

Prevalence and certain characteristics of mid-cyclic estrus in crossbred cows

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ABSTRACT

Cows presented for artificial insemination (A.I.) may not always be in a normal estrus. Mid-cyclic estrus (MCE) may be one such situation when the cows may be inseminated or treated, thereby leading to economic losses. The present study comprised of 2092 crossbred cows presented for A.I. during a normal estrus (E1). Some of these cows were presented again during MCE (Group I; n = 51), whereas others were not reported for any evidence of MCE (Group II; n = 2041). Some cows in Group I (n = 42) and Group II (n = 525) were submitted again during subsequent normal estrus (E2) for second A.I. The prevalence of MCE was 2.43% and was expressed at an average interval of 9.1 ± 0.5 days after E1 in Group I cows. The average interestrus interval between E1 and E2 was 21.2 ± 1.2 days in Group I, which was similar ($P > 0.10$) to 20.9 ± 1.1 days in Group II. In Group I, good uterine tone was more common (67.8%) during E1, whereas mild (34.5%) or moderate (48.3%) uterine tone was preponderant during MCE. Also, the genital discharge in majority of the Group I cows was clear, copious and stringy (80.6%) during E1, whereas the majority of these cows had either clear and scanty (61.3%) or turbid and scanty (25.8%) genital discharge during MCE. A large proportion of Group I cows (82.3%; 42/51) did not conceive from A.I. during E1. This requires endocrine readdressal. It was concluded that cows presented for A.I. with a subdued estrus in the form of a scanty genital discharge and varying uterine tone, most likely mild or moderate, should be ruled out for MCE, especially in the absence of a proper breeding record.

Key words: crossbred cows, mid-cyclic estrus

Introduction

Efficient and accurate detection of estrus is the key management factor determining the successful use of A.I. and acceptable reproductive performance in dairy cows (DISKIN and SREENAN, 2000). Inaccurate estrus detection results in insemination of cows that are

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not in estrus, thereby leading to loss of quality semen as well as other expenses involved in insemination (NEBEL et al., 1987). Under the existing dairy conditions, visual detection of estrus remains the most ideal method of estrus detection in Indian (SOOD and NANDA, 2006) and European (HERES et al., 2000; LYIMO et al., 2000) cows. As the majority of the farmers possess few cows that are raised under a tie-stall system, mounting activities are seldom detected (VAN VLIET and VAN EERDENBURG, 1996), so the animals are presented for A.I. on the basis of other estrous behavior signs (VAN EERDENBURG et al., 2002; SOOD and NANDA, 2006). On the basis of cow-side milk progesterone estimation it was found that 50% of the cows not in estrus at their first postpartum insemination were near the middle of their estrous cycle because the number of days between first and second insemination did not fit the expected distribution of estrous cycle length (OLDS and SEATH, 1951). Insemination of cows during such an aberrant estrus, designated as 'mid-cyclic estrus' would be one situation leading to economic losses. The present investigation was undertaken to delineate the prevalence and certain features associated with mid-cyclic estrus in comparison to normal estrus in crossbred cows, so that any inadvertent breeding or treatment could be prevented.

Materials and methods

The present investigation was conducted on Jersey predominant crossbred cows presented in the A.I. unit of Veterinary College Clinics, Palampur, from 1997 to 2005. The cows incorporated in the study had passed the voluntary waiting period of 80 days since their last normal calving, had normal estrous duration and no other current reproductive problems. The cows had varying nutritional status that depended on the socio-economic status of the farmers, season and lactation.

