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HAEMATOLOGICAL PARAMETERS IN EXOTIC COWS DURING GESTATION AND LACTATION UNDER SUBTROPICAL CONDITIONS

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ABSTRACT

Seventy Holstein-Friesian and Jersey cows of different ages kept at the Livestock Experiment Station, Bhunikey (Pattoki), district Kasur, Pakistan were used for this study. These cows were divided into seven groups having 10 animals in each group. Group numbers 1 to 7 were named as pregnant heifers, pregnant lactating cows, non-pregnant dry cows, non-pregnant heifers, parturient cows, pregnant dry cows and non-pregnant lactating cows, respectively. Blood samples from all the animals were collected and haematological values were recorded, using routine haematological procedures. The highest Hb concentration (11.32 ± 0.32 gm/dl) was recorded in group-4, while the lowest (9.24 ± 0.35 gm/dl) was observed in group-7. The highest RBCs count and PCV (6.18 ± 0.47 x 10^6/µl and 35.51 ± 1.51%) were recorded in group-4 and the lowest (4.55 ± 0.26 x 10^6/µl and 29.23 ± 1.09%) values were observed in group-6. The highest MCV, MCH and MCHC (65.26 ± 1.96 fl, 23.50 ± 1.31 pg and 35.75 ± 0.99 gm/dl) were noted in group-5 and the lowest (55.16 ± 1.72 fl, 16.77 ± 1.14 pg and 30.09 ± 1.15 gm/dl) were noted in group-2. The highest ESR (7.60 ± 1.15 mm/24 hours) was recorded in group-6 and the lowest (4.89 ± 0.40 mm/24 hours) values were observed in group-5. The highest WBCs count (9.43 ± 1.15 x 10^3/µl) was observed in group-1 and the lowest (6.35 ± 0.72 x 10^3/µl) was recorded in group-5. Amongst DLC, highest ($P<0.05$) lymphocyte count (69.10 ± 2.55%) was observed in group-4, while lowest count (56.70 ± 5.16%) was in group-5. The differences between monocyte, neutrophil, eosinophil and basophil counts in all the groups were statistically non-significant.

Key words: Holstein-Friesian, Jersey, haematological parameters, gestation, lactation, subtropical conditions.

INTRODUCTION

Physiological equilibrium is maintained mainly by the blood in the body (Geneser, 1986) but many physiological conditions may alter this equilibrium. Hence, the haematological values during different physiological situations should be known for the diagnosis of various pathological and metabolic disorders, which can adversely affect the productive and reproductive performance of cows, leading to heavy economic losses (Pyne and Maira, 1981; Dutta *et al.*, 1988).

Holstein-Friesian and Jersey cows are amongst the best dairy breeds of cattle. In 1985, 86 Holstein-Friesian and 100 Jersey cows were imported from USA at the Livestock Experiment Station, Bhunikey (Pattoki), district Kasur, Pakistan. However, studies on haematological aspects have never been conducted in these exotic cows under the subtropical conditions. This study was, therefore, planned to investigate the haematological parameters in these exotic cows at different stages of gestation and lactation period under subtropical conditions of Livestock Experiment Station, Pattoki, district Kasur, Paskistan.

MATERIALS AND METHODS

Seventy exotic heifers and adult cows (Holstein-Friesian and Jersey breeds) of different ages were used for this study at the Livestock Experiment Station, Bhunikey (Pattoki), district Kasur, Pakistan (latitude 31° 34 N; longitude 74° 20 E). These animals were maintained and housed under similar conditions of feeding and management. The animals were fed daily 40-50 Kg of green fodder and 2-3 Kg of concentrate mixture, containing 15% crude protein and 65% total digestible nutrients. These animals were divided into 7 groups, having 10 animals in each group. The grouping was done depending upon their physiological conditions as follows: group 1- pregnant heifers, group 2- pregnant lactating cows, group 3- non pregnant dry cows, group 4- non pregnant heifers, group 5- parturient cows, group 6- pregnant dry cows and group 7- non pregnant lactating cows.

Ten ml of venous blood from the Jugular vein of each animal was collected, using one mg of disodium salt of ethylenediaminetetraacetic acid per ml of blood as an anticoagulant (Sastri, 1985; Schalm, 1971). Different haematological parameters were studied according to the methods described by Sastri (1985). The detail of the parameters studied is as follows: haemoglobin (Hb) concentration, red blood cells (RBC) count, packed cell volume (PCV), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), erythrocyte sedimentation rate (ESR), white

blood cells (WBC) count and differential leucocytic count (DLC).

