PRE-PARTURIENT ISOLATION OF DAIRY COWS AND ITS EFFECT ON THEIR MATERNAL CARE AND NEONATAL BEHAVIOUR

By

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SUMMARY

This study was carried out on 27 multiparous Friesian cows to investigate the effects of isolation of diary cows before parturition on the behaviour of cows and their newborn calves. The behavioural aspects prior to, and during parturition as well as the behaviour of cows and calves in the earliest post-partum period were studied. The results indicated that, restless behaviour commenced earlier in group calved cows than in individual calved cows expressed by significant increased in standing and walking times and decreased in resting time. Regarding parturient behaviour, the commencement of abdominal straining was earlier in group calved cows and they spent significant more total time in act of parturition than isolated cows in calving pens. While the individual calved cows expelled their placenta earlier than the group calved. With respect to the behaviour of cows after parturition, the isolated cows stood and licked their calves earlier and also, spent longer total time licking than group calved cows. The percentage of cows eating placenta was high (73.3%) in group calved cows than in isolated cows (58.3%). The results of neonatal behaviour indicated that calves from isolated cows were stood and suckled for the first time earlier and spent also longer time in suckling than those from group calved cows. There was no significant effect of the treatment on the both first defecation and urination.

INTRODUCTION

For large dairy farms, loose housing of dairy cows around parturition in group pens may be a good alternative to individual pens or tied stalls. However, calving in a group may lead to behavioural problems which can depress neonatal sucking of colostrum (Illeman and Spinka,1993). There seems to be at least four such problems, first, newborn calves may attract maternal licking of a cow other than its dam, (Hudson and Mul-lord,1977). Second, calves may fail to suck during the first few hours for other reasons. Third, the occurrence of cross-sucking could depress consumption of colostrum. Fourth, the sucking may be too short for adequate colostrum ingestion (Edwards,1982).
Maternal isolation at calving has been suggested to lower the risk of predation on the calf and to facilitate imprinting between cow and calf (Lidfors et al., 1994). In isolation, the bond between mother and young may be formed without the disturbance of interactions from other herd members (Lewandrows and Hurnik, 1981). Cows have been found to show maternal responsiveness prior to parturition and in some cases they have adopted alien calves, which has caused the mothers to reject their own calves after calving (Schilling and Hartwig, 1984 and Owens et al., 1985).

Maternal behaviour actually begins prior to calving. Cows do not prepare a birth site per se, but they demonstrate some tendencies to select a birth site. A common question is whether cows isolate themselves at calving? Some studies and some producers will report that a high percentage of cows will seek isolation at calving. Yet other research studies will claim the tendency to isolate is not that strong. Unlike some behaviour which are rather rigid or fixed, the behaviour to seek isolation at calving is more "flexible" in nature (Owens et al., 1985).

Edwards (1983) observed the onset of maternal behaviour for as long as 24 hours before birth. Also, during a few days to a few hours before parturition, cows sometimes show increased walking, getting up and lying down, pawing the ground, licking the flanks and switching the tail (George and Barger, 1974 and Houwing et al., 1990).

Maternal care consists of a wide range of activities directed towards the young by the mother. Basically maternal care represents the mother's willingness to sacrifice her time, energy and resources towards the rearing and protection of her offspring (Stokey, 1997). Maternal and neonatal behaviour differs among food-producing mammals and our management must reflect these differences. Restrictions placed on ewes and cows by confinement at the time of parturition may result in their being unable to select an appropriate birth site (Gonyou and Stokey, 1987). Our management must accommodate these needs by producing sites that are protected from the harsh environments and also allow separation from the rest of the flock. Cows must be allowed to bond to their offspring soon after birth if they are to provide adequate maternal care (Lidfors et al., 1994).
The present study was carried out to investigate the effects of pre-parturient isolation of dairy cows on the behaviour of cows and their newborn calves i.e. the study explores the behaviour of animals in group calving and compares this with animals calved in individual pens.

MATERIAL AND METHODS

I-Animal and Housing
This study was carried out to investigate the effects of pre-parturient isolation of dairy cows (calving site) on their maternal care and neonatal behaviour. The cows under study were part of a herd of approximately 80 cows of dairy breeds (Friesian cows) in a private farm located in Giza province. The cows under study were multiparous and aged from 5-8 years old.

These cows were loose housed in two separated concrete floor byres and fed a balanced ration twice daily offered in two common manger alongside and two common trough for each byre, and attached with three separated calving boxes for isolation of cows before calving. The cows under study were identified by plastic ear-tags and calves were weighed and ear tagged approximately just after birth (Albright, 1987).

