Induction of Lactation and Reproductive Response in Non-producing Buffalo Heifers Following Steroid Hormone Treatment

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ABSTRACT : Buffalo heifers weighing from 400-500 kg and having a history of reproductive problems like anestrus, irregular estrus or failure to conceive after repeated inseminations were administered subcutaneously with estradiol-17β and progesterone in two dosage rate 0.1 mg and 0.25 mg, respectively, per kg body weight per day for 7 days in experiment-I and 0.1 mg and 0.125 mg, respectively, per kg body weight per day for 7 days in experiment II. In experiment-I, 9 out of 10 buffaloes responded positively to the hormonal treatment. Milk secretion started between 14-20 days after the start of the treatment. The total milk yield in the successfully induced animals varied from 471.98-625.40 kg. The average daily milk yield varied from 2.08-2.76 kg and peak yield from 3.6-5.3 kg. The time taken to reach peak yield varied from 12-14 weeks. In experiment-II, the established lactation response was absent, although milk secretion process was initiated, the yield could not reach more than 50-100 gm at each milking. In experiment-I, the first estrus occurred between days 87-231 following the hormonal treatment. Four animals in which lactation was established successfully got pregnant after one or two services. In experiment-II the first estrus occurred between 85-173 days following the treatment and only one animal got pregnant.

(**Key Words** : Lactation, Induction, Estradiol-17β, Progesterone, Anestrus, Buffaloes)

INTRODUCTION

A significant number of buffalo heifers fail to reproduce due either to anestrus condition or conception failure even after repeated inseminations. Present knowledge of hormonal interplay with mammary function and the role of hormone action in milk synthesis by mammary cells could be applied to induce lactation in such heifers. Meites (1961) reviewed the different procedures which were used to induce lactation in cattle with estrogen alone or with a combination of estrogen and progestrone for shorter or longer periods of time. Because of long treatment, commercial applications for hormonal induction of lactation were considered impractical. However, Smith and Schanbacher (1973) successfully induced lactation in cattle using a 7 day treatment. The principle behind inducing lactation lies in the fact that gonadotropin release from the pituitary is blocked by exogenous progesterone followed by a spurt release when progesterone administration is stopped. Simultaneously, exogenous estradiol stimulates duct growth of the udder, and estrogen and progestrone trogether stimulate alveolar growth. This knowledge has been applied in present studies to induce lactation in non-producing heifers.

MATERIALS AND METHODS

This study was carried out on buffalo heifers above the age of 42 months and body weight ranging from 400-500 kg. All the heifers had a history of reproductive problems like anestrus, irregular estrus and failure to conceive after repeated inseminations. Rectal palpation of the animals presented no apparent pathological conditions. The brief history of the animals is given in the tables 1 and 2. The present investigations were carried out in two sets of experiments.

Experiment-1

Ten buffalo heifers were administered subcutaneously estradiol-17β and progesterone at the rate of 0.1 mg and 0.25 mg, respectively, per kg body weight per day for 7 consecutive days as per procedure described by Chakravarty et al. (1981). The quantity of hormones were calculated as per the above dosage rate for individual animal and dissolved in absolute alcohol. Daily doses were divided into two volumes and administered at 12 hourly interval.

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Table 1. Showing reproductive history of buffalo heifers of experiment - I

Animal number	Body weight (kg)	Reproductive history	Dams 3rd lactation yield (kg)
B - 1	490	repeat breeder	2,628
B - 2	490	repeat breeder	2,090
B - 3	480	anestrus	2,506
B - 4	400	anestrus	730
B - 5	450	repeat breeder	1,730
B - 6	460	anestrus	1,910
B - 7	410	anestrus	1,844
B - 8	425	anestrus	2,632
B - 9	420	repeat breeder	2,403
B - 10	425	repeat breeder	2,362

Table 2. Showing reproductive history of buffalo heifers of experiment - II

Animal number	Body weight (kg)	Reproductive history	Dams 3rd lactation yield (kg)
A	478	anestrus	2,506
B	500	anestrus	1,910
C	482	anestrus	1,844
D	480	anestrus	1,880
E	500	anestrus	2,008
F	410	anestrus	1,975

Experiment - II

Six animals were administered subcutaneously E2 and P4 at the rater of 0.1 mg and 0.125 mg, respectively, per kg body weight per day for 7 consecutive days as per method used in experiment - I.

