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EFFECT OF GENETIC COMPOSITION, PARITY AND CALF SEX ON PREPARTUM BEHAVIOR IN CROSSBRED CATTLE

***Dharmarao MV[1], Seshaiah V. Ch[1], Srivastava BB[2] and Koul GL[2]**

[1]Department of Livestock Production Management, NTR College of Veterinary Science, Gannavaram, Andhra Pradesh, India

[2]Dairy farm section, Indian Veterinary Research Institute, Izatnagar, Utter Pradesh, India

E-mail: dharma_vet@yahoo.co.in (**Corresponding Author*)

Abstract: The aim of the present study is to know the influence of genetic composition of cow, parity and sex of calf on prepartum behaviour in crossbred cattle for improving welfare and management to avoid calving difficulties during parturition. Observations were made on a total of 60 crossbred cattle which were subdivided into three genetic groups viz., Friesian x Hariana (FH), Friesian x Brown Swiss x Hariana (FBH) and Friesian x Jersey x Hariana (FBH). In each genetic group a total of 20 cows of which 10 primiparous and 10 multiparous were included for the study. All the cows were closely observed for various external signs from impendent of parturition to calving. The time taken from abdominal straining and onset of intense and regular straining to calving was significantly ($P<0.05$) higher in FH cows than FBH and FJH cows. The onset of restlessness, abdominal straining, appearance and rupture of chorioallantoic sac, appearance of calf at vulva, onset of intense and regular straining and parturition period was significantly ($P<0.05$) higher in primiparous cows than pluriparous cows and in dams of male calves than female calves. Increased calving time may increase the incidence of dystocia in FH cows than FBH and FJH cows. Primiparous cows and dams of male calves require more prepartum care than pluriparous cows and dams of female calves.

Keywords: Pre-partum, behavior, genetic composition, crossbred cattle.

Introduction

The prepartum period is one of the most important phases in mammalian life, characterized by a sequence of chronologically organized, interdependent behavioral adjustments involving intuitive actions as well as the succession of learned responses. A minor disturbance in prepartum period may upset proper synchronization of many variables, and thus hinder with a successful reproductive effort leads to dystocia. Most of the dairy farmers paying little attention to the welfare implications of calving associated problems (Garry 2004). Recent Canadian studies revealed that prepartum problems and dystocia has the greatest effect on future cow fertility (Bonneville-Hebert *et al.*, 2011). The economic loss due to sequelae of calving associated problems is four-times greater than treatment costs alone (Oltenacu *et al.,* 1988). Hence, a well-defined management program to reduce cases of calving associated

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problems is important for cow health, welfare and farm profitability (Bell and Roberts 2007) and (Potter *et al.,* 2010).

The crossbreeding of Zebu and Taurus has been introduced at a large scale, to augment milk production in different agro-climatic regions of India. With the increase of number of different genetic groups, it has become imperative that a detailed understanding of the prepartum behaviour of dams belonging to different genetic groups is a necessary prerequisite for improving welfare and management during the prepartum period. Therefore, the present work has been carried out to study the influence of parity and genetic composition on prepartum behavior in crossbred cattle to minimize the problems associated calving.

Materials & Methods

Experimental animals

The study was carried out at Cattle and Buffaloe Farm, Livestock Production Management Section, Indian Veterinary Research Institute (IVRI), Izatnagar. The observations were made on a total of 60 crossbred cattle which were divided in to three groups of 20 animals each. The genetic composition of the experimental animals is Friesisan x Hariana (FH), Friesian x Brown Swiss (FBH) and Friesian x Jersey x Hariana (FJH) crosses. In each group 10 primiparous and 10 multiparous dams were included to study the effect of parity on prepartum behaviour. All animals were farm born and raised under similar standard managemental practices. They were artificially inseminated and diagnosed for pregnancy after 2 months of insemination by rectal palpation.

Housing and feeding management

All the animals were housed under loose housing system and the animals were shifted from their pre-calving shed to calving shed three weeks before their expected date of calving. During the last trimester of pregnancy, animals were fed adlibitum green fodders (Berseem, Lucerne and Oats) twice daily in the morning and evening and were also offered 3 kg concentrates daily at 10 AM.

Observation of prepartum behaviour

The animals were closely observed for the onset of various external signs of impendent of parturition 2 weeks before the expected date of calving. The prepartum behavioural events were recorded uninterrupted from the time the animals first showed signs of parturition. The following observations were made on all the cows for

1. Onset of signs of restlessness
2. Onset of intermittent abdominal straining

3. Appearance and rupture of chorioallantoic sac
4. Appearance of calf at vulva
5. Onset of intense and regular straining
6. Parturition period.

Data analysis

The data was analyzed using least –square analysis of variance (Harvey 1990) to study the effects of parity of dam (heifers and cows) and genetic composition of dam (FH, FBH and FJH), sex of calf (male and female) on the various signs (stages) of parturition.

The following fixed effect mathematical model was fitted to the data.