II-Experimental design:-
A total of 27 multiparous, Friesian cows and their newborn calves were used in this study. The service date was recorded and cows were diagnosed for pregnancy. Out of this number, 12 cows were isolated (individual calved), approximately two weeks before their expected time of calving and moved to individual calving pen measured 4m x 4m prepared for calving while the others (15 cows) gave birth within the group in the byre (group calved). Calving season extended from June to October.

III-Observation and records.
A-Observation
Detailed observation of the behaviour of the dam and neonate during the peri-parturient period (i.e. from the time the cow showed behavioural signs of approached parturition, during calving and until the calf or calves had sucked successful) were recorded (Edwards and Broom 1982).
B-Parameters measured
1-Pre-parturient behaviour.
Cows under study in both individual and group calving were subjected to two observation sessions 3 days/week each for 60 min. two weeks before calving to record the following behavioural patterns: 1- percentage of walking time., 2- Percentage of standing time., 3- percentage of the resting time., and 4- Total time of rumination. (Dechamps et al.,1989).

2- Parturient (calving behaviour).
The following patterns of behaviour were recorded during the act of parturition in minutes according to (Kolomazinik,1992), 1-Commencement of abdominal straining (this behaviour was generally first observed when the cow arched her back and held the tail in a stiff horizontal position, cows frequently voided small amount of urine and faeces at this period (Metz and Metz,1987) ,2-Appearance of chorioalantoic membrane.3- Appearance of calf at vulva. 4-Expulsion of placenta. and 6- Posture at calving (Lying or standing).

3-Post-parturient behaviour.
Continuous focal observation samples were recorded for each cow and its calf for about 6 hour after calving , for both individual and group calved animals.(Selmen et al.,1970a and b).

A-Behaviour of the dam.
Detailed measurement were taken to the following patterns i.e. the actual time for the cow to stand following calving, commence to lick their calves, total licking time, and licking bout. Also the percentage of cow eating placenta and the time spent eating were recorded for all cows under study (Ewbank,1988).

B-Calf behaviour (neonatal behaviour).
The following neonatal behaviour patterns were recorded:-1- time to first standing 2- teat seeking time. 3- time to first suckling. 4- Total suckling time. 5- duration of suckling bout. 6-nursing alien cows. And 7- first defecation and urination, (Metz and Metz, 1986 ).
VI- Statistical analysis:
Data were statistically analyzed using t-test and correlation coefficient (r) according to Snedecor and Cochran (1989).

RESULTS

Table (1): Pre-parturient and parturient behaviour for both individual and group calved cows. (Mean ± SD).

<table>
<thead>
<tr>
<th>Pattern of behaviour</th>
<th>Individual calved N=12</th>
<th>Group calved N=15</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Pre-parturient</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of walking time</td>
<td>28.1±5.6</td>
<td>36.7±8.1**</td>
</tr>
<tr>
<td>% of standing time</td>
<td>31.2±6.9</td>
<td>37.8±5.9*</td>
</tr>
<tr>
<td>% of resting time</td>
<td>39.1±7.6</td>
<td>27.0±5.3**</td>
</tr>
<tr>
<td>Total time of rumination (min.)</td>
<td>39.2±8.1</td>
<td>31.2±7.1</td>
</tr>
<tr>
<td>2- Parturient behaviour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commencement of abdominal straining + (min)</td>
<td>80.7±8.4</td>
<td>121.6±9.1**</td>
</tr>
<tr>
<td>Appearance of chorioallantoic mem*  (min)</td>
<td>52.0±7.0</td>
<td>75.2±8.9**</td>
</tr>
<tr>
<td>Rupture of chorallantoic mem. + (min.)</td>
<td>44.2±6.3</td>
<td>57.3±7.1**</td>
</tr>
<tr>
<td>Appearance of calf at vulva + (min.)</td>
<td>.17.2±3.2</td>
<td>30.0±3.6*</td>
</tr>
<tr>
<td>Total time of parturition (min.)</td>
<td>110.7±11.8</td>
<td>172.1±13.1**</td>
</tr>
<tr>
<td>Expulsion of placenta (hours)</td>
<td>2.5</td>
<td>4.1*</td>
</tr>
<tr>
<td>Posture at calving</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laying %</td>
<td>75 (9/12)</td>
<td>53.3 (8/15)</td>
</tr>
<tr>
<td>Standing %</td>
<td>25 (3/12)</td>
<td>46.75 (7/15)</td>
</tr>
</tbody>
</table>

* There was a significant difference at P < 0.05
** There was a significant difference at P < 0.01.
+ The time was calculated as the interval from commencement of an event to the complete delivery of calf
Table (2): Post-parturient behaviour for individual and group calved cows during 6 hours of observation after calving (Mean ± SD).

