

# **Managing the Transition Cow: Recent Research and Recommendations**

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## **Introduction**

The transition period is roughly defined as three weeks prior to calving until three weeks after calving. This period is aptly named. Major metabolic transitions occur in a cow's body as she converts from a non-lactating to a lactating state and undergoes the stress of parturition. Management transitions such as pen moves and ration changes are additionally occurring. Cows often fail to adapt to these metabolic and management changes, resulting in 75% of dairy cow disease incidence during the first month after calving and substantial economic losses to the dairy industry (LeBlanc et al., 2006).

Not surprisingly, considerable research is being conducted to better understand transition cow physiology and to develop improved techniques for transition cow management. This review will begin with a discussion of the drop in intake during the transition period and how that drop relates to cow health. Next, three transition cow management strategies will be addressed: 1) supplementing monensin, 2) shortening dry periods, and 3) manipulating prepartum photoperiod. Each of these areas has received substantial attention in the past several years and each offers new tools to dairy producers managing cows during this difficult time. Finally, this review will conclude with a summary of transition cow management goals.

## **Immune Function and Transition Cow Intake**

Recent research has focused on understanding why disease risk is greatest during the transition period. White blood cells, neutrophils in particular, prevent disease by destroying pathogens before they cause infection. It is now becoming clear that high postpartum disease incidence is related to suppression in immune function that naturally occurs around calving. For example, the ability of neutrophils to fight infections is severely reduced during the transition period, with the greatest reduction occurring immediately after calving (Burton et al., 2005). Researchers have also found that those cows with the poorest functioning white blood cells are the most likely to develop disease (Kimura et al., 2002). Because transition cows are immune suppressed, producers need to do all they can to reduce disease exposure. Such measures include providing clean, dry bedding and maintaining adequate ventilation. Additionally, sick cows should not be housed with or near prefresh and postfresh cows. Although facility limitations may make that difficult if not impossible, the worst animals to house with immune suppressed transition cows are sick cows that harbor and spread infectious organisms.

On average, dry matter intake decreases 32% in the three weeks prior to calving, with the majority of that decrease occurring in the final week before calving (Hayirli et

al., 2002). Although dry matter intake rises following calving, it lags behind milk production and causes negative energy balance in early lactation. Cows with poor intakes have extremely negative postpartum energy balances, increased blood ketones and non-esterified fatty acids (NEFA), and increased disease susceptibility (Grummer and Mashek, 2004). For instance, researchers in Canada have found that cows that develop metritis spend less time eating both pre- and post-calving than healthy cows (Urton et al., 2005). It is important that we try to maximize intake during the transition period by providing a comfortable environment, minimizing stress, and providing a well-balanced and palatable ration. Additionally, monitoring intake of pre- and post-fresh cows (for example, do fresh cows vigorously drink and eat after milking?) will help identify those cows at greatest risk of disease.

### **Monensin in the Transition Ration**

After parturition a cow's glucose requirements increase substantially due primarily to requirements for milk lactose production. The transition cow's body must adapt to these increased glucose demands by increasing glucose production. The most important source of glucose is from propionate that is produced by rumen microbes and converted to glucose in the cow's liver. However, after parturition propionate supplies are low due to low intakes and cows must find alternative sources for glucose and energy, primarily by breaking down body protein and fat. Cows that cannot quickly adapt to the new glucose and energy requirements develop metabolic disorders including ketosis. The ionophore monensin affects ruminal metabolism by increasing propionate production. Recent research studies have been conducted to determine whether monensin can be fed to transition cows to enhance glucose production and reduce ketosis incidence.

Two Canadian studies involving a large number of cows have evaluated the potential benefits of including monensin in transition cow management programs. In the first study 185 cows were given either no monensin or a monensin controlled release capsule (delivering 335 mg/day from 3 weeks prepartum to 10 weeks postpartum). The monensin treatment increased plasma glucose by 8% and decreased plasma BHBA by 30% for the first two weeks after calving (Zahra et al., 2006). Additionally there was a tendency for cows that received monensin to have lower liver fat at three weeks postpartum. Although that data is promising, monensin controlled release capsules are not available in the United States and our only option is to include monensin in the ration. The second Canadian study evaluated 136 cows that were given no monensin, a monensin controlled release capsule, or monensin in the ration at 20 grams per ton of dry matter (Pettersson-Wolfe et al., 2007). Although in that experiment there were no effects on plasma glucose, monensin did reduce plasma BHBA by approximately 30% for the first two weeks prepartum. Perhaps more importantly, both the controlled release capsule and monensin in the ration were equally as effective at reducing plasma BHBA. These studies suggest that including monensin in the diet of pre- and post-fresh cows may be a way to increase glucose production and reduce incidence of both ketosis and fatty liver.

