

Using Behaviour to Improve Housing and Management Around the Time of Calving

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■ Take Home Messages

- The onset of labour is associated with behavioural changes
- Cows isolate themselves from herd mates when they are about to calve
- Moving cows once calving has commenced is associated with prolonged labour
- Calving in an individual maternity pen decreases risk of failure of passive transfer for calves
- Cows will give up resting, feeding and self-grooming opportunities to focus on the newborn calf in the hours immediately following parturition.

■ Introduction

Calving is painful and the transition to lactation is associated with many physiological changes and an increased risk of production diseases. To date there has been a dearth of research on how best to manage the dairy cow around parturition. Current trends towards increased use of group calving pens in dairy farming have also raised questions on whether the cow is adequately able to express maternal behaviours and if there are any risks associated with calving in this environment.

In the following proceedings we will summarize some of the new research in this area and where possible we will identify challenges and possible solutions associated with housing and managing cows around the time of calving. We will also illustrate how behavioural studies may form the basis for improved recommendations on housing and management that better accommodates cows' special needs during this vulnerable period.

■ **Housing and Management at Calving**

Should Cows be Housed Individually or in Groups during Calving?

Use of group maternity pens for dairy cows is becoming increasingly widespread in Europe and North America. There is, however, a growing body of evidence that calving in a group pen comes with some challenges.

The motivation to express certain maternal behaviours increases dramatically before calving due to hormonal changes. In group maternity pens these highly motivated maternal behaviours can result in the adoption of alien calves by pregnant cows. Studies have shown that 25 and 33% of calves were nursed by an alien cow when born in a group maternity pen (Illman and Spinka, 1993; Edwards, 1983, respectively). Furthermore, Edwards (1983) found that 66% of cows that had nursed alien calves had not yet calved and 15% of cows nursed alien calves within 6 hours after they themselves had calved. Illman and Spinka (1993) also reported that cows that nursed alien calves were within 8 hours of calving. Clearly, the nursing of calves by alien cows creates a number of challenges. Firstly, there is risk that the calf may have its first meal from a cow that has already been previously suckled and thus the newborn calf may not receive colostrum of sufficient quality or quantity to ensure passive transfer. Secondly, premature suckling of cows before parturition will also compromise the colostrum availability for the calves of the previously suckled dam once they are born.

Should Cows Have the Opportunity to Isolate From the Herd?

Studies of cattle conducted under near-natural conditions have shown that cows seek isolation from the herd before calving, but this tendency is strongly affected by the topography of the habitat. When kept on open grassland where the opportunity to isolate is limited, cows tended to calve in proximity of the herd. However, when cows were kept in an area with trees and bushes, they tended to seek a secluded area for calving (Lidfors et al., 1994).

How Do We Know When a Cow is Ready to Calve?

Despite the fact that length of the gestation period is 282 days most cows deviate considerably from the expected calving date. It is not surprising then that one of the greatest challenges facing the producer is to accurately identify when labor begins. Individual monitoring of close-up cows is an integral part of the day-to-day management of the close-up pen for producers that elect to move cows to an individual maternity pen. Regardless of group or individual maternity pens all producers are sensitive to identifying cows that may experience dystocia and thus require intervention. Although most farmers have considerable experience in identifying cows that are

approaching parturition the onset of labor signs (Figure 1) varies considerably between cows, which makes prediction of calving time difficult. Given this high degree of variation efforts at identifying changes in behaviour that accompany physical signs have received some attention.

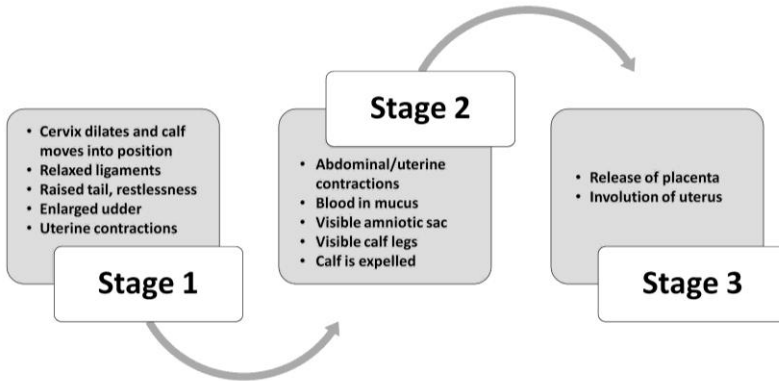


Figure 1. The three stages of labour in dairy cattle according to the descriptions provided by Noakes (2001).