The study was based on a retrospective assessment of history and associated clinical/gynecological findings of the cows presented for A.I, following exhibition of different estrous behavioral signs (VAN VLIET and VAN EERDENBURG, 1996). The total number of cows included in this study was divided into two groups. In Group I, the cows were submitted for A.I. during normal estrus (hereafter designated as E1) as well as mid-cyclic estrus (MCE) a few days later. In Group II, the cows were only submitted for A.I. during E1. Some of the cows in Group I and Group II were submitted again during the subsequent normal estrus (E2) for a second A.I. The A.I. was always done using a single dose of frozen / thawed bull semen filled in a French mini straw. The MCE in the cows of Group I was suspected from a shorter than expected interestrus interval (HEERSCHKE and NEBEL, 1994; NOAKES, 2001) and confirmed by transrectal palpation of a corpus luteum on one of the ovaries.

The characteristics of uterine tone and genital discharge were compared between E1 and MCE in Group I. The uterine tone was assessed by transrectal palpation of turgidity

in the uterine horns. Depending on the extent of uterine tone (SOOD et al., 2000), it was classified as (i) flaccid (uterine horns completely relaxed as recorded during diestrus phase) (ii) mild (uterine horns slightly turgid) (iii) moderate (uterine horns more turgid than mild, but without coiling) or (iv) good (uterine horns feeling erect, turgid and somewhat coiled). The genital discharge was assessed during its outflow from the vulva on transrectal examination of genitalia or after gentle milking of the cervix and fornix vagina. In this procedure, if the genital discharge was not observed, it was aspirated from the floor of the fornix vagina in a sterile A.I. sheath with the help of a syringe. Depending on its appearance (SOOD et al., 2000), the genital discharge was classified as (i) clear, stringy and copious (transparent, free flowing and hanging from the vulva) (ii) clear and scanty (transparent, had to be aspirated) or (iii) turbid and scanty (milky/dirty white, had to be aspirated).

Amongst the total cows, the number of cows in Group I indicated the prevalence of MCE. The number of days between E1 and MCE in Group I indicated the average interval between normal estrus and mid-cyclic estrus. The number of days between E1 and E2 indicated the average interestrus interval and also the return rate to the first A.I. in Group I and Group II.

The uterine tone and genital discharge between E1 and MCE in Group I and return rates to the first A.I. between Group I and Group II were analysed by Chi-square analysis (SNEDECOR and COCHRAN, 1994).

Results

A total of 2092 cows were presented for the first A.I., out of which MCE was prevalent in 51 cows (2.43%). The average interval between the E1 and the MCE in Group I (n = 51) was 9.1 ± 0.5 days (range 5 to 15 days). From 51 cows in Group I and 2041 cows in Group II, 42 and 525 cows, respectively, were submitted during E2 for a second A.I. Hence, the average interestrus interval between E1 and E2 in Group I was 21.2 ± 1.2 days (range 18 to 23 days), which was similar ($P > 0.10$) to 20.9 ± 1.1 days (range 17 to 24 days) in Group II. The characteristics of uterine tone and genital discharge compared during E1 and MCE in Group I cows (n = 51) are presented in Table 1. The majority of the cows in Group I had moderate or good uterine tone (67.8%) during E1 compared to a preponderant mild (34.5%) or moderate (48.3%) uterine tone during MCE. The genital discharge was clear, copious and stringy in 80.6% cows of Group I during E1, whereas the majority of these cows during MCE had turbid and scanty (61.3%) or clear and scanty (25.8%) genital discharge.

The return rate to first A.I. performed during E1 was 82.3% (42/51 cows) in Group I, which was higher ($P < 0.01$) than 25.7% (525/2041 cows) in Group II.

Table 1. Comparison of certain characteristics of uterine tone and genital discharge in 51 crossbred cows (Group I) presented during normal estrus (E1) and mid-cyclic estrus MCE*

Stage of estrous cycle	Uterine tone			Genital discharge		
	Mild	Moderate	Good	Clear, copious and stringy	Clear and scanty	Turbid and scanty
Normal estrus (E1)	0 ^a (0.0%)	16 (32.2%)	35 ^a (67.8%)	41 ^a (80.6%)	10 (19.4%)	0 ^a (0.0%)
Mid-cyclic estrus (MCE)	18 ^b (34.5%)	25 (48.3%)	8 ^b (17.2%)	7 ^b (12.9%)	13 (25.8%)	31 ^b (61.3%)

*Values are expressed as the number of animals in each defined characteristic; ^{a,b}Values with different superscripts differ ($P < 0.01$) from the adjacent value within the same column

Discussion

To our knowledge there is no information on MCE in crossbred cows in India. Perhaps this is the first available report elaborating certain characteristics of MCE in cows.

