Estrus Induction and Conception Percentage in Anestrus Buffaloes treated with Progesterone

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Abstract

An investigation was carried out by administration of progestagens through various routes in different formulations for the treatment of anestrus condition in buffaloes. Among the methods of progesterone administration, the low cost intravaginal sponge designed locally for this study resulted in better induction response and conception rate compared to CIDR vaginal insert and progesterone depot.

Keywords: *Anestrus, Buffaloes, Progesterone, Conception*

Introduction

India has emerged as the largest milk producer in the world. Buffaloes constitute 36 per cent of total bovine population in India and account for 56 per cent of country's total milk production. To improve calf yield from a dairy animal and ultimately milk yield, the reproduction should receive greater emphasis. One of the major factors of economic importance in buffalo reproduction is the delayed return to postpartum cyclicity (Honparkhe *et al.,* 2008), which impacts high reproductive efficiency required in dairy animals. In order to maintain the recommended calving interval, the buffaloes need to conceive within 100 to 150 days postpartum. Any deviation or prolongation in the breeding rhythm results in a progressive economic loss through widening of days open, dry period and inter-calving period, reduced calf crop and lactation yield (Kavani *et al.,* 2005).

Trials with a variety of progestagens administered through various routes in different formulations for the treatment of anestrus condition have produced variable results (Singh and Singh, 2006). The regimen include oral administration (Shankar *et al.,* 1996), injection of progesterone depot (Kang *et al.,* 2007), ear implants (Nayak *et al.,* 2009) and intravaginal progesterone inserts like progesterone releasing intravaginal device (PRID) (Kacar and Aslan, 2004), controlled internal drug release (CIDR) (Singh, 2003a) and intravaginal sponge (Ayalon and Marcus, 1975).

However, fewer studies were conducted on the use of exogenous progesterone for inducing cyclicity in postpartum anestrus buffaloes and the results were not consistent. Scanty data is available on the use of progesterone vaginal sponge in buffaloes. Hence, the present study was proposed to ascertain the efficacy of different routes of administering progesterone on induction of estrus and conception rate in postpartum anestrus buffaloes.

Materials and Methods

Forty three numbers of healthy she buffaloes, in second to fourth parity, which did not express estrus signs for more than five months postpartum and having smooth ovaries with no palpable structures were selected and divided into four groups namely, group I (10 animals, CIDR retained for 9 days and removed on 10th day + GnRH given at the time of insemination), group II (10 animals, CIDR retained for 9 days and removed on 10th day), group III (13 animals, locally prepared intravaginal polyurethane sponge [8X5 cm size, fitted with nylon thread] impregnated with 1.5 g progesterone retained for 9 days and removed on 10th day,) and group IV (10 animals, progesterone depot injection twice at 10 days interval). Ten numbers of regular cycling buffaloes maintained at similar management and feeding conditions as anestrus animals were selected to serve as control (group V). The artificial insemination was done with good quality frozen semen twice at 24 hours interval at induced estrus as well as for second or subsequent estrus in animals that are not conceived at previous estrus.

The selected animals belonged to small farmers in rural areas in Namakkal, Salem and Karur districts of Tamilnadu state and were mostly maintained on grazing for 3-4 hours per day and supplemented with mixed ration of paddy straw, dried jowar, greens along with little concentrate feed. Drinking water was provided to animals *ad lib*. The selected animals were routinely being subjected to bathing under tap water/ wallowing in pond water by the owners.

Results and Discussion

The percentage of estrus induction in anestrus buffaloes administered progesterone through different routes is presented in Table 1.

Table 1: Estrus Induction Response in Anestrus Buffaloes treated with Progesterone

Group	No. of animals treated	No. of animals retained CIDR/ sponge	No. of animals induced to estrus				
			Hours				
			24-36	36-48	48-60	60-72	>72
Group I (CIDR + GnRH)	10	10 (100%)	--	6 (60%)	3 (30%)	1 (10%)	--
Group II (CIDR)	10	10 (100%)	--	2 (20%)	4 (40%)		4 (40%)
Group III (Progesterone sponge)	13	13 (100%)	--	--	3 (23%)	3 (23%)	7 (54%)
Group IV (Progesterone depot injection)	10		--	--	--	--	9 (90%)

All the 10 anestrus buffaloes in group-I were induced to estrus. Thus an estrus response of 100 per cent was observed in this group. In group II, all the anestrus buffaloes were induced to estrus and thus an estrus response of 100 per cent was observed in this group also. All the 13 anestrus buffaloes in group III were induced to estrus by progesterone impregnated sponge inserted

intravaginally. Out of 10 buffaloes in group IV which were injected with hydroxyprogesterone, 9 animals (90 %) were induced to estrus.