Gentle massaging of the udder and teats was started on the first day after end of treatment. Teats were observed for exudation of udder secretions and when the secretions turned milky, gentle milking was started, Milking was done twice a day in the morning and in the evening. Milk recording of animals successfully induced into lactation was done daily at each milking until they dried off or yields were less than 1 kg per day. Oestrus detection was done by prading teaser bull daily in the morning and evening.

RESULTS AND DISCUSSION

Lactational traits of animals induced to lactate under experiment - I are given in table 3. Nine out of 10 animals responded positively to the hormonal treatment when E2 and P4 were given in the ratio of 1 : 2.5. Milk secretion started between 14 - 20 days after the start of treatment. In the beginning the milk secretions were yellowish in colour which slowly (3 - 5 days) turned milky as the time progressed. In four animals milk yield per day remained less than 1 kg upto day 35 of lactation. Milking was discontinued in these animals as the response was considered insufficient to warrant further milking.

The total milk yield in the successfully induced animals varied from 471.98 to 625.40 kg in a lactation period of 228 days. The total fat yields varied from 33.28 to 47.50 kg. The average daily milk yield varied from 2.08 to 2.76 kg and the peak milk yield from 3.6 kg to 5.3 kg. The time taken to reach peak yield varied from 12 - 14 weeks.

In experiment - II the established lactation response was absent, although the milk secretion process was initiated. However, the yield could not reach more than 50 to 100 g at each milking. This might be due to the poor development of udder as observed visually.

The results of the study were comparable to those of Singh and Ludri (1992) who reported that lactation was induced successfully in all the buffaloes given E2 and P4

Table 3. Lactation traits in induced lactation - Experiment - I

Animal No.	Total milk yield (kg)	Total fat yield (kg)	Days in lactation	Average milk yield/day (kg)	Peak milk yield/day (kg)	Time taken to reach Peak yield (Weeks)
B - 1	617.84	47.50	227	2.72 + 0.06	4.50	12.10
B - 2	477.63	36.93	227	2.10 + 0.07	3.60	14.00
B - 3	625.40	37.42	227	2.76 + 0.08	5.30	12.50
B - 4	471.98	33.28	227	2.08 + 0.07	4.20	14.00
B - 5	399.76	27.68	169	2.37 + 0.07	4.00	12.30
B - 6*	22.17	1.57	34	0.65 + 0.05	0.96	2.10
B - 7*	19.33	1.42	34	0.57 + 0.04	1.07	2.00
B - 8*	19.16	0.57	29	0.32 + 0.03	0.52	1.40
B - 9*	10.04	0.62	31	0.32 + 0.03	0.52	2.30

*Buffaloes dried after one month.

in 1 : 1 ratio. Peak yield reportedly varied from 3 to 5 kg per day which was better than that reported by other workers on buffaloes (Sud, 1979; Atheya and Sud, 1985; Venkataramaiah and Narshimha Rao, 1992). Sud (1979) reported that the treatment (E2 : P4 : 1 : 2.5) was a failure in four buffaloes and only in two buffaloes was the reponse encouraging. Atheya and Sud (1985) were successful in inducing lactation in 5 out of 9 old buffaloes and they started yielding more than 1 kg milk/day within 60 days. Venkataramaiah and Narshimha Rao (1992) reported peak yield from 0.7 to 3.2 kg of three buffaloes treated with steroid hormone, dexamethasone and reserpine.

The results of this study that 90 percent of the buffaloes were induced into lactation and milk secertions started between 14-20 days after beginning of treatment corroborate the findings in cattle. However, the time taken to reach peak yield (12-14 weeks in the persent study) was longer than reported in cattle (6-9 weeks; Smith and Schanbacher, 1973; Narendran and Hacker, 1974; Willet et al., 1974; Chakravarty et al., 1981, Deshmukh et al., 1992).

