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Controlled Induction of Parturition in the Dairy Buffaloes: An Approach of Success of Buffalo Breeding Farm in Bangladesh

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ABSTRACT

Controlled induction of parturition is a very useful tool for managing calving and post-parturition management and successful parturition in dairy farms. In the present study, 12 pregnant buffaloes were treated with dexamethasone in combination with cloprostenol for controlled induction of parturition in Lal Teer Livestock Research and Development Farm, Mymensingh, Bangladesh. The buffaloes were divided into two groups according to their gestation length. The gestation length of buffaloes of group-A was up to 330 days (305-330) and group-B was more than 330 days (331-345). Buffaloes were injected with 6 mL Roxadex and 2 mL Ovuprost intra-muscularly (Roxadex[®], Nuvista Pharma Limited, Bangladesh containing 5 mg Dexamethasone sodium phosphate mL⁻¹ and Ovuprost[®], Bayer Animal Health, New Zealand containing 250 µg Cloprostenol sodium mL⁻¹). Induction of parturition was occurred in all buffaloes in an average time 29.17±3.06 h after the treatment. The duration between treatment and the induction of parturition showed a significant difference (p<0.01) between two groups. Retention of placenta was recorded in 33.33% of animals and the occurrence of dystocia was 25.00%. The viability of newborn (calves) was 91.67% as compared with dead calves 8.33%. It was concluded that dexamethasone in combination with cloprostenol can be used successfully for induction of parturition in buffaloes of Bangladesh although there was a moderate incidence of dystocia and retention of placenta, which needs to be minimized by careful follow up, critical observation and prompt assistance. Further therapeutic trials are needed to minimize the incidence of retention of placenta and dystocia.

Key words: Induction, parturition, dexamethasone, cloprostenol, buffalo

INTRODUCTION

Buffalo (*Bubalus bubalis*) is an important worldwide species in terms of milk and meat production as well as draft (Terzano *et al.*, 2012). Buffaloes play an important role in domestic economy and trade in Bangladesh. The population of buffaloes has been estimated to 0.83 million head in Bangladesh.

An intensive system for buffalo production is not practiced anywhere in Bangladesh even for institutional herds. Due to lack of research and extension services, it has not yet been

demonstrated that dairy farming can be transformed into an attractive and profitable business. However, there is no national milk grid and milk processing facilities in Bangladesh. The productive and reproductive efficiency in buffalo is so alarmingly that it poses a very serious threat of economic losses to farm owners and animal husbandry professionals. In such a scenario, an ample scope exists for increasing the productive and reproductive efficiency by modifications in the traditional methods of breeding, feeding, management and disease control (<https://www.academia.edu>).

Induction of parturition can be a very useful tool for managing calving (Hopper, 2014). The induction of parturition in dairy cows and buffaloes presents great economic incentives and significant economic benefits and advantages as a management tool animal husbandry (Mansell *et al.*, 2006). Induction of parturition may be indicated to terminate pregnancy if desired, to advance the calving date in late conceiving cows, to synchronize the beginning of lactation, to terminate gestations, which have run too far over their time, to control fetal development where gross fetal oversize could be expected to cause dystocia at full term parturition, to treat of uterine hydrops or other health-related matters, in which salvage of the fetus or the life of the cow are being considered (Barth, 2006; Shukla *et al.*, 2008). The procedure facilitates close observation of calving for detection and correction of dystocia and could reduce perinatal calf deaths (Bellows *et al.*, 1994). In dairy herds, parturition may be induced 1-2 weeks early to prevent excessive udder edema and distension that predispose cows to mastitis and difficulty in milking. Induction of parturition with long-acting corticosteroids has gained widespread acceptance with dairy producers in New Zealand and Australia to synchronize lactation with the grazing season (MacDiarmid, 1983). So, induction and synchronization of estrous and parturition is very important to increase the productive and reproductive efficiency of dairy buffaloes and to success dairy farming in Bangladesh.

Progesterone is essential for establishing and maintaining pregnancy in all mammalian species. In cattle, the corpus luteum is the primary source of progesterone throughout gestation and luteal regression is necessary for parturition to occur (Johnson *et al.*, 1981). Placental maturation may require exposure to elevated cortisol levels for a period of time prior to calving as the placenta begins to secrete progesterone after first half of gestation (Wood, 1998). It's believed that initiating signals for hormonal changes that terminate pregnancy come from the foetus through an increase in secretion of cortisol (Al-Hamedawi *et al.*, 2012a). The first report on the use of corticoids to induce premature parturition in cattle and buffalo was reported by Adams (1969) and Prakash and Madan (1985), respectively. Cortisol and prostaglandins analogues have been used for the on-farm induction of parturition in ruminants (Taverne, 1998).