The findings revealed that the progesterone was effective in re-establishing ovarian cyclicity in anestrus buffaloes both as intravaginal insert and as depot form.

The findings of this study agrees with the report of Singh (2003b) and Naikoo and Patel (2009) who reported 90 and 100 per cent respectively for anestrus buffaloes treated with CIDR for 10 to 12 days exhibited estrus following withdrawal of CIDR.

Similarly, Lakra *et al.* (2003) observed an estrus response of 83.3 per cent in anestrus buffalo heifers as well as in pluriparous animals treated with CIDR for 10 days and injected with PMSG at the time of withdrawal of progesterone.

Resumption of estrus cyclicity in buffaloes following intravaginal progesterone therapy had been reported earlier by several researchers (Andurkar and Kadu, 1995; Andurkar *et al.,* 1997; Zaabel *et al.,* 2009).

It was suggested that dysfunction of the hypothalamic GnRH and pituitary gonadotropins secretion were the contributing factors in the etiology of inactive ovaries (Aboul-Ela *et al.,* 1985; Gordon, 1996). The CIDR applied for the treatment of postpartum anestrus and estrus synchronization might have elevated progesterone level in blood as there was sustained release of progesterone and might have sensitized the hypothalamus and pituitary to induce ovarian cyclicity (Gonzalez-Padilla *et al.,* 1975; Macmillan and Peterson, 1993).

After withdrawal of progesterone, the inhibitory effect of progesterone on the secretion of GnRH might have been abolished and increased the GnRH pulse and FSH release causing follicular growth, exhibition of estrus cyclicity and subsequent ovulation in buffaloes (Singh, 2003b). Singh (2003a) showed that elevation of progesterone in circulation for at least 10 days was sufficient to sensitize the hypothalamo-hypophyseal and gonadal system of buffaloes for resumption of estrus cyclicity.

Palomares-Naveda *et al.* (2008) and Perea *et al.* (2008) recorded an estrus response of 59.10 and 78.20 per cent in anestrus cows treated with intravaginal sponge impregnated with MAP. Sreenan and Mulvehill (1975) also recorded similar findings in cow heifers inserted with progestagen impregnated vaginal sponges. Ayalon and Marcus (1975) observed 100 per cent estrus response in cows treated with progesterone sponges intravaginally.

In the depot form of progesterone administration, 90 per cent of animals were induced to estrus which was higher than the reports of Markandeya and Patil (2003) and Honparkhe *et al.* (2008) who observed 83.30 and 87.50 per cent induction rate respectively in anestrus buffaloes treated with hydroxyprogesterone. However, Parveen *et al.* (2009) found a lower induction rate (50 %) in anestrus buffaloes while Singh *et al.* (2004) observed 100 per cent of the anestrus cows treated with hydroxyprogesterone were induced to estrus. The variations obtained

in the above studies might be due to the failure of maintaining homogenous level of progesterone in circulation during the treatment (Srivastava, 2005).

Conception rate for the different treatment groups and regular cyclic buffaloes is presented in Table 2.

Table 2: Conception Rate in Anestrus Buffaloes treated with Progesterone and Regular Cyclic Buffaloes

Group	No. of animals in each group	No. of animals conceived at 1st estrus	No. of animals conceived at 2nd estrus	No. of animals conceived at 3rd estrus	Overall conception rate	Services per conception
Group I (CIDR + GnRH)	10	5/10 (50%)	1/2 (50%)	--	6/10 (60%)	1.20 (12/10)
Group II (CIDR)	10	4/10 (40%)	2/6 (33.30%)	0/2 (0%)	6/10 (60%)	1.80 (18/10)
Group III (Progesterone sponge)	13	8/13 (61.53%)	1/2 (50%)	0/1 (0%)	9/13 (69.23%)	1.23 (16/13)
Group IV (Progesterone depot injection)	10	2/9 (22.20%)	3/4 (75%)	--	5/9 (55.50%)	1.30 (13/10)
Control (Regular cycling)	10	1/10 (10%)	1/9 (11.10%)	3/5 (60%)	5/10 (50%)	2.40 (24/10)

In group I buffaloes, the first service conception rate was 50 per cent. Two animals returned to estrus and inseminated subsequently. Out of this two, one animal conceived. Thus, an overall conception rate of 60 per cent with service per conception of 1.20 was recorded in group I buffaloes.

