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Influences of Lactation and Pregnancy on Physio-Chemical Properties of Buffalo Blood: Red and White Cell Indices

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Abstract: Ten hematological parameters were studied in 160 apparently healthy productive milk Nili-Ravi buffaloes. Four groups were comprised of 40 lactating pregnant, 40 lactating not-pregnant, 40 dry pregnant and 40 dry not-pregnant buffaloes. Statistical analysis revealed that out of 10 hematological parameters studied: I) lactation altered seven parameters: raising ESR and neutrophil percentage in lactating but RBC, PCV, TLC, percentages of eosinophils and lymphocytes in dry buffaloes. ii) pregnancy affected a total of three parameters significantly: raising eosinophil percentage in pregnant but ESR and TLC in not-pregnant buffaloes. It is assumed that metabolic stress and hormonal changes may lead by and far changes in the blood composition in order to maintain the homeostasis.

Key words: Hematology, lactation, pregnancy, buffaloes

Introduction

Lactation and pregnancy lead to transient adjustments in the *Melieu interieur* of domestic animals (Chaudhry, 1989). Besides the diagnosis of various health and reproductive problems of dairy animals, the adequate knowledge of changes in blood composition associated with lactation and pregnancy may be helpful in the improvement of milk production (Adams *et al.*, 1978). The buffalo is an animal of great economic importance in developing countries. A 70 % of total milk production is derived from buffalo in Pakistan (Akhtar, 1987). Yet the data on hematological and hemato-chemical parameters of indigenous buffalo is inadequate (Majeed *et al.*, 1985).

Therefore, this study deals with quantitative assessment of the changes that might occur from disturbances in the equilibrium of blood due to physiological stresses, e.g., lactation and pregnancy in buffaloes.

Materials and Methods

A total of 160 apparently healthy adult female buffaloes were randomly selected at the Livestock Production Research Institute, Bahadarnagar and Punjab Military Farms, Okara. Age animals varied from 32 to 203 months with a mean of 98 ± 2 months. The samples were taken from 160 animals comprising of 40 lactating pregnant, 40 lactating not-pregnant, 40 dry pregnant and 40 dry not-pregnant buffaloes. The blood was drawn by jugular venipuncture in the morning hours. About 20 ml blood was drawn directly into two dry clean test tubes, one of these contained few oxalate crystals as an anticoagualnt. Blood smears were prepared at the time of blood collection.

Blood smears were fixed with methanol and stained with Hemacolor (E. Merck, Darmstadt, F.R. Germany). Specific gravity (SG) was determined by chloroform benzol mixture method (Zoethout and Tuttle, 1955). Bleeding time was recorded in seconds by Duke's method as detailed by Kolmer *at al*. (1959). Red blood cells (RBC) and the total leukocytic counts (TLC) were determined with the help of Coulter Counter (Model D1). Erythrocyte sedimentation rate (ESR) was determined using Westergren sedimentation tubes after Benjamin (1978) and the readings in millimeters (mm) were recorded after first hour. Micro hematocrit method as described by Jain (1986) was used for the determination of Packed cell volume (PCV) per cent. Mean corpuscular volume (MCV) in femtoliters (fl) was worked out using the formula of Benjamin (1978). Differential leukocytic count (DLC) was obtained from the Hemacolor (E. Merck, Darmstadt, F.R. Germany). Stained blood smears after Benjamin (1978) . Of every 100, white cells were encountered the numbers of Neutrophils (neut.) , Eosinophils (Eosi.), Basophils (Baso.), Lymphocytes (Lymp.) and Monocytes (Mono.) gave their respective counts in percentages.

Statistical Analysis: The data were analyzed to study the effects of two extremes of lactation and pregnancy by the analysis of variance technique. Two-factor interactions were also worked out. The significant main effects as well as their interactions were further subjected to Student-Neuman-Keul's multiple range test. Various group means were thus compared.

Results

Effects of lactation on hematological parameters of 160 buffaloes are presented in Table 1a and b. Statistical analysis revealed that out of 10 hematological parameters studied: I) lactation altered seven parameters: raising ESR and neutrophil percentage in lactating, but RBC, PCV, TLC, percentages of eosinophils and lymphocytes in dry buffaloes. ii) pregnancy affected a total of three parameters significantly: raising eosinophil percentage in pregnant but ESR and TLC in not-pregnant buffaloes.

Discussion

The values of all parameters under study were found by and large within the physiological means.

Analysis of variance revealed that only the lactation effect on red blood cell count was significant and that too at 5 percent level. Irrespective of pregnancy relatively higher red cell count was, therefore, recorded in dry than lactating buffaloes. Unlike the present study Hafez *et al.* (1983) found no significant difference on mean red cell count due to lactation. But they compared 30 lactating not-pregnant with 17 dry not-pregnant Egyptian buffaloes. In other words they were in fact looking at the not pregnant buffaloes when in the lactating or dry stages. This was in line with the findings of the present study that lactation had no significant effect in the buffaloes, which were not-pregnant. Lactation and pregnancy affected the first hourly ESR at 5 and 1 percent levels, respectively. Comparatively high ESR was observed in lactating than dry and not-pregnant than pregnant buffaloes. Younas (1988) also observed highly significant differences in the first hourly ESR among 4 each of his lactating pregnant, lactating not pregnant and dry pregnant buffaloes.

