PHYSICAL PROPERTIES OF ESTRUAL MUCUS IN GIR COWS WITH REFERENCE TO THEIR BODY CONDITION SCORE AND FERTILITY

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ABSTRACT

Fifty Gir cows (10=normal cyclic, 20=repeat breeders and 20=hormonally-CIDR induced estrus) were used to determine physical properties of estrual cervico-vaginal mucus (CVM) collected 5 to 30 minutes before the first AI. In normal cyclic cows, clean and thin CVM with higher spinnbarkeit value (14.40±0.30 cm) showing typical fern pattern (80 %) was observed to provide favourable environment for conception. In induced estrus cows, clean or turbid and thin or thick mucus with atypical fern pattern was observed to favour conception. Among all the groups, viz., normal cyclic, repeat breeders and induced estrus, non-significantly higher mean pH of CVM was observed in non-conceived as compared to conceived cows (7.40±0.10, 7.62±0.15 and 7.28±0.07 vs 7.11±0.0, 7.54±0.15 and 7.34±0.08). The physical properties of CVM in general were independent of conceived and non-conceived status in normal cyclic, repeat breeder and induced estrus cows. The findings revealed the higher mean value of body condition score in repeat breeder (3.27±0.07) as compared to induced estrus (3.00±0.07) and normal cyclic cows (2.90±0.08). The typical fern pattern was observed more in normal cyclic and induced estrus cows with 3.0 BCS (Body Conditon Score) as compared to repeat breeder cows with similar BCS whereas, the atypical fern pattern was observed more in repeat breeder with the 3.5 BCS as compared to induced estrus cows and normal cyclic cows with the similar BCS. The turbid and dirty colour of CVM was observed more in repeat breeder cows with the 3.5 BCS.

KEY WORDS: Body condition score, Cervico-vaginal mucus, Induced estrus, Fern pattern, Spinnbarkeit.

INTRODUCTION

Cervical mucus is a viscoelastic secretion produced constantly by the secretory cells of the endocervix and represents a mechanical barrier against invading organisms. The nature of cervical mucus has a great influence on spermatozoon activity in the female reproductive tract (Sharma and Tripathi, 1987). The colour, consistency, pH, spinnbarkeit and fern pattern of cervico-vaginal mucus (CVM) are considered as effective laboratory tools to predict the infertility in cattle as they have pronounced effect on the fertilizing capacity of the spermatozoa (Rangnekar et al., 2002). Body condition score (BCS) is a management technique that can be used routinely by farmers and stockmen to assess the body reserves of individual cows, which is directly related with fertility or reproductive efficiency of cows. Therefore, the relationship between various estrus characteristics and time of ovulation has been studied to investigate the possibility of ovulation time prediction and also this study was attempted to correlate physical attributes of estrual mucus with BCS and fertility in Gir cows.

MATERIALS AND METHODS

The study was conducted from November 2009 to April 2010 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 as well as at private farms of Anand district of Gujarat.

The CVM samples from 50 Gir cows (10=normal cyclic, 20=repeat breeders and 20= CIDR induced estrus) were collected aseptically in beakers by Pipette and Syringe method (Panangala et al., 1978). These samples were evaluated for the rheological properties, viz., colour, consistency, pH, spinnbarkeit and fern pattern soon after collection. Colour of the CVM was judged by direct examination as per Deo and Roy (1971) and classified as clear (white of an egg), turbid (cloudy in appearance) and dirty (yellowish, grey, red etc) mucus. Consistency was classified into thin and thick as described by Deo and Roy (1971). The pH of CVM was determined by using digital pH meter. The spinnbarkeit of CVM was measured in centimeter as described by Panigrahi (1964). The fern pattern was studied in air dried estrual mucus smears under low power (10 X) and high power (40 X) microscope and was classified as typical, atypical and nil type (Luktuke and Roy, 1967). The cows confirmed for estrus by visual and recto-vaginal examinations were inseminated with good quality frozen-thawed semen and were subjected to body condition scoring from 1 to 5 as described by Edmonson et al. (1989). Pregancy was confirmed per rectum 60 days post-AI and the results were correlated with BCS and rheological properties of CVM. The data were analysed statistically.

RESULTS AND DISCUSSION

Colour of CVM and BCS

Among 20 repeat breeding cows 20, 60 and 20 % cows had clear, turbid and dirty mucus, respectively. The respective figures in induced estrus cows were 50, 40 and 10 %; while among 10 normal cyclic cows, 70 and 30 % cows had clear and turbid mucus. These findings, particularly in normal cyclic cows, corroborated with the report of Sharma (1983). The findings in repeat breeding cows were related with the earlier findings of 67.50 % turbid and 35.00 % clear mucus by Modi (2007). However, Sharma et al. (1987) reported that 93.02 % repeat breeding cows had clean, 2.33 % had turbid and 4.65 % had dirty coloured mucus.