## Shortened Dry Period Research

Current recommendations for cows with a traditional 60 day dry period is to feed a far-off diet containing high forage and low concentrate for about five weeks, a close-up diet containing medium forage and concentrate for the final three weeks of the dry period, and finally a low forage and high concentrate diet in early lactation. That strategy requires two dietary changes and perhaps two pen moves in the transition period. Those dietary and pen changes can stress transition cows, causing reduced intake and increased disease susceptibility. Switching to a shortened dry period could ease management by eliminating the far-off dry group and ease transition cow stress by eliminating one dietary and pen change (Grummer, 2007).

A good amount of research has come out in the recent past examining the effects of shortened dry periods. Two studies from the University of Wisconsin are fairly representative of the current data. The first experiment had three treatments: a traditional management scheme with 56 day dry periods; 28 day dry periods with cows fed an early lactation diet throughout; and a 0 day dry period with cows fed an early lactation diet throughout (Gumen et al., 2005; Rastani et al., 2005). Cows were in a tie stall barn and were not moved with ration changes. As evidenced in the table below, shortening or eliminating the dry period caused a substantial reduction in milk production. Interestingly, there were also positive effects of shortening or eliminating the dry period including reduced body condition score loss and reduced days open:

	<u>0 d dry (n=19)</u>	<u>28 d dry (n=21)</u>	<u>56 d dry (n=18)</u>
Milk (lbs/d); 1-70 DIM	75 <sup>a</sup>	84 <sup>b</sup>	94 <sup>c</sup>
Total BCS loss	0.53 <sup>a</sup>	0.76 <sup>b</sup>	1.31 <sup>c</sup>
Days open	94 <sup>a</sup>	121 <sup>b</sup>	145 <sup>c</sup>

These results suggest that the benefits in animal health and reproduction with a shortened dry period would offset some of the decrease in milk production.

A second trial was conducted on a commercial farm with a large number of animals (Watters et al., 2006; Grummer, 2007). Cows were given either a 34 day dry period with a moderate-energy transition diet followed by a high-energy lactation diet or a 55 day dry period with a low-energy far off diet, a moderate-energy transition diet, and a high-energy lactation diet. Each ration change was associated with a pen move. The shortened dry period only reduced milk production by 3 lbs/day, and the decrease was entirely due to effects in second lactation cows. Production of third and later lactation cows was not affected. Additionally plasma NEFA were reduced with the shortened dry period, indicating that the shortened dry period reduced the extent of negative energy balance. Finally, days open was reduced by the shortened dry period:

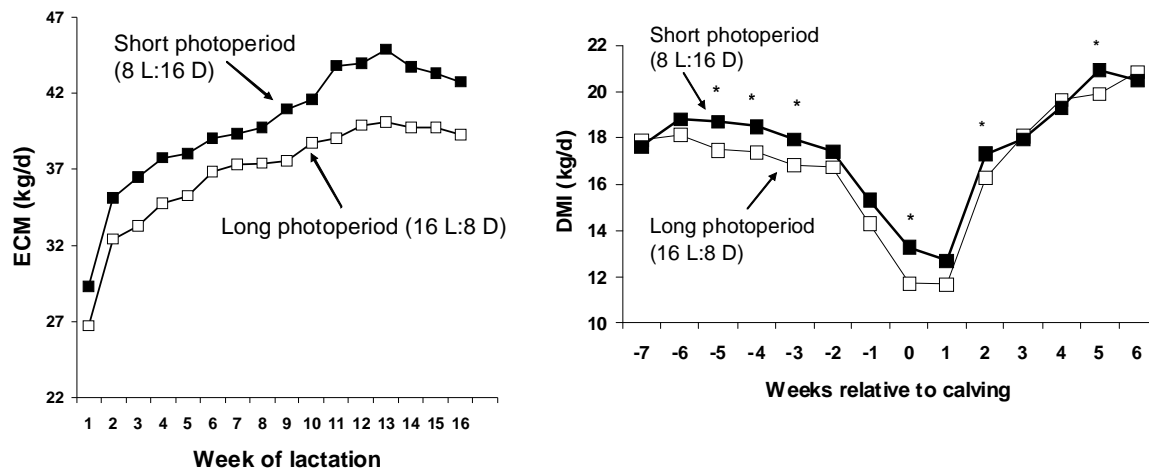
	<u>34 d dry (n=353)</u>	<u>55 d dry (n=342)</u>
Postpartum milk (lbs/d)	82 <sup>a</sup>	85 <sup>b</sup>
Postpartum NEFA ( $\mu$ Eq/L)	337 <sup>a</sup>	429 <sup>b</sup>
Days open	110 <sup>a</sup>	127 <sup>b</sup>

In summary, a shortened dry period may be a viable option to ease management and enhance postpartum metabolism and reproductive performance with a minimal effect on milk production.

