# Managing the Money Makers

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Most of the cows in a typical dairy herd should be money makers, but too frequently there are a number of cows that should have been profitable that are culled early in lactation because they failed to make the transition from the dry period to milking successfully. The risk of developing a mastitis infection, metabolic disease, and/or injury is greatest during the transition period from gestation through early lactation. Cows that succumb to metabolic disease during the transition period tend to have lower milk yields, do not bred back, have a greater likelihood of being culled or die. One report indicated that cows experiencing a health disorder around calving produced 16 lb/d less milk during the first 20 days postpartum (Wallace et al., 1996). A more recent report indicated that as many as 25% of the cows culled are less than 60 days in milk (Godden et al., 2003). The economic losses associated with metabolic disease and treatment, lost milk production, and increased number of cows that are culled in early lactation can be significant in many herds.

Years ago, the dry period was considered a time that the cow needed to rest before she calved and started working again. To a degree, this is still true but we need to remember that the modern dairy cow is similar to a professional athlete. During the "off season" they need to stay in good shape and actually start training for the next season. Although we have learned a lot about the biology of the cow during this critical time, there are still many unanswered questions. We do know that much of the success in transition cow programs relate to basic management practices that keep cows comfortable, control weight loss or gain, and minimizes stress. There are also some nutritional practices that can also be used to address certain metabolic diseases.

## *Dry matter intake depression*

One of the biggest challenges during the transition period is to maintain dry matter intake (DMI) during late gestation and stimulate intake after calving. During the last week of gestation, DMI intake normally decreases approximately 2.1 lb/d as illustrated in Figure 1 (Chan et al., 2006). This reduction in DMI just prior to calving is though to be related to the many endocrine changes associated with parturition and initiation of lactation coupled with reduced rumen capacity as the fetus grows (Bertics et al., 1992). Reduced DMI reduces energy intake resulting in a negative energy balance primarily because of the high demands for fetus growth. Immediately after calving, additional energy is requirement for milk production increasing the severity of negative energy balance. The body responds by mobilizing body fat to provide

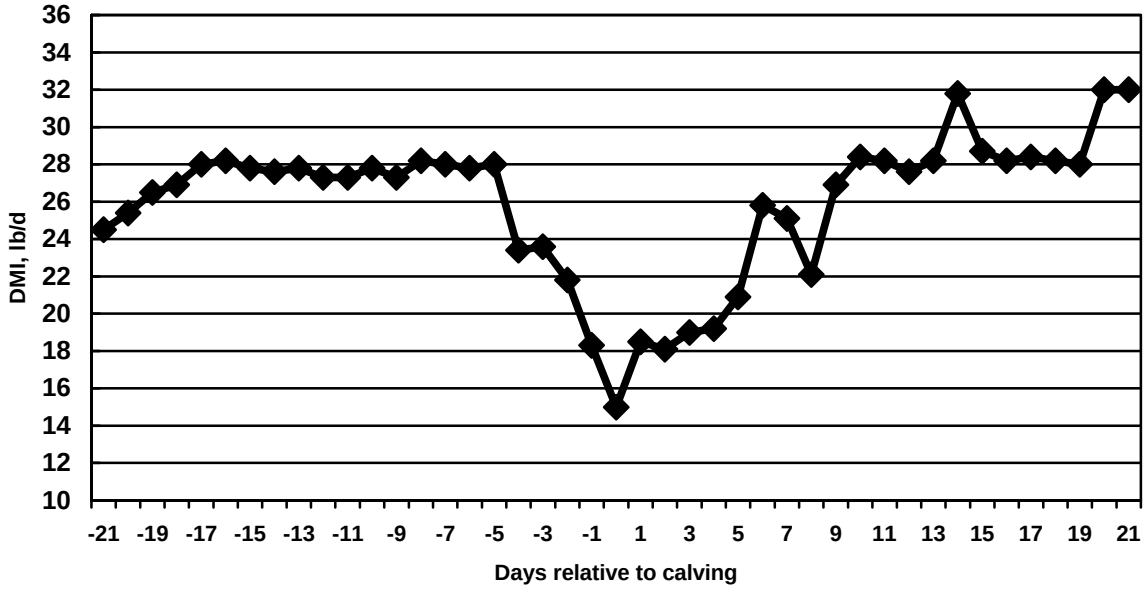


Fig. 1 Average change in dry matter intake (DMI) of primiparous and multiparous cows related to calving. Adapted from Chan et al., 2006.