The frequency of clear, turbid and dirty colour mucus was 30, 24 and 4 %, respectively, in conceived cows and 12, 22 and 8 % in non-conceived cows. The conception rate was higher in normal cyclic cows (100 %) with clear cervical mucus compared to repeat breeder cows (50 %) and induced estrus cows (60 %). The dirty mucus was not observed in normal cyclic cows. Overall, 75.00 and 41.67 % cows conceived with turbid mucus in induced estrus and repeat breeder groups, respectively. All the induced estrus cows with dirty mucus conceived, whereas none conceived in repeat breeder group with similar type of mucus. Contrary to these findings, Salphale et al. (1993) and Selvaraj et al. (2002) reported the frequency of clear cervical mucus as 83.33 and 76.90 % in conceived repeat breeding crossbred cows, respectively.

The findings revealed the higher mean value of body condition score in repeat breeder (3.27±0.07) as compared to induced estrus (3.00±0.07) and normal cyclic cows (2.90±0.08). All the normal cyclic cows with 2.5 BCS had clear mucus. The CVM samples of 6 normal cyclic cows with 3.0 BCS revealed 66.67 and 33.33 % clear and turbid mucus, respectively. Among 10 normal cyclic cows, only one cow had 3.5 BCS and it passed cloudy mucus. The CVM samples of 2 repeat breeder cows with 2.5 BCS showed equal frequency of clear and turbid mucus. The CVM samples of repeat breeding cows with 3.0 and 3.5 BCS revealed frequency of clear, turbid and dirty mucus as 60.00, 40.00 and 0.00, and 00.00, 69.23 and 30.77 %, respectively. The CVM samples of 6 induced estrus cows with 2.5 BCS showed 50.00 % each as clear and turbid. The CVM samples of induced estrus cows with 3.0 and 3.5 BCS revealed 63.64, 27.27 and 09.09, and 00.00, 66.67 and 33.33 % as clear, turbid and dirty colour mucus, respectively.

Consistency of CVM

The percentages of CVM samples with thin and thick consistency were 50-50 in repeat breeding, 55-45 in induced estrus cows and 70-30 in normal cyclic cows. The frequency of the thin and thick mucus was 70 and 10 %, respectively, in conceived and 00 and 20 % in non-conceived normal

cyclic cows. The corresponding frequency for conceived and non-conceived repeat breeder cows was 20 and 15, and 30 and 35 %. The frequency of thin and thick mucus observed was equal for conceived cows (35.00 %) and 20 and 10 %, in non-conceived induced estrus cows. Rangnekar et al. (2002) reported the frequency of thin and thick mucus as 54.54 and 77.78 % in majority of fertile and non-fertile estruses, respectively. The conception rate was higher in normal cyclic cows (100 %) and induced estrus cows (63.64 %) with thin cervical mucus as compared to repeat breeder cows (40 %). The conception was higher with thick mucus (77.78 %) in induced estrus cows as compared to normal cyclic (33.33 %) and repeat breeder cows (30.00 %). Contrary to these findings, Sharma et al. (1987) reported higher conception with thin mucus (86.36 %) in repeat breeder

Crossbred COWS

All the normal cyclic cows with 2.5 BCS had thin mucus. The CVM samples of 6 normal cyclic cows with 3.0 BCS revealed 66.67 and 33.33 % thin and thick mucus, respectively. Among 10 normal cyclic cows, only one cow had 3.5 BCS and it passed thick mucus. The CVM samples of 2 repeat breeder cows with 2.5 BCS showed equal frequency of thin and thick mucus. The CVM samples of 5 repeat breeding cows with 3.0 and 3.5 BCS revealed frequency of thin and thick mucus as 60.00 and 40.00, and 46.15 and 53.85 %, respectively. The CVM samples of 6 induced estrus cows with 2.5 BCS showed 66.67 and 33.33 % as thin and thick mucus, respectively. The CVM samples of 11 induced estrus cows with 3.0 BCS revealed 63.64 and 36.36 % as thin and thick mucus, respectively and all the CVM samples of cows with 3.5 BCS had thick mucus.

PH of CVM

The mean (±SE) pH of CVM in normal cyclic, repeat breeder and induced estrus cows was 7.17±0.04, 7.22±0.04 and 7.69±0.10, respectively. Similar findings were reported by Siddiquee (2006). Contrary to these findings, Pandey et al. (1983) and Modi (2007) reported higher pH of cervical mucus of normal cows (7.38 and 8.39) than repeat breeder cows (7.20 and 6.19). The pH of CVM of conceived and non-conceived normal cyclic cows was 7.11±0.03 and 7.40±0.10, respectively, which differed significantly ($P<0.01$). The pH values of CVM of repeat breeders were 7.54±0.15 and 7.62±0.15 in conceived and non-conceived cows, and among induced estrus cows, 7.34±0.08 and 7.28±0.07, respectively, which however did not differ significantly. Overall non-significantly higher mean pH of cervico-vaginal mucus was observed in non-conceived (7.50±0.10) as compared to conceived (7.32±0.06) cows. Salphale et al. (1993) and Bennur et al. (2004) reported alkaline pH values of CVM of cows with fertile (8.0±0.07 and 8.13±0.07) and infertile estrus (7.98±0.08 and 8.15±0.06, respectively). The mean (±SE) values of pH of CVM of cows of all three groups increased with increase in BCS from 2.5, 3.0 to 3.5 BCS .

