SERUM ELECTROLYTES AND ENZYMES IN ENDOMETRITIC NILI-RAVI BUFFALOES OF TWO AGE GROUPS AND AT TWO STAGES OF LACTATION

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ABSTRACT

Serum concentrations of four electrolytes including sodium (Na), potassium (K), calcium (Ca) and Chloride (Cl) and activities of two enzymes i.e., aspartate transaminase (AST) and alanine transaminase (ALT) were compared amongst 80 pregnant Nili-Ravi buffaloes in a 2^3 factorial experiment; between endometritic and healthy lots of two age groups and at two stages of lactation. The analysis of variance revealed that: endometritic buffaloes showing muco-purulent vaginal discharge exhibited rise in ALT, AST and Cl, while decline in Ca. Milking stage affected two parameters namely, serum Cl and ALT. Both Cl and ALT were found to be decreased up to 11 months of lactation. Age groups remained inert on all of the parameters studied. This data indicates that electrolytes and enzymes clearly deviate from their normal levels in endometritic buffaloes, which may in turn affect reproductive performance negatively. Thus, maintenance of optimal uterine health and balanced nutrition, particularly with reference to blood constituents, are critical for better reproductive performance in animals of this species.

Key words: Buffalo, age, lactation stage, endometritis, enzymes, electrolytes

INTRODUCTION

The basic knowledge of the normal biochemical life processes and further, a thorough understanding of pathobiochemistry in abnormalities of all types, whether nutritional, metabolic, physiologic, or anatomic and of internal or external infectious or toxic agents are critical to confirm disease or non-disease state (Kaneko, 1988). The Nili-Ravi buffalo (*Bubalis bubalis*) is a dairy animal of significant economic importance in Pakistan. Irrespective of the degree, endometritis is by far the most common reproductive disorder of the uterine abnormalities and non-specific uterine infection in buffalo in Pakistan (Samad *et al*., 1987). The endometritis results into irregular oestrus cycle hence impaired fertility and early embryonic mortality (Robert, 1971).

Previous studies conducted at this laboratory have reported effects of metritis, milking stage and age on haematological and hematochemical parameters in buffaloes (Iqbal *et al*., 1990; Majeed *et al*., 1990). In the present paper, some important changes in serum electrolytes and enzymes, which may occur in the blood of lactating non-pregnant buffaloes suffering from endometritis are reported. This may help to ascertain the relationship between these haematochemical constituents and reproductive performance of the buffaloes.

MATERIALS AND METHODS

Animals:

This study encompassed 80 buffaloes; 40 of which were suffering from endometritis and other 40 had clinically normal reproductive tract. Of the 80 buffaloes, one half had calved up to 11 months and other half from 12 to 18 months prior to sample taking. Similarly, one half of these buffaloes were in 1^{st} – 2^{nd} lactation and the other half had entered 3^{rd} – 6^{th} lactation and were giving various quantities of milk. Each replicate included 10 buffaloes.

The endometritic buffaloes when presented at the Reproduction Clinic of the University of Agriculture, Faisalabad, invariably showed variable amount of muco-purulant vaginal discharge. In each case, endometritis was confirmed by rectal palpation and culture test.

The healthy buffaloes were randomly selected from the lactating non-pregnant buffaloes maintained at the Livestock Production Research Institute, Bahadurnagar and the Panjnad Military Farms at Okara. There was no history of reproductive disorder in these animals. Lactation and age of these animals were comparable with those of endometritic buffaloes.

Laboratory techniques:

About five ml of blood was taken directly into a dry clean test tube by a usual jugular venipuncture method and allowed to clot. Centrifugation for 2 to 3 minutes at about 1500 rpm facilitated serum separation. Clear straw coloured serum when separated, was carefully pipetted into screw-capped bottles and stored at –20 °C until analysed. Samples showing slightest sign of hemolysis were discarded. All tests were performed in duplicate and the arithmetic means of the readings were incorporated in the analysis.

The four electrolytes and two enzymes studied are detailed below:

a) Serum Electrolytes: Corning Flame Photometer (Model 405 Corning Ltd. UK) gave mEq of both sodium (Na^+) and potassium (K^+) per decilitre (dl) of serum.

Calcium (Ca^{++}) was estimated in mg per decilitre (dl) of serum by the direct colorimetric method: using Ca-color kit (Wiener Lab., Argentina) and Spectronic-20. Titrimtric estimation, using Mercko-test kit (E. Merck, Germany) gave mg of chloride (Cl^-) per decilitre of serum.

b) Serum Enzymes: Mercko-test kit Nos. 14329 and 14330 were employed along with Spectronic –20 for the colorimetric estimations of serum Aspartate transaminase (AST) and serum Alanine transaminase (ALT), respectively. The results were expressed in U/ml.

