BLOOD METABOLITES OF BUFFALOES WITH DIFFERENTIAL FERTILITY UNDER UNIFORM FEEDING

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ABSTRACT

The present study was conducted on 18 anestrus (nulliparous, n=12; pluriparous, n=6) and 12 cycling (nulliparous, n=7; pluriparous, n=5) buffaloes that were blood sampled three times at weekly interval. Plasma samples were analyzed for glucose, total proteins, albumin, urea, creatinine, lipid profile, AST, ALT, LDH, Ca and P. This study reveals that none of the blood metabolites were different between anestrus or cycling nulliparous buffaloes. However, cycling pluriparous buffaloes had higher ($p<0.05$) plasma glucose, total proteins, albumin, creatinine, LDL and lower ($p<0.05$) LDH compared to anestrus.

Keywords: Anestrus, Blood metabolites, Buffalo, Nutrition

Initiation of ovarian cyclicity in post-pubertal and post-partum dairy animals is affected by their feeding status (Mwaanga and Janowski, 2000). Intriguingly, even after uniform feeding in a dairy herd, ovarian cyclicity is not exhibited by all the animals of comparable age, body condition, parity and lactation status (personal observations). The metabolic profile of dairy animals fed on similar diet can suggest reasons behind differential fertility (Cetin *et al.*, 2002). Hence, the present work was planned to examine whether the differences exist in metabolic profile of buffaloes (nulliparous and pluriparous) raised under uniform feeding but showing disparity in ovarian cyclicity (anestrus or cycling).

At the university dairy farm, thirty buffaloes of comparable age, body condition, parity and lactation status but displaying anestrus (nulliparous, n=12; pluriparous, n=6) or regular cyclicity (nulliparous, n=7; pluriparous, n=5) were used. The daily feed of all the buffaloes consisted of adequate chaffed green fodder, wheat straw, concentrates (maize or wheat 60%, groundnut cake 25%, wheat bran 10%, rice bran 5% and common salt 1%), mineral mixture and free access to water available. Estrus detection was carried out regularly through close observation of estrus behavior and bull parading twice daily. Jugular vein heparinized blood samples were collected at weekly intervals for three consecutive weeks. Plasma was separated (1500rpm x 10 min) and stored at -20°C for calorimetric analyses of glucose, total proteins, albumin, urea, creatinine, lipid profile (total cholesterol, TG: triglycerides, total lipids, HDL: high density lipids, LDL: low density lipids, VLDL: very low density lipids), aspartate amino transferase (AST), alaline amino transferase (ALT), lactate dehydrogenase (LDH), calcium (Ca) and phosphorus (P) using commercially available kits. Weekly data of each metabolite was pooled and difference ($p<0.05$) of mean was examined for anestrus or cycling nulliparous and pluriparous buffaloes using Students paired *t*-test (Dytham, 1999) with Minitab release 14.2 statistical software (Minitab Inc., State College, PA, USA).

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In this study, similar body weight of anestrus or cycling nulliparous and pluriparous buffaloes (Table) suggested that estrus expression is not dependent upon the body weight which is in contrast to previous reports (Formigoni *et al.*, 2003).

Present investigation revealed higher ($p<0.05$) plasma glucose, total proteins, albumin and creatinine in cycling compared to anestrus pluriparous buffaloes (Table 1). Optimum concentrations of blood glucose and proteins act as a metabolic signal to hypothalamo-hypophysial system to induce estrus cyclicity (Tandle *et al.*, 1998, Singh and Singh, 2006). This suggested low energy levels of anestrus pluriparous buffaloes, though these were fed diet similar to their cycling

Table: Body weight and blood metabolites of anestrus or cycling nulliparous and pluriparous buffaloes.

Parameters (mean SEM)	Nulliparous		Pluriparous	
	Anestrus (n=12)	Cycling (n=7)	Anestrus (n=6)	Cycling (n=5)
Body Weight (kg)	430.3±18	457.1±30	482.5±25	562.0±35
Glucose (mg/dl)	61.16±1.7	58.1±2.4	61.7±2.9	70.9±2.4*
Total proteins (g/dl)	7.4±0.1	7.2±0.2	7.4±0.2	8.1±0.2*
Albumin (g/dl)	2.9±0.005	3.1±0.1	2.7±0.1	3.0±0.1*
A/G ratio	0.6±0.02	0.7±0.03*	0.6±0.03	0.6±0.04
Urea (mg/dl)	34.5±1.1	33.4±1.3	39.8±2.2	45.9±5.6
Creatinine (mg/dl)	1.8±0.1	1.7±0.1	1.4±0.1	1.7±0.1*
Total cholesterol (mg/dl)	51.6±1.7	52.5±2.3	67.1±3.0	66.7±4.8
Triglycerides (mg/dl)	32.9±2.7	34.4±2.3	17.5±1.5	19.1±3.3
Total lipids (mg/dl)	169±7.9	173.9±8.1	165.2±6.6	171.6±6.0
HDL (mg/dl)	34.5±1.4	35.3±1.7	54.5±2.8	50.0±4.2
LDL (mg/dl)	10.3±0.9	10.4±0.9	9.0±1.0	15.9±3.3*
VLDL (mg/dl)	6.7±0.5	6.8±0.5	3.3±0.3	3.9±0.6
AST (U/L)	139.3±5.4	121.6±3.9	159.0±7.7	148.4±14
ALT (U/L)	52.1±2.7	47.7±1.8	40.8±2.7	42.9±3.4
LDH (U/L)	1542±62	1407±64	1544±64	1478±18*
Calcium (mg/dl)	9.9±0.2	9.4±0.3	8.6±0.3	9.0±0.4
Phosphorus (mg/dl)	6.8±01.2	5.7±0.2	5.5±0.3	6.0±0.8

*$p<0.05$: significantly different from anestrus buffaloes in respective group

counterparts. Nevertheless, under uniform feeding, the cause of buffalo-to-buffalo variation in these blood metabolites may be attributed differences in genetic origin with regard to their body metabolism rate (Rhodes *et al*. 1995). No differences were observed in the plasma glucose, total proteins, albumin, creatinine and urea of anestrus or cycling nulliparous buffaloes

The dairy animals having higher plasma cholesterol are more likely to express estrus as lipids are the precursors of gonadal steroid hormones (Westwood *et al.,* 2002). However, in this study, except LDL which was higher ($p<0.05$) in cycling compared to anestrus pluriparous buffaloes, none of the other parameters of lipid profile was different between anestrus or cycling buffaloes (nulliparous and pluriparous, Table 1).

Deranged enzymatic actions affect animal's normal reproductive behavior (Fischbach, 2000). Compared to cycling, anestrus pluriparous buffaloes had higher ($p>0.05$) LDH in this study (Table 1). Possibly, low proteins observed in anestrus buffaloes might have caused muscular destruction followed by subsequent increase in LDH (Fischbach, 2000). None of the other plasma concentrations of enzymes had discrepancy though the buffaloes (nulliparous or pluriparous) displayed differential fertility (Table 1).

Significant positive correlations exist between initiation of ovarian activity and plasma Ca and P (Shah *et al*. 2003). In this study, neither nulliparous nor pluriparous anestrus or cycling buffaloes had differences in their plasma Ca and P (Table).

Thus, blood metabolite status is not the cause of differential fertility in nulliparous buffaloes raised under similar feeding. However, some pluriparous buffaloes in a herd may need additional supplementation in the form of multi-nutrient blocks for achieving optimum fertility.

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