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COMPARATIVE STUDIES ON HAEMATO-BIOCHEMICAL PROFILE OF CYCLIC AND NON-CYCLIC HOLSTEIN-FRIESIAN CROSS-BRED COWS

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This experiment was conducted on Holstein-Friesian cross-bred cows to investigate the major haemato-biochemical parameters and their correlation with cylicity and non-cyclicity. Accordingly, 24 apparently healthy cows of about 3 - 7 years of age were divided into cyclic and non-cyclic groups based on the presence or absence of corpus luteum on the ovaries. Significantly higher ($p \leq 0.05$) levels of Hb, PCV, TLC and neutrophil were observed in the cyclic cows. Non-significant alteration was found for TEC, lymphocyte, monocyte and basophil between the two groups, whereas eosinophil count was significantly higher in non-cyclic cows. There was also significant increase in the levels of total protein, urea and cholesterol in non-cyclic group as compared to cyclic group; while non-significantly higher glucose level was noticed in cyclic cows. Our study suggests that urea, cholesterol and total protein level may be potential risk factors effecting cyclicity in Holstein-Friesian cross-bred cows.

Keywords: “cyclic”, “haemato-biochemical”, “Holstein-Friesian cross-bred cows”, “non-cyclic”.

Haemato-biochemical profile plays key role in diagnosis of an array of productive and reproductive disorders in different livestock species. Normal level of vital haemato-biochemical constituents are of utmost importance for maintaining functional integrity of the reproductive system (Niazi et al., 2003). Any change in hematological parameters adversely affects the reproductive efficiency of livestock including cattle. Similarly, alterations in various biochemical constituents are also held responsible for reproductive failures (Prabha et al., 2000). Amongst the reproductive disorders, non-cyclicity is considered to be one of the major reproductive Problem which affect the economy for the dairy farmers. The level of different haemato-biochemical constituents varies during various reproductive states signifying their role in reproductive performance of the animals (Dutta et al., 1988). However, Holstein Friesian cross bred, which are considered to be world's highest milk producers amongst cross-bred cows, remains unexploited for heamato-biochemical profile. Further, no attempt has been made till date to delineate the underlying cause of non-cyclicity of the economically important cross-bred in the light of blood-biochemistry. The present study was, therefore, undertaken to explore the alteration of major hematological and biochemical parameters in cyclic and non-cyclic Holstein-Friesian cross-bred cows, so that reproductive disorders can be handled efficiently.

MATERIALS AND METHODS

A total of 24 apparently healthy Holstein-Friesian cross-bred cows between 3 - 7 years of age were grouped into cyclic and non-cyclic, with 12 cows in each group. All animals received concentrate feed @ 1kg/animal/day , green fodder @ 25-30 kg/animal/day and dry fodder @ 6-8 kg/animal/day. The cows with corpus luteum on one of the ovaries were considered as cyclic animals, while cows having plane inactive ovaries were considered as non-cyclic animals. Blood samples (10 ml) were collected from animals of both the groups by jugular vein puncture. Five ml aliquots of each blood sample were poured in sterile vials containing anti-coagulant (EDTA @ 2 mg/ml of blood) for hematological studies. The remaining 5 ml of each sample were collected in centrifuge tubes and allowed to clot. After clotting, serum was collected in sterile vials and stored at -200C till biochemical estimation. Standard procedures were followed for quantitative determination of biochemical and hematological indices. Haemoglobin (Hb) concentration and packed cell volume (PCV) were determined by Sahli's method and Wintrobe method, respectively. Neubauer's slide method was used for studying total erythrocyte count (TEC) and total leucocyte count (TLC). The differential distribution of leukocytes was determined by counting 100 cells per slide using the "battlement" method described by Jain (1986). Biochemical analyses of the serum samples were performed to measure glucose, total protein, urea and cholesterol by auto analyzer (Systronik-635) using standard ready to use kits. The significance of difference between means for different biochemical parameters were tested by applying t-test as per the method of Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

