EFFECT OF HORMONAL AND HERBAL THERAPIES ON TOTAL CHOLESTEROL AND TRIGLYCERIDES PROFILE IN HOLSTEIN FRIESIAN COWS*

B.B. PATEL, D.M. PATEL, J.A. PATEL AND V.P. BELSARE

Department of Animal Reproduction, Gynaecology and Obstetrics
Gujarat College of Veterinary Science and Animal Husbandry
Anand Agricultural University, Anand 388 001, India

ABSTRACT

Twenty-eight recently calved HF cows of University farm were monitored through clinical diagnosis and fortnightly plasma profile of total cholesterol and triglycerides from the day of calving till 75 day postpartum. The animals were equally divided into four groups, each of seven animals. Group I served as Control; Group II herbal ecbolic (Vantab), 3 intra-uterine infusions given at weekly interval postpartum; Group III received Oxytocin 50 iu and $PGF_{2\alpha}$ 25 mg and Group IV $PGF_{2\alpha}$ 25 mg alone i/m immediately after parturition. The average levels of plasma cholesterol and triglycerides in postpartum cows were 106.92 ± 2.53 (range 63.20 to 158.02) mg/dl and 12.76 ± 0.14 (range 8.3 to 17) mg/dl, respectively. The average fortnightly values from parturition (0 hr) to 75 day postpartum were 69.83± 1.19, 95.64 ± 5.45, 121.85 ± 4.38, 134.98 ± 5.80, 148.06 ± 5.17, and 139.44 ± 4.62 mg/dl, respectively. The corresponding values for triglycerides were 15.20 ± 0.40, 11.78 ± 0.31, 11.88 ± 0.29, 12.07 ± 0.30, 12.41 ± 0.28, and 11.80 ± 0.24 mg/dl, respectively. The pooled means of both total cholesterol and triglycerides were significantly lower in group-III as compared to others. The plasma cholesterol content on the day of parturition (0 day) was lower in all the groups and then showed a gradual and significantly increasing trend till day 75 postpartum, while triglyceride showed reverse trend.

Key words: Holstein Friesian cows, Hormone therapy, Cholesterol, Triglyceride, Postpartum period.

INTRODUCTION

Failure to resume ovarian activity after calving is the main factor of delayed conception and thereby calving interval (Whitemore *et al.*, 1974). Moreover, nutritional inadequacy and negative energy balance postpartum are the major causes of anestrus and subestrus condition in dairy animals (Butler *et al.*, 2000). Early postpartum period exerts biological and physiological stress on the dam resulting into altered blood metabolic profile (Setia *et al.*, 1992). There are certain biochemical and metabolic constituents, which directly reflect the nutritional status and influence the reproductive performance of the animal either by acting as precursor of hormone synthesis or by stimulating response of target tissues for their action. Such biochemical, particularly glucose, cholesterol and triglycerides, profiles have been studied in postpartum fertile & infertile buffaloes (Setia *et al.*, 1992; Shah *et al.*, 2003) and even in exotic cattle from abroad (Kappel *et al.*, 1984; Mesaric *et al.*, 1997). The plasma profile of triglycerides reflects lipid metabolism particularly in mammary glands of ruminants (Guedon *et al.*, 1999), while cholesterol being a constituent of plasma lipoproteins involved in lipid transport system of the body (Taylor *et al.*, 1966) and an essential precursor of steroid hormone synthesis in gonads and adrenal cortex (Rowlands *et al.*, 1980), can be a good probe to guide clinician towards improving postpartum fertility in female bovines. However, no literature was available on monitoring the postpartum plasma profile of cholesterol and triglycerides in exotic cattle born and reared under tropical climate. Hence, the present study was aimed to monitor these parameters during early postpartum period with use of $PGF_{2\alpha}$ and $PGF_{2\alpha}$ with

*A part of M.V.Sc. thesis of first author approved by Anand Agricultural University, Anand 388 001, Gujarat.

oxytocin treatment in HF cows under tropical farm management.