supplemental energy in the form of non-esterified fatty acids (NEFA). The NEFA can be used as an energy source by the mammary gland and other tissues, but excess NEFA are deposited in the liver as triglycerides which can accumulate in the liver resulting in fatty liver. One researcher reported that 66% of Friesian cows in their study have moderate to severe fatty liver at one week postpartum (Reid, 1980). Cows that have greater body tissue loss prior to calving have greater increases in NEFA concentrations that contribute to these cows being more susceptible to metabolic diseases at or immediately after calving.

Wisconsin researchers conducted a trial to measure the contribution of reduced DMI prepartum to the development of fatty liver in two groups of cows which had been fitted with rumen cannula. All cows were fed the same diet, but one group was forced fed any feed they did not consume through the rumen cannula to maintain DMI. The control group experienced a 30% decrease in DMI during the last week of gestation whereas DMI of the forced fed group was maintained at approximately 30 lb/d. Although NEFA concentrations were similar for both groups, liver triglyceride concentrations increased 227% in the control cows whereas the force fed cow only experienced a 75% increase relative to baseline concentrations measured at 17 days prior to calving. By 28 days in milk there were no differences in liver triglyceride concentrations among the two groups of cows demonstrating that the liver is able to metabolize the additional triglycerides as long as no other complications occur. Cows that were forced fed cows prior to calving tended to produce more milk than the control cows indicating that the higher triglyceride accumulation in the liver may have limited production in the control cows.

Although we do not have a full understanding of the biology of fatty liver syndrome, it is clear that cows that lose excessive body condition during late gestation before calving are more susceptible to developing fatty livers. Cows with fatty livers are also more susceptible to other metabolic disorders including fetal retained membranes, metritis, milk fever, ketosis, and displaced abomasum. To minimize these problems, dry cow management programs should be designed to maintain body condition or minimize body condition loss.

## *Body condition score*

Cows that are over conditioned at dried off have lower DMI. A summary of 16 research trials demonstrated that the decline in DMI increases linearly as body condition score (BCS) increases (Table 1, Hayirli et al., 2002). The prepartum decline in DMI of cows classified as obese (BCS = 4.01 to 5.0) was 40% compared to 28 to 29% for those classified as thin (BCS = 1.0 to 3.0) or medium (BCS = 3.01 to 4.00). The DMI of the obese cows declined gradually throughout the last three weeks of gestation whereas the cows classified as thin or medium BCS maintained DMI until the last week of gestation when DMI declined sharply. No health data were summarized by these researchers, but previous work has shown increased incidence of health problems for obese cows at calving. This empathizes the need to keep cows from getting over conditioned. Some dairy producers maintain separate groups for over conditioned dry cows so they can be fed lower energy diets to prevent additional weight gain.

Thin cows (# 3.0 BCS) tend to eat more compared to cows with greater BCS, but peak milk yield is not as high and they tend to be harder to get bred. Monitoring BCS it is a good tool to use for avoiding some of the problems associated with obese cows. If there are extreme differences in BCS among cows at dry off, it may be beneficial to consider establishing an additional group for obese cows to better manage body condition.

