Management and Nutrition of Dry Cows

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Presented at the 2006 Tennessee Nutrition Conference
Sponsored by Department of Animal Science and UT Extension, The University of Tennessee.

Dairy cows are especially susceptible to diseases and metabolic disorders during the periparturient period. Dairy cattle that are able to navigate the perilous waters of this period without succumbing to disease and metabolic disorders are likely to produce more milk and become pregnant.

Costs of Periparturient Diseases and Disorders

For dairy cattle afflicted with retained placentas, metritis, fever, ketosis and/or a displaced abomasum, the outcome is quite predictable. These cows produce less milk and are less fertile (NRC, 2001; Ferguson et al., 2004a; Overton and Waldron, 2004; Hutjens, 2006). For dairy cattle that become lame in the first 30 days of lactation, the outcome is also quite predictable. These cows suffer from lower first service conception rates, increased incidence of ovarian cysts and lower pregnancy rates at 480 d postpartum (Melendez et al., 2002). More importantly, greater than 30% of these cows are culled before recording any reproductive event compared with approximately 5% of cows that did not become lame in the first 150 d of lactation.

Clearly, removing cows from the herd in very early lactation is not a profitable venture. Cows that die or are culled in the first weeks of lactation generate limited revenue toward recouping the investment of feeding, caring and housing of dairy replacements and dry cows. Yet, cows commonly leave the herd in early lactation. In a study examining the records of 625,000 cows in 2800 Minnesota DHIA herds, 24.75% of cows exiting the herd were removed in the first 62 days of lactation (Godden et al., 2003). Dairies should strive to have less than 14% of cows removed, leave the herd prior to 60 days in milk (AgSource Cooperative Services, 2006).

The costs of periparturient diseases and metabolic disorders go beyond the costs of reduced milk yield, reduced fertility and premature death and culling. Dairy producers need to factor in the additional medication and labor required for treating and caring for ailing animals. Dr. Chuck Guard, Cornell University estimated the costs associated with periparturient metabolic disorders and diseases range from $145 per ketosis case to $346 for each lame cow (Table 1). Surveys estimate that average occurrence rates for these diseases and disorders range from 3.5% for left displaced abomasums to 14.7% for clinical mastitis (Duffield et al., 1998; National Animal Health Monitoring Systems, 2002; Table 1). Based upon the typical costs and occurrence rates, the average 100-cow dairy loses $13,841 to these diseases and metabolic disorders. Estimates of the cost of these diseases and metabolic disorders to the average dairy are probably conservative as most producers report only clinical cases of diseases and metabolic disorders when surveyed, failing to report subclinical cases. Finally, one factor that is not included in the cost of these diseases and disorders is the demoralizing effect on labor of working with ailing cattle.

Table 1. Cost per case of common diseases and metabolic disorders.

Disease/disorder	Cost per case[a]	% Incidence in US Dairy Cattle[bc]
Ketosis	$145	13.0
Clinical mastitis	$190	14.7
Retained placenta	$285	7.8
Milk fever	$334	5.2
Left displaced abomasum	$340	3.5
Lameness	$346	11.6

[a] Values are estimates of disease cost and should be used to help estimate magnitude of losses and evaluate potential return for preventative new strategies, C. L. Guard, Cornell University.

[b] Duffield et al., 1998

[c] National Animal Health Monitoring Systems, 2002.

Assessing How Well Your Dry and Transition Program is Working

There are a number of tools available to assess effectiveness of a dairy's dry and transition cow program. Incidence of calving diseases and disorders is a good indicator of program efficacy. A realistic goal for dairies is to have a combined incidence rate of dystocia, milk fever, retained placenta, metritis, ketosis, displaced abomasum, fatty liver, and lameness of less than 40% (Drackley, 2005).

Milk fat:protein ratio can also be used to assess effectiveness of the dry and transition programs. Cows, 5 to 40 days in milk, with a milk fat:protein of > 1.4, most likely have developed a fatty liver and are prone to developing ketosis and displaced abomasum (AgSource Cooperative Services, 2006). Dairy producers should strive for less than 40% of cows having a milk fat:protein ratio of >1.4 (AgSource Cooperative Services, 2006).

