RESEARCH ARTICLE
Open Access

Journal of Veterinary and Animal Sciences
ISSN (Print): 0971-0701, (Online): 2582-0605

Characteristics of oestrus and conception rate in postpartum dairy cows induced ovulation by using 3000 IU of hCG in 5-day and 7-day cidr-based oestrus synchronisation protocols*

M. P. Nayana [1*], C. P. Abdul Azeez [2], K. Promod [3], Leeba Chacko[4] and Lijo John[5]
Department of Animal Reproduction, Gynaecology and Obstetrics, College of Veterinary and Animal Sciences, Pookode, Wayanad-673 576.

Citation: Nayana, M. P., Abdul Azeez, C. P., Promod, K., Chacko L. and John L. 2020. Characteristics of oestrus and conception rate in postpartum dairy cows induced ovulation by using 3000 IU of HCG in 5-day and 7-day CIDR-based oestrus synchronisation protocols. *J. Vet. Anim. Sci.* **51**(1): 19-24.

Received : 12.07.2019 *Accepted : 20.08.2019* *Published : 01-01-2020*

Abstract

The aim of the study was to compare oestrus characteristics and evaluate the conception rate of postpartum dairy cows by inducing ovulation using 3000 IU hCG in 5-day and 7-day CIDR-based oestrus synchronisation protocols. Twenty-four apparently healthy, cyclic cows, which had completely involuted uterus as assessed by clinico-gynaecological examination and without any history of peripartum and postpartum complications were selected and randomly allotted into two treatment and one control group (n=8 each). On day 40 postpartum (Day 0), animals of Group I (5d CIDR group) were inserted with CIDR followed by administration of GnRH on the same day. The CIDR insert was removed on day 5 and and $PGF_{2\alpha}$ administered. After 36 h of CIDR removal, 3000 IU of hCG was given followed by TAI at 50 - 56 h after CIDR removal. In Group II (7d CIDR group), similar protocol was followed as in group I, with the difference that CIDR was kept for 7 days. Animals in Group III (Control) were observed for occurrence of natural postpartum oestrus from day 40 till day 90 postpartum and inseminated at detected oestrus. The oestrus response, time taken for onset of oestrus, intensity of oestrus and duration of oestrus after CIDR removal were recorded. Pregnancy diagnosis was done on day 25 post AI through ultrasonography and on day 60 through transrectal palpation. The results demonstrated no significant difference in oestrus characteristics between group I and II but the 5-day CIDR-based protocol had higher overall conception rate and was superior to 7-day CIDR-based protocol when 3000 IU of hCG was used to induce ovulation in oestrus synchronisation protocols.

Key words: *Oestrus synchronisation, post-partum dairy cows, CIDR, hCG*

Reproductive efficiency is one of the most important factors determining the productivity and profitability of dairy farming. The reproductive performance of postpartum dairy cow is limited

** Part of the MVSc thesis submitted by the first author to Kerala Veterinary and Animal Sciences University, Pookode, Wayanad, Kerala*

1. *M.V.Sc. Scholar and corresponding author (Mobile no. 9590657510, email id: nayanagowdamp@gmail.com)*
2-4. *Assistant Professors*
5. *Assistant Professor, Department of Veterinary Biochemistry*

by factors like failure to ovulate or display oestrus, delayed interval to first oestrus and poor oestrus detection. Calving interval of 12 to 13 months was recommended optimum for high annual milk yield and economic benefits which were not attainable without decreasing the number of days open. Ovulation induction protocols involving follicular/ luteal development, regression of corpus luteum (CL) and subsequent fixed timed artificial insemination (FTAI) were considered essential to improve the fertility of dairy cows. Initially, the Ovsynch protocol was developed as a breeding strategy to eliminate the need for oestrus detection. Later, modified Ovsynch protocol with inclusion of an exogenous progestogen was developed.

Human chorionic gonadotropin (hCG), besides having potent luteinizing hormone (LH) like effect in cattle, extends life span of the CL, increases progesterone synthesis and pre-ovulatory follicle size favouring ovulation. This hormone acts directly on the ovarian follicle when compared to gonadotropin releasing hormone (GnRH), which acts via the hypophyseal-ovarian axis. Recent studies have shown that a five day progesterone based oestrus synchronization protocols with ovulation induction regimen yielded younger and healthier follicles with a shorter dominant life span and higher fertility rate compared to conventional seven to nine-day protocols. Hence, the present study is formulated to compare the effects of inducing ovulation using 3000 IU of hCG in 5-day and 7-day progesterone-based protocols to determine the most suitable protocol for augmenting the fertility in postpartum crossbred dairy cows.