Key behavioural changes that take place beginning about 6 hours before calving are the increased frequency and duration of tail raising (Miedema et al., 2011) and an increased number of position changes from standing to lying (lying bouts; Figure 2). This increased restlessness is normally accompanied by uterine contractions, which increase markedly as parturition approaches. These expulsive contractions are often associated with increased attention paid to the abdomen by the expectant mother (Jensen, 2012; Proudfoot et al., 2013). Other work reported a dramatic increase (80%) in the number of standing bouts from 2 days before calving to the day of calving (Huzzey et al., 2005). Collectively, these results suggest that cows were more restless, likely due to the discomfort associated with calving, and that special attention should be placed on cow comfort in the maternity pen. This may be particularly important for cows experiencing dystocia (Proudfoot et al., 2009).

The increased frequency of lying bouts may be a particularly useful indicator in identifying cows that are approaching calving. These data can be collected automatically via sensors using accelerometer technology attached to the animal's leg. Although more work is required early indications are that this type of technology shows much promise as an objective measure to predict the time of calving.

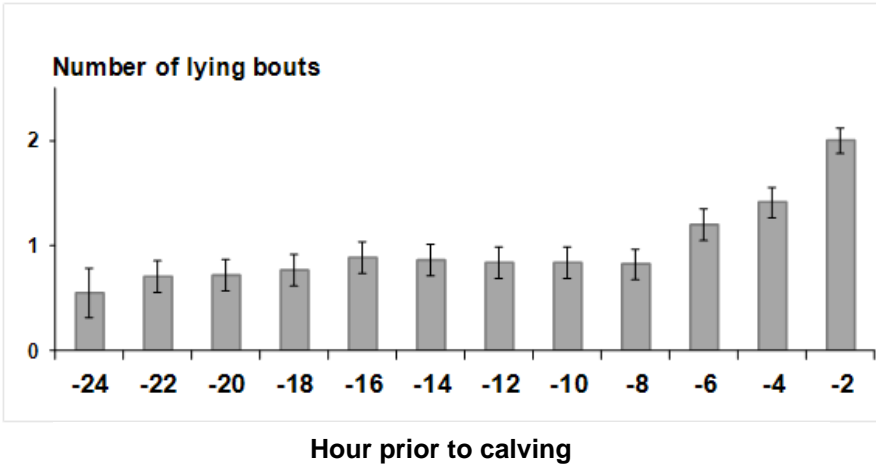


Figure 2. Number of lying bouts (means and SE) in the twelve 2-h periods of the last 24 h before calving (Modified from Jensen, 2012).

When Should the Cow be Moved to a Maternity Pen?

Labour in dairy cattle is normally classified into three distinct stages (Figure 1) with the onset of labour referred to as stage 1, the birth of the calf occurring in stage 2 and the fetal membranes expelled during stage 3.

Cows are often moved from a group to an individual maternity pen just before calving. However, despite this common management practice producers are faced with the question of when is the optimum time to move the cow. To our knowledge we undertook the first study investigating this specific question. The study design involved 48 cows that were moved at three different stages before parturition: 1) well before labour, 2) early stage 1 (signs included enlarged udder, raised tail or relaxed pelvic ligaments) or 3) late stage 1/early stage 2 (signs included bloody mucous and/or abdominal contractions). Cows moved during late stage 1/early stage 2 had a longer second stage of labour (Figure 3) and spent less time lying in the final hour before calving compared to cows moved earlier. These results suggest that moving cows to a maternity pen during this time have a higher risk of prolonging the second stage of labour, which may be associated with prolonged pain and inflammation as well as increased risk of calving complications. On the other hand, no adverse effects were found of moving cows to a maternity pen before the onset of any signs of labour, or during the early part of stage 1 labour. Of the 48 cows included in this experiment 7 cows were moved during the later part of stage 2 labour (signs included visible amniotic sac and/or visible calf legs). These cows were not included in the final analyses as they all calved within about 30 min of being moved,

which prevented us from collecting any meaningful behavioural data. Although many producers advocate '*just in time*' movement, we caution the use of this management practice. Waiting for cows to be in late stage 2 labour increases the risk that they will calve in undesirable areas such as the freestall. Despite the fact that cows were observed 7 times per day in our study by experienced stockpersons, 10 cows still calved in the group pen, and this creates additional challenges as described in the previous section.