The response obtained for milk production in this study was not uniform. There was variation among individual animals. The lactation curve (figure 1) showed that milk yield in the beginning of lactation was very low which increased gradually and reached a peak by 14 weeks. The peak yield was maintained for about 8-9 weeks and then the yield declined gradually till the end of lactation. However, in normal parturient animals, the milk production begins with a higher yield reaching peak level at aproximately 4 to 7 weeks and after maintaining for a few weeks milk yield tapers off.

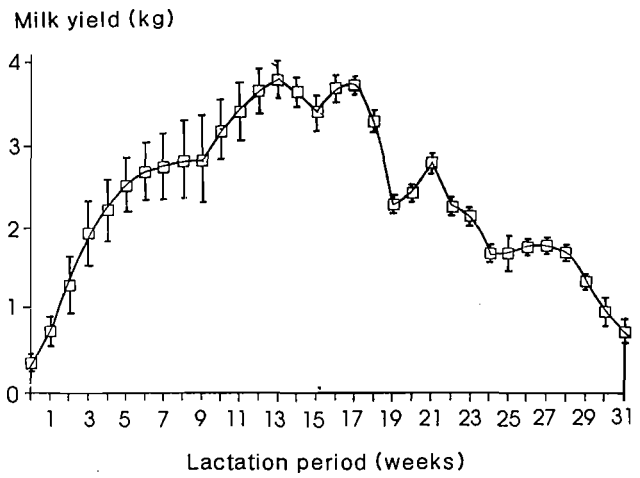

Figure 1. Average weekly milk yield.

The persent study was conducted on buffalo heifers, and milk production cannot be compared with a previous lactation. But if we compare with their Dam's yield, the milk production in induced lactation is variable and lower than would have been obtained following normal parturition. As reported in cattle by Erb (1977), mammary gland development and subsequent milk production were more variable in induced lactation following treatment with E2 and P4 for 7 days than for longer periods of treatment (180 days).

The large variation in lactation response of individual animals may be due to the degree of ovarian activity, response level of steroid receptors, the rate of absorption from the injection site and metabolism of hormones, differences in the functional activity of other endocrine glands related to milk production, viz, pituitary, thyroid, adrenal etc.

Due to lack of sufficient information on induction of lactation in buffaloes, it is difficult to make valid comparisons on a quantitative basis. However, the results obtained here clearly indicated that good lactational responses could be obtained in buffaloes under induced lactation following a 7 day treatment with E2 and P4 in the ratio of 1 : 2.5.

The animals did. not exhibit estrus when detected by teaser bull during first 35-40 days after the hormonal treatment. In experiment-I, the first detected estrus using teaser bulls, occurred between 87 to 231 days. Four animals in which lactation was established successfully were inseminated one or two times and subsequently confirmed as pregnant. In experient-II, the first detected estrus appeared between 85 and 173 days following hormonal treatment and one animal got pregnant.

Various workers have reported the reproductive behaviour of hormonally induced cattle. The animals have been reported to exhibit intense estrus activity (Smith and Schanbacher, 1973) or estrus like activity (Erb et al., 1973 ; Chakriyarat et al., 1978) following induced lactation treatment.

In the present study the percent pregnancy rate 16.6 to 40.0% was low compared to cattle (30.0 to 90.0%) as reported by various workers (William et al., 1955, Narender and Hacker, 1974, Peel et al., 1978). Furthermore the time taken to exhibit estrus after hormonal treatment (87-231 days) was longer in buffaloes than in cattle (91-152 days, Chakravarty et al., 1981). Hence it cannot be concluded that the hormone treatment given for inducing lactation in the present experiments had any direct role in the reproductive behaviour post treatment. As the animals treated had irregular reproductive activity and none had conceived prior to hormonal treatment, and

as some animals did concieve after the treatment athough conceptions were considerably delayed post treament, there is indirect evidence that the hormonal treatment may have activated the endogenous hypothalamo-pituitary-gonadal axis resulting in subsequent normal oestrus and conception.

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