Recently, AgSource Cooperative Services (2006) introduced a new tool to help dairy producers assess how well their dry and transition cow programs are working. The Transition Cow Index™ (TCI™) was developed at the University of Wisconsin Veterinary School and combines metabolic and health indicators to assess how well cows are transitioning from the dry period to lactation. The TCI compares a herd's fresh cow performance to an industry standard and is calculated only for cows having completed a lactation. Milk production from cows, 5 to 40 days in milk, is used to predict 305 d yield. The TCI is the difference between expected 305 d prediction and the projected 305 d yield based upon milk production in the first 5 to 40 days in milk. For example, if a cow has an expected 305 d prediction of 30,000 lbs and she starts her lactation very well and has a first projection of 32,000 pounds, her TCI is +2000 pounds.

Mastitis Control in the Dry and Transition Periods

The mammary gland is especially susceptible to intramammary infections the first and last two weeks of the dry period and the first two weeks of lactation (Smith et al., 1985a;

Waldner, 2006). Preventing or curing intramammary infections that occur in the dry period will reduce clinical mastitis cases that occur in the subsequent lactation. Quarters succumbing to clinical mastitis in lactation increase if the quarter cultured positive for *Streptococcus dysgalactiae, Streptococcus faecalis, Escherichia coli* or *Enterobacter* spp at dry off or *Escherichia coli,* coagulase-positive staphylococcus, *Serratia* spp., or *Streptococcus faecalis* in two of the three samples collected two weeks prior to and one week after calving (Green et al., 2002). Sixty-seven percent of the clinical mastitis cases that occur in the first month of lactation originate in the dry period, while in months 2 through 5 of lactation, 46, 44, 29, and 17% of clinical mastitis cases originated in the dry period (Green et al., 2002).

At dry off, infusing all quarters of all cows with an FDA-approved commercial antibiotic product formulated specifically for dry cow therapy has been shown to be especially effective in reducing intramammary infections (Jones, 1999; NMC, 2006; Waldner, 2006), in particular those occurring early in the dry period (Smith et al., 1985b). Cure rates are higher for antibiotic treatment during the dry period than during lactation because a much higher dose of antibiotic can be safely used and retention time of antibiotic in the udder is longer (NMC, 2006).

Several publications that outline the proper procedure for treating cows with dry-cow antibiotic preparations as well as other management practices to reduce mastitis at calving include Jones, 1999, NMC, 2006, and Waldner, 2006. In order to minimize the risk of milk marketed from the dairy being adulterated, cows receiving dry-cow antibiotic therapy (DCT) should be removed from the milking string. Milk from cows receiving DCT should be tested for the presence of microbial inhibitory substances prior to being marketed.

The time during the dry period at which the mammary gland is most resistant to intramammary infections is when the mammary gland is fully involuted and when the teat ends have formed a natural keratin plug (Dingwell et al., 2003). The keratin plug acts as a physical barrier preventing bacteria from entering the mammary gland (Dingwell et al., 2003). However, in many cows, the keratin plug fails to form until the cow is several weeks into the dry period. Furthermore, it appears that cows producing larger amounts of milk at dry off, in other words, higher producing cows in the herd, are most likely to have teats in which the keratin plug fails to seal the quarter. In a survey of 300 cows, researchers found that at week 2 of the dry period, 34.5% of quarters of cows producing less than 46.3 lb milk/d at dry off were open, while 62.1% of quarters of cows producing greater than 46.3 lb milk/d at dry off were open. In week 6 of the dry period, 48.3% of quarters of cows producing more than 46.3 lb milk/d at dry off were still open allowing mastitis causing pathogens to enter the mammary gland.

One method dairy producers can use to seal teats at dry off, minimizing the number of bacteria that can enter the mammary gland, is to use an internal teat sealant such as Orbeseal®. Researchers found that administration of an internal teat sealant in conjunction with standard DCT at dry off, reduced new intramammary infections from 16.7% for cows receiving DCT alone to 8.0% in cows receiving DCT and the internal teat sealant. In the following lactation, clinical cases of mastitis in the first 100 days in milk were reduced from 29.9% for cows receiving only DCT to 23.4% for cows receiving both DCT and the internal teat sealant.