Statistical analysis:

Three variables namely, health status, age as depicted by calving number and duration after last calving, were simultaneously tested at two levels each (endometritic or healthy; young or old, and medium or long postpartum periods) in a 2^3 factorial arrangement.

Overall means, group means and standard errors were studied in endometritic and healthy, medium or long postpartum periods and young or old age groups, separately. All computations were done using "MSTAT" programme.

RESULTS AND DISCUSSION

Table I shows that the effect of replication was not significant for any of the parameter under study. This would suggest that the size of the sample and the methodologies used were appropriate. The values of all parameters recorded in this study were largely comparable with physiological ranges for corresponding age groups, as reported earlier in the literature (Kulkarni *et al.*, 1984; Pateria *et al.*, 1990; Chaudhry *et al.*, 1995).

Among four electrolytes and two enzymes studied, serum chloride, AST and ALT showed an increase ($P<0.05$) in endometritis, while serum calcium decreased significantly in endometritic buffaloes (Table I). These results confirm the findings of Pateria *et al.* (1990). According to Cornelius (1980), whenever infectious agents cause damage to liver and muscle or any other tissue of body, there is increase in the level of AST and ALT. In large animals, serum AST and ALT are in fact muscle enzymes (Kerr, 1989). Hence increase in serum enzymes in endometritis was most likely due to inflamed uterine tissues. A parallel increase in ALT and AST indicates the presence of a more advanced and severe form of endometritis. It is generally believed that calcium had a marked influence on the breeding performance of a buffalo. Like present study, Lodhi *et al.* (1998) have reported a lower concentration of serum calcium in endometritic buffaloes. Serum concentration of electrolytes is representative of its extracellular fluid concentration; higher serum chloride level in the present study might be net result of enhanced outflow of water ions due to inflammation.

The serum chloride concentration in late lactating buffaloes was found to be lower ($P<0.05$) than early lactating buffaloes. Kulkarni *et al.* (1984) reported that this decrease might be due to low profile of oxytocin, which regulates the transfer of these ions from blood to milk. Age did not affect any parameter included in the present study.

The present study indicates that some electrolytes and enzymes clearly deviate from their normal levels in endometritic buffaloes, which may in turn affect reproductive performance negatively. Thus, maintenance of optimal uterine health and balanced nutrition, particularly with reference to blood constituents, are critical for better reproductive performance in animals of this species.

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Table 1: Effects of health status, milking stage and age on electrolytes and enzymes under study. All figures in the ANOVA table are mean squares

A. Analysis of Variance:

Source of Variation	df	Sodium	Potassium	Calcium	Chloride	AST	ALT
Replication	9	144.285	0.159	13.780	707.307	395.890	320.144
Health status (H)	1	66.612	0.001	90.970	43012.813**	20576.112	21451.250**
Milking stage (M)	1	23.112	0.036	0.583	5040.313*	62.612	2442.050**
H X M	1	195.313	0.213	1.183	12078.613**	66.613	480.200
Age (A)	1	177.013	0.253	0.147	43.512**	324.012	28.800
H X A	1	7.813	0.210	0.893	15373.512**	52.313	1.250
M X A	1	418.612	0.045	20.696	0.313	15.313	224.450
H X M X A	1	0.612	0.406	0.018	12276.120**	63.012	500.000
Error	63	118.294	0.239	13.020	764.120	243.966	186.151

* = P < 0.05; ** = P< 0.01

B. Other statistics

		N						
Range		80	105.00-160.00	2.70-5.50	2.09-23.020	2.70-5.50	10.00-98.00	8.00-101.00
Average ± S.E.M.			129.188 ± 1.464	3.919 ± 0.066	10.342 ± 0.409	470.913 ± 2.514	57.413 ± 2.514	53.800 ± 2.507
Denomination			mg/dl	mg/dl	mEq/dl	mEq/dl	IU/l	IU/l
Coefficient of Variation			10.39	15.92	34.89	6.78	27.21	25.36
Group Means:								
Health status	Healthy	40	128.275	3.915	11.408*	384.725*	41.375 *	37.425*
	Endometritic	40	130.100	3.922	9.275*	431.100*	73.450*	70.175*
Milking stage	Early lactating	40	129.725	3.940	10.256	415.850*	54.325	48.275*
	Late Lactating	40	128.650	3.898	10.427	399.975*	60.500	59.325*
Age	Young	40	127.700	3.862	10.385	408.650	59.425	53.200
	Old	40	130.675	3.975	10.299	407.175	55.400	54.400

* Differ significantly for each group (P<0.05)

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