Various types and combinations of hormone treatments have been studied for efficacy and safety in parturition induction, including corticosteroids or prostaglandins in combination with various estrogen preparations and oxytocin in cows (Barth, 2006) but there has been no appreciable reduction in the incidence of placental retention. Little data is available on induction of parturition in buffaloes and as such, based on clinical experience and a few reports the techniques used for cattle are presumed to be similarly applicable in the buffalo. A great deal more study is needed before to recommend controlled induction of parturition in dairy buffaloes. Therefore, the present study was designed to observe the efficacy of Dexamethasone in combination with Cloprostenol in controlled induction of parturition of dairy buffaloes in Bangladesh.

MATERIALS AND METHODS

The study was performed on 12 pregnant buffaloes in Lal Teer Livestock Research and Development Farm, Mymensingh, Bangladesh to observe the efficacy of dexamethasone in

combination with cloprostenol in controlled induction of parturition of dairy buffaloes in Bangladesh. The buffaloes were divided into two groups according to their gestation length. The gestation length of buffaloes of group A (n = 6) was up to 330 days (305-330) and group B (n = 6) was more than 330 days (331-345). Buffaloes were injected with 6 mL Roxadex and 2 mL Ovuprost intramuscularly (Roxadex[®], Nuvista Pharma Limited, Bangladesh containing 5 mg Dexamethasone sodium phosphate mL⁻¹ and Ovuprost[®], Bayer Animal Health, New Zealand containing 250 µg Cloprostenol sodium mL⁻¹). The number of responsive buffaloes (%), duration of response (h), nature of parturition, viability (%) and sex of new born as well as to their complication (%) (retention of fetal membrane and dystocia) were recorded. Placentas were considered retained if they were not released by 24 h after calving. Independent sample t-test and Pearson's correlation analysis (Bivariate) were used (with the help of SPSS Statistics version 20) for analysis of data of this study.

RESULTS AND DISCUSSION

The observations in relation to induction of parturition in buffaloes (Mean±SE) were shown in the Table 1 and 2.

The normal gestation period of buffaloes is longer than that of cows and is approx. 310-330 days (<http://www.partners-in-reproduction.com>). The gestation length of buffaloes used in this study was from 305 to 345 days. The effect of dexamethasone to induction of parturition is reported in cows (Peters and Poole, 1991) and effect of cloprostenol in induction of parturition of cows is reported by Nakao *et al.* (1994). Authors defined successful induction as parturition occurring within 47 h after administered dexamethasone in combination with cloprostenol. It was recorded that all the buffaloes (100%) calved in between 12 and 47 h. Phogat *et al.* (1994) accounted that Dexamethasone successfully induced parturition in buffaloes. Al-Hamedawi *et al.* (2012b) got 91.6% induction response by dexamethasone in Iraqi buffaloes. Peters and Poole (1991) also reported 96.67% success in controlled induction of parturition in dairy cows.

Table 1: Detailed information of buffaloes and induction of parturition

Sl. no.	Tag no.	Date of AI	Induction at day of gestation	Time required for parturition after treatment (h)	Sex of calf	Calf weight (kg)	Remarks
A1	A-093	14-08-13	311	31.00	Male	33.7	Dystocia, dead calf, retention of placenta
A2	A-051	05-08-13	305	45.00	Female	29.2	Normal delivery
A3	A-007	05-08-13	315	47.00	Male	36.5	Dystocia, retention of placenta
A4	A-044	14-08-13	326	33.00	Male	31.2	Normal delivery
A5	A-086	14-08-13	330	34.00	Female	25.4	Normal delivery, retention of placenta
A6	A-010	10-09-13	321	28.00	Male	35.1	Dystocia
B1	A-070	05-08-13	334	25.00	Male	34.8	Normal delivery
B2	A-028	05-08-13	339	31.00	Male	35.1	Normal delivery
B3	A-043	05-08-13	339	29.00	Female	31.7	Normal delivery
B4	A-029	15-08-13	345	12.00	Male	36.3	Normal delivery
B5	A-095	14-08-13	336	22.00	Male	33.2	Normal delivery
B6	A-014	05-08-13	342	13.00	Male	35.8	Normal delivery, retention of placenta

Table 2: Observations in relation to induction of parturition in buffaloes (Mean±SE)

Observations	Groups		
	Group A (n = 6)	Group B (n = 6)	General (n = 12)
Time required for parturition (h)	36.33±3.18	22.00±3.27**	29.17±3.06
Occurrence of dystocia (%)	50.00*	-	25.00
Occurrence of retention of placenta (%)	50	16.67	33.33
Live calves (%)	83.33	100	91.67
Average birth weight of calf (kg)	31.85±1.68	34.48±0.71	33.17±0.96
Sex ratio (Female: Male)	1:2 (2:4)	1:5	1:3 (3:9)

*p<0.05 and **p<0.01

In the present study, it was recorded that the overall duration between commencements of treatment to induction of parturition was 36.33 ± 3.18 h in group A and 22.00 ± 3.27 h in group B with an average 29.17 ± 3.06 h. The present finding was in close accordance with the findings of Al-Hamedawi *et al.* (2012a) and Shukla *et al.* (2008) who reported the average interval of 38.56 ± 6.3 and 26.58 ± 2.57 h and after the treatment given for induction of parturition in cattle and buffaloes, respectively. The duration was significantly greater ($p < 0.01$) in Group A in comparison to Group B. The reason for greater duration required in Group A may be because of lower gestation length in the buffaloes than the group B.