Improving zinc status of cows by feeding a more bioavailable zinc source may also help increase formation of the keratin plug. Missouri researchers initially collected more keratin from teat canals of primiparous cows fed ZINPRO zinc methionine than primiparous cows fed an equivalent amount of zinc from zinc oxide. However, due to the time required to regenerate keratin, there was no difference in amount of keratin collected from cows at subsequent collections (Jones, 1995).

Late gestation cows may particularly benefit from a sound trace mineral program. In the last two months of gestation zinc status, as measured by liver zinc content, declines by approximately 15% (W. G. Olson, U. of Minnesota, personal communication), and most likely reflects increased zinc demand for continued fetal development and colostrum production. Copper status, as measured by liver copper content, declined by approximately 23% from 60 days prepartum through calving (W. G. Olson, U. of Minnesota, personal communication) and is reflective of the large transfer of copper from dam to the fetus prior to birth. Similary, the Minnesota workers reported liver manganese content was lowest in late gestation and then increased after calving.

Cattle with insufficient copper status at calving have been shown to be more prone to mastitis than cattle with sufficient copper status. Texas researchers found that severely copper deficient cattle supplemented with 40 and 80 of copper from copper amino acid complex (Availa®Cu) the last 3 months of gestation had lower colostrum SCC than cows receiving 0 and 20 ppm of copper from Availa-Cu during the same time period (565,000 and 379,000 vs. 1,746,000 and 1,628,000; Branum et al., 1998). Feeding 40 or 80 ppm copper is not recommended under the vast majority of feeding situations due to the potential for copper toxicosis (NRC, 2001). However, this study does illustrate that if cows do not maintain adequate copper status in late gestation, cows are more prone to developing mastitis.

Impact of increased trace mineral status in response to feeding cows a combination of zinc, manganese, copper and cobalt from Zinpro Minerals on reducing mastitis risks and reductions in SCC,, are most pronounced when Zinpro Mineral supplementation begins in the dry period and continues through lactation versus supplementing cows with Zinpro Minerals only in the lactation period. In a summary of eight trials, Kellogg et al. (2003) observed that SCC was reduced only 3.1% when cows were supplemented with Zinpro Minerals only in the lactation period versus a 29.3% reduction in SCC when cows received Zinpro Minerals in both the dry and lactation period. Another benefit of supplementing dry cows with Zinpro Minerals is increased IgG content of colostrum. In a summary of three trials, IgG content of colostrum increased on average 23.8% (Kinal et al., 2005; Kincaid and Socha, 2004; Zinpro TB-D-4017, 2003).

Another nutrient that is of particular interest during the dry period is vitamin E. Plasma α-tocopherol concentrations decline by approximately 50% from 14 days prior to calving until calving (Goff and Stabel, 1990). Researchers at The Ohio State University found that a supplementation regiment of 1000 IU vitamin E/d in the first 46 d of the dry period, 4000 IU vitamin E/d in the last 14 d of the dry period and 2000 IU vitamin E/d in the first 30 d of lactation (High E) resulted in a 63% reduction in intramammary infections in comparison to heifers receiving a supplementation regiment of either 100 IU vitamin E/d in the dry and lactating periods (Low E) or 1000 IU vitamin E/d in the dry period and 500 IU vitamin/d in the first 30 d of lactation (Medium E) (Weiss et al., 1997). Mature cows receiving the High E regiment in late gestation and early lactation had a 44 and 333% reduction in intramammary infections in comparison to cows receiving the Low E or Medium E supplementation regiment. Increasing the level of vitamin E supplementation in dry and early lactation periods also reduced clinical cases of mastitis. Clinical mastitis affected 25.0, 16.7 and 2.6% of quarters during the first 7 d of the lactation for cows and heifers receiving the High E, Medium E and Low E supplementation regiments (Weiss et al., 1997).

Lush green pasture is an excellent source of vitamin E (NRC, 2001). However, dairy producers should supplement pastured cattle with vitamin E if herbage is mature or of limited availability.