In group II, first service conception rate of 40 per cent was obtained. Those animals not conceived were returned to estrus in next cycle and inseminated. Two animals conceived with a second service conception rate of 33.30 per cent. Two animals returned to estrus third time but failed to conceive. Thus an overall conception rate of 60 per cent was obtained in this group and the service per conception was 1.80 in these buffaloes.

In group III, eight out of 13 treated buffaloes conceived with the first service conception rate of 61.53 per cent. Two animals returned to estrus and inseminated in the next cycle. Out of this, one conceived and the non-conceived animal in the second service returned to estrus third time and inseminated, however failed to conceive. Thus an overall conception rate of 69.23 per cent was achieved in this group. The service per conception was 1.23 in vaginal sponge inserted buffaloes which was lower than group II and IV animals.

In group IV, nine animals that resumed cyclicity at induced estrus were inseminated. Only two animals conceived at first service with a conception rate of 22.20 per cent. Four animals returned to estrus second time and inseminated. Out of

this, three animals conceived. The animals that were not pregnant did not return to estrus third time. Thus, an overall conception rate of 55.50 per cent and service per conception of 1.30 were recorded.

In control group, only one animal out 10 conceived at postpartum first estrus. Non-conceived animals were inseminated at next cycle. Only one animal conceived at second service. Five animals returned to estrus third time and were inseminated. Out of this, three conceived with a third service conception rate of 60 per cent. Thus, an overall conception rate of 50 per cent was obtained. The service per conception in this group was 2.40.

The results of conception rate revealed that first service conception rate was the highest in progesterone sponge treated group while it was the lowest in progesterone depot injected group. Among CIDR treated animals (group I and II), GnRH administration at the time of insemination gave an additional 10 per cent conception rate at first service in group I, whereas, regular cyclic buffaloes exhibited only 10 per cent conception rate in the postpartum first service.

Progesterone administered in silastic or sponge devices by intravaginal route allow more uniform release at designed rate and might have maintained homogenous level of progesterone during the treatment period (Srivastava, 2005) when compared to progesterone injection (Bolta *et al.,* 1990).

The results are in agreement with the conception rate reported by Naikoo and Patil (2009) in CIDR treated anestrus buffaloes. On the contrary, Ali and Fahmy (2007) reported a lower conception rate (37.50 %) in buffaloes treated with CIDR. Andurkar and Kadu (1995) and Lakra *et al.* (2003) have reported a higher conception rate (71.42 and 80 per cent respectively) compared to the present study.

An additional 10 per cent first service conception rate in group I animals over group II animals may be attributed to the supplemental injection of GnRH which might have caused LH release for ovulation at appropriate time (Zaabel *et al.,* 2009) thereby improving the chances of successful fertilization and embryo survival (Pawson and McNeilly, 2005). However, a lower conception rate (27.30 %) in buffaloes treated with CIDR + GnRH was reported by Murugavel *et al.* (2009). Similarly, Wheaton and Lamb (2007) reported that inclusion of GnRH in CIDR-PGF2α protocol did not appear to increase the effectiveness of the treatment.

Ayalon and Marcus (1975) and Palomares-Naveda *et al.* (2008) reported 60.00 and 45.50 per cent overall conception rate respectively in cows inserted with progesterone impregnated intravaginal sponge. In the present study, a higher percentage of conception than the above authors was achieved by progesterone impregnated intravaginal sponge therapy for anestrus buffaloes.

The conception percentage observed in group IV animals treated with hydroxyprogesterone injection was comparable with the findings of Srivastava (2005) who reported 50 per cent conception rate in buffaloes given

hydroxyprogesterone injection. Higher conception rates were also reported by Reddy *et al.* (1994) and Singh *et al.* (2004), while lower conception rate was reported by Andurkar and Kadu (1995) in progesterone depot injected buffaloes.

Locally designed low cost progesterone vaginal sponge was retained in the vagina of buffaloes for the required period of time and was able to sustain progesterone release as well or better than the commercially available CIDR as indicated by the results.

It can be inferred from the results that the progesterone treatment to the true anestrus buffaloes could enhance estrus induction percentage and conception rate than the regular cyclic buffaloes and required less number of service per conception. Further studies are required to elucidate progesterone release rate from sponges and monitoring progesterone level in the blood during vaginal sponge *in situ.*

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