\ The mean hematological and biochemical values have been presented in Table-1 and Table-2, respectively. The levels of haemoglobin, PCV, TLC and neutrophil were significantly higher in cyclic cows than those in non-cyclic cows. But the level of TEC didn't differ significantly between the two groups. These variations are in accordance with the findings of Ahmed et al. (2003). The higher level of Hb and PCV is attributed to the increase in RBC count in cyclic animals because of hyperactivity and excitement under the influence of estrogen. Sastry (1989) explained that leukocytosis and neutrophilia may result during oestrus since adrenaline mobilizes the marginal neutrophil pool cells through leukocytosis-inducing-factor (LIF). Further, the lower level of neutrophils in non-cyclic cows might be due to bone marrow depression or due to lack of neutrophil maturation and endocrine imbalance (Ray et al., 2004). Present study also revealed only a slight divergence in the lymphocyte and monocyte count between the two groups of cows, which are in agreement with the report of Awodu et al. (2002), who observed that physiological status including pregnancy has no effect in the count of the agranulocytes. However, eosinophil count was significantly higher in non cyclic cows than in cyclic cows, whereas variation in the basophil count was statistically non-significant. These observations corroborate earlier reports (Ahmed et al., 2003). It was reported that excitement and stress in humen being stimulates the release of endogenous glucocorticoids, particularly cortisol and adrenaline that results in a response manifested by leukocytosis with neutrophilia, lymphopenia and eosinopenia (Mohammed et al., 2007). These findings may be ascribed to the cyclicity of animals as normal cyclical changes of the reproductive tract induce some kind of stress leading to release of cortisol. Oxidative stress has been reported in human to effect normal functioning of the reproductive system inducing female infertility (Agarwal and Allamaneni, 2004).

Table: 1 Haematological parameters (Mean ± S.E.) of cyclic and non-cyclic cows

Parameters	Cyclic cow group	Non-cyclic cow group
Hb (g %)	11.81 ± 0.21*	9.86 ± 0.26
PCV (%)	32.31 ± 1.12*	30.78 ± 1.04
TEC (10^6 / mm^3)	6.79 ± 0.42	6.42 ± 0.36
TLC (10^3 / mm^3)	8.24 ± 0.31*	7.93 ± 0.26
Neutrophil count (%)	33.63 ± 2.31*	31.13 ± 2.27
Lymphocyte count (%)	59.58 ± 2.53	60.18 ± 1.86
Eosinophil count (%)	5.21 ± 0.18*	7.11 ± 0.19
Monocyte count (%)	1.62 ± 0.12	1.53 ± 0.08
Basophil count (%)	0.78 ± 0.03	0.44 ± 0.06

* Means differ significantly ($p \leq 0.05$) from each other within a row

The biochemical estimates (Table-2) showed non-significant increase in glucose levels of cyclic cows. But the level of total protein in non-cyclic cows was significantly higher than that of cyclic cows. These data are in agreement with the results of Ahmed et al. (2004). Conversely, Burle et al. (1995) reported significantly higher value of total serum protein in cyclic cows. This contrasting finding might be due to the difference in the nutritional level. Nonetheless, previous report stating excessive intake of protein rich feed reduce fertility and increase the number of service per conception (Randel, 1990) supports our findings. The mechanism by which high level of protein adversely affects reproductive ability of dairy cows is unknown. Hence, further study is needed in this aspect. Unlike earlier report (Zaman et al. 1985), a significant increase in the concentration of urea and cholesterol level in non-cyclic cow was observed in the present investigation. Utilization of cholesterol for optimum steroid hormone biosynthesis for maintaining cyclical changes may be correlated with the lower level of cholesterol in cyclic animals. However, Larson et al., (1997) reported that, impaired fertility may occur in cows with liver damages due to failed transport of cholesterol to ovary whereby steroid synthesis is depressed and cyclicity get delayed. Several investigators reported that increased urea concentration also lead to impaired fertility in cows (Butler, 2000) as higher plasma urea concentrations interfere with normal inductive actions of progesterone on the microenvoronment of the uterus and thereby cause suboptimal conditions for support of embryo development (Butler, 2000).

Table: 2 Biochemical parameters (Mean ± S.E.) of cyclic and non-cyclic cows

Parameters	Cyclic cow group	Non-cyclic cow group
Glucose (mg/dl)	52.58 ± 1.38	49.17 ± 1.29
Total protein (g/dl)	9.42 ± 1.04*	12.63 ± 1.16
Urea (mg/dl)	28.73 ± 1.73*	32.21 ± 1.93
Cholesterol (mg/dl)	184.63 ± 11.58*	193.43 ± 13.37

* Means differ significantly ($p<0.05$) from each other within a row

CONCLUSION

Present study thus indicates that increased level of urea, cholesterol and total protein may be potential risk factors of non-cyclicity in Holstein- Frisian cross bred cows. Present finding revealed that, the ovarian cyclic changes significantly affecting the levels of Hb, PCV, TLC, Neutrophil and Eosinophil in HF cros-bred cows. However, no significant changes observed for TEC, Lymphocyte, Monocyte and Basophil count. Consequently, comprehensive investigations on health, nutrition and metabolic status as well as progesterone profile are needed for better understanding of non-cyclicity in Holstein Friesian cross-bred cows.