Reducing Lameness in the Dry and Transition Periods

The weight of the cow is suspended within the claw capsule by the suspensory apparatus. A breakdown of the suspensory apparatus results in increased pressure being placed on the corium. Increased pressure on the corium is manifested as production of poor quality horn, or even complete blockage of horn production, resulting in development of claw horn lesions (Lischer and Ossent, 2002).

Breakdown of the suspensory apparatus within the claw is a multiphasic process for which all phases have not been completely elucidated. In the initial phase, an inflammatory response is elicited when vasoactive substances, such as endotoxins or histamine, impair blood supply to the corium (Lischer and Ossent, 2002). Impaired blood flow to the corium results in hypoxia and edema in the corium leading to erythema, hemorrhage, thrombus and, finally, necrosis (Lischer and Ossent, 2002).

Previously, it was widely accepted that in the next phase there was a break down in the dermal-epidermal junction, resulting in the pedal bone compressing the corium tissues (Lischer and Ossent, 2002). Recently, however, this theory has fallen out of favor as it has been demonstrated that a force 20 times greater than that exerted by normal load is required before connective tissue between the phalanx and wall horn tears (Lischer and Ossent, 2002). Rather, it is believed that metalloproteinases are released during the inflammatory response softening connective tissue (Tarlton and Webster, 2002; Lischer and Ossent, 2002). The softened collagen fibers are more elastic and are not as effective in supporting the weight of the animal, resulting in the pedal bone compressing the corium and ultimately, development of claw horn lesions.

Metalloproteinases may also be released in response to elevated circulating levels of the hormone, relaxin. Relaxin is produced by the corpus luteum and is present in both pregnant and non-pregnant females (Lischer and Ossent, 2002). Circulating relaxin levels are elevated just prior to calving, resulting in softening of connective tissue of the birth canal (Tarlton and Webster, 2002).

Research indicates that relaxin may also induce metalloproteinases in the claw, softening connective tissue of the suspensory apparatus and ultimately predisposing transition cows to claw lesions (Lischer and Ossent, 2002). Since it takes several weeks for corium injuries to manifest as claw lesions, it is not surprising that incidence of lameness are more prevalent in early lactation (Green et al., 2002).

In the dry period, overgrown claws may be especially conducive to development of claw lesions. Horn overgrowth generally occurs in the toe and abaxial wall region, resulting in the claw tilting axially and backwards (Raven, 1989). This conformational shift results in overloading the suspensory apparatus of the pedal bone as the weight of the animal is concentrated in the heel region (Lischer and Ossent, 2002; Raven, 1989). Overloading of an already softened suspensory apparatus increases the risk of corium compression, and the development of painful claw lesions that result in the cow becoming lame. (Lischer and Ossent, 2002; Raven, 1989).

Proper trimming of claws (see Raven, 1989) will improve foot and leg confirmation, resulting in weight of the animal being more evenly distributed within the claw (Raven, 1989). At the very least, hooves should be trimmed (examined) at dry off by a trained hoof trimmer. If needed, claws should be trimmed with the goal of restoring functional weight balance. Claws should be correctively trimmed if horn lesions are present. Vet wraps applied at trimming should be removed within 3 to 4 days of application. Blocks applied to sound claws to alleviate weight bearing on claws afflicted with horn lesions be removed within 4 to 6 weeks of application.

In addition, late gestation cows not on pasture should be housed on bedded packs or in free stalls that are properly sized and provide a soft lying surface (see Anderson, 2005 for proper stall dimensions). Webster (2002) observed that heifers placed in free stalls from four weeks prior to calving through eight weeks postpartum had increased incidence and severity of claw lesions, as indicated by increased cumulative claw lesion scores, than heifers placed into bedded packs during this same period of time. Despite both groups of heifers being placed into free stalls at eights weeks postpartum, heifers housed in free stalls during the transition period had increased incidence and severity of claw lesions up to 16 weeks after both groups of heifers were placed into a common environment. This study indicates that environment during the transition period can have long lasting implications on claw integrity.

