Success rate and recovery of milk production following induction of lactation in infertile dairy cows

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ABSTRACT

The study was conducted to determine the success rate of induction of lactation in infertile dairy cows following induction of lactation protocol. The experiment was conducted on non-lactating parous cows having good body condition score (BCS) between 2-4 of 5 point scale. The selected cows were randomly divided into two groups each containing six animals (n= 6). Animals of group-1 (G-1) were treated with intramuscular injection of estradiol valerate depot @ 0.10 mg/kg along with injection of hydroxy progesterone depot @ 0.25 mg/kg OID for seven days. Intramuscular injection of dexamethasone @ 0.050 mg/kg was given and OID at 10th, 11th, 12th and 13th day followed by hand milking started onwards. In group-2 (G-2) intramuscular injection of estradiolvalerate depot @ 0.10 mg/kg along with consecutive injection of hydroxy progesterone depot @ 0.25 mg/kg OID for seven days was given. After that intramuscular injection of dexamethasone @ 0.050 mg/kg along with metoclopromide @ 0.10 mg/kg OID at 10th, 11th, 12th and 13th day was administered and hand milking started onwards. The milk production up to 20 days after the last injection was discarded in both the groups. The data generated were analysed statistically using t-test assuming equal variance in Microsoft Excel 2007.

Keywords: Milk; dairy cows; lactation; infertile; induction

INTRODUCTION

India ranks first among the world's milk producing countries since 1998 and has the largest bovine population in the world (https://iasscore.in/upsc-prelims/livestock-resources-fisheries). Livestock sector is an integral part of Indian agriculture contributing about 30 per cent of the total agrarian economy of country. Artificial induction of lactation reduces the cost of maintaining barren non-lactating animals in the herd. Protocols for the induction of lactation in non-lactating and non-pregnant dairy cows have focused on the practical uses of these procedures on farms (Fulkerson 1979). With the use of such protocols farmers may be able to reduce herd culling losses and replacement costs by retaining animals that would otherwise be culled from the dairy herd. Substantial non-voluntary culling losses and long calving intervals may be attributed to reproductive problems and failure to breed.

MATERIAL and METHODS

The study was carried out on infertile and non-lactating dairy cows of Livestock Farm, Adhartal, Madhya Pradesh at farmers' doors and Department of Veterinary Gynaecology and Obstetrics, College of Veterinary Science and Animal Husbandry, Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh. For this 12 non-lactating parous, approximately 4-8 years old, non-pregnant cows having good body condition score (BCS) between 2-4 of 5 point scale were selected. They had history of good milk production in the previous lactation (approximately 10 l/day) and infertility (anoestrus and repeat breeding) since last six months or more.

The selected cows were randomly divided into two groups each containing six animals (n= 6). Animals of group-1 (G-1) were treated with intramuscular

injection of estradiol valerate depot @ 0.10 mg/kg along with injection of hydroxy progesterone depot @ 0.25 mg/kg OID for seven days. Intramuscular injection of dexamethasone @ 0.050 mg/kg was given and OID at 10th, 11th, 12th and 13th day followed by hand milking started onwards. In group-2 (G-2) intramuscular injection of estradiolvalerate depot @ 0.10 mg/kg along with consecutive injection of hydroxy progesterone depot @ 0.25 mg/kg OID for seven days was given. After that intramuscular injection of dexamethasone @ 0.050 mg/kg along with metoclopromide @ 0.10 mg/kg OID at 10th, 11th, 12th and 13th day was administered and hand milking started onwards. The milk production up to 20 days after the last injection was discarded in both the groups. The data generated were analysed statistically using t-test assuming equal variance in Microsoft Excel 2007.

RESULTS and DISCUSSION

Success rate of induction of lactation

The success of induction of lactation in present study was determined by secretion of milk with udder engorgement at day of first milking. The induction of lactation in present study yielded 100 per cent success rate in both the groups (Table 1).

Table 1. Success rate of induction of lactation

Group	Animals treated	Successful induction of lactation	
		n	%
G-1	6	6	100
G-2	6	6	100

Recovery of peak milk production following induction protocol

The individual recovery of milk production and mean recovery were determined by comparing the induced peak milk production from the previous peak milk production of the experimental animals (Tables 2 and 3). The maximum milk was recorded nearly at eighth week or onward (average 8.11week) and the data of this period were considered as peak milk production. The individual peak milk production ranged from 0.8 to 3.8 l per day in G-1 and from 1.0 to 4.5 l per day in G-2. However per cent recovery of milk ranged from 8.80 to 40.00 in G-1 and 11.10 to 47.36 in G-2 (Table 2). The mean milk recovery percentage was recorded significantly higher in G-2 (38.06 ± 5.5) as compared to G-1 (21.11 ± 4.8) (Table 3).

