

Merits of Feed Additives for the Transition Dairy Cow

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Implementing sound feeding and managing practices during the dry period and the first month after calving can and does translate into more profits for the dairy farmer. A cow's dry period must be viewed as the start of the next lactation. Cows which are properly managed during the dry period are healthier after calving, give more milk, and have fewer reproductive problems.

Often times, farmers want to believe that the addition of feed additives will correct or mask problems associated with poor feeding and management practices of dry cows and/or fresh cows. Some feed additives will help reduce problems seen in fresh cows. But, the addition of feed additives may elicit an even greater response in cows which are well managed. This paper reviews (in outline format) some of the feed additives specifically used in diets for the close-up dry cow and the recently fresh dairy cow.

Implementing a Sound Dry Cow Program- Place to Start

Dry cows should be separated and managed and fed as two groups. Why separate dry cows into two separate groups? The reason is to more closely match the needs of the dry cow when she is dry and then just before she calves. Also, many of the feed additives are more cost effective when added to close-up dry cow diets versus addition for the entire dry period.

Two Groups of Dry Cows

Far-off dry cows- Cows from day of dry off until 14 to 21 days before expected calving date.

Close-up dry cows- Cows from 14 to 21 days before expected calving date

Far-off Dry Cows : One group of dry cows would include cows from the day they are dried-off and until they are within 14 to 21 days of expected calving date. This group is the conventional dry cow group currently called the far-off dry cow group. Far-off dry cows are fed high roughage diets generally at the rate of 2% of the cow's body weight. Long-stemmed forages usually account for at least 50% of the total forage intake or 1% of the cow's body weight. Corn silage can be fed to far-off dry cows but intake should be limited to 50% of the forage dry matter. For example, Holsteins should not be fed more than 35 lbs of corn silage (on an as fed basis with 35% dry matter). The remainder of the forage would be provided from long-stemmed forages such as hay or baleage.

Like the milking herd diet, forages fed to dry cows need to be tested and then rations should be balanced to specifically meet the requirements of the far-off dry cow. When balancing rations for these dry cows, the amounts of each nutrient needs to be provided. If the nutrient needs of the far-off dry cow can not be met by forages alone a concentrate or grain mix is formulated to supply the shortages. **The amount and protein**

content of this concentrate or grain mix is determined by the quality and type of forage fed. To supply the nutrients not provided by the forages, far-off dry cows should be supplemented with one to eight pounds of grain daily. As the quality of a forage decreases, more concentrate mix or grain needs to be fed to supply the needed nutrients. For proper growth of the fetus and health of the dry cow, adequate amounts of protein, energy, minerals and vitamins need to be provided.

Cows should be turned dry at a body condition score of 3.5 and this condition should be maintained during the dry period. Cows are the most efficient at laying down body stores when they are lactating versus when they are dry. Early lactation cows use their stores of body fat to supply additional energy needed to support milk production because they are unable to consume enough feed to meet their energy needs during this time period. In addition, dry cows should not lose weight during the dry period. Besides losses in peak milk production, dry cows which lose weight are more susceptible to disease problems after calving.

Providing adequate amounts of minerals and vitamins are necessary to minimize health problems around freshening time. Adequate amounts of selenium, vitamin A and E, iodine, copper, and calcium are necessary to prevent problems with a retained placenta. Copper, zinc, selenium, and vitamins A and E all play a role in improving a cow's immune response. Feeding adequate amounts during the dry period is necessary to give the cow the best chances to fight off a disease challenge such as a mastitis infection.

Close-up dry cow group: The close-up dry cow group includes dry cows within 14 to 21 days of expected calving. Several studies have shown that feed intake decreases gradually the last three weeks before calving with the most dramatic decrease seen within a week of calving. This dramatic drop in feed intake just before calving can account for a 30% decrease in dry matter intake. The reason for this reduction in feed intake has not been determined but is believed to be related to hormone changes associated with the calving process (estrogen and estrogen to progesterone ratio).

