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## Effect of forage quality during the transition period

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**T**HE transition period – three weeks before calving (“close-up period”) to three weeks after calving – is considered the most stressful time in a cow’s life. A properly formulated close-up diet should encourage ruminal adaptation to subsequent lactation diets, prevent metabolic disorders, and minimize tissue mobilization prior to and immediately following parturition.

Problems during the transition period often result in peak milk losses of 10 to 20 pounds (Wallace et al 1996), which translates into an economic loss of \$300 to \$600 for that lactation. The occurrence of health problems during the transition is clearly a major complicating factor for subsequent reproductive performance (Ferguson, 2001), resulting in additional economic losses. Therefore, poor management during the transition period increases feed costs per unit of milk produced and depresses income through lost production, a decline in reproductive efficiency, and greater incidences of metabolic disorders.

The general concept of ration changes during the transition is that nutrient density is increased gradually from that fed to far-off dry cows to the higher nutrient density required for transitioning cows so that milk pro-



duction can be maximized for the upcoming lactation. During the last two weeks of pregnancy, feed intake drops by about 30 percent, (Hayirli et al, 2002) but at the same time, nutrient requirements grow. Thus, it is important to feed a more nutrient dense diet to compensate for lower intakes. However, dry cows total dry matter intake (DMI) is usually in the range of 1.7 to 2.0 percent of body weight (BW). The amount of dry matter to feed depends upon the composition of available forages and the amount of weight gain

desired. The typical decline in DMI before calving results in the need to increase contents of crude protein (CP) and net energy of lactation (NEL) by about 2 percentage units and 0.2 Mcal/kg of DM, respectively, in the close-up diet (Drackley, 1999).

### Dietary consideration

Forage intake during the close-up period should be a minimum of 1.0 percent of body weight or 50 percent of the dietary DMI. Typically, high-quality forage results in more available nutrients, less feed needed to formulate a ration, a diet that is more similar to milking cow feed, and generally contains less molds and toxins.

Some things to watch out for with high-quality forages are too much energy/nutrients per unit of forage, thus, potentially adding body condition to cows, resulting in greater risk for ketosis and other problems associated with mineral imbalances. High-quality feeds may also decrease the amount of corn, soybean meal, and other grains (typically fed) to a point that we may not be feeding a ration similar enough to the diet that will be fed postcalving.

Some typical roughage sources for the dry period include coarse hays, grass hays, or grass-legume mixtures. Corn or sorghum stalks may be used when properly supplemented. High-quality forages maybe best reserved for early-lactation cows with high energy requirements. Also, finely chopped silage or ground hay should be minimized to reduce

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sorting of feed in the bunk and to avoid limiting effective fiber.

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Cows should consume at least 2 to 4 pounds of forage dry matter that is at least 1.5 inches long. Using higher-quality forages can have a major impact on ration energy density. High noneffective fiber by-product feeds such as wet corn gluten feed, soy hulls, beet pulp, and wheat midds that are easily digestible also can improve total energy intake.

While fermentation of fibrous feeds typically is thought to result in more acetate than propionate production in the rumen, greater fermentability still improves total energy supply and the supply of propionate for glucose production.

All feeds (particularly forages) vary in mineral concentration and should always be properly analyzed to determine their composition. Legume forages may need to be limited to no more than 30 to 50 percent of forage dry matter intake because heavy feeding of these forages can result in excessive protein, calcium, and potassium intake which increases the cow's susceptibility to udder edema, milk fever, ketosis, and certain types of reproductive problems caused by protein and mineral imbalances.

Corn silage should not provide more than 50 percent of forage DMI. Dry cows fed corn silage at greater than 50 percent of forage dry matter may become overconditioned and have more metabolic and reproductive problems at calving and during early lactation.

Maximizing DMI during the pre-fresh period will promote maximum DMI in early lactation and improve milk production. A grain mix should be formulated to meet the nutrient needs of the dry cow that are not supplied by the forage portion of the ration. If high quality hay or finely chopped silages are fed, it is usually beneficial to have grain mixtures higher in fiber to offset the low effective fiber intake from these forages. On medium-quality forage diets, usually a minimal amount of grain is needed to meet the energy and protein needs of dry cows.

Vitamins A, D, and E are all important for proper dry cow nutrition. Retained placentas have been associated with both vitamin A and E deficiencies (Hurley et al, 1989). Vitamin E deficiency is also related to reduced resistance to infection and higher incidence rates of mastitis and should always be supplemented during the transition.

The need for additional vitamin A is dependent largely upon the type and quality of forage fed. If green sun-cured hay is fed or if green pasture is available, there may not be a need for vitamin A supplement. However, if corn or sorghum silage or poor-quality hay is fed, it is good insurance to provide a source of supplemental vitamin A.

Vitamin D supplementation will also be needed when cows are fed direct-cut forages or forage that is ensiled. If doubt exists about the quality of the forages, it is cheap insurance to supplement dry cows with recommended levels of Vitamins A, D, and E.

The primary goal when feeding minerals during the dry period is to avoid excessive calcium (maintain a calcium to phosphorus ratio of 2.0:1), excessive potassium, and/or low levels of chloride. The control of calcium and phosphorus is important for the prevention of milk fever. Additionally, potassium levels

greater than 1.5 percent of the ration dry matter may interfere with magnesium absorption and calcium mobilization, also resulting in milk fever, as well as retained placenta, and downer cow problems at calving.

To assure proper intake of minerals and vitamins, it is desirable to incorporate these into the grain mix instead of offering them free-choice. Unlike lactating cows, buffers should not be fed to dry cows because of the greater likelihood of udder edema and milk fever. If udder edema is a problem, salt should be removed from the close-up ration.

Trace minerals are also important in preventing many of the metabolic disorders and infectious diseases encountered during the dry period.

Research by Mashek and Grummer, (2003)

### Take home messages:

1. Provide a palatable, well-balanced, and highly digestible diet.
2. Formulate a diet that properly adapts the rumen environment for the next lactation.
3. Design management systems to minimize stress on cows.
4. Body condition score at dry-off should be 3.25 to 3.75 (and maintained during the dry period).
5. Feed low potassium forages (get close to 1% as possible).
6. Feed adequate selenium (0.3 ppm) and vitamin E (2000 IU per day