Abruptness of ration change during the transition period also affects prevalence of claw lesions. Donovan et al. (2004) observed that cows switched from a 47% NDF prepartum diet to a 31% NDF postpartum diet had higher hoof scores, indicating more frequent and more severe claw lesions, than cows switched from either a 40% NDF prepartum diet to a 37% NDF postpartum diet, a 40% NDF prepartum diet to a 31% NDF postpartum diet or a 47% NDF prepartum diet to a 37% NDF diet postpartum diet. Differences between treatments in hoof scores were significant up to d 70 of lactation.

Providing cattle with a good trace mineral program in the dry and prefresh period has been shown to reduce incidence and severity of claw lesions in early lactation. Ferguson et al. (2004b) observed that when, daily, 360 mg Zn, 200 mg Mn, 125 mg Cu and 25 mg Co from inorganic sources were replaced with minerals supplied by 4®Plex, incidence of sole lesions (double soles, sole ulcers and sole erosions) were reduced at 30 d postpartum. Diets were fed from 60 d precalving through 250 d postcalving. Similarly, Ballantine et al. (2002) observed that when, daily, 360 mg Zn, 200 Mn, 125 mg Cu and 12 mg Co from sulfate sources were replaced with minerals supplied by Availa®4, incidence of claw lesions were reduced at 75 d postpartum. In particular, incidence of white line lesions were reduced at 75 and 250 d postpartum. If cows did develop white line lesions, severity of these lesions were reduced when Availa-4 was added to the diet in place of sulfate trace minerals. Treatments in this study were administered from 21 d prepartum through 250 d postpartum.

Periparturient Metabolic Disorders Reduce Fertility of Cows

Ferguson (2002) summarized six trials to determine the effect of calving disorders on fertility. When compared to a normal cow, assigned a relative conception rate of 50%, cows with chronic metritis, acute metritis, retained placenta, ketosis and lameness had relative conception rates of 32, 35, 37, 46 and 43% respectively. Another factor that affects fertility of cows postpartum is mastitis.

Mastitis has also been shown to reduce fertility of cows. In a retrospective study looking at the records of 1001 cows, Santos et al., (2004) observed that cows that develop mastitis prior to breeding are almost twice as likely to abort the pregnancy as cows that do not develop mastitis prior to breeding. In another study, Tennessee researchers found that cows that develop mastitis prior to breeding have 22 more days open than cows that do not develop mastitis before breeding (Barker et al., 1998). Clearly, metabolic disorders and diseases that occur around calving reduce fertility of cows.

Improving the trace mineral program of dry and early lactation cows has been shown to help minimize the effect of calving disorders on fertility. Tennessee researchers observed that when 4-Plex was added to diets of cows on the first day of lactation, there was minimal effect on fertility if cows did not retain the placenta (Campbell et al., 1999). However, retention of the fetal membranes increased days to first luteal activity, days to first corpus luteum and days to first estrus for the control cows, but not cows fed 4-Plex.

Similarly Ferguson et al. (2004b) observed that replacing inorganic minerals with those supplied by 4-Plex in diets of dry and lactating cows had minimal effect on pregnancy rates if cows did not exhibit a transition health disorder such as retained placenta, metritis, fever, ketosis, and displaced abomasum. Cows fed only inorganic trace minerals that had a transition disorder became pregnant at a slower rate than cows without transition disorders. In contrast, cows fed 4-Plex that had transition disorders became pregnant at a similar rate as cows without transition disorders. It should be noted that cows fed 4-Plex numerically had fewer transition health disorders than cows fed only inorganic minerals (58.5 vs. 66.2%).

Results of these studies indicate that improving trace mineral programs of transition cows by feeding Zinpro Minerals may reduced transition disorders. If cows do develop a transition health disorder, feeding Zinpro Minerals helps overcome the negative effect of transition health disorders on fertility.