<table>
<thead>
<tr>
<th>Pattern of behaviour</th>
<th>Individual calved cows (N=12)</th>
<th>Group calved N=15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to 1st stand after calving (min)+</td>
<td>7.3±0.9</td>
<td>12.8±1.2*</td>
</tr>
<tr>
<td>Time to lick her calf (min)+</td>
<td>15.7±1.3</td>
<td>25.9±2.3**</td>
</tr>
<tr>
<td>Total time of licking calf (min)</td>
<td>54.3±4.3</td>
<td>41.9±3.7*</td>
</tr>
<tr>
<td>Duration of licking bout (min)</td>
<td>5.1±0.8</td>
<td>2.7±0.11</td>
</tr>
<tr>
<td>Licking by alien cows (%)</td>
<td>Not occur</td>
<td>26.6 (4/15)*</td>
</tr>
<tr>
<td>% of cows eating placenta</td>
<td>58.3 (7/12)</td>
<td>73.3 (11/15)*</td>
</tr>
<tr>
<td>Time spent eating placenta (min)</td>
<td>12.8±1.4</td>
<td>5.3±0.71**</td>
</tr>
</tbody>
</table>

+ Time was calculated as interval from complete delivery to commencement of an event.
* There was a significant difference at P < 0.05
** There was a significant difference at P < 0.01.

Table (3): Post-parturient (neonatal) behaviour of calves from isolated and non-isolated cows before calving. (Mean ± SD).

<table>
<thead>
<tr>
<th>Pattern of behaviour</th>
<th>Individual calved N=12</th>
<th>Group calved N=15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to 1st standing after birth (min)+</td>
<td>39.3±3.9</td>
<td>52.7±4.2*</td>
</tr>
<tr>
<td>Timespent teat-seeking (min)</td>
<td>15.7±1.2</td>
<td>21.3±2.8*</td>
</tr>
<tr>
<td>Time to 1st suckling (min)+</td>
<td>66.1±8.2</td>
<td>85.2±9.3*</td>
</tr>
<tr>
<td>Total suckling time (min.)</td>
<td>32.1±2.7</td>
<td>21.7±2.8*</td>
</tr>
<tr>
<td>Duration of suckling bout (min.)</td>
<td>7.9±1.5</td>
<td>4.8±0.27*</td>
</tr>
<tr>
<td>Nursing alien cows (%)</td>
<td>Not occur</td>
<td>20 (3/15)</td>
</tr>
<tr>
<td>Time to 1st defecation (min.)+</td>
<td>231.2±11.4</td>
<td>249.3±12.3</td>
</tr>
<tr>
<td>Time to 1st urination (min.)+</td>
<td>249.1±9.8</td>
<td>262.1±12.4</td>
</tr>
</tbody>
</table>

+ Time was calculated as the interval from complete delivery to the commencement of an event.
* There was a significant difference at P < 0.05.
DISCUSSION

1-Pre-parturient behaviour.
Restlessness in cows generally occurred about 120.3±12.1 min. for isolated cows while about 142.3±13.3 min. for group calved cows before birth. Restless behaviour occurred in the form of increased walking and standing and decreased resting behaviour percentage (28.1±5.6, 31.2±6.9 and 39.1±7.6%) (36.7±8.1, 37.8±5.9 and 27.0±5.3%) for individual and group calved cows respectively.

The total time of rumination was not significantly affected by isolation of cows before calving (39.2±8.1 and 31.2±7.1 min. respectively) but generally the total time decreased as the time of calving approached. This results agree with (Aitken et al.,1982)

2-Parturient behaviour.
The behaviour at parturition of Friesian cows was recorded as shown in table (1), generally calving was equally distributed throughout the day and night hours, although significantly more cows calved in mid-day (i.e. from 11.00 to 14.00h) than during any other period of daylight hours.

The commencement of irregular abdominal straining was generally first observed when the cow arched her back and held the tail in a stiff horizontal position (Metz and Metz 1987). The interval from the onset of abdominal straining to delivery was significantly (p<0.05) longer for group calved cows (121.6±9.1 min.) than individual calved cows (80.7±8.4 min.). The chorioallantoic sac usually appeared at the vulva when the cow was lying in a sternal recumbent position. The appearance and rupture of chorioallantoic sac occurred at 52.0±7.0 and 44.2±6.3 min. before delivery of calves for isolated cows earlier than for group calved cows (75.2±8.9 and 57.3±7.1 min.) respectively.

The interval from the appearance of the calf at the vulva to delivery was 17.2±3.2 and 30.0±3.6 min. for isolated and group calved cows respectively. Generally the interval (min.) from commencement of abdominal straining to final delivery (the total calving time) was significantly (P<0.01) longer in group calved cows (172.1±13.1), than in isolated cows (110.7±11.8) and this attributed to the high incidence of calving in sternal recumbent position for isolated cows (75.0 %) (i.e. this isolated cows were less dis-
turbed) than for group calved cows (58.3%). The interval (hours), from final delivery to voiding of placenta was longer for group calved cows (4.1 hours) than for isolated (individual) calved one (2.5 hours). These results agree with that of Arthur (1961); Yarney et al. (1982); Phillipo, (1993) and Albright and Arave (1997).