Table 2. Recovery of individual peak milk production following induction protocol

Group	Animal number	Previous peak milk production (l/day)	Peak milk production (l/day)	Recovery of milk (%)
G-1	1	9.0	0.9	10.00
	2	9.0	0.8	8.80
	3	10.0	2.5	25.00
	4	9.5	3.8	40.00
	5	9.0	1.5	16.60
	6	9.5	2.5	26.31
G-2	1	9.0	4.1	45.50
	2	10.0	4.0	40.00
	3	9.5	4.5	47.36
	4	10.0	4.0	40.00
	5	9.0	1.0	11.10
	6	9.0	4.0	44.44

Table 3. Mean recovery of milk following induction protocol

Group	Previous peak milk production (l)	Peak milk production at 8th week (l)	Mean milk recovery (%)
G-1	9.33 ± 0.16	2.00^{a} ± 0.47	21.11^{a} ± 4.8
G-2	9.41 ± 0.20	3.60^{b} ± 0.52	38.06^{b} ± 5.5
P-value	0.75	0.05	0.04

Mean values with different superscripts in a column differ significantly (P <0.05)

The success of induction of lactation was determined by first secretion of milk with udder engorgement at the day of first milking. The induction of lactation yielded 100 per cent success rate in both the groups. The results of using estrogen, progesterone and dexamethasone (G-1) for induction of lactation are comparable to the reports of Ball et al (2000) who reported 100 per cent success rate. However Collier et al (1975), Chakriyarat et al (1978), Suresh Babu et al (1996) and Verma et al (2002) reported comparatively low induction ie 50-90 per cent in their

studies. The higher rate of induction of lactation in this study may be due to criteria of success ie as compared to only milk secretion and udder engorgement milk yield >9 kg/day (Collier et al 1975), >5 kg/day (Chakriyarat et al 1978), >4.5 kg/day (Suresh Babu et al 1996) and >7-10 kg/day (Verma et al 2002). The role of estrogens in stimulating mammogenesis in dairy cows showed that estrogen stimulates mammary duct growth and estrogen and progesterone in combination stimulate lobule-alveolar development of the mammary gland.

Estrogen initiates lactation in two ways. It causes release of prolactin from the anterior pituitary gland into blood and increases the number of prolactin receptors in mammary cells. Although combinations of exogenous progesterone and estrogen work synergistically to stimulate lobular-alveolar growth, it is the high level of progesterone during pregnancy that helps to regulate lobular-alveolar growth and block lactogenesis. Progesterone blocks lactogenesis in several ways. It blocks glucocorticoid receptors in mammary tissues which would suppress the lactogenic activity of glucocorticoids (Tucker 2000).

The results of the study using estrogen, progesterone, dexamethasone and metoclopromide (G-2) are in accordance to the finding of Mohan et al (2010) who reported 100 per cent success rate of induction of lactation. The success rate of induction using estrogen and progesterone by Isle (1975) and estrogen, progesterone and somatotropin by Mellado et al (2012) was with 100 per cent success rate.

The individual peak milk production using estrogen, progesterone and dexamethasone (G-1) was from 0.8 to 3.8 l/day. The results are comparable to the reports of Ball et al (2000). However Collier et al (1975), Chakriyarat et al (1978), Suresh Babu et al (1996) and Verma et al (2002) reported comparatively higher peak milk yield ranging from 5 to 32 kg/day in their studies. The lower peak milk production in the present study may be due to use of comparatively low producer animals with poor body condition score, insufficient feeding management and longer dry period. The recovery of peak milk using estrogen and progesterone by William and Turner (1960) was reported to be 3.04 to 5.51 l/day, using estrogen, progesterone and hydrocortisone by Delouis et al (1978) was 6.6 to 10 l/day, using estrogen, progesterone, dexamethasone and thyrotropin by Head et al (1982) was 14.3 l/day and using estrogen and progesterone by Singh et al (2000) was 13.0 l/day.

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