With this decrease in feed intake, the close-up diet is made more nutrient dense so that the cow and calf inside her receive the appropriate amounts of each nutrient. The close-up ration should contain some of the same forages and other feed ingredients fed in the milking herd diet. This practice allows the microorganisms or bugs in the cow's rumen a chance to adjust to the diet before calving. This may help prevent cows from going off-feed after calving. When cows go off-feed shortly after calving, they lose a lot of weight through mobilization of body fat reserves which can increase the incidence of ketosis and fatty liver. Thus, close-up dry cow programs can help reduce metabolic disorders or diseases after calving. In addition, close-up dry cow diets can be formulated to help reduce the

incidence of milk fever with the addition of anionic salts and by properly balancing the diet for the macrominerals, such as sodium, potassium, chloride, and sulfur.

Getting these cows off to a good start before calving will help cows milk well after calving. These cows will be able to enter the milking herd with fewer problems. Studies have shown that dry matter intake before calving is positively related to dry matter intake at 21 days after calving. These fresh cows may peak 10 pounds higher, and for every additional pound at peak there is an additional 250 pounds of milk over the lactation. This means an additional 2500 pounds of milk per lactation per cow and at \$13.00 a hundred weight, this equates to \$325 more income per fresh cow.

Feed Additives for the Transition Dairy Cow

Increased NSC levels in close-up dry cow diets

Role: Initiate transition to the milking herd ration before the cow calves

Evidence:

- 1) Help elongate rumen papillae to enhance absorption of volatile fatty acids. Development of the rumen papillae is very important in minimizing the accumulation of ruminal volatile fatty acids, preventing reductions in rumen pH, and in preventing ruminal acidosis after calving when fresh cows are introduced to lactating cow diets.
- 2) Stimulates the production of propionate in the rumen. Propionate is converted to glucose within the liver ° Glucose production increases concentration of insulin in the blood ° insulin is antilipolytic and may help reduce fatty acid mobilization from adipose tissue (May decrease amount of fat stores mobilized in early lactation cows)
- 3) Increase dry matter intake before calving. Studies have shown a positive relationship between feed intake before calving and feed intake after calving. (Minor et al. 1996. J. Dairy Sci 79(Suppl. 1):199)
- 4) Increase energy and protein density of close-up dry cow diets

Recommendation: Separate dry cows into two groups: far-off dry cows (first 45 days of 60-day dry period) and close-up dry cows (14-21 days before calving)

Propylene Glycol

Role: May prevent fatty liver through enhanced carbohydrate status
(Converted to glucose within the liver ° Glucose production increases concentration of insulin in the blood ° insulin is antilipolytic and may help reduce fatty acid mobilization from adipose tissue)

Evidence:

- 1) Drenching cows with 32 oz of propylene glycol daily starting at 10 days before calving and continuing until calving. Drenching cows with propylene glycol decreased plasma fatty acids and ketones and increased plasma glucose and insulin (Studer et al 1993 J Dairy Sci 76:2931)
- 2) Drenching with 10 oz of propylene glycol was as effective as the 32 oz dose using feed restricted heifers 90 days before calving (Grummer et al. 1994 J Dairy Sci 77: 3618)
- 3) Feeding propylene glycol as part of a TMR was not effective. Propylene glycol needs to be slug fed either as a drench or mixed with concentrate (1 lb propylene glycol in 6 lbs of grain) (Christensen et al. 1995 J Dairy Sci 78: (Suppl 1):240)

Recommendation: In herds with high incidence of ketosis and/or fatty liver, drench cows daily for 10 days before calving with 10 oz of propylene glycol or include 1 lb propylene glycol in 6 lbs of grain.

Anionic Salts

Role: Prevent subclinical hypocalcemia (Low concentrations of calcium in the blood but cows do not exhibit clinical signs of milk fever.

Evidence: See previous paper by Jesse Goff and Ron Horst

Recommendation:

- 1) Three weeks before calving, close-up dry cow diets formulated with low potassium forages
- 2) To achieve low DCAB diets, add anionic salts as needed according to recommendations in previous paper. Remember to increase dietary calcium content.