3-Post-parturient behaviour of cows:-
Cows generally stood and began to groom the calf immediately after delivery but in non-isolated cows, they took 12.8±1.2 min. to stand and 25.9±2.3 min. to lick her calf while in cows isolated in calving box before calving, they took less time to stand after delivery and to lick her calf, 7.3±0.9 and 15.7±1.3 min. respectively.

Licking of the calf after birth seems to be important in strengthening the maternal bond between cow and calf. Several functions have been suggested for licking, removal of the fetal membrane, drying of the coat leading to a reduction in heat loss, stimulation of activity and breathing, circulation, urination and defecation, improvement of general hygiene leading to reduced risk of infection (Arthur, 1961 and Metz and Metz, 1986).

It was be noticed that the cows calved in calving box spent more time licking her calf (54.3±4.3 min), than those calved in group (41.3±3.7 min.) and also, the duration of licking bouts was significantly longer by isolated cows than by non-isolated cows before calving (5.1±0.8 and 2.7±0.11 min. respectively). A reasonable hypothesis is that of the cow spends a large amount of time licking her calf after birth, this would strengthen the bond between mother and offspring which later could be observed in high frequencies of behavioural interactions between mother and calf. It was observed that 26.6% (4/15) of alien cows in group calved licked the newborn calves and this interference adversely decreased the total licking time received by calves from their own mother. These results agree to large extent with (Selmen et al., 1970a and Fraser, 1976).

Regarding placentophagia there was increase in the percent of cows eating placenta among group calved (73.3%) than individual calved group (58.3%). On the other hand there was decrease in the time spent eating placenta among group calved (5.3±0.71), than individual calved cows (12.8±1.4).
4-Post-parturient (neonatal) behaviour of calf.
The calves initial attempts to stand consisted of raising the hindquarters and then attempting to raise the forequarters to a standing position (Kent, 1987). As shown in table (3), calves from isolated cows tended to be quicker to stand than those from non-isolated (group calved) cows before calving (i.e. the time to 1st standing was 39.3±3.9 and 52.7±4.2 min. after birth for calves from isolated and non-isolated, respectively). This may be attributed to that the calves from isolated cows received a large amount of licking without disturbance than those from non-isolated group of cows (r = 0.43).

Also, the time spent in teat seeking behaviour by calves from isolated cows was less than that by calves from non-isolated cows it was 15.7±1.2 and 21.3±2.8, respectively. As the calves from non-isolated cows were confronted with number of alien cows, therefore, the time for teat-seeking was longer than those were confined with their mother in the calving pen. This result agree with that of Ventorp and Michanek, (1992).

Generally it was be noticed that a smaller distance from udder to floor (e.g. low slung udders) lead to increase in the time spent teat-seeking, it also had a significant effect on the time of the first suckle.

Regarding to suckling behaviour, as stated by Ventorp and Michanek (1991), the length of time between birth and to obtain its first suckle play an important role in the acquisition of passive immunity. The results in table (3) indicated that, calves from isolated cows suckled for the first time at a median time of 66.1±8.2 min. earlier than those non-isolated cows which suckled for the 1st time at 85.2±9.3 min. after birth and this suggested that calves that were active early usually suckled early. The shorter time to first suckling for calves from isolated cows was due to the short time spent in teat-seeking behaviour and the absence of interference by alien cows as in group calved cows. (Edwards and Broom, 1979).

During observation of cows after calving it was be noticed that the calves from isolated group have longer total suckling bout (7.9±1.5) and consequently longer total suckling time (32.1±2.7), than those from group calved cows (4.8±0.27) and (21.7±2.8) respectively, this agree with Das et al. (2001), who stated that calves were suckled earlier were
spent longer total suckling time. It is worth to mention that (20%) of calves from the group calved cows nursed alien cows and this explained their shorter suckling bout and total suckling time. This result agree with that of (Leneidre, 1983).

There were no significant effect of pre-parturient isolation of cows on either 1st defecation or 1st urination, the average time to 1st defecation and 1st urination was (231.±11.4 and 249.1±9.8 min.) and (249.3±12.3 and 262.1±12.4 min) for calves from isolated and non-isolated cows respectively.

It was concluded that the quality of maternal care given by cows isolated before parturition in calving boxes was superior to that provided by cows calved in their pens (group calved cows). Also, the occurrence of miss-mothering in a group calving situation could result in delayed suckling and hence impaired colostrum ingestion and acquisition of passive immunity.

REFERENCES