Visual detection of estrus (SOOD and NANDA, 2006) followed by transrectal confirmation of the varying extent of uterine tone and a clear genital discharge (KASH et al., 2003) remains the benchmark for evaluating and breeding the cows using A.I. Error of estrus detection (milk progesterone greater than 1 ng/ml) on the day of service was recorded in from 5.1% to as high as 60% cows in some herds (MCCAUGHEY and COOPER, 1980; REIMERS et al., 1985; NEBEL et al., 1987). The prevalence of MCE recorded in the present investigation is in consonance with a previous report indicating 50% of 5.1% cows presented for A.I. to be in the middle of their estrous cycle (REIMERS et al., 1985), as the number of days between the first and second insemination did not fit the expected distribution of estrus (OLDS and SEATH, 1951; HEERSCHKE and NEBEL, 1994). In light of the characteristics of uterine tone and genital discharge (Table 1) and absence of a proper record of estrous cycles, the clinical implications of MCE would be that 48.3% and 17.25% cows on the basis of uterine tone might have been considered to be in estrus and 12.9% and 25.8% cows would have been inseminated during MCE on the basis of clear genital discharge. Another substantial percentage of such cows with turbid and scanty discharge (61.3%) would have been considered to be affected with endometritis and infused with some antibiotic/antiseptic during MCE. As estrous behavior during the luteal phase is not accompanied by ovulation, due to high progesterone production from an active corpus luteum (GINTHER et al., 1989), breeding on such occasions would be futile and lower the expected conception rate (REIMERS et al., 1985). Moreover, insemination or any other treatment during MCE would also be harmful to the developing embryo in cows that might be pregnant from the A.I. in the estrus preceding MCE (E1 of Group I in the present study).

The return rates to first A.I. in the Group I cows (82.3%) showing MCE was higher ($P < 0.01$) than in the Group II cows (25.7%) and even much higher than the standard figure of 40% cows not conceiving on first service (PARKINSON and NOAKES, 2001).

Estrogen production from ovarian follicles is responsible for expression of estrous behavior signs (NOAKES, 2001). Although the peak estrogen levels occur at the beginning of estrus, there are also some discrete peaks during the luteal phase, which may be related to the follicular waves (IRELAND and ROCHE, 1983). Considering these facts, it is plausible to assume that the exhibition of MCE coincides most likely with estrogen production from the dominant follicle, developing during the anovulatory wave in the luteal phase, which, however, requires ultrasonographic / endocrine confirmation. The intensity of uterine tone and amount of genital discharge (NOAKES, 2001) and estrous behavior (LYIMO et al., 2000) are dependant on and positively correlated to the concentration of estrogen. Moreover, the maximum diameter of the anovulatory dominant follicle arising in the luteal phase is smaller than the succeeding ovulatory follicle in crossbred cows (SOOD, 2005). Therefore, a propensity towards mild / moderate uterine tone and scanty genital discharge may be due to low estrogen levels from a smaller anovulatory follicle in the luteal phase (GINTHER et al., 1989). As not every cyclic cow exhibits MCE, it needs to be investigated whether the cows exhibiting MCE have higher estrogen concentration during the luteal phase. If that is so, this could be a plausible explanation for the increased conception failure and return to estrus in the cows showing MCE, as recorded in the present study. Aberrant estrogen production is known to affect embryonic development (BREUEL et al., 1993) and fertility (WEHRAM et al., 1993) in cows.