Materials and Methods

The work was conducted at Instructional Livestock Farm Complex (ILFC), Pookode and Livestock Research Station (LRS), Thiruvazhamkunnu. Crossbred cows without any peripartum and postpartum complications were subjected to clinico-gynaecological examination at day 30 and 40 postpartum for the assessment of uterine involution and ovarian functional status of the animals. Among these, 24 cows with parity two to five, having a body condition score of 2.5 to 3.5 (Smijisha, 2012) were selected and randomly allotted to two treatment and one control group (n=8). The oestrus synchronisation protocol was started on day 40 postpartum (day 0) in treatment groups I and II.

Treatment animals of Group I were inserted with controlled internal drug release (CIDR) progesterone intra vaginal device (1.38 g progesterone, EAZI BREED®) on day 0 and were given intramuscular injection of 20µg of GnRH analogue, (Buserelin acetate, Receptal®). On day 5, CIDR insert was removed and 500 µg of $PGF_{2\alpha}$ analogue (Cloprostenol sodium, Estrumate®) was administered intramuscularly. After 36 h of CIDR removal, cows were treated with 3000 IU of hCG (Chorulon®) intramuscularly, followed by FTAI at 50 - 56 h after CIDR removal with cryopreserved semen. Animals of group II were inserted with CIDR insert on day 0 and were administered with 20 µg of Buserelin acetate. On day seven, CIDR insert was removed with 500 µg of Cloprostenol sodium administration. After 36 h of CIDR removal, cows were treated with 3000 IU of hCG, followed by FTAI at 50 - 56 h after CIDR removal with cryopreserved semen. Animals of group III (Control) were not given any treatment and observed for occurrence of natural oestrus signs from day 40 till 90 days postpartum. AI was done 12 h after the onset of detected oestrus.

The animals were closely observed at 6 h interval upto 56 h after CIDR removal for behavioural oestrus signs like bellowing, discharge through vulva, vulval oedema and hyperemia of vestibular mucosa to assess the oestrus response, time taken for the onset of oestrus, intensity of oestrus and duration of oestrus. Oestrus response was determined as the number of animals exhibiting oestrus following the treatment. Intensity of oestrus was estimated based on behavioural signs, physiological changes and clinico-gynaecological observations and was scored as intense, intermediate and weak as described by Azeez (2014) with slight modification with respect to uterine tonicity.

The interval from the CIDR removal to the onset of oestrus signs in treatment animals

Score card for assessing intensity of oestrus in cattle (Azeez, 2014)

Sl. No	Oestrus characteristics	Points		
		Split up	Maximum	Remark
1.	**Behavioural signs**			
	1. Standing to be mounted 2. Mounting on other animals 3. Restlessness and alertness 4. Bellowing 5. Chin resting and rubbing	3 1 1 1 1	7	Intense ≥ 5 Moderate 2 - 4 Mild < 2
2.	**Physiological changes**			
	1. Vulval oedema ▪ High ▪ Medium ▪ Low	 2 1 0	2	6
	2. Hyperaemia of vestibular epithelium ▪ High ▪ Medium ▪ Low	 2 1 0	2	
	3. Genital discharge ▪ Copious ▪ Moderate ▪ Scant	 2 1 0	2	
3.	**Gynaecological observation**			
	Uterine tonicity ▪ High ▪ Medium ▪ Low	 2 1 0	2	2
	Total			**15**
	Grading of intensity of oestrus High: More than 10 Points Medium: 5 to 10 Points Low: Less than 5 Points			

was recorded as the time taken for the onset of oestrus. Duration of oestrus was calculated as the time from the onset to the end of the behavioural and physiological signs of oestrus. Pregnancy diagnosis was carried out on day 25 after AI by B mode transrectal ultrasonography and confirmed later by per rectal examination on day 60.

Results and Discussion

Oestrus response rate of 100 per cent was achieved in the present study in group I and II (Table 1). The result was similar to the findings of Abubaker (2013) and also Ahmadzadeh *et al.* (2015) found that there was no difference between the per-cent of animals detected in oestrus among 5-day and 7-day CIDR treatment groups. Better oestrus response in the present study was due to progesterone priming through progesterone insert, and establishment of proper endocrine synchrony (Ammu *et al.* 2012). Also, Garcia-Ispierto *et al.* (2018) reported that cows receiving 3000 IU of hCG were more likely to show oestrus than cows receiving GnRH or 1000 IU of hCG after $PGF_{2\alpha}$ injection.