MATERIALS AND METHODS

This study was carried out over 0 to 75 day postpartum on 28 healthy HF cows managed under routine feeding and housing protocol of University farm at Anand, from May 2007 to April 2008. The animals were divided at random into four groups each having seven animals. The four groups were: Group I Control; Group II Herbal ecbolic (Vantab), 3 intra-uterine infusions at weekly interval postpartum; Group III animals received Oxytocin 50 iu plus $PGF_{2\alpha}$ 25 mg i/m immediately after parturition, and Group IV $PGF_{2\alpha}$ 25 mg alone i/m immediately after parturition

Jugular blood samples were collected in heparinized vaccutaniers at 0, 6 and 24 hrs, and on day 15, 30, 45, 60 and 75 postpartum. Blood plasma was separated out immediately after collection and was stored at –20°C till analysis. A drop of 0.01 % sodium merthiolate solution (Thiomeral) was added as preservative. The estimation of the concentrations of plasma total cholesterol and triglycerides was done using standard assay kits and an autoanalyzer. The data were analyzed statistically using 2 factors' factorial completely randomized design (Snedecor and Cochran 1994).

RESULTS AND DISCUSSION

Total Cholesterol

The average level of plasma cholesterol in cows under study was found to be 106.92 ± 2.53 (range 63.20 to 158.02) mg/dl. There was significant difference ($P<0.05$) between groups for plasma cholesterol concentrations. A highly significant difference between fortnightly periods was ($P<0.01$) also observed for plasma cholesterol concentrations. The average fortnightly values from parturition (0 hr*) to 75 day postpartum were 69.83± 1.19, 95.64 ± 5.45, 121.85 ± 4.38, 134.98 ± 5.80, 148.06 ± 5.17, and 139.44 ± 4.62 mg/dl, respectively. The values at 6 and 24 hrs of calving were 70.97 ± 1.58, 74.64 ± 2.10 mg/dl, respectively. The values on the day of parturition (0 day) were found lower in all the groups, which then increased significantly and gradually till day 75 postpartum. The overall mean plasma cholesterol level was significantly ($P<0.05$) higher in group-IV (113.21 ± 5.47 mg/dl) when compared with group-I, II and III (110.05 ± 5.43, 103.96 ± 4.73. 100 ± 4.52 mg/dl, respectively).

The increasing trend of plasma total cholesterol concentrations seen from the day of calving to subsequent weeks postpartum, was associated with the initiation of ovarian activity and establishment of estrus cyclicity postpartum. The mean level of plasma cholesterol was slightly higher in treatment groups than control. These findings were in close agreement with the reports of Belyea *et al.* (1975), Sato (1978), Guedon *et al.* (1999), Lakum (2004). Rowlands *et al.* (1980) observed a 2.5 fold increase in cholesterol levels during the first 8 weeks postpartum in non-suckled HF cows, but it had no relation with conception rates. Saha *et al.* (1991) also observed lowest cholesterol values on the day of parturition in cows, which increased through out the lactation thereafter.

Prakash and Tandon (1979) and Tainturier *et al.* (1984) observed a significant drop in serum cholesterol concentrations at calving and then a steep rise leading to 2-3 fold increase by second month of lactation. This may be attributed to drop in circulatory levels through increased coupling with oestrogen and thyroxine after parturition, which normally inhibits cholesterogenesis. Lactation probably also affect the level of serum cholesterol, which act as a fatty acid carrier in the form of cholesterol ester for milk synthesis, as a result there is gradual increase in serum cholesterol level with advancing lactation. These reports and the present findings clearly proved that plasma total cholesterol, being precursor of steroid hormones, is closely associated with physiological status of animal reproduction. It might be suggested that increasing trends of cholesterol concentration postpartum help in gonadal steroidogenesis, which subsequently increase the ovarian rebound and pregnancy.

Plasma Triglycerides

The average plasma triglycerides concentration in postpartum cows was 12.76 ± 0.14 (range 8.3 to 17) mg/dl. There was significant difference (P<0.05) between treatment groups for plasma triglycerides concentrations. Also a highly Significant difference was (P<0.01) observed within group between periods for plasma triglycerides concentration. The fortnightly values from parturition (0 hr*) to 75 day postpartum were 15.20 ± 0.40, 11.78 ± 0.31, 11.88 ± 0.29, 12.07 ± 0.30, 12.41 ± 0.28, and 11.80 ± 0.24 mg/dl, respectively. The values at 6 and 24 hrs after calving were 14.37 ± 0.38 and 12.60 ± 0.37 mg/dl, respectively. The value on the day of parturition (0 day) was found higher in all the groups, which showed a decreasing trend subsequently till day 75 postpartum. The overall treatment means of plasma triglycerides were significantly (P<0.01) higher in group-I (13.16 ± 0.28 mg/dl) and group-II (13.26± 0.29mg/dl) as compared to the group-III and IV (12.23 ± 0.25 and 12.39± 0.28 mg/dl, respectively.