Yijklm= μ+Gi+Pj+Bk+Si+eijklm
μ= Least –Square mean
Gi = Effect of ith genetic group (i=1, 2,3)
Pj = Effect of jth parity (j=1,2)
Bk = Effect of kth body condition
S1=Effect of lth sex of the calf (l=1,2)

Results and Discussion

The sequential time-intervals from the onset of restlessness to delivery recorded on FH, FBH and FJH crossbred cows during parturition are presented in Table 1. The findings of the present study were consistent with the results reported in various exotic breeds of cattle (Owens *et al.,* 1985 and Berglund *et al.,* 1987). The signs of restlessness observed in most of the heifers and cows were aimless walking, tail swishing, kicking off the abdomen (colic like symptoms), looking at abdomen and tail head was raised to a higher position than normal. Restlessness in FH, FBH and FJH cows on an average have started 179.5, 169.4 and 166.5 minutes before the actual birth of the calf. Even though the difference was not significantly different, FH cows had taken 10.1 and 13.0 minutes more time than FBH and FJH cows, respectively (Table 1).

The commencement of intermittent abdominal straining was first observed when the cows arched the back and held the tail in a horizontal position. At this point, the cows frequently voided small amounts of urine and faeces. Commencement of intense straining was generally observed when the cow was in sternal recumbent position with one hind leg stretched out. After a straining bout, the cow would either stay recumbent or stand up, turnaround or sniff the ground where her hindquarters had been. As the straining bout become more intense, dams rolled from sternal recumbence to lateral recumbent position with one or both hind legs stretched out.

The time taken from abdominal straining to calving and onset of intense and regular straining to calving was significantly (P<0.05) higher in FH cattle than FBH and FJH cattle. This might be due to a higher level of Holstein Friesian blood in FH cattle than FBH and FJH which might responsible for increased time taken to complete the calving procedure. Similar findings were previously reported by Berglund *et al.* (1987) and Berglund and Philipsson (1987*)* in Swedish dairy cattle in which the time intervals during the parturition were longer for dams mated with Friesian than the Jersey dams. There was a curvilinear relationship exists between birth weight and dystocia dependent upon pelvic area, breed, parity and dystocia (Mee 2008). The incidence of dystocia increase by 13%/kg increase in birth weight (Johanson and Berger 2003). Therefore, the dams with HF blood produced calves with more birth weight than dams with Jersey blood which might responsible for longer time required for calving in FH cattle. The genotype of the cow can account for up to 60% of the variation in birth weight of the calf though the heritability of dystocia is only 2-10% (Steinbock 2006).

Table 1: Time taken to complete various stages of parturition by three genetic groups

Time (min)	FH	FBH	FJH
Onset of restlessness to calving	179.5+8.2	169.4+8.2	166.5+8.4
Abdominal straining to calving	117.8+6.1[a]	109.0+6.1[b]	97.6+6.2[b]
Appearance of chorioallantoic sac to calving	69.1+4.3	71.0+4.5	64.5+4.5
Rupture of chorioallantoic sac to calving	66.7+4.1	68.9+4.3	62.5+4.3
Appearance of calf at vulva to calving	46.6+2.6	44.3+2.7	41.6+2.7
Onset of intense and regular straining to calving	34.32+1.8[a]	32.0+1.8[b]	27.2+1.8[b]
Parturition period	2.72+0.2	2.31+0.2	1.98+0.2

Means bearing different superscripts within a row differ significantly (P<0.05)

In majority of the cows, chorioallantoic sac appeared at the vulva when the dam was lying in a sternal recumbent position. The sac was burst either when the cow was still recumbent or when it stood up. In few cows, sac ruptured inside the vulva. It was common for the dams to sniff and lick the spilled chorionic fluids. The calf appeared at vulva whilst the dam was in a recumbent position. No significant difference was observed among the three genetic groups in completing this step of parturition. The time required for the expulsion of calf from anterior to posterior position is called as parturition period, which was not significantly different among the genetic groups

Parity had a significant effect on time from onset of restlessness to the delivery of calf (Table 2). Primiparous cows showed restlessness significantly earlier than the pluriparous cows.

Table 2: Time taken (min) to complete various stages of parturition by heifers and cows

	Heifers	Cows
Onset of restlessness to calving	194.6+6.9 [a]	149.0+6.8[b]
Abdominal straining to calving	130.5+5.1 [a]	86.1+5.1[b]
Appearance of chorioallantoic sac to calving	78.0+3.8 [a]	58.4+3.6 [b]
Rupture of chorioallantoic sac to calving	76.4+3.7 [a]	55.8+3.5 [b]
Appearance of calf at vulva to calving	51.7+2.2 [a]	36.7+2.2 [b]
Onset of intense and regular straining to calving	36.47+1.5 [a]	25.9+1.5 [b]
Parturition period	3.00+0.2[a]	1.67+0.2 [b]

Means bearing different superscripts within a row differ significantly (P<0.05)

The onset of restlessness, abdominal straining, appearance and rupture of chorioallantoic sac, appearance of calf at vulva, onset of intense and regular straining and parturition period was significantly (P<0.05) higher in primiparous cows than pluriparous cows. The increased time required to complete calving in heifers might be due to less pelvic size (Mee, 2008) and body size (Dargatz *et al.* 2004) in heifers compared to cows. Similar results of significantly (P<0.001) higher time required for calving in heifers also previously reported (Eriksson *et al*. 2004)

Sex of the calf had significant (P<0.05) influence on the time of prepartum behavior exhibited by the cows. The dams of the male calves had taken significantly (P<0.05) higher time in completing all the all steps of parturition. This might be due to increased birth weight of males than female calves. The majority of the increase in calving associated problems in dams of male calves (Johanson and Berger, 2003) is attributable to higher body weight (1-3 kg).