Also, the statistical analysis of the data revealed that the intensity of oestrus in animals of treatment group I and II were significantly ($p \leq 0.05$) higher than the intensity of oestrus among the control animals., which had higher per cent of low and medium intensity oestrus (Table 1) which is in accordance with Landaeta Hernandez *et al.* (2002) who reported that higher percentage of cows exhibited weak and intermediate oestrus in natural and spontaneous oestrus compared to induced

Table 1. Oestrus response and intensity of oestrus in crossbred dairy cows treated with two different oestrus synchronisation protocols on day 40 postpartum (n = 8)

Groups	Oestrus response	Intensity of oestrus in animals of experimental groups (%)			F value	P value
		High	Medium	Low		
Group I	8/8 (100 %)	75.00	25.00	0	4.628*	0.026
Group II	8/8 (100 %)	62.50	25.00	12.50		
Group III	8/3 (37.5 %)	0	12.50	25.00		

(Group I: 5 days CIDR + GnRH + $PGF_{2\alpha}$ + HCG, Group II: 7 days CIDR + GnRH + $PGF_{2\alpha}$ + HCG, Group III: Control) *- significant at $p < 0.05$

Table 2. Time taken for the onset of oestrus (mean ± SE) and the duration of oestrus (mean ± SE) in crossbred dairy cows treated with two different oestrus synchronisation protocols on day 40 postpartum (n = 8)

Particulars	Group I	Group II	Group III	F – value	P – value
Onset of oestrus (h)	44.87 ± 0.66	45.62 ± 1.06	-	0.355 ns	0.561
Duration of oestrus (h)	28.13 ± 1.06[a]	26.12 ± 1.09[a]	17.33 ± 0.73[b]	18.054**	<0.001

ns – Non significant, **- significant at $p < 0.01$

Table 3. First service conception rates and Overall conception rates in crossbred dairy cows treated with two different oestrus synchronisation protocols on day 40 postpartum (n = 8)

Groups	No. of animals	No. of animals conceived in first AI	First service conception rate (%)	No. of animals conceived after three consecutive AI	Overall Conception rate (%)
Group I	8	5	62.50	6	75.00
Group II	8	3	37.50	5	62.50
Group III	8	1	12.50	2	25.00

oestrus. This might be due to the fact that in the present study, removal of progesterone insert leaded to increase in LH pulse frequency and concentrations which promoted follicular growth resulting in increased oestradiol production (Herlihy *et al.* 2012). Gumen and Wiltbank (2005) also noted that exogenous progesterone increased the oestrogen receptor numbers in the hypothalamus basal median resulting in a preovulatory LH surge by re-establishing responsiveness to endogenous oestradiol and increasing the intensity of oestrus.

The time taken for the onset of oestrus in animals of treatment groups I and II was found to be 44.87 ± 0.66 h and 45.62 ± 1.06 h, respectively (Table 2). Contrary to this, Wilson *et al.* (2010) reported higher time taken for induction of oestrus varying from 64 to 71 h after removal of CIDR in Select-Synch + CIDR protocol. It could be inferred that the shorter interval from the implant removal to onset oestrus in the present study might be due to the use of 3000 IU of hCG as reported by Johnson *et al.* (2010) who opined that administration of hCG plays a role in advancing follicular growth to ovulation and early onset of oestrus. No significant difference was observed in the time taken for the onset of oestrus between animals of group I and II was observed. These findings were in accordance with the findings of Bridges *et al.* (2008) who reported that the interval between CIDR withdrawal to oestrus did not vary among the seven-day CIDR (55.9 ± 1.5 h) and five-day CIDR (58.9 ± 1.3 h) Select-Synch protocol.

The duration of oestrus (h) observed in groups I, II and III are represented in Table 2. Statistical analysis of data revealed that the duration of oestrus in groups I and II differed significantly ($p \leq 0.01$) from the control group.

However, there was no significant difference in duration of oestrus between the groups I and II which indicated that the administration of hCG for artificially inducing LH surge was effective in promoting follicular growth, maturation and ovulation thereby exhibiting higher duration of oestrus when compared to that of control animals and also an increased circulating oestradiol concentrations was noticed following CIDR withdrawal leading to increase in the mean duration of oestrus in cows as reported by Gumen and Wiltbank (2005).

Means having same letter as superscript are homogeneous within a row

The first service and overall conception rate in all the groups are represented in Table 3. The highest first service and overall conception rate obtained in 5-day CIDR group (Group I) in the present study concurred with the findings of Lopes *et al.* (2013) and Ahmadzadeh *et al.* (2015) who reported that conception rates were improved with a 5-day CIDR program compared to a 7-day CIDR program. This might be due to the fact that in a short-term 5-day progesterone-based oestrus synchronisation protocol, younger and healthier follicles of shorter dominant life span were induced compared with conventional 7-day protocols and extending length of CIDR treatment from 5 to 7 days resulted in prolonged dominance of ovulatory follicles, which compromises quality of oocytes and subsequent embryos. These findings are in conformity with that of Cerri *et al.* (2009).