Statistical analysis

The arithmetic means (± SE) of haematological parameters in different groups were calculated. Further analysis was done using analysis of variance (ANOVA) technique (Steel and Torrie, 1984) and significant results were subjected to Duncan's multiple range (DMR) test (Duncan, 1955). The differences were considered statistically significant at $P<0.05$.

RESULTS AND DISCUSSION

Mean (± SE) values for various haematological parameters in cows of seven groups are given in Table 1. The highest Hb concentration was recorded in non-pregnant heifers (Group-4), while the lowest values were observed in non-pregnant lactating cows (Group-7), the difference was statistically significant ($P<0.05$). Similarly, the highest RBCs count and PCV were recorded in non-pregnant heifers (Group-4), while the lowest values were observed in pregnant dry cows (Group-6), the difference being statistically significant ($P<0.05$). Similar to our study, Neelu *et al.* (1996) reported significantly higher values for Hb, RBCs count and PCV in heifers than the other groups. Esievo and Moore (1979) reported a decrease in Hb concentration in non-pregnant lactating Holstein-Friesian cows during early lactation. Ahmad (1995) reported PCV 28.4 ± 0.61 to 31.4 ± 0.50%, Hb 9.7 ± 0.30 to 11.1 ± 0.30 gm/dl and RBC count 4.7 ± 0.41 to 7.0 ± 0.42 10^6/µl in Sahiwal cows during last trimester of pregnancy (pregnant dry cows). These values are closely related to the values of the present study. Unlike our study, Steinhardt *et al.* (1994) reported decrease in Hb with advancing lactation and pregnancy, which increased at parturient stage.

In the current study, the highest MCV, MCH and MCHC were noted in parturient cows (Group-5) and the lowest values were observed in pregnant lactating cows (Group-2), the differences were statistically significant ($P<0.05$). Ahmad (1995) reported MCV 46.0 ± 3.0 to 69.7 ± 9.6 fl, MCH 15.0 ± 1.24 to 23.2 ± 3.21 pg, MCHC 32.5 ± 1.25 to 38.1 ± 3.47 gm/dl in Sahiwal cows during last trimester of pregnancy (pregnant dry cows). These values are closely related to those of the present study. However, Neelu *et al.* (1996) reported significantly higher MCHC in pregnant cows than the other groups. Similarly, Kumar and Pachauri (2000) reported highest MCV and MCH, and lowest MCHC in non-pregnant dry cows compared to other groups.

In the present study, the highest ESR was recorded in pregnant dry cows (Group- 6) and the lowest values were observed in parturient cows (Group-5), the difference was statistically significant ($P<0.05$). Ahmad (1995) reported ESR 5.9 ± 0.40 to 17.1 ± 1.89 mm/24 hr in Sahiwal cows during last trimester of pregnancy (pregnant dry cows) which are closely related to our study.

The highest WBCs count was recorded in pregnant heifers (Group-1) and the lowest values were observed in parturient cows (Group-5), the difference was significant ($P<0.05$). Significantly ($P<0.05$) higher lymphocyte count was observed in non-pregnant heifers (Group-4) compared to parturient cows (Group-5). On the other hand, the differences of monocytes, neutrophils, eosinophils and basophils between all the groups were statistically non-significant. Ahmad (1995) reported WBC count of 6.8 ± 0.28 to 8.3 ± 0.29 10^3/µl, lymphocytes 55.5 ± 1.96 to 65.3 ± 2.49%, monocytes 3.50 ± 0.87 to 3.90 ± 0.81%, neutrophils 21.1 ± 1.12 to 30.0 ± 3.69%, eosinophils 5.50 ± 1.66 to 8.00 ± 0.71% and basophils 0.20 ± 0.25 to 0.40 ± 0.18% in Sahiwal cows during last trimester of pregnancy (pregnant dry cows). Most of these values are closely related to the present study. Pereira *et al.* (1987) also reported that there was an increase in the number of leukocytes during gestation. Unlike our study, Mallard *et al.* (1998) and Meglia *et al.* (2005) reported higher WBC and lower lymphocytes in parturient cows than earlier in the dry period ($P<0.001$). Discrepancies in values for various haematological parameters between our findings and previous studies may be explained by differences in sampling interval, methods used, numbers of cows sampled, and/or degree of metabolic disturbances. Moreover, genetic differences between cows (Mallard *et al.*, 1998) and subtropical conditions of the present study might have played a role for the differences with other studies. In the present study, the reasons for immune suppression in parturient cows are not fully known, but several factors such as management, feeding and changes in hormonal levels may be involved (Meglia *et al.,* 2005). According to Meglia *et al.* (2005), suppression of leukocyte functions in dairy cows has been associated with negative energy balance around calving and in early lactation. Sometimes blood leukocyte numbers and their functions change considerably around parturition, resulting in suppression of the immune response from a few weeks before to a few weeks after calving (Mallard *et al.,* 1998). Lymphocytes decrease around parturition mainly due to reduced lymphocyte proliferation (Saad *et al.,* 1989).