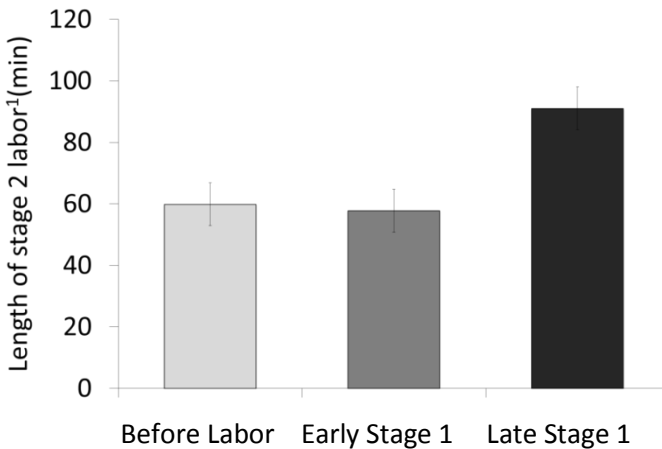


Figure 3. Length of stage 2 of labour for cows moved from a group to an individual maternity pen before labour, early in stage 1, or late in stage 1 of labor (Modified from Proudfoot et al., 2013).

■ Housing and Management during the Early Post-Partum Period

Maternal Behaviour Immediately after Calving

Most cows calve lying down, but immediately after the delivery of the calf the cow stands up to lick her calf, licking very intensively during the first hour after calving and then gradually declining the number licks in the subsequent hours (Edwards and Broom, 1982; Illmann and Spinka, 1993). Jensen (2012) showed that the cow's intensive licking of the calf during the first 6 hours was at the expense of her feeding and resting behaviour. Expression of these behaviours towards the calf continued to decline over the first 24 hours after calving. Not surprising, as maternal behaviours declined there was a corresponding increase in time spent lying and feeding over the same period (Figure 4). Other work has shown similar findings, for instance, recent work by

Newby et al. (in press) reported that while the calf was present in the maternity pen cows spent less time auto-licking, scratching themselves, or using a mechanical brush located in the pen, electing to focus on the calf. Collectively these studies illustrate that cows do not prioritize resting and feeding until several hours after giving birth (when the calf is present) illustrating the strength of maternal motivation. It should be noted that cows do not fully compensate for the decreased lying time lost in the hours immediately following parturition, as lying time during the first 24 h after calving was lower than during the subsequent days after calving (Jensen, 2012).

When housed in individual maternity pens, cows lie down longer if the calf is separated immediately after birth compared to when separation is delayed (Lidfors, 1996). However, even if the calf is removed immediately after birth lying time is reduced during the first day after calving (Huzzey et al. 2005). This reduced lying time is undesirable as reduced resting and feeding in the post-partum period have been associated with increased risk of production diseases (Proudfoot et al., 2010).

Dairy cows are typically separated from the calf within 24 h after calving and immediately introduced to the milking herd. Given the reductions in lying and feeding that occur in response to regrouping (von Keyserlingk et al., 2008) providing ample opportunity to rest and feed in the first hours and days following labor may be beneficial for the cow to recover from parturition. Providing cows increased opportunities to rest and feed can be achieved by lengthening the duration of stay in the maternity pen and by housing fresh cows in small groups for a week or two before regrouping them into the main milking herd.

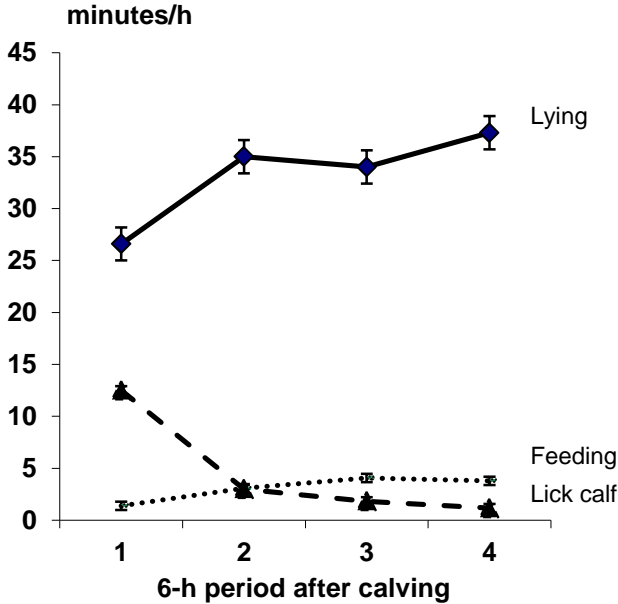


Figure 4. The duration of cows' lying (–), licking calf(---) and feeding (....) during the first four 6 h periods after calving (Modified from Jensen, 2012).

