl	7.12 \pm 0.19	1.39	0.39	4.3–7.8
Magnesium	mg/dl	2.15 \pm 0.05	0.37	0.11	1.7– 3
Albumin	gm./dl	2.75 \pm 0.05	0.37	0.11	2.8–3.9
Globulin	gm./dl	3.89 \pm 0.14	0.98	0.28	2.9–4.9
A:G	-	0.86 \pm 0.11	0.82	0.24	0.79-0.97
Ca:P	-	0.89 \pm 0.04	0.3	0.09	1.41-1.95

Note: Significantly differed values * ; RR: Reference Range

6. CONCLUSION:

The values which are in normal range can be used as reference values at lactating stage of jersey cattle for similar climate and season. The variables significantly different are not recommended as baseline value. Further several studies are needed to exacting the standard reference value for this breed of animals.

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