Conclusion

In the present study, there was no difference in oestrus characteristics between 5-day and 7-day CIDR protocol but the 5-day CIDR-based protocol with highest overall conception rate was superior to 7-day CIDR-based protocol when 3000 IU of hCG was used to induce ovulation in oestrus synchronisation protocols.

References

Abubaker, S.P.S. 2013. Augmenting fertility in postpartum dairy cows with CIDR progesterone insert, Ovsynch and Doublesynch protocols. *M.V.Sc thesis*, Kerala Veterinary and Animal Sciences University, Wayanad, 77p.

Ahmadzadeh, A., Gunn, D., Hall, J.B. and Glaze Jr, J.B. 2015. Evaluation of treatment with a 5-day versus 7-day controlled internal drug-release insert on reproductive outcomes of beef heifers using a modified timed–artificial insemination protocol. *The Professional Animal Scientist*. **31**(3): 270-277.

Ammu, R., Dhami, A.J., Naikoo, M., Parmar, B.C. and Divekar, B.S. 2012. Estrus induction and fertility response in postpartum anestrus Gir cows. *Indian Journal of Animal Reproduction*. **33**(1): 37-42.

Azeez. C.P.A.2014. Management of anoestrum in crossbred heifers and cows by hormonal induction of oestrus. *PhD* Thesis, Kerala Veterinary and Animal Sciences University, Wayanad. pp53-55.

Bridges, G.A., Helser, L.A., Grum, D.E., Mussard, M.L., Gasser, C.L. and Day, M.L. 2008. Decreasing the interval between GnRH and PGF2α from 7 to 5 days and lengthening proestrus increases timed-AI pregnancy rates in beef cows. *Theriogenology*. **69**(7): 843-851.

Cerri, R.L., Rutigliano, H.M., Chebel, R.C. and Santos, J.E. 2009. Period of dominance of the ovulatory follicle influences embryo quality in lactating dairy cows. *Reproduction*. **137**(5): 813.

Garcia-Ispierto, I., De Rensis, F., Casas, X., Caballero, F., Mur-Novales, R. and López-Gatius, F. 2018. Reproductive performance of lactating dairy cows after inducing ovulation using hCG in a five-day progesterone-based fixed-time AI protocol. *Theriogenology*. **107**: 175-179.

Gümen, A. and Wiltbank, M.C. 2005. Length of progesterone exposure needed to resolve large follicle anovular condition in dairy cows. *Theriogenology*. **63**: 202-218.

Herlihy, M.M., Crowe, M.A., Diskin, M.G. and Butler, S.T. 2012. Effects of synchronization treatments on ovarian follicular dynamics, corpus luteum growth, and circulating steroid hormone concentrations in lactating dairy cows. *J. Dairy. Sci.* **95**(2): 743-754.

Johnson, R., Bennett, W.A., Cuadra, E.J., Njiti, V., Jung, Y. and Mason, M. 2010. Roles of hCG in advancing follicular growth to ovulation after concurrent injections of $PGF_{2\alpha}$ and GnRH in postpubertal Holstein Heifers bearing a CL. *Veterinary Medicine International*. **33**(1): 37-42.

Landaeta-Hernández, A.J., Yelich, J.V., Lemaster, J.W., Fields, M.J., Tran, T., Chase Jr., C.C., Rae, D.O. and Chenoweth, P.J. 2002. Environmental, genetic and social factors affecting the expression of estrus in beef cows. Theriogenology. 57(4): 1357-1370.

Lopes Jr, G., Johnson, C.R., Mendonça, L.G.D., Silva, P.R.B., Moraes, J.G.N., Ahmadzadeh, A., Dalton, J.C. and Chebel, R.C. 2013. Evaluation of reproductive and economic outcomes of dairy heifers inseminated at induced estrus or at fixed time after a 5-day or 7-day progesterone insert-based ovulation synchronization protocol. *J. Dairy Sci.* **96**(3):1612-1622.

Smijisha, A. S. 2012. A body condition score system for predicting performance of cross bred cattle. *PhD Thesis,* Kerala Veterinary & Animal Sciences University, Mannuthy*,* 4p.

Wilson, D.J., Mallory, D.A., Busch, D.C., Leitman, N.R., Haden, J.K., Schafer, D.J., Ellersieck, M.R., Smith, M.F. and Patterson, D.J. 2010. Comparison of short-term progestin-based protocols to synchronize estrus and ovulation in postpartum beef cows. *J. Ani. Sci.* ***88*****(6)**: 2045-2054. ■