EFFECT OF BODY CONDITION SCORE AND FERTILITY STATUS ON PROTEINS AND MICRO-MINERALS PROFILE OF ESTRUAL MUCUS IN GIR COWS*

M.M. GOHEL[1], F.S. KAVANI[2] AND K.K. HADIYA[3#]

Dept. of Animal Reproduction Gynaecology & Obstetrics, College of Veterinary Science and Animal Husbandry Anand Agricultural University, Anand

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ABSTRACT

A total fifty Gir cows of different reproductive status (10=normal cyclic, 20=repeat breeders and 20=induced estrus) were selected to determine total proteins and micro-minerals profile in their estrual cervico-vaginal mucus (CVM) in relation to body condition score (on 0-5 point scale) and fertility post-AI. The overall mean concentrations of total protein (g/dl) and micro-minerals, viz, copper, iron, zinc and manganese (ppm) in CVM of these cows were 3.48±0.04, 0.90±0.06, 9.78±0.38, 1.02±0.04 and 1.75±0.10, respectively. Total protein content of CVM was neither influenced by groups, conception nor body condition score (BCS). The concentrations of copper and manganese were significantly lower ($P<0.01$) and those of zinc and iron apparently lower in repeat breeding cows than in normal cyclic and induced estrus cows. The levels of all four mineral elements were signifiantly higher in CVM of conceived than non-conceived cows. However, there was no any specific trend between levels of these constituents in CVM and BCS of cows of any group, though a trend of decreasing levels with increasing BCS was noted in copper and zinc, and the levels of copper and manganese were high in cows with BCS 3.0 and 3.5, respectively. The results indicated that the micro-minerals deficit in CVM could be the cause of conception failure in repeat breeding cows.

Key words: Gir cows, Estrual cervical mucus, Total protein, Micro-minerals profile, BCS, Fertility.

INTRODUCTION

The importance of various constituents of cervico-vaginal mucus (CVM) has been well recognized, since their deficiency or excess adversely affects the viability and fertilizing ability of sperms (Vadodaria and Prabhu, 1990). Studies have indicated that a major component of CVM is glycoprotein (Vickery and Bennett, 1968) that provides the cervical mucus with rheological properties (Gibbons and Mattner, 1966). The higher or lower level of proteins in the cervical mucus was one of the responsible factors of the repeat breeding (Hawk, 1979). Goel *et al.* (1974) observed that the proteins in CVM improve sperm transport and regulate its osmolarity, consistency, threadability and buffering capacity. Similarly, the micro-minerals in CVM help regulate certain enzyme reactions in sperm migration, metabolism and fertilization. This study was aimed to evaluate the total protein and micro-minerals profile in estrual mucus of Gir cows of different reproductive status and body condition score.

MATERIALS AND METHODS

The study was conducted during 2009-10 on Gir cows maintained at Livestock Research Station, AAU, Anand, and Heifers Development Project of the Baroda District Co-operative Milk Producers' Union Ltd., Itola, Vadodara, Gujarat. The estrual cervico-vaginal mucus (CVM) samples from 50 Gir cows of 3 different

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[1]Asstt. Research Scientist, Amul Research and Development Association, Anand, Gujarat-388 001. [2]Retd Professor & Head, [3#]Assistant Professor & corresponding author, Dept. of ARGO

reproductive status (10 = normal cyclic, 20 = repeat breeders and 20 = CIDR induced estrus) were collected aseptically just before insemination in beakers by "Pipette and Syringe Method" (Panangala *et al.,* 1978). The CVM samples were diluted with triple glass distilled water @ 1:3 and stored at -20°C until analyzed for total protein and micro-minerals profile (Vadodaria and Prabhu, 1990). The body condition score (BCS) of each cow was assessed on 0 to 5 point scale as per the guidelines of Edmonson *et al.* (1989). The cows in mid estrus were inseminated with good quality frozen-thawed semen soon after aspiration of mucus. Pregnancy was confirmed per rectum in non-return cases 60 days after AI.

