

Cow Behavior and Implications for Housing and Management

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Introduction

The transition cow has been the focus of a substantial amount of nutritional research over the last few decades. The majority of dairy herds in North America follow the recommendation of a two group dry period, with far-off dry cows managed in one group from 60 to 14-21 d before expected calving date; and close-up or pre-fresh cows managed in a second group, typically from 14 to 21 d before calving.

Arguments continue to reign regarding the content of the diets used – especially for the pre-fresh group. However, recent work has determined that absolute dry matter intake (DMI) at calving may not be the most important factor driving health and production in the immediate post-partum period. Rather, the change in DMI immediately prior to and soon after calving appears to be more significant. Recently, shorter dry periods of 30-40 days have been suggested, with one group of cows fed the same ration throughout the entire period.

Our clinical service at the University of Wisconsin is focused exclusively on investigations of herd problems, and fresh cow investigations are a primary activity. Data gathered in the course of these investigations support the view that management changes around calving time can be important risk factors for fresh cow disease. Ten years ago, the focus of our fresh cow problem investigations was on nutrition and feed delivery systems. In contrast, over the past several years, the emphasis has shifted toward assessment of

the transition cow environment, the sequence of pen moves just before and after calving, the time spent in each pen, and the stocking density in each pen.

Transition Cow Environment

During expansion, it is typical to see a large capital investment in lactating cow housing and the milking parlor, with dry cows largely neglected. Far-off dry cows may be left at pasture, or housed in a modification of the existing buildings. Many of these are barely adequate, but in general it is difficult to link fresh cow problems to management of this group.

Close-up dry cow accommodation is of greater concern. This may be a loose housed bedded pack or free stall located with the far-off dry cows, or in the lactating cow barn. Obviously, cow comfort is critical for this group. Stall design deficiencies may be particularly acute for these animals; as in the last few weeks of gestation, their girth will be greater than the post-partum cow and stall widths may be inadequate to accommodate this increase. Typically, we find stalls with dividers mounted 45” on center, far smaller than the 54” wide stalls that we are currently recommending for typical pre-fresh mature cows.

It is commonly thought that because these cows are not lactating and DMI is lower, the close-up group can be overstocked relative to feed bunk space. This is not the case. Field data collected by Ken Buelow in New Mexico demonstrates a decline in group DMI with increasing cow

numbers relative to headlocks in two dirt lot housed dairy herds. From that data, it appears that DMI begins to decline when stocking density, relative to headlocks, exceeds 80%.

Field trial data collected by Gary Oetzel demonstrates that the impact of overstocking in a pre-fresh group on a 1600 cow facility may be greater for first lactation animals penned with mature cows. There is a 6.5 lb/d increase in milk production over the first 80 d of lactation in first lactation animals stocked at 80 % with respect to stalls, compared to overstocking at 120 %. Access to feed for all cows at the same time is the key. A minimum of 30" of bunk space is; therefore, recommended for the pre-fresh group.

Control of stocking density in the close-up group is not easy, even in a well-designed facility. This group consists of a small number of cows, grouped together for a short period of time under a constant state of flux. Factors influencing throughput have to be managed, and fresh cow problems may often be traced back to environmental changes during a few months in the summer in warm climates. It is common for fertility to be very depressed through July and August in Wisconsin. Following return to cooler conditions, the cows recover body condition and reproductive performance rebounds. This has a major impact on throughput through the transition cow facility – from being under-stocked during April and May, the facility may be extremely overstocked during July and August ...just at the time when these cows will face the next round of heat stress. Adequate heat abatement measures for both lactating cows during the breeding period and transition cows are; therefore, vital for the control of throughput during the transition period.

Overstocking not only influences access to stalls and feed, but affects air quality too. We have field experience of an overstocked special needs facility with associated fresh cow pneumonia problems, which resolved subsequent to a switch to a shortened dry period. Over the course of a few months, this change resulted in a reduction of stocking pressure on the close-up facility.

Minimum Time in the Close-Up Pen

If a two group dry period strategy is present on the farm, clearly there is a minimal amount of time that cows should be exposed to the close-up ration. The majority of sources indicate that this minimum period should be around 14 to 21 d. Interestingly, Robinson et al. (2001) found that maximum yield for milk and milk protein was achieved when heifers were exposed to an experimental close-up ration for 9-12 d; suggesting that 9 d may be the minimum duration of exposure for this sub-group.

In a one group short dry period strategy, benefits may accrue not only from increased consistent exposure to a close-up type ration, but from a reduction in group changes.