Table 3: Time taken (min) to complete various stages of parturition by the dams of male and female calves

	Male calves	Female Calves
Number of observations	28	32
Onset of restlessness to calving	180.5+7.2 [a]	163.1+6.0 [b]
Abdominal straining to calving	117.9+5.3 [a]	98.7+4.8 [b]
Appearance of chorioallantoic sac to calving	77.16+3.7 [a]	59.3+3.6 [b]
Rupture of chorioallantoic sac to calving	74.8+3.6 [a]	57.3+3.5 [b]
Appearance of calf at vulva to calving	50.2+2.3 [a]	38.1+2.1 [b]
Onset of intense and regular straining to calving	35.8+1.6 [a]	26.6+1.4 [b]
Onset of restlessness to calving	2.82+0.2 [a]	1.86+0.2 [b]

Means bearing different superscripts within a row differ significantly (P<0.05)

Dams which gave birth to calf with more birth weight experienced more difficult at the calving, which requires more time to complete the steps of parturition (Lombard *et al.* 2007 and Linden *et al.* 2007)

Conclusion

Increased calving time in FH cows may increase the incidence of calving difficulties compared to FBH and FJH cows. Primiparous cows and dams of male calves require more prepartum care than pluriparous cows and dams of female calves.

References

[1] Bell, M.J. and Roberts, D.J. 2007. The impact of uterine infection on a dairy cow's performance. *Theriogenology,* 68: 1074-1079.

[2] Berglund, B., Philipsson J. and Danell, E.J. 1987. External signs of preparation for calving and course of parturition in Swedish dairy cattle breeds. *Anim. Reprod. Sci*., 15: 61-79.

[3] Berglund, B. and Philipsson,J. 1987. The influence of relative birth weight and certain other factors on calving performance in Swedish dairy cattle breeds. *Anim. Reprod. Sci*., 15: 81-93.

[4] Bonneville-Hebert, A., Bouchard, E., Du Tremblay, D. And Lefebvre, R. 2011. Effect of reproductive disorders and parity on repeat breeder status and culling of dairy cows in Quebec. *Can. J. Vet. Res*. 75:147- 151.

[5] Dargatz, D.A., Dewell, G.A. and Mortimer, R.G. 2004. Calving and calving management of beef cows and heifers on cow-calf operations in the United States. *Theriogenology*, 61: 997– 1007

[6] Eriksson, S. Näsholm, A. Johansson, K. and Philipsson, J. 2004. Genetic parameters for calving difficulty, stillbirth, and birth weight for Hereford and Charolais at first and later parities. *Journal of Animal Science* 82 375–383.

[7] Johanson, J.M. and Berger, P.J. 2003. Birth weight as a predictor of calving ease and perinatal mortality in Holstein cattle. *J. Dairy Sci*. 86:3745- 3755.

[8] Garry, F, B. 2004. An overview of animal welfare in the US dairy industry. *Bovine Practice*, 38: 1-22.

[9] Harvey, W.R. 1990. Least squares analysis of data with unequal subcalss number. ARS: USDA, USA.

[10] Lombard, J.E., Garry, F.B., Tomlinson S.M. and L.P. Garber. 2007. Impacts of dystocia on health and survival of dairy calves. *J. Dairy Sci*. 90:1751-1760.

[11] Linden, T.C., Bicalho, R.C. and Nydam, D.V. 2009. Calf birth weight and its association with calf and cow survivability, disease incidence, reproductive performance, and milk production. *J. Dairy Sci*. 92:2580-2588.

[12] Mee, J.F. 2008. Prevalence and risk factors for dystocia in dairy cattle. *Veterinary Journal*, 176: 93-101.

[13] Oltenacu, P.A., Frick, A. and Lindhe, B. 1988. Use of statistical modeling and decision analysis to estimate financial losses due to dystocia and other disease in Swedish cattle. Proc. 5 th Intl. Symp. Vet. Epidem. and Econ., Copenhagen, Denmark, 353-355.

[14] Owens, J.L., Edey, T.N., Bindon, B.M. and Piper, L.R. 1985. Parturient behaviour and calf survival in a herd selected for twinning. *Appl. Anim. Behay. Sci*., 13: 321-323.

[15] Potter, T.J., Guitian, J. Fishwick J, Gordon PJ and Sheldon IM (2010). Risk factors for clinical endometritis in postpartum dairy cattle. *Theriogenology,* 74: 127-134.

[16] Steinbock, L. 2006. Comparative analysis on genetics of stillbirth and calving difficulty in Swedish dairy cattle breeds. Licentiate *thesis*, Swedish Univ. Ag. Sci., Uppsala, 22 pp.