Spinnbarkeit of CVM

The average spinnbarkeit value of estrual mucus from normal cyclic, repeat breeder and induced estrus cows under study was observed to be 14.40±0.30, 11.81±0.45 and 13.77±0.39 cm, respectively. Cows that conceived irrespective of normal or repeat breeder status also had non-significantly higher spinnbarkeit values (14.68±0.42 or 13.10±1.07) as compared to those that did not conceive (14.25±0.25 or 11.85±0.49), whereas the spinnbarkeit value was higher in non-conceived (13.58±0.08) as compared to conceived (13.03±0.50) induced estrus cows. Overall non-significantly higher mean spinnbarkeit of mucus was observed in conceived (13.50±0.38) as compared to non-conceived cows (12.57±0.41). The mean value of the spinnbarkeit in normal cyclic cows was non-significantly higher as compared to repeat breeder cows and induced estrus cows. Enkhia and Kohli (1982) and Modi (2007) reported mean spinnbarkeit value of 11.0 and 15.30 cm in normal cyclic and 6.85 and 8.0 cm in repeat breeding cows, respectively. However, Siddiquee (1980) reported significantly ($P<0.01$) higher mean spinnbarkeit value in repeat breeder cows (21.10±0.66 cm) as compared to normal breeder cows (16.70±4.31 cm). The mean spinnbarkeit values of CVM of repeat breeder and induced estrus cows decreased with increased in BCS from

2.5, 3.0 to 3.5, but no such trend was noted in normal cyclic cows.

Fern pattern of cvm

Typical and atypical fern pattern of CVM was noted in 45 and 55 % of repeat breeders and 50 and 50 % of induced estrus groups, respectively, whereas, the values noted in normal cyclic cows were 80 and 20 %. The nil type of fern pattern was not observed in any of the groups. The crystallization of CVM in induced estrus cows was typical and atypical in equal number (50 %). The degree of cervical mucus crystallization in the induced (CIDR) estrus group was lower than that in the normal estrus group. These findings compared well with the report of Enkhia and Kohli (1982) who reported 90.00 and 10.00 % typical, and 65.00 and 35.00 % atypical fern pattern among normal cyclic and repeat breeding cows, respectively. Out of 10 normal cyclic animals, 8 cows conceived with 70 and 10 % typical and atypical fern pattern, respectively, whereas, the corresponding values in non-conceived cows were 10 % each. The frequency of typical and atypical fern pattern was 20 and 15 % in conceived and 20 and 45 % in non-conceived repeat breeding cows. Similarly, in the induced estrus cows the frequency of typical and atypical fern pattern was 30 and 40 % in conceived and 20 and 10 % in non-conceived cows. The conception rate was higher in normal cyclic cows (87.50 %) with the typical fern pattern as compared to repeat breeder (44.44 %) and induced estrus cows (60.00 %) whereas, the higher conception rate was observed in induced estrus cows (80.00 %) with atypical fern pattern as compared to normal cyclic (50.00 %) and repeat breeder (27.27 %) cows. Bishnoi et al. (1982) reported 96.00 and 4.00 % typical and atypical fern pattern, respectively in normal cows with the 96.20 % conception rate, whereas the corresponding values in repeat breeder cows were 38.00 and 62.00 % with the 38.40 % conception rate. Selvaraj et al. (2002) reported 57.80 and 42.10 % of atypical and typical type of fern pattern in non-pregnant repeat breeding cows. Rangnekar et al. (2002) reported that majority of fertile estruses (81.82 %) had typical fern pattern of cervical mucus, while majority of non-fertile estruses (55.56 %) had atypical fern pattern of mucus. Bennur et al. (2004) reported that the typical and atypical crystallizations of CVM were 87.50 and 12.50 % in conceived and 80.00 and 20.00 % in non-conceived cows.

The CVM samples of 3 normal cyclic cows with 2.5 BCS showed typical (66.67 %) and atypical (33.33 %) fern pattern. All the CVM samples of cows with 3.0 and 3.5 BCS had typical and atypical fern pattern, respectively. The CVM samples of 2 repeat breeder cows with 2.5 BCS showed equal frequency of typical and atypical fern pattern. The CVM samples of 5 repeat breeding cows with 3.0 and 3.5 BCS revealed the frequency of typical and atypical fern pattern as 60.00 and 40.00, and 38.46 and 61.54 %, respectively. The typical and atypical fern pattern of CVM samples of induced estrus cows was observed in 4 (66.67 %) and 2 (33.33 %) cows, respectively. The frequency of CVM samples of induced estrus cows with 3.0 BCS for fern pattern was 6 (54.55%) typical and 5 (45.45 %) atypical, respectively. All the CVM samples of these cows with 3.5 BCS had atypical fern pattern. The typical fern pattern was observed more in normal cyclic and induced estrus cows with 3.0 BCS as compared to repeat breeder cows with similar BCS whereas, the atypical fern pattern was observed more in repeat breeder with the 3.5 BCS as compared to induced estrus cows and normal cyclic cows with the similar BCS.

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