Pen Moves and the Effect of Re-Grouping

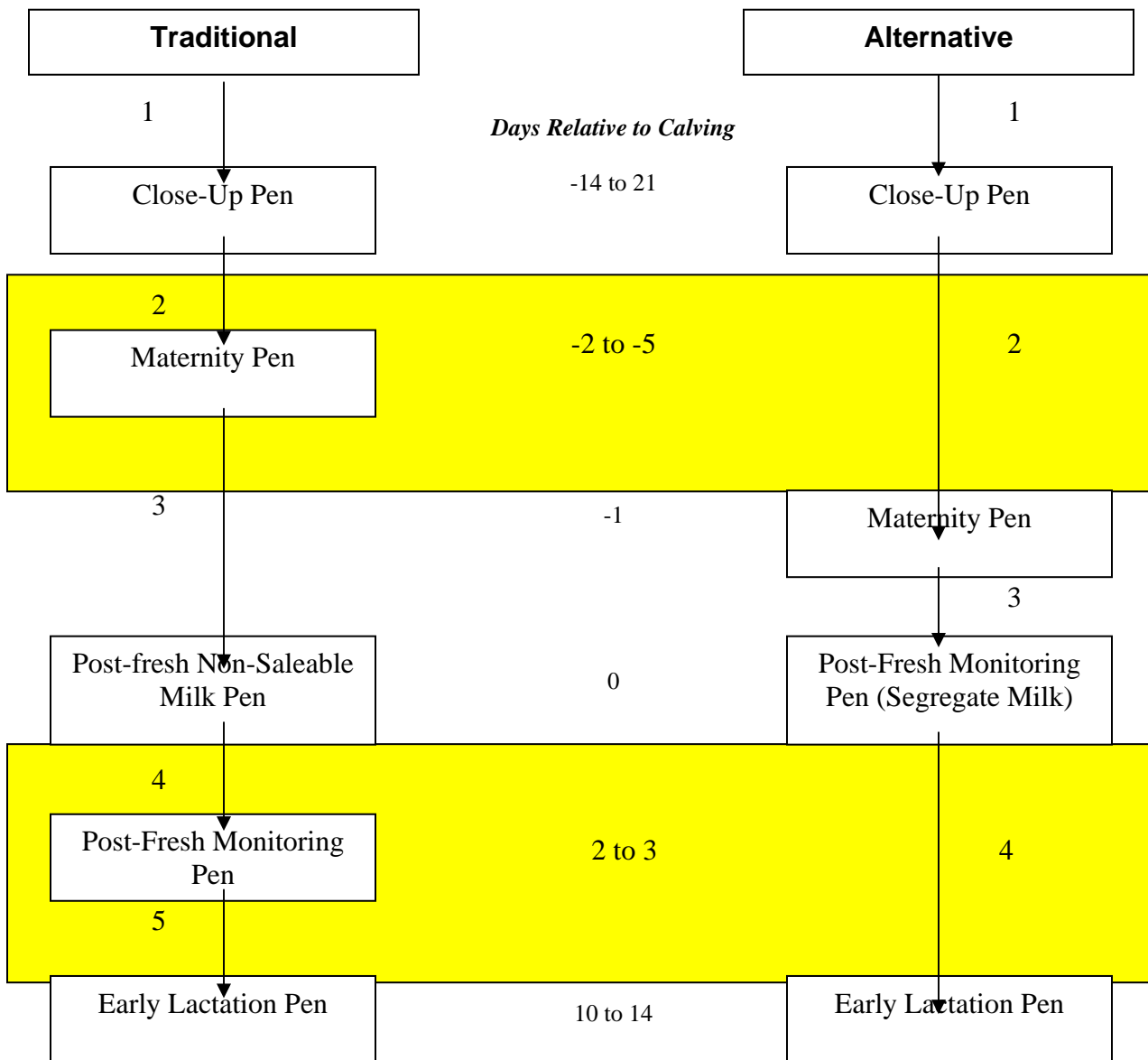
We have been interested in the rate of change of the environment that transition cows are subjected to within a very short period of time around calving. The typical sequence of moves a free stall housed dairy cow is subjected to during the transition period consists of a move from the far-off dry group to the close-up dry cow group at 14-21 d before calving (Figure 1). The cow then typically moves to a loose housed bedded pack maternity pen for 2-3 d at the

point of calving, then on to a non-saleable milk pen for 2 d after calving, and then a fresh cow pen for 14 d for health monitoring. Finally she is moved to a high group pen – a total of 5 pen moves in less than 3-4 wk.

Moving cattle between groups brings about a considerable change in behavior and a period of increased interaction before social stabilization and the development of a

stable hierarchy. These changes may have a negative effect on milk yield in the moved individuals for a short period of time on the order of 2-5 %. Typically, the average transferred cow is involved in around ten interactions per hour immediately after a move – approximately twice as many as the other cows in the group (Brakel and Leis, 1976). Interactions may be either physical – which includes bunting, pushing, and fighting, or non-physical – which includes

Figure 1. A comparison of the traditional sequence of pen moves in many free stall herds with an alternative strategy, which removes a pen move at 2 to 3 d before calving and 2 to 3 d after calving. These risk periods are represented by the shaded areas.



threatening and avoidance behavior. The frequency of these agonistic interactions in a Canadian study was high for the first 48 h after grouping, but stabilized thereafter. Interestingly, the nature of these interactions changed during this period. During the first 48 h, approximately 65 % of interactions were physical and 35 % non-physical. After the second day, this ratio had reversed to around 40 % physical and 60 % non-physical (Kondo and Hurnik, 1990).