Buffers

Role: Help maintain rumen pH for better rumen fermentation, to stimulate dry matter intake, and prevent metabolic diseases associated with ruminal acidosis

Evidence: Contain cations which increase the alkalinity of diets and may increase the incidence of subclinical hypocalcemia

Recommendation: Do not include buffers in close-up dry cow diets because they may increase incidence of subclinical and clinical milk fever. Use in diets after calving especially corn silage based diets, wet rations (<55% dry matter), low fiber diets (<19% ADF), finely chopped forages, greater than 6 lbs of grain fed at a feeding, and during heat stress conditions at the rate of approx. 0.75% of dry matter intake

Vitamin E

Role: Acts as a cellular antioxidant, prevention of white muscle disease, and retained placentas, and improves immune function to decrease the incidence and severity of clinical mastitis

Evidence:

- 1) Concentration of vitamin E in feedstuffs highly variable
 - Fresh green forage^o high amounts of alpha tocopherol
 - Longer mowed forages exposed to sunlight ^o lower concentrations of alpha tocopherol
 - Concentrates ^o low concentrations of alpha tocopherol
- 2) Supplementation of Vitamin E with adequate amounts of selenium ^o half of the studies have shown a decrease in the incidence of retained placentas, but other studies have shown no effect. (Weiss 1998 J. Dairy Sci 81:2493)
- 3) Studies by Smith and Hogan have shown that 1000 IU/day Vitamin E decrease the incidence of mastitis
- 4) No titration studies have been conducted with graded amounts of vitamin E and adequate amounts of selenium

Recommendation: Dry cows fed stored forages should be fed 1000 IU/day of vitamin E until further studies with varying amounts of vitamin E and adequate amounts of selenium are conducted. Continue to supplement dry cow diets with selenium at 0.3 ppm.

Niacin

Role: Decrease mobilization of fat from adipose tissue to help prevent fatty liver and ketosis

Evidence:

- 1) Some studies have shown an increase in milk production while others have not shown a production response. Early lactation cows may show the greatest response.
- 2) Generally, studies have shown that niacin fed prior to calving decreases concentrations of ketones in plasma.
- 3) However, niacin supplementation has had inconsistent effects on decreasing plasma concentrations of fatty acids and increasing plasma concentrations of glucose.
- 4) In two studies, niacin supplementation did not decrease severity of fatty liver at 1-day after calving or at 4 to 5 weeks after calving.

Recommendation: For prevention of fatty liver, feed 6 g daily of niacin. For treatment, 12 g daily of niacin may be needed.

Choline

Role: Serves as a methyl donor, may help prevent fatty liver, involved in neurotransmissions in the nervous system

Evidence: Excessively degraded in the rumen (less than 1% reaches the small intestines)

Recommendation: Not recommended until research with ruminally protected choline proves cost effective

Biotin

Role: Sulfur-containing water soluble B vitamin, important as a co-factor in various enzymes, plays a key role in gluconeogenesis, fatty acid synthesis, and amino acid catabolism in cattle, and plays a role in propionate production by rumen bacteria.

Evidence:

- 1) Three field trials reported by Seymour showed a reduction in hoof disorders when either 10 or 20 mg/day of supplemental biotin was fed. (Feedstuffs May 11, 1998)
- 2) To the authors knowledge, no studies have looked at the role of biotin in preventing metabolic problems in the close-up dry cow.
- 3) In one US trial, 20 mg/day of supplemental biotin increased 305-day ME milk production of first lactation cows.

Recommendation: More research is needed before biotin is added to diets for transition cows. May have a role in improving the hardness and tensile strength of hoof horns (supplement 20 mg/day throughout lactation and supplement 10-20 mg/day in the dry period)

Keys to a Profitable Dry Cow Program

- Test forages and balance rations for far-off dry cows. Grain mix fed to the far-off dry cows should supply the needed amounts of crude protein, energy, minerals and vitamins which can not be provided by the forages.
- Separate dry cows into a far-off and close-up dry cow group. Close-up dry cows are fed a diet specially formulated to meet their needs, prevent milk fever and other metabolic diseases, and to get these cows off to a good start after they calve.
- Feed mid to late lactation cows so they are turned dry with body condition score of 3.5. Dry cows should not be allowed to lose body condition during the dry period.
- House dry cows in an environment which decreases the chances of environmental mastitis. Dry cows should not be allowed access to stagnant ponds or allowed to congregate under shade trees.