Table 1: All the 10 hematological values analyzed. Averages and standard errors are given in each physiological state. The mean ± SE values have been compared by Student- Neuman's-Keul's multiple range test.

Source of Variation	df	RBC $10^6/mm^3$	ESR mm/Ist hr	PCV %	MCV fl	TLC k/mm^3	Neut.. %	Eosi. %	Baso. %	Lymp. %	Mono. %
(a) Analysis of Variance:											
Lactation (L)	1	7.72*	1174.28*	836.89**	587.13	128.38	397.16	18.81	0.04	7.50	218.63
Pregnancy (P)	1	0.13	2420.00**	153.320	1615.39	38.18	11.44	105.11	0.57	51.51	39.55
L x P	1	4.67	851.51	10.33	1757.46*	114.47**	323.01**	8.58	0.17	0.03	261.91**
Error	160	1.57	302.97	59.24	429.79	8.86	28.47	2.61	0.32	2.84	30.96

(B) Averages ± Standard Errors:
Denominations physiological state

	RBC $10^6/mm^3$	ESR mm/Ist hr	PCV %	MCV fl	TLC k/mm^3	Neut.. %	Eosi. %	Baso. %	Lymp. %	Mono. %
Lactating	4.90±0.09a	9.12±1.61a	34.00±0.55A	72.29±1.52	7.01±0.24A	35.29±0.44A	2.99±0.14A	0.58±0.04	55.78±0.45A	5.32±0.12
Dry	5.22±0.11b	5.29±1.23b	37.23±0.73B	75.00±1.80	8.27±0.25B	33.00±0.45B	3.48±0.14B	0.55±0.04	57.44±0.48B	5.63±0.16
Pregnant	5.04±0.11	4.45±0.93A	36.31±0.65	75.89±1.66	7.30±0.23a	33.98±0.41	3.81±0.14A	0.61±0.05	56.25±0.43	5.41±0.14
Not-pregnant	5.08±0.10	9.95±1.79B	34.92±0.66	71.40±1.67	7.99±0.26b	34.36±0.48	2.66±0.13B	0.52±0.04	56.96±0.51	5.54±0.14
Lactating Preg.	4.76±0.14	4.74±1.45	34.87±0.78	76.88±2.15a	7.26±0.40B	34.09±0.50B	3.73±0.18	0.59±0.06	56.34±0.54B	5.25±0.17
Lactating not-preg.	5.04±0.11	13.50±2.80	33.12±0.77	67.70±2.05b	6.76±0.27B	36.48±0.69A	2.26±0.17	0.56±0.06	55.23±0.71B	5.39±0.17
Dry pregnant	5.32±0.16	4.17±1.18	37.74±1.03	74.90±2.54ab	7.33±0.27B	33.88±0.67B	3.89±0.20	0.62±0.07	56.78±0.67AB	5.56±0.22
Dry not pregnant	5.12±0.15	6.41±2.17	36.72±1.05	75.10±2.59ab	9.22±0.41A	32.24±0.58B	3.07±0.20	0.49±0.06	58.69±0.67A	5.69±0.23

*Significant at 5% ** Significant at 1% Different letters in a column indicate significant differences between the means listed therein.

Lactation affected the PCV: Dry buffaloes showed higher PCV than their lactating counterparts. Mean corpuscular volume did not interact either with lactation, pregnancy or both. Lactation and pregnancy however, interacted with each other at 5 percent level.

Lactation and pregnancy were found to alter TLC: Raising the values in dry and not pregnant buffaloes. The interaction between lactation and pregnancy was also found highly significant ($P<0.01$). It appears, that none of the previous workers has statistically tested the effect of these two variables on TLC. However, like the present study, TLC was found to decrease with the advancement in pregnancy (Hafez *et al.*, 1983). Yet pregnancy was found to have no bearing on TLC (Desoky and Fadaly, 1979). Many geophysical and genetic factors obviously have a combined effect on TLC. Sample size, nutritional status and the physiological state of the buffaloes being studied are not quite comparable. Higher PCV and TLC in dry buffaloes than their lactating counter parts might be probably due to haemodilution in lactating buffaloes.

Comparatively higher neutrophil count was recorded in lactating than dry buffaloes. Pregnancy was, however, found inert. Lactating buffaloes when not-pregnant gave comparatively higher neutrophil percentage than when pregnant. Hafez *et al.* (1983) did not observe any significant effect of lactation on neutrophil count. Late pregnancy leukocytosis, reaching its peak at the time of parturition, was considered by Desoky and Fadaly (1979) to be primarily due to rise in the neutrophil count. Like present study they observed no significant difference in count of their dry and lactating not-pregnant group.

Mean eosinophils and lymphocytes counts were found significantly higher in dry than lactating buffaloes. No study was available to compare these results.

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