Benefits of a Two-group Dry Cow Program

Two-group dry cow programs allow producers to target diets to more closely meet the nutrient needs of dry cows. In the early dry period, energy requirements for maintenance and sustaining pregnancy are minimal and are easily met by diets composed almost exclusively of forages (NRC, 2001). However, in the last weeks of gestation, dry matter intake decreases, while at the same thing nutrient requirements for sustaining pregnancy and colostrum production, increase (NRC, 2001). In order to meet these higher nutrient requirements, nutrient density of the diet needs to be increased. Furthermore, feeding increasing amounts of concentrate prior to calving allows cows to more gradually adjust to high concentrate, lactation diets. Overton and Waldron (2004) noted that, "in general, available research supports feeding the higher energy diet for two to three weeks prior to parturition."

Due to the problems associated with managing two groups of dry cows, some producers have resisted adopting this management practice. Problems with managing two groups of dry cows include having dedicated space for two groups of dry cows, uniform mixing of small batches of feed and inventorying separate feed supplements for far-off and close-up dry cows.

Recently, Corbett (2002) found that cows that were in the close up pen for > 21 days produced 11.9% more milk than cows in the close up pen for 1 to 7 d, raising the question; what would happen if cows were fed a close up diet for the entire dry period? Feeding a close up diet throughout the dry period would eliminate many of the problems associated with a two-group dry cow program and may eliminate some of the problems of switching cattle from a high forage, far-off dry cow diet to a high grain lactation diet.

Contreras et al. (2004) examined the effect of feeding a close-up diet to dry cows for 21 or 60 d. These researchers found that cows fed the close up diet for 60 days produced 3.7 lb/d less milk and had a 65.4% increase in metabolic diseases including ketosis, metritis, retained fetal membranes, displaced abomasum and milk fever. Agenas et al. (2003) found that energy content of the diet fed during the dry period did not affect postpartum milk production. However, cows fed the most energy dense diet during the dry period lost the most body weight in the first 4 weeks of lactation. Similarly, University of Illinois research found that cows fed ad libitum amounts of a diet containing 0.72 Mcal NE_L had lower dry matter intake after calving, had higher serum nonesterfied fatty acid (NEFA) and β-hydroxybutyrate (BHBA) concentrations and tended to produce less milk after calving. Increased serum NEFA and BHBA concentrations indicated that cows were mobilizing more body fat and were more prone to developing fatty liver, ketosis and metabolic diseases that develop secondary to ketosis. Clearly the results of these studies indicate that feeding a diet similar to a close-up diet for the entire dry period does not benefit the cow or the producer.

One possible explanation for the negative response to feeding a higher energy diet for the entire dry period is that cows develop increased insulin resistance when exposed to high starch diets for extended periods of time (Drackley, 2005). Cows normally develop some degree of insulin resistance in late gestation. Glucose uptake by muscle and adipose is insulin dependent, while glucose uptake by the mammary gland and fetal mass appear to be insulin independent. In late pregnancy and early lactation, a reduction in sensitivity of peripheral tissue to insulin spares glucose for use by the mammary gland and the fetal mass. Thus the cow mobilizes body tissue in the form of NEFA to help support the metabolic energy needs of the peripheral tissue (Smith, 2004).

Cows that are more adept at mobilizing body tissue or that are more insulin insensitive would tend to produce more milk. However, the liver takes up NEFAs in direct proportion to their concentration in the blood (Overton and Waldron, 2004). Since the ruminant liver has a limited ability to export fatty acids or lipid, lipids accumulate in the liver (Overton and Waldron, 2004). Increased fat infiltration reduces capacity of the liver to synthesize urea and glucose, predisposing cows to ketosis (Overton and Waldron, 2004). Fatty acids are oxidized in the liver to help provide energy. However, fatty acids are incompletely oxidized, resulting in the production of ketone bodies such as BHBA. Thus, it appears that cows that are more insulin resistant in late gestation are more prone to develop fatty liver, ketosis and secondary metabolic disorders that develop with ketosis.

Reducing energy intake of cows in the far-off dry period appears to limit insulin resistance development (Drackley, 2005). Limit feeding cows to reduce energy intake is only practical when cows are individually fed. Limit feeding group-fed cows is not practical, especially in situations where bunk space is limited.