**Table 1. Effect of body condition score (BCS) prepartum on intake.**

| | Thin[1] | Medium | Obese |
|---|---|---|---|
| Average BCS | 2.8 | 3.6 | 4.4 |
| DMI, % of BW | 1.84 | 1.83 | 1.68 |
| DMI depression, %[2] | 28 | 29 | 40 |

[1]Thin = BCS of 1.0 to 3.0; Medium = BCS of 3.01 to 4.0; Obese = BCS of 4.01 to 5.

[2]Decline in DMI from 21 day prepartum compared to the day prior to calving.

Adapted from Hayirli et al., 2002.

## *Dry cow grouping strategy*

A two-group dry cow strategy has been recommended by most nutritionists to provide more controlled feeding programs to the close up cows as a means of controlling body condition change and feed cost. Two-group systems typically consist of a far-off dry cow group (just dry until three weeks prior to calving) and close-up dry cow group (last three weeks before calving). The far-off dry cows have lower energy requirements and can be fed diets containing greater amounts of forage whereas the close-up dry cows need additional energy and fermentable carbohydrates to adapt the rumen to the feeds that will be fed during lactation. Although this may be a problem for small herds, the potential savings in feed cost make it desirable.

Cornell researchers examined the effect of dry cow management on two commercial farms where cows were assigned to either two-group program and fed a close-up diet for three weeks prior to calving or a one-group system that received the same close-up ration for the entire dry period. Cows in the two-group system tended to produce more fat corrected milk during the first five months of lactation than cows in the one-group system (Contreras et al., 2004). Cows in the one-group system had a higher incidence of displaced abomasum (5.6%) compared with those in the two-group system (0.6%). There were no differences in the incidence of other metabolic and non-metabolic disorders. These researchers also observed that cows that were thinner (initial BCS #3.0) in the two-group system had higher yields of milk and fat during the first five months of the following lactation than heavier cows (initial BCS $3.25) or the thin cows maintained on the one-group system. In addition to the benefits of improved milk yield for the two-group system, feed cost were lower compared with that for the one-group system.

## *Heat stress abatement*

Heat stress is an important stressor of dairy cows in the Southeast. Although the degree of heat stress in Kentucky is not as great as in Georgia or Florida, it can be a complicating factor. Previous research has demonstrated that providing supplemental shade for dry cows increases the birth weight of calves and milk yield in that lactation. California researchers recently reported the results of a trial examining the effect of providing access to dry lots with feed alleys equipped with either sprinklers or sprinklers, fans and shade for the last two weeks of gestation (Urdaz et al., 2006). No differences were observed in health or metabolic measures at calving or immediately after. This may be related to less severe heat stress during the trial than we typically observe during July through mid October. However, the cows provided supplemental shade, sprinklers, and fans produced 3.1 lb/d more milk during the first 60 days of lactation than cows provided only sprinklers. Based on a partial budget analysis, there was a positive return on investment for providing supplemental cooling and shade.

In recent years, several producers have either build barns for housing dry cows or provided space in their existing barn for dry cows even if it meant putting low producers outside on a dirt lot. These barns are equipped with fans and sprinklers to provide similar supplemental cooling as the lactating herd receives. Most producers report improved cow health at calving, lower death losses, and improved milk yield in the subsequent lactation. Prior to building these facilities, the dry cows were maintained in pastures with some shade. The dairy producers observed that during the summer and much of the fall, these cows did not want to leave the shade to eat at the feed bunks which were commonly placed in the middle of the pasture. Much of the improvement has been attributed to lower stress and improved DMI. Unfortunately there are limited research data to adequately measure the response of supplemental cooling for dry cows because of the cost of conducting these type of trials, but this has not deterred more producers from implementing this strategy.