REFERENCES

1. Agarwal, A. and Allamaneni, S.S., 2004. Role of free radicals in female reproductive diseases and assisted reproduction. Reprod. Biomed., 9: 338-347.
2. Ahmed, I., Lodhi, L.A., Qureshi, Z.I. and Younis, M. 2004. Studies on blood glucose, total proteins, urea and cholesterol levels in cyclic, qnon-cyclic and endometritic cross-bred cows. Pakistan Vet. J., 24(2): 92-94.
3. Ahmed, I., Gohar, A., Ahmed, N., and Ahmed, M. 2003. Haematological profile in cyclic, non-cyclic and endometritic cross-bred cattle. Int. J. Agri. Biol., 5 (3): 332-334.
4. Awodu, O.A., Enosolease, M.E., Ubaru, A.G. and Famodu, A.A. 2002. Leucocyte count in pregnant Nigerian woman with sickle cell trait. Afr. J. Reprod. Health., 6 (3): 112-116.
5. Burle, P.M., Mangle, N.S., Kothekhar, M.D. and Kalorey, D.R. 1995. Blood biochemical profiles during various reproductive states of Sahiwal and Jersey x Sahiwal cattle. Livestock Adv., 20(7): 13-20.
6. Butler, W.R. 2000. Nutritional interactions with reproductive performance in dairy cattle. Anim. Reprod. Sci., 2: 449-457.
7. De Vries, M.J. and Veerkamp, R.F. 2000. Energy balance of dairy cattle in relation to milk production variables and fertility. J. Dairy Sci., 83: 62-69.
8. Dutta, J.C., Baruah, R.N., Dutta, L. and Talukar, S.C. 1988. Blood biochemical studies in anoestrus and normal cyclic cattle. Indian Vet. J., 65: 239–241.
9. Jain, N.C. 1986. Hematologic techniques. In Schalm's Veterinary Hematology. 4th ed. P23-56. Lea and Febiger, Philadelphia.
10. Larson, S.F., Butler, W.R. and Currie, W.B. 1997. Reduced fertility associated with Low progesterone post-breeding and increased Milk Urea nitrogen in lactating cows. J. Dairy sci., 80:1288-1295.
11. Mohammed, A.K., Mohammed, G. and Akerejora, O.O. 2007. Haematological and serum biochemical changes in Bunaji work bulls after farmland riding exercise in Kaduna state, Nigeria. J. Anim. Vet. Adv., 6 (4): 576-579.
12. Niazi, A.A., Khalid, J., Sattar, A. and Haq, A.U. 2003. Comparative studies on plasma profile of calcium, inorganic phosphorus and magnesium in repeat breeder and non-cyclic Holstein Friesian and Jersey cows. Pakistan J. Biol. Sci., 6 (13): 1139-1141.
13. Prabha, B., Singh, C., Murtaza, M. and Pandey, R.P.2000. Total serum and inorganic phosphorus concentration in cross-bred (Friesan x Hariana) pregnant cows and calves. Indian J. Anim. Sci., 70:50-51.
14. Randel, R.D. 1990. Nutrition and post partum rebreeding in cattle. J. Anim. Sci., 68: 853-862.
15. Ray, S.K.H., Dash, H.D., Mohanty, D.N., Das, S., Bisoi, P.C. and Barik, A.K.2004. Studies on certain haematological and biochemical constituents in cows with retained fetal membranes. Indian J. Anim. Reprod., 25 (2):128-130.
16. Sastry, G.A., 1989. Veterinary Clinical Pathology. 3rd Ed., CBS. Publishers and Distributors (Pvt.) Ltd. Dehli, India.
17. Snedecor, G.W. and Cochran, W.G. 1994. Statistical Methods. The Iowa State Univ. Press, U.S.A.
18. Zaman, M.S., Ali, C.S. and Ahmed, K.M. 1985. Comparative study of blood glucose, cholesterol, protein and urea contents in cyclic, non-cyclic and sub-oestous lactating buffaloes. Pakistan Vet. J., 5(2): 72-75.