The overall incidence of dystocia after the treatment for induction of parturition was recorded up to 25%. The rate of dystocia was close to the finding of Al-Hamedawi *et al.* (2012b) (28.3%) but higher than the finding of Shukla *et al.* (2008) (17.64%) in buffaloes. The overall occurrence of dystocia was significantly higher ($p < 0.05$) in Group A in comparison to Group B. It was recorded that the occurrence of dystocia was more common in the cases in which the foetus was born dead. In the present investigation, the occurrence of dystocia was much higher (25%) than the normal range 3.3% as reported by Williams (1943). The reason may be incomplete preparation of birth canal for parturition due to shorter gestation length in the buffaloes treated for induction of parturition. Chew *et al.* (1979) reported that the cows that were induced for parturition more than two weeks pre-maturely suffered a higher incidence of dystocia than normal cows; this may be due to incomplete uterine maturation coupled with malpresentation of foetus.

Average incidence of retention of placenta for normal dairy cows ranges from 4-18% (Han and Kim, 2005). It was recorded that the overall incidence of retention of placenta was higher (33.33%) than the normal limits but the incidence was lower than the reported during induction of parturition in buffaloes with dexamethasone alone or in combination with PGF₂ alpha (Shukla *et al.*, 2008). Peters and Poole (1991) and Kask *et al.* (2000) have also recorded higher incidences of retention of placenta in cows after induction of parturition with prostaglandin F₂ alpha. Increased occurrence of retained placenta in buffaloes in this study might be due to lack of tone and slow involution or damage to the uterus by mechanical stress resulting from calving difficulty (Klerx and Smolders, 1997). In agreement with other reports (Erb *et al.*, 1985; Thompson *et al.*, 1983), the dystocia was associated with the incidence of retained placenta in this study. Retention of placenta was insignificantly higher in Group A (50%) in comparison with the Group B (16.67%). The higher incidence of retained placenta in Group A may be because of shorter gestation length resulting in improper maturation of placenta. Chassagne *et al.* (1996) and Joosten *et al.* (1987) on the relationship between gestation length and the incidence of retained placenta showed that shorter gestation lengths are associated with a higher incidence of retained placenta. Sex of the calf had no influence on the retained placenta rate. A similar pattern was found by Muller and Owens (1974). Joosten *et al.* (1987) founded that the retained placenta for male calves were associated with 0.2% higher rates. It is debatable whether this statistically significant difference is indicative of a real difference or the number of cases analyzed.

The calf mortality in the present study was 8.33 percent which was a little higher than the permissible limit. Shukla *et al.* (2008) also reported higher calf mortality rate (11.77%) in buffaloes after induction of parturition with dexamethasone alone or in combination with PGF₂ alpha. It was observed that more live foetuses were found in treatment Group B (100%) in comparison to Group A (83.33%). The high incidence of calf mortality appears to be due to premature placental separation and increased frequency of uterine inertia. However, calf mortality may be reduced to some extent by careful observation and prompt assistance.

Table 3: Correlation between gestation length and birth weight

Gestation length	Body weight of calves at birth (kg)	Pearson's correlation (p-value)
311	33.7	
305	29.2	
315	36.5	
326	31.2	
330	25.4	
321	35.1	0.251 (0.431)
334	34.8	
339	35.1	
339	31.7	
345	36.3	
336	33.2	
342	35.8	

The average birth weight of calves was 33.17 ± 0.96 kg with an insignificant difference between group A and B. The correlation between gestation length and birth weight of calves was 0.251 and it was insignificant (p-value = 0.431) (Table 3). The correlation between gestation length and birth weight of present study in buffaloes was similar to some extent with the findings of Wagner *et al.* (1974) in cattle. Lower birth weight in group A due to lower gestation length since the fetus gains about 0.5 kg day^{-1} in the final weeks of gestation (Barth, 2006). Although, it was expected that a decreased birth weight might decrease dystocia, that was not the case. The rate of dystocia was 50% in group A though there was lower birth weight. It may be associated with different factors including placental maturation, Body Condition Score (BCS), blood concentration of calcium etc.

CONCLUSION

It was concluded that dexamethasone in combination with cloprostenol can be used for emergency or controlled induction of parturition of buffaloes in Bangladesh with lower incidence of dystocia, retention of fetal membranes and mortality of calves. The optimal dose, regime and route of administration need further investigation. We hope that the results of this study enormously help to develop cost-effective and successful dairy farms and will also help to develop an intensive system for buffalo production in Bangladesh.

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