## *Nutrition considerations*

Dry cows need a different diet than the lactating herd. Rations fed to lactating cows contain higher concentrations of energy and protein that support body condition gain and increases feed cost, dietary buffers increases the incidence of milk fever, and higher sodium and protein concentrations can increase udder edema. As stated earlier, the far-off dry cows can be fed diets that contain lower concentrations of energy (approximately 0.56 Mcal $NE_l$/lb DM) and crude protein (13% DM) according to NRC (2001) recommendations. These diets can maximize forage which will reduce feed cost considerable, especially with ingredient cost in today's markets. However, close-up dry cows require more energy (0.74 Mcal $NE_l$/lb DM) and protein (15% DM) based on NRC (2001) recommendations, so additional concentrate is required.

Forages fed to dry cows (especially close-up dry cows) should be good to high quality, palatable, and free of dust, mold, and mycotoxins. To reduce the potential for milk fever, forages that do not have elevated concentrations of potassium should be fed to the close-up cows. If dietary concentrations of potassium and sodium(cations) are high resulting in a positive dietary cation-anion difference (DCAD), it is desirable to feed some type of anionic supplement to reduce DCAD and reduce the chance of milk fever. There is considerable research to support the use of lowering dietary DCAD concentrations, but the approach must not reduce DMI as that would offset the positive response to lower DCAD.

The type of energy supplement needed for close-up cows has been the focus of several trials. Fermentable carbohydrates stimulate microbial fermentation and protein synthesis and help adapt the cow to the diets that will be fed after calving. Many research studies have reported improved DMI and milk yield and reduced NEFA and liver triglyceride concentrations when dietary concentrations of non-fibrous carbohydrate (NFC) increased (Overton and Waldron, 2004), but energy intake was confounded with NFC concentration in these trials. Other work has

demonstrated that diets that provide adequate energy and contain moderate concentrations of NFC using ingredients that are more fermentable may be just as effective as only increasing NFC concentrations. Too much fermentable carbohydrate in the diet results in lower ruminal pH and subclinical acidosis which reduces intake and can contribute to lameness.

Yeast culture has been shown to stimulate microbial protein synthesis, stabilize ruminal pH, and improve DMI when fed to dairy cows. Supplemental yeast culture has been shown to improve DMI during the last week of gestation and supports a more rapid increase in DMI postpartum (Dann et al., 2000) which should improve overall milk yield. Research reports on yeast culture have been variable, but more consistent responses have been observed when supplementation begins during the close-up dry period rather than waiting to introduce it in the diet postpartum. There are many sources of yeast culture on the market, many of which have limited or no data to indicate that they work the same as those from companies that have research data to support their product. Unlike generic medicine, they do not have to meet the same standards as the original commercial products.

The recent approval of monensin by FDA for feeding to dairy cattle provides another opportunity for nutritional management of dry cows. Monensin works by increases ruminal propionate production at the expense of acetate and methane production improving overall energetic efficiency. Canadian researchers reported a 50% reduction in the incidence of subclinical ketosis when dairy cows were given a controlled-release capsule containing monensin (Duffield et al., 1998). In a more recent report, this group reported improved concentrations of blood glucose and decreased beta-hydroxybutyrate (BHBA) in transition cows (Zahra et al., 2006). In the same trial, ruminal protected choline improved postpartum milk yield by 2.6 lb/d but most of the increase was attributed to cows with initial BCS greater than 4.0 that exhibited a 9.7 lb/d increase in milk yield. Choline is involved in lipid transport from the liver and is required for the synthesis of phosphatidylcholine, a component of the very low density lipoprotein membrane.

## *Summary*

Cows that successfully make the transition from dry cows through calving into lactation without experiencing a metabolic disorder have a greater likelihood of being profitable. Failure to make this transition frequently decreases any chance of the cow making a positive contribution if she is not culling early in lactation. Managing DMI so the cow does not loose body weight is one of the key factors for making the transition. Two-group dry cow programs not only help maintain body weight, they also help control feed cost which is important to overall profitability. During periods of heat stress, providing dry cows supplemental cooling has also been shown to make a positive impact on the health and performance. There are some nutritional additives that can be used successfully in close-up dry cows ration, but producers

should consult with their nutritionist and veterinarian before including these.

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