Conclusions

From the present investigation it can be concluded that MCE could be a source of economic losses in dairy cows if proper records pertaining to estrous cycles are not maintained. However, in the absence of proper breeding records, cows showing a scanty discharge with varying degrees of uterine tone, most likely mild or moderate, should be ruled out for MCE.

References

- BREUEL, K. F., P. E. LEWIS, F. N. SCHRICK, A. W. LISHMAN, E. K. INSKEEP, R. L. BUTCHER (1993): Factors affecting fertility in the postpartum cow: role of the oocyte and follicle on conception rate. *Biol. Reprod.* 48, 655-661.
- DISKIN, M. G., J. M. SREENAN (2000): Expression and detection of oestrus in cattle. *Reprod. Nutr. Dev.* 40, 481-491.
- GINTHER, O. J., J. P. KASTELIC, L. KNOPF (1989): Composition and characteristics of follicular waves during the bovine estrous cycle. *Anim. Reprod. Sci.* 20, 187-200.

- HEERSCHKE, G., R. L. NEBEL (1994): Measuring efficiency and accuracy of detection of estrus. *J. Dairy Sci.* 77, 2754-2761.
- HERES, L., S. J. DIELEMAN, F. J. VAN EERDENBURG (2000): Validation of new method of visual estrus detection on the farm. *Vet. Q.* 22, 50-55.
- IRELAND, J. J., J. F. ROCHE (1983): Development of non ovulatory follicles in heifers: changes in steroids in follicular fluid and receptors for gonadotropins. *Endocrinology* 112, 150-156.
- KASH, K., J. KURYKIN, R. LINDJARV, A. KASK, H. KINDAHL (2003): Assessment of early postpartum reproductive performance in two high producing Estonian dairy herds. *Acta. Vet. Scand.* 44, 131-143.
- LYIMO, Z. C., M. NIELEN, W. OUWELTJES, T. A. KRUIP, F. J. VAN EERDENBURG (2000): Relationship among estradiol, cortisol and intensity of estrous behavior in dairy cattle. *Theriogenology* 53, 1783-1795.
- MCCAUGHEY, W. J., R. J. COOPER (1980): An assessment by progesterone assay of the accuracy of estrous detection in dairy cows. *Vet. Rec.* 107, 508-510.
- NEBEL, R. L., W. D. WHITTIER, B. G. CASSELL, J. H. BRITT (1987): Comparison of on-farm and laboratory milk progesterone assays for identifying errors in detection of estrus and diagnosis of pregnancy. *J. Dairy Sci.* 70, 1471-1476.
- NOAKES, D. E. (2001): Endogenous and exogenous control of ovarian cyclicity. In: *Arthur's Veterinary Reproduction and Obstetrics*. (Noakes, D. E., T. J. Parkinson, G. C. W. England, Eds.). 8th ed., Baillier Tindall, London. pp. 19-21.
- OLDS, D., D. M. SEATH (1951): Repeatability of the estrous cycle length in the dairy cattle. *J. Dairy Sci.* 34, 626-631.
- PARKINSON, T. J., D. E. NOAKES (2001): Veterinary control of herd fertility. In: *Arthur's Veterinary Reproduction and Obstetrics*. (Noakes, D. E., T. J. Parkinson, G. C. W. England, Eds.). 8th ed., Baillier Tindall, London. pp. 512.
- REIMERS, T. L., R. D. SMITH, S. K. NEWMAN (1985): Management factors affecting reproductive performance of dairy cows in the northeastern United States. *J. Dairy Sci.* 68, 963-969.
- SNEDECOR, G. W., W. G. COCHRAN (1994): *Statistical Methods*, 8th ed., Affiliated East-West Press and Iowa State University Press.
- SOOD, P. (2005): Effect of lameness on reproduction in dairy cows. PhD Thesis. Department of Animal, Reproduction, Gynaecology and Obstetrics. Punjab Agricultural University, Ludhiana, India.
- SOOD, P., A. S. NANDA (2006): Effect of lameness on estrous behavior in crossbred cows. *Theriogenology* 66, 1375-1380.
- SOOD, P., S. VERMA, N. K. VASISHTA, M. M. SINGH, R. C. KATOCH (2000): Factors affecting therapeutic efficacy of PGF₂ α , uterine infusion of Lugol's iodine during or one day after estrus in management of clinical endometritis in cycling cows. *Himachal Vet. J.* 4, 1-6.
- VAN EERDENBURG, F. J. C. M., D. KARTHAUS, M. A. M. TAVENE, I. MERICS, O. SZENCI (2002): The relationship between estrous behavioral score and time of ovulation in dairy cattle. *J. Anim. Sci.* 59, 1430-1439.