## Dry Period Photoperiod Research

Research from the University of Maryland and University of Illinois has shown that photoperiodic manipulation during the dry period can be used to enhance cow performance. Specifically, exposing cows to a short photoperiod (8 hours of light and 16 hours of dark per day) compared to a long photoperiod (16 hours of light and 8 hours of dark) during the entire 60 day dry period increased postpartum milk production by 7 lbs/day and increased prepartum intake by about 2 lbs/day (Miller et al., 2000; Auchtung et al., 2005). The increased intake prepartum would likely improve health status throughout the transition period and indeed white blood cell function was found to be improved in cows exposed to the short photoperiod (Auchtung et al., 2004).

A second experiment was conducted at the University of Illinois to examine whether a short photoperiod prepartum would still work if cows were also given a shortened dry period. Cows were given a 42 day dry period and the same photoperiod treatments were applied as in the previous studies (Velasco et al., 2006). Similar to the previous experiments, we found that a short photoperiod increased energy corrected milk production by 8 lbs/day and increased prepartum dry matter intake by 2 lbs/day:



Together, these studies demonstrate that a short photoperiod prepartum can increase prepartum intake and postpartum milk production, and it may improve transition cow health. Manipulating the photoperiod can benefit producers using a traditional 60 day dry period or a shortened 42 day dry period. Although a short photoperiod requires certain facilities (closed so that dark periods are dark enough and well illuminated so that light periods are light enough), increased profits can quickly offset facilities costs.

## Transition Cow Management Recommendations

The final portion of this review summarizes some common recommendations and benchmarks for transition cow management. Before implementing changes in transition cow management, it is important to evaluate the current transition cow program. The potential benefits of adding dietary monensin, shortening dry periods, or manipulating the photoperiod will be greatest in well managed herds. For example, if there is a problem

with transition cow rations or facilities, those should be addressed before considering any of the strategies discussed above. Finally, some experts differ slightly in their recommendations to evaluate current transition cow programs. If your operation's numbers are close to the recommendations you are probably in good shape but if they are quite different, that will likely pinpoint an area that needs to be evaluated.

Fresh cow monitoring program: All dairies should closely monitor their fresh cows. That involves using a standardized protocol and recording daily observations. Such a monitoring program will identify sick or at-risk cows quickly, allowing earlier treatment. Producers are most commonly recommended to evaluate fresh cows daily until 10 days in milk for healthy cows or longer as needed for sick or questionable cows. Work with your veterinarian to develop a program if one is not already in place. Daily observations may include:

- **Intake.** Although you will likely not know individual intake, monitor the cow daily as she returns from milking. Does she vigorously drink and eat right after milking? Try to turn that into a quantitative score (ie 1=no interest to 4=vigorous eating and drinking) that can be recorded and evaluated.
- **Temperature.** Record temperature daily until the temperature drops below 102.5°.
- **Rumen contractions.** A healthy cow should have one to two strong rumen contractions in a minute.
- **Uterine discharge.**
- **Urinary ketone test.**
- **First test day DHIA results.** Although the first DHIA test day may not be within the first 10 days in milk, critically evaluate the first DHIA test results. Is the 305ME reasonable? Does the somatic cell score suggest mastitis may be present? Are fat and protein levels appropriate?