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Table 1: Haematological parameters (mean ± SE) in exotic cows/heifers at different physiological stages

Haematological parameters	Pregnant heifers	Pregnant lactating cows	Non-pregnant dry cows	Non-pregnant heifers	Parturient cows	Pregnant dry cows	Non-pregnant lactating cows
	Group-1	Group-2	Group-3	Group-4	Group-5	Group-6	Group-7
Haemoglobin conc. (gm/dl)	10.92 ± 0.23^{ab}	9.44 ± 0.34^{c}	10.28 ± 0.40^{bcd}	11.32 ± 0.32^{a}	10.82 ± 0.38^{ab}	10.38 ± 0.43^{abcd}	9.24 ± 0.35^{cd}
RBC count (x 10^6/µl)	5.00 ± 0.26^{bc}	5.88 ± 0.46^{ab}	5.74 ± 0.38^{ab}	6.18 ± 0.47^{a}	4.72 ± 0.29^{cd}	4.55 ± 0.26^{cd}	5.30 ± 0.58^{abcd}
PCV (%)	31.39 ± 0.85^{b}	31.79 ± 1.65^{ab}	32.63 ± 1.37^{ab}	35.51 ± 1.51^{a}	30.38 ± 1.12^{b}	29.23 ± 1.09^{b}	29.75 ± 1.80^{b}
MCV (fl)	63.50 ± 1.84^{abc}	55.16 ± 1.72^{d}	57.93 ± 2.15^{cd}	58.85 ± 2.16^{bcd}	65.26 ± 1.96^{a}	65.07 ± 2.27^{ab}	58.17 ± 2.46^{bcd}
MCH (pg)	22.34 ± 1.22^{abc}	16.77 ± 1.14^{d}	18.62 ± 1.43^{cd}	19.23 ± 1.44^{bcd}	23.50 ± 1.31^{a}	23.38 ± 1.51^{ab}	18.78 ± 1.64^{bcd}
MCHC (gm/dl)	34.93 ± 0.91^{ab}	30.09 ± 1.15^{cd}	31.74 ± 1.22^{cd}	32.26 ± 1.28^{bc}	35.75 ± 0.99^{a}	35.60 ± 1.04^{ae}	31.70 ± 1.56^{bcde}
ESR (mm/24 h)	5.80 ± 0.51^{ab}	6.20 ± 0.73^{ab}	5.20 ± 0.36^{ab}	5.00 ± 0.67^{ab}	4.89 ± 0.40^{b}	7.60 ± 1.15^{a}	5.10 ± 0.67^{ab}
WBC count (x 10^3/µl)	9.43 ± 1.15^{a}	8.35 ± 0.97^{ab}	8.75 ± 1.32^{ab}	8.42 ± 1.14^{ab}	6.35 ± 0.72^{b}	8.10 ± 0.76^{ab}	7.65 ± 0.87^{ab}
Lymphocytes (%)	59.90 ± 2.94^{b}	59.30 ± 3.11^{b}	64.40 ± 6.63^{ab}	69.10 ± 2.55^{a}	56.70 ± 5.16^{b}	64.30 ± 2.91^{ab}	65.20 ± 3.00^{ab}
Monocytes (%)	5.60 ± 0.73^{a}	7.20 ± 0.74^{a}	5.70 ± 1.16^{a}	5.40 ± 0.81^{a}	6.40 ± 0.45^{a}	6.30 ± 0.88^{a}	6.40 ± 0.78^{a}
Neutrophil (%)	29.40 ± 3.07^{a}	28.30 ± 3.20^{a}	25.40 ± 5.00^{a}	21.90 ± 3.08^{a}	32.60 ± 4.71^{a}	22.90 ± 2.20^{a}	23.30 ± 2.97^{a}
Eosinophil (%)	4.20 ± 0.49^{a}	4.40 ± 1.25^{a}	3.80 ± 1.57^{a}	3.00 ± 0.67^{a}	3.90 ± 0.75^{a}	5.40 ± 1.24^{a}	4.30 ± 0.54^{a}
Basophil (%)	0.90 ± 0.23^{a}	0.80 ± 0.33^{a}	0.70 ± 0.26^{a}	0.60 ± 0.40^{a}	0.40 ± 0.22^{a}	1.10 ± 0.35^{a}	0.80 ± 0.20^{a}

Values bearing different superscripts in a row differ significantly ($P<0.05$) but sharing at least one superscript in a row differ non-significanlty.

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