- VAN VLIET, J. H., F. J. C. M. VAN EERDENBURG (1996): Sexual activity and oestrus detection in lactating Holstein cows. *Appl. Anim. Beh. Sci.* 71, 1063-1072.
- WEHRAM, M. E., M. S. ROBERTSON, A. S. CUPP, F. N. KOJIMA, T. T. STUMPF, L. A. WERTH, M. W. WOLFE, R. J. KITTOCK, J. E. KINDER (1993): Increasing exogenous progesterone during synchronization of estrus decreases endogenous 17 beta-estradiol and increases conception in cows. *Biol. Reprod.* 49, 214-220.

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SAŽETAK

Krave dovedene na umjetno osjemenjivanje ne nalaze se uvijek u pravilnom spolnom ciklusu. Jedno od takvih stanja je i pojava estrusa u sredini jajničkoga ciklusa, kad krave mogu biti osjemenjene ili pripuštene što nanosi gospodarske štete. Tim su istraživanjem bile obuhvaćene 2092 križane krave umjetno osjemenjene u tijeku pravilnoga spolnog ciklusa (E1). Neke od tih krava ponovno su dovedene u sredini spolnoga ciklusa (skupina I; n = 51), dok u drugih nije ustanovljen estrus u sredini jajničkoga ciklusa (skupina II; n = 2041). Neke krave skupine I (n = 42) i skupine II (n = 525) bile su dovedene ponovno na umjetno osjemenjivanje nakon normalnoga drugoga estrusa (E2). Gonjenje u sredini jajničkoga ciklusa bilo je ustanovljeno u 2,43% krava, prosječno u razdoblju od $9,1 \pm 0,5$ dana nakon E1 u krava skupine I. Prosječno trajanje međuestrusnoga razmaka između E1 i E2 iznosilo je $21,2 \pm 1,2$ dana u krava skupine I, slično kao i u skupine II u kojoj je međuestrusni razmak bio $20,9 \pm 1,1$ dana ($P > 0,10$). U skupini I dobar tonus maternice bio je uobičajen (67,8%) u tijeku E1, dok je srednji (34,5%) ili umjeren (48,3%) maternični tonus bio ustanovljen u tijeku gonjenja u sredini ovarijalnoga ciklusa. Vaginalni iscjedak je u većine krava skupine I bio bistar, obilan i viskozozan (80,6%) u tijeku E1, dok je većina tih krava imala bistar i oskudan (61,3%) ili mutan i oskudan (25,8%) vaginalni iscjedak u sredini jajničkoga ciklusa. Velika većina krava skupine I (82,3%; 42/51) nije postala bređa nakon umjetnoga osjemenjivanja u tijeku E1. To je zahtijevalo endokrinu obradu. Može se zaključiti da bi krave dovedene na umjetno osjemenjivanje s tihim estrusom (gonjenjem) u obliku slaboga vaginalnoga iscjetka i različitim tonusom maternice, većinom srednjim do umjerenim, trebalo smatrati kao one s estrusom u sredini jajničkoga ciklusa i naročito slabim uzgojnim rezultatima.

Ključne riječi: križane krave, estrus, jajnički ciklus