When is the Cow Ready to Join the Herd?

In studies in near-natural environments where cows have isolated themselves from the herd to calve, descriptive reports indicate that they elect to rejoin the herd with the calf 1-2 weeks after calving (Vitale et al., 1986). However, no work has addressed what intensively-housed cows would prefer to do if given the opportunity. To assess motivation to interact with herdmates following parturition Jensen (2011) housed cows in large individual maternity pens that allowed contact to a neighbouring cow through a window to determine the development of social behaviour towards the calf and the neighbouring cow. Interestingly, cows only reduced the time spent sniffing and licking their calves by about 10 min (1 h to 50 min) over days 3, 7 and 11 after calving. Moreover, they increased the time spent seeking social contact with the neighbouring cow from approximately 30 sec on days 3 and 7 to 1 min on day 11. This small increase in seeking social contact with the neighbouring cow may suggest an increased motivation to associate more with other cows given that calving occurred nearly two weeks before this time.

Interestingly, calves increased the time spent sniffing and licking their dams' head from 2 to 8 min over the same time period, which may coincide with the

gradual shift from the dam being the initiator of cow–calf contact to the calf being the initiator. It is noteworthy that the level of contact to another cow was minimal as compared to contact to the calf, and although the cow may be ready to rejoin the herd, the high level of calf contact suggests that the expression of maternal behaviour remains high.

When is the Cow Ready to leave her Calf?

In nature weaning is typically a gradual process and usually takes place when the calf is 6-9 months old, with the cow reducing her nursing frequency and milk output over the course of several months. On most dairy farms weaning is imposed by human caregivers, and normally takes place much sooner than would occur in nature, often within the first 24 h of birth (von Keyserlingk and Weary, 2007). Removing the milk-fed calf from the cow results in a strong behavioural and vocal reaction, and the longer the contact between cow and calf, the greater the intensity of these responses (Weary and Chua, 2000; Flower and Weary, 2001). Although it has been commonly accepted that extended cow-calf contact is difficult to manage in modern dairy farming a number of lines of evidence now indicate that there may be unrealized benefits to delaying separation.

Compared to conventionally hand-reared calves (provided ~10% BW equivalent in milk) calves housed with the cow for days or weeks following birth showed higher growth rates attributed to higher milk intakes (Flower and Weary, 2001; Fröberg et al., 2011), improved health (Rajala and Castrén, 1995), and more appropriate social responses (Flower and Weary, 2001; Duve et al., 2012). Fortunately, recommended best practice in Canada now states that calves should be provided ~20% BW equivalent in milk (NFACC, 2009) resulting in similar growth rates compared to dam-reared calves. Questions however remain regarding possible benefits in health and social responses but more research is required to verify the earlier findings listed above.

This is a novel area of research and will require concerted efforts by scientists to explore the possible health and welfare benefits of delayed separation on the cow and calf. Clearly, researchers will need to “*think outside the box*” to identify new management schemes that overcome the challenges that come with extended cow-calf contact from both the weaning and milk production perspective. Work undertaken with beef cattle does provide some insights into possible management strategies that could be implemented that could help manage the various challenges associated with delayed separation. Haley et al. (2005) weaned calves by placing a nose-flap on them that prevented sucking but still allowed the calf to remain in contact with the dam. These authors found that calves that been fitted with the nose flap 3 days before separation responded less when separated from the dam compared to control calves. In dairy cattle, Loberg et al. (2008) found similar results, and this and

other alternative management strategies warrant further exploration. The use of foster cows, a popular practice used in many countries (Loberg et al., 2008), is another potential management practice that requires more work to determine if it could be adopted to work in the modern dairy operation.

■ Conclusion

Housing and management during the calving and early post-partum period is critical as the dairy cow and her calf are extremely vulnerable during this period. Behavioural studies can help us determine what types of environments cows prefer and may need during these periods. During the calving period, cows will seek isolation to calve if given the opportunity. This isolation seeking behaviour is likely hindered in group housing situations, as other cows in the group are also motivated to care for alien calves. In the immediate post-partum period the cow prioritizes the calf over resting, self-grooming and feeding behaviours. New work now indicates that when the calf is present the cow does not seek social contact with other cows until days after calving, suggesting that ample space for fresh cows to feed and rest is likely beneficial. Alternative housing strategies that allow for some contact between the cow and calf should be explored.

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