The total protein content of CVM was estimated by Biuret method (Lowry *et al.*, 1951). The part of samples (3 ml each) were wet digested with 10 ml of di-acid mixture (Sulphuric acid: Nitric acid: 1:5) on hot plate till the content evaporated and the residue appeared clear. These digested residues were diluted with triple glass distilled water to make the final volume up to 15 ml for estimation of micro-elements, viz., copper, iron, zinc and manganese on an atomic absorption spectrophotometer (Elements AS AA54141, ECI Ltd). Data on mucus profile were analyzed statistically using completely randomized design and critical difference test as well as unpaired 't' test (Snedecor and Cochran, 1994).

RESULTS AND DISCUSSION

The mean concentration of total proteins in CVM of normal cyclic, repeat breeders and induced estrus Gir cows was more or less identical (3.53±0.10, 3.42±0.04 and 3.51±0.07 g/dl, respectively), with an overall mean of 3.48±0.04 g/dl. Further, the conceived cows had non-significantly higher overall mean total proteins than non-conceived cows (3.53±0.05 vs 3.41±0.06 g/dl; Table 1). The influence of BCS was also not significant on total protein content of CVM, though there was a little trend of decrease in values with increase in BCS from 2.5 to 3.5. In contrast to the present findings, Sood *et al.* (2000), Manjunath *et al.* (2001), Shukla and Sharma (2006) and Modi (2007) reported significantly higher total proteins content in CVM of either normal cyclic than repeat breeder or conceived than non-conceived cows.

The mean copper concentration in the CVM of normal cyclic, repeat breeder and induced estrus Gir cows was 0.92±0.11, 0.62±0.05 and 1.17±0.09 ppm, respectively, with an overall value of 0.90±0.06 ppm. The copper content was significantly ($P<0.05$) lower in repeat breeder as compared to normal cyclic and induced estrus cows. Further, conceived cows had significantly higher mean copper content in CVM as compared to non-conceived cows, overall (1.03±0.07 vs 0.71±0.08 ppm) and in normal cyclic group. It was apparently higher in normal cyclic and induced estrus cows with BCS of 3.0 as compared to higher or lower score, but in induced estrus cows, it was high with 3.5 BCS. The present findings compared with the reports of Shukla and Sharma (2006) and Modi (2007) who reported significantly higher value of copper in CVM of normal cyclic as compared to repeat breeder cows. Vadodaria and Prabhu (1990) reported higher copper in CVM of non-conceived than conceived buffaloes.

The iron content was non-significantly higher in normal cyclic cows (10.56±0.87 ppm) and induced estrus cows (10.35±0.43 ppm) as compared to repeat breeders (9.11±0.65 ppm), with pooled mean of 9.78±0.38 ppm. Further, the mean value of iron was significantly ($P<0.01$) higher in CVM of conceived than non-conceived cows, overall (10.99±0.39 vs 8.10±0.55 ppm) and in induced estrus group. The levels showed decreasing trend with increasing BCS in normal cyclic and induced estrus cows. Modi (2007) reported significantly higher value of iron in normal cyclic cows as compared to repeat breeder cows. Vadodaria and Prabhu (1990) found significantly higher concentration of iron in cervical mucus of conceived than non-conceived group of buffaloes (2.39±0.60 vs 1.65±0.62 mg %). However, Gupta *et al.* (1985) reported insignificantly lower mean concentration of iron in fertile than the repeat breeder cows.

The mean zinc content in CVM of normal cyclic, repeat breeders and induced estrus cows was

0.98±0.04, 0.95±0.07 and 1.11±0.08 ppm, respectively, which did not differ significantly. It was significantly (P<0.05) higher in CVM of conceived as compared to non-conceived cows (1.12±0.07 vs 0.88±0.04 ppm), with overall mean of 1.02±0.04 ppm. Further there was no clear trend of zinc with BCS in any of the groups. Vadodaria and Prabhu (1990) reported similar findings in conceived/non-conceived buffaloes. However, Gupta *et al.* (1985) observed non-significant difference between sub-groups. Shukla and Sharma (2006) also reported non-significant alteration in the concentration of zinc between normal and repeat breeding cows, whereas, Modi (2007) reported significantly higher zinc in CVM of normal cyclic cows as compared to repeat breeders. Tsiligianni *et al.* (2001) documented higher zinc in CVM of cows with induced estrus as compared to spontaneous estrus.