Another option is to reduce energy content of the far-off dry cow diet. Currently researchers are recommending that far-off dry cow diets contain 0.59 Mcal NE_l/lb (Drackley, 2005; Hutjens, 2006). Diets containing 18% (DM) corn silage, 81% (DM) mature grass and legume hay and 1% (DM) vitamins and minerals will contain approximately 0.60 Mcal NE_l/lb (NRC, 2001). Energy content of diets containing higher quality hay and silage or higher levels of corn silage, can be reduced by adding lower quality roughages, such as straw and corn stalks, to the diet. However, feeding corn silage separate from the lower quality roughage, such as that which occurs when corn silage is fed in the bunk and a bale of low quality roughage is placed in the round bale feeder, is usually not successful, especially if bunk space is limited.

Lower quality roughage sources should be free of mold and contain very minimal amounts of weeds. Lower energy far-off dry cow diets appear to work best in a group feeding situation when fed as a TMR. However, lower quality roughages should be processed to a relatively uniform length of 1” to 2” to facilitate mixing and to minimize sorting of the TMR (Drackley, 2005). Additionally, producers may want to consider adding water to the TMR to minimize sorting (Hutjens, 2006). Feeding a TMR containing unprocessed amounts of low quality roughage to cattle with limited feed bunk space is not a desirable situation as dominant cows will sort the TMR for the more palatable corn silage, leaving the submissive cows the low quality roughage. Finally, these low energy diets should be supplemented to meet the protein, mineral and vitamin requirements of the far-off dry cow.

Minimizing Stress On Dry Cows

Stress increases circulating cortisol concentrations. Cortisol belongs to a group of steroid hormones called glucocorticoids. The metabolic action of these hormones includes stimulation of glucose synthesis, increased protein breakdown and mobilization of body fat in the form of NEFA. Thus, reducing stress in the dry period should reduce the risk of cows developing ketosis and related metabolic disorders.

In order to minimize stress, pens should be stocked at <90% of capacity and provide 3 ft. of bunk space to minimize confrontations between cows (Cook and Nordlund, 2004). Bunk space allotments for dry cows need to be greater than bunk space allotments for lactating cows as dry cows are wider than lactating cows (Cook and Nordlund, 2004).

In a review paper, Cook and Nordlund (2004) summarized a study in which pens of mixed parity cows were overstocked to two cows per stall. Heifers were most negatively affected in this situation. They spent more time walking and lying outside of free stalls and had a greater cortisol response to adrenocorticopic hormone than mature cows, indicating an increased level of stress. Wisconsin researchers noted that stocking dry cow pens in excess of 92% of headlock capacity was shown to reduce dry matter intake. Stocking mixed prefresh pens at >80% reduced milk production of heifers in the first 83 days in milk. Each 10% increase in stocking density above 80% reduced postcalving milk yield by 1.6 lb/d (Cook and Nordlund, 2004).

British Columbia researchers observed that decreasing bunk space from 39.3” to 19.7” per cow resulted in increased aggressive interactions between cows and reduced feeding times for submissive cows. Feeding times of dominant cows were minimally affected (Cook and Nordlund, 2004). Michigan researchers found that incidence of displaced abomasums were higher if there was only 11.8” of bunk space per cow or if there was 11.8 to 23.6” of bunk space per cow and the diet was limit fed (Cook and Nordlund, 2004).

Another management factor that stresses cows is pen moves. Following each movement of cattle into a pen, confrontations between cows, both physical and nonphysical, increased dramatically (Cook and Nordlund, 2004). Also, housing cattle in individual maternity pens for more than 3 d has been shown to increases blood NEFA concentrations and double the risk of ketosis and displaced abomasum (Cook and Nordlund, 2004). Thus, dairy producers should strive to minimize pen moves and to limit the amount of time cows are isolated from the herd.

Summary

The cow’s next lactation begins the day the she is dried off. Dry cow therapy, use of teat sealants, two-group dry cow programs, minimizing stress and feeding well-balanced diets, including highly available trace mineral sources and adequate vitamin supplementation, have all been shown to help minimize the number of cows succumbing to periparturient diseases and metabolic disorders. In addition, cows that do not succumb to perirparturient diseases and metabolic disorders are less prone to leaving the herd in early lactation, produce more milk, are more fertile and are more profitable.

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