Obviously this increase in physical interactions during the first 48 h of joining a new group may have an effect on other behaviors performed during the day – in particular feeding and resting time, which may in turn influence milk production. Other factors may also be involved; however, for example parity and social dominance. An excellent Japanese study described the interactions between first lactation heifers; examining the effect of moving groups on dominant, middle-rank, and subordinate animals. Although dominant animals showed little change in behavior or production, middle rank and subordinate heifers that were moved produced 3.8-5.5 % less milk in the second week after movement and showed altered patterns of behavior (Hasegawa et al., 1997).

It is clear that dramatic changes in behavior last for only 48 h after a move and most groups have stabilized after around 7 d. Effects on milk production for mature cows moved after the transition period are small and short-term in nature. However, not all movements between groups should be considered equal, and the effect on individuals; first lactation animals and subordinate animals, during a high risk period, ie. the transition period, may be greater and last for longer. Although detected changes in milk yield may be small, there may be longer term effects on health

that have yet to be identified that are of greater significance. Data collected from several field investigations support this view.

An Alternative Strategy

It is suggested that the ideal time to move the cow prior to calving is 12-24 h. Unfortunately, a growing amount of field collected data and experience suggests that this timing is difficult to manage in practice. Predicting calving time is unreliable, and cows may remain in the maternity pen for 3-7 d, rather than 2-3 d as expected. Although the cows in a spacious maternity pen, lying down on a well bedded pack, may appear to be in an ideal environment for freshening, we believe that the timing of the move to the maternity pen is critical. Moves occurring between 2 and 5 d before calving appear to have an adverse effect on cow health, NEFA concentrations, and associated risk for ketosis and displaced abomasum (**DA**). Interestingly, cows which are not moved or that have a short stay in the maternity pen of less than 1-3 d appear to fair better than contemporaries that undergo a longer duration stay.

A grouping strategy which is finding favor in a growing number of medium to large size dairies involves around the clock monitoring of the close-up dry cow group. The group is checked hourly and cows and heifers are moved at the point of calving – when feet are showing or when no progress is apparent. Animals are quietly moved a short distance to a well bedded individual calving pen, where they are left to deliver the calf. Progress is checked at 2 h intervals and assistance provided if necessary. Once the calf is delivered and the cow has returned to her feet and is able to walk without ataxia, she is transferred to the post-fresh pen and the calf moved to the neonatal

housing area. Maternity pen stays are measured in hours, rather than days.

The cow remains in the post-fresh pen for 10-14 d, where her health is monitored, after which she makes a move to a pen where she will remain for most of her lactation. Instead of five moves, we have reduced the number of times the cow must cope with a transition between groups to only four occasions – timed to avoid the three day period either side of calving, so that they have a minimal impact on change in DMI (Figure 1). However, for the strategy to work, the facility must be well designed, and the management excellent.

Critical Control Points are as follows:

1. The close-up pen must be checked by a well trained person hourly, 24 h/d.
2. The close-up pen must be located immediately adjacent to the individual cow calving pens, so that the move at the point of calving is easy and stress free.
3. The calving pens must also be located in an area away from cow traffic, so that the animals are not disturbed during labor.
4. Cows, and in particular heifers, must be allowed to progress through the stages of labor, without repeated disturbance.
5. The calving pen floor must have a cushioned surface and be bedded with a plentiful supply of clean, dry bedding between each cow.

Problems will occur if a poorly trained individual is responsible for monitoring the close-up pen and this is done infrequently. If animals must be moved the length of the barn to the calving pen and not given time to deliver undisturbed – especially in the case of heifers, increased rates of dystocia and fetal death may occur. However, if the system is managed successfully, these problems may be avoided and improved health and productivity have resulted.

Summary

In herds experiencing fresh cow problems, once gross ration mistakes have been ruled out, we suggest exploring several risk factors related to transition cow management and the environment in which these animals are kept, namely:

- The close-up and maternity areas – consider comfort and stocking density
- Determine duration of exposure to the close-up ration, especially in heifers and account for monthly fluctuations in calving pattern
- Determine the adequacy of heat abatement strategies for both breeding cows and transition cows
- Examine cow flow and the number of pen moves between the close-up group and the high yielding group for mature cows and heifers

If current farm records fail to capture this type of data, the recording system should be modified to store this information for future analysis.

References

Brakel, W.J., and R.A. Leis. 1976. Impact of social disorganization on behavior, milk yield, and body weight of dairy cows. *J. Dairy Sci.* 59:716-721.

Hasegawa, N. A. Nishiwaki, K. Sugawara, and I. Ito. 1997. The effects of social exchange between two groups of lactating primiparous heifers on milk production, dominance order, behavior and adrenocortical response. *Appl. Anim. Behav. Sci.* 51:15-27.

Kondo, S., and J.F. Hurnik. 1990. Stabilization of social hierarchy in dairy cows. *Appl. Anim. Behav. Sci.* 27:287-297.

Robinson, P.H., J.M. Moorby, M. Arana, R. Hinders, T. Graham, L. Castelanelli, and N. Barney. 2001. Influence of close-up dry period protein supplementation on productive and reproductive performance of Holstein cows in their subsequent lactation. *J. Dairy Sci.* 84:2273-2283.