The mean manganese content in CVM of normal cyclic, repeat breeders and induced estrus cows was 2.17±0.27, 1.45±0.17 and 1.83±0.10 ppm, respectively, with an overall mean of 1.75±0.10 ppm. The level was significantly (P<0.05) lower in repeat breeding than the normal cyclic cows, and in non-conceived as compared to conceived cows (1.46±0.17 vs 1.95±0.11 ppm). Vadodaria and Prabhu (1990) also found similar trend and results in conceived and non-conceived buffaloes, while Modi (2007) recorded non-significantly higher manganese in normal cyclic than repeat breeder cows.

The results in general indicated that the protein profile was optimal but, the micro-minerals deficit in CVM, that was inversely related with body condition of cows and infertility, could be the cause of conception failure in repeat breeding cows.

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REFERENCES

Edmonson, A.J., Lean, I.J., Weaver, L.D., Farver, T. and Webster, G. (1989). A body condition scoring chart for Holstein dairy cows. *J. Dairy Sci.*, **72:** 68-78.

Gibbons, R.A. and Mattner, P. (1966). Some aspects of the chemistry of cervical mucus. *Int. J. Fertil.*, **11:** 366-372.

Goel, V.C., Rao, M.V.N. and Khirwar, S.S. (1974). Biochemical changes in the cervical mucus during different stages of estrus in crossbred and zebu cattle. *Indian J. Dairy Sci.*, **27**(4): 238-245.

Gupta, R.C., Luthra, R.A., Baru, P. and Krishnaswamy, A. (1985). Concentration of iron and zinc in the cervico-vaginal mucus of fertile and repeat breeder cows. *Indian J. Anim. Reprod.*, **6**(2): 26-28.

Hawk, H.W. (1979). Infertility in dairy cattle. *Beltaville symposia in Argi. Reserch, 3.* (c.f. *Vet. Bull.*, **50:** 2307)

Lowry, O.H., Rosebrough, N.J., Farr, A.L. and Randall, R.J. (1951). Protein measurement with the Folin-Phenol reagents. *J. Biol. Chem.*, **193:** 265-275.

Manjunatha, R., Mahmood, S., Harendrakumar, Rajindersingh and Purbey, L.N. (2001). Serum and estrual cervical mucus biochemical profile during estrous cycle in repeater crossbred cows. *Indian Vet. J.*, **78:** 710-713.

Modi, L.C. (2007). Studies on biochemical profiles of blood serum and cervical mucus in repeat breeding Kankrej cows. *M.V.Sc. Thesis, SDAU, S.K. Nagar, Gujarat.*

Panangala, V.S., Fish, N.A. and Barnum, D.A. (1978). Microflora of the cervico-vaginal mucus of repeat breeder cows. *Canadian Vet. J.*, **19:** 83-89.

Shukla, S.P. and Sharma, R.D. (2006). Studies on biochemical changes in the uterine fluid of repeat breeding crossbred cows. *Indian J. Anim. Reprod.*, **27**(1): 21-22.

Snedecor, G.W. and Cochram, W.C. (1994). *Statistical Methods*. 7th Ed. The Iowa State Univ. Press, Ames. Iowa, U.S.A.

Sood, P., Vasishta, N.K., Singh, M.M. and Nigam, J.M. (2000). Relationship of certain biochemical attributes in cervical mucus with conception rate in cows. *Indian J. Anim. Reprod.*, **21**(1): 57-58.

Tsiligianni, T., Karagiannidis, A., Brikas, P. and Saratsis, P. (2001). Chemical properties of bovine cervical mucus during normal estrus and estrus induced by progesterone and/or $PGF_{2\alpha}$. *Theriogenology,* **56:** 41-50.

Vadodaria, V.P. and Prabhu, G.A. (1990). Effect of level of trace elements in estrual cervical mucus on fertility in Mehana buffaloes. *Indian J. Anim. Reprod.,* **11:** 130-135.

Vickery, B.H. and Bennett, J. P. (1968). The cervix and its secretion in mammals. *Physiol. Rev.,* **48:** 135-154.