Guedon *et al.* (1999) observed that the plasma triglycerides levels were influenced by physiological status of the animal and were higher during last 10 weeks of pregnancy than at or after calving. Mesaric *et al.* (1997) did not find any significant variation in plasma triglycerides levels in cows at 70, 150 and 225 days postpartum. Prakash and Tandon (1979) found that a rapid increase in the triglycerides during early postpartum/ lactation was attributed to increased demand of the udder for fatty acids synthesis for milk fat, and also to lowest level of circulatory oestrogen and thyroxine concentration, which influence the lipid metabolism.

ACKNOWLEDGEMENTS

We thank Unit Officer of HF Project, AAU, Anand, for permitting us to take up this work on their animals. The financial support and lab facilities provided by Principal of the College and Professor of Veterinary Clinical Service Complex is also gratefully acknowledged.

REFERENCES

Belyea, R.L., Martz, F.A. and Rickets, R. (1975). Plasma metabolites in early postpartum cows. J. Anim. Sci., **41**: 3431 (Abstr.).

Butler, W.R., Forsenberg, M., Greve, T., Gustafsson, H., Kalita, T., Kindahl, H. and Ropstad, E. (2000). Nutritional interactions with reproductive performance in dairy cattle. Anim. Reprod. Sci., **60**: 449-457.

Guedon, L., Saumande, J., Dupron, F., Couquel, C. and Desbals, B. (1999). Serum cholesterol and triglycerides in postpartum beef cows and their relationship to the resumption of ovulation. Theriogenology, **51**: 1405-15.

Kappel, L.C., Ingraham, R.H., Morgon, E.B. and Babcock, D.K. (1984). Plasma copper concentration and packed cell volume and their relationship to fertility and milk production in Holstein cows. Am. J. Vet. Res., **45**: 346-350.

Lakum. P.D. (2004). Management of reproductive problems in Holstein Friesian cows. M.V.Sc. Thesis, Anand Agril. Univ., Anand, India.

Mesaric, M., Nernec, M. and Zadnik, T. (1997). The variation of cholesterol and triglycerides in blood serum of dairy cows with regards to physiological time and feeding seasons. Zbornik veterinarske Fakultete Univerza Ljubljana, **34**: 59-65.

Prakash, B.S. and Tandon, R.N. (1979). A note on the late pregnancy and early lactation on blood serum cholesterol and total lipids of Holstein x Tharparkar first lactation cows. Indian J. Anim. Sci., **49**: 308-309.

Rowlands, G.J., Manston, R., Stark, A.J., Russel, A.M., Collis, K.A. and Collis, S.C. (1980). Changes in albumin, globulin, glucose and cholesterol concentration in the blood of dairy cows in late pregnancy and early lactation and relationship with subsequent fertility. J. Agric. Sci., **94**: 517-527.

Saha, K., Roychoudhury, R., Kanjilal, B.C., Bandopadhyay, S.K. and Ghosh, B.B. (1991). Serum cholesterol level in crossbred cows during prepartum, partum and post partum period. Indian J. Anim. Reprod., **12**(2): 170-172.

Sato, H. (1978). Plasma glucose, lipids and mineral levels from 3 weeks before to 10 weeks after parturition in dairy cows. Japanese J. Zutcech Sci., **49**: 333-338 (c.f. Vet. Bull., 48: 7781).

Setia, M.S., Duggal, R.S. and Singh, R. (1992). Biochemical constituents of blood in buffaloes and cows during late pregnancy and different stages of lactation - A longitudinal study. Buffalo J., **8**: 123-129.

Shah, R.G., Dhami, A.J., Patel, K.P., Patil, N.V. and Kavani, F.S. (2003). Biochemical and trace minerals profile in fertile and infertile postpartum Surti buffaloes. Indian J. Anim. Reprod., **24**: 16-21.

Snedecor, G.W. and Cochran, W.G. (1994). Statistical Methods. 8th edn. Iowa State University Press, Ames, Iowa, USA.

Tainturier, D., Braun, J.P., Rico, A.G. and Thouvenot, J.P. (1984). Variations in blood composition in dairy cows during pregnancy and after calving. Res. Vet. Sci., **37**: 129-131.

Taylor, R.L., Pahnish, O.F., Roubicek, C.B. and Kale, W.H. (1966). Plasma cholesterol concentrations in unsupplemented range cattle. J. Anim. Sci., **25**: 1035-39.

Whitemore, H.L., Tayler, W.J, and Casida, L.E. (1974). Effects of early postpartum breeding in dairy cattle. J. Anim. Sci. 38: 339-346.