Dry cow feeding program: Many problems with transition cow management start with the feeding program. Rations need to contain high quality forages and adequate nutrients and they need to be consistently mixed from day to day. Changes in ration composition or quality can depress intake in transition cows and increase their chances of developing problems after calving. In a traditional 60 day dry period, cows should be given a far-off dry ration until about three weeks prepartum, followed by a close-up ration and then the lactation ration. To avoid drops in intake during ration transitions, try not to alter ration ingredients and avoid drastic changes in nutrient composition. All feeds should be analyzed by wet chemistry to properly balance for nutrient and mineral content. Common recommendations include:

Far-off cows:

- 12-13% dietary protein
- 60-80 grams per day of calcium
- 30-40 grams per day of phosphorus
- Minerals and vitamins in ration (not free choice)

Close-up cows:

- 15-16% dietary protein
- 5 to 8 pounds per day of grain
- 5 to 8 pounds per day of long stem, high quality forage mixed in ration
- No supplemental fat
- Minerals and vitamins in ration (not free choice)
- Include anionic salts or low potassium forages to prevent milk fever
- Push up feed often to encourage intake
- Never have an empty bunk. Aim for 5-8% refusals daily.
- Consider using some early lactation TMR in ration
- Consider adding commercial yeast culture
- Consider adding 6 grams per day niacin
- Consider adding 1500-1800 IU/day Vitamin E

Dry cow facilities. Because dry cows, particularly close-up cows, have suppressed immune systems and decreased appetite, it is important to provide the best facilities possible to dry cows. Cow comfort should be maximized by providing clean, dry bedding, adequate ventilation, and properly sized stalls. Some common recommendations include:

- Try to reduce stress associated with pen moves by minimizing the number of pen moves, only moving animals one day a week, and trying to move multiple animals together from one group to the next.
- If possible, separate close-up and fresh heifers from mature cows. Heifers housed alone will spend more time resting and will consume more than heifers housed with cows.
- Never overcrowd close-up or fresh cow pens. Ideally the stocking density should be maintained at or below 85%.
- During the summer, minimize heat stress in close-up and fresh cow pens to maximize intake. Add fans or sprinklers if necessary.
- Move cows to maternity pens only when parturition is imminent. Cows that spend more than 12 hours in a maternity pen have greater chances of experiencing stress that can reduce intake and increase disease risk.
- Maternity pens should be clean and dry and the bedding material should be changed frequently.
- Try not to house pre- or post-fresh cows with sick cows.
- Provide ample clean water to close-up, calving, and fresh cows.

Body condition score. Over- and under-conditioned fresh cows are at greater risk for disease and reproductive problems. Monitoring and recording body condition scores are necessary when evaluating a transition cow program. If cows are over- or under-conditioned at calving, work with your nutritionist and veterinarian to change early or late-lactation cow management and feeding strategies. Common tips include:

- Recently dry cows should have a body condition score of 3.25 to 3.75
- Cows should calve at a body condition score of ideally 3.5. Minimize the number of cows that calve with body condition scores of less than 3 or more than 4.

- Cows should not gain much weight during the dry period. Limit weight gain during the dry period to less than 0.5 body condition score units.
- Monitor the change in body condition score over the lactation. The nadir in body condition should be no less than 0.75 points below the body condition at calving and should ideally be 0.5 points.

Monitor disease incidence. Keep and evaluate records of disease incidence. Work with your veterinarian and nutritionist to reduce problem diseases. Recommended disease incidence goals from the University of Minnesota are in the table below:

<u>Item</u>	<u>Goal</u>
Milk fever	3-5%
Retained placenta	5-7%
Metritis	5-7%
Ketosis	3-5%
Displaced abomasum	3-5%
Culls/deaths before 60 DIM	<8%

For the original recommendations see:

North Dakota State University, Feeding and Managing the Transition Dairy Cow, J. W. Schroeder, <http://www.ag.ndsu.edu/pubs/ansci/dairy/as1203w.htm>

University of Illinois, Managing the Transition Cow, M. Hutjens, <http://www.livestocktrail.uiuc.edu/dairynet/paperDisplay.cfm?ContentID=548>

University of Minnesota, Keys to a Successful Fresh Cow Monitoring Program, J. Salfer, <http://www.extension.umn.edu/dairy/dairystar/11-25-06-Salfer.htm>

University of California-Davis and Monsanto, Transition Cow Management Checklist, M. W. Overton and G. Boomer, <http://make10.net/FILES/Health%20Challenges/Managing%20the%20Transition%20Cow.pdf>

### **Summary**

Good management during the transition period is essential for maximizing dairy profitability. Care should be taken to provide the best management possible for close-up and fresh cows to avoid depressions in intake and to reduce disease incidence and reproductive problems. Keeping detailed records and regularly evaluating those records is an essential component of a good transition cow management program. Some operations may benefit from including new management practices such as feeding monensin to transition cows, using a shortened dry period, or manipulating photoperiod during the dry period. Before considering such changes producers must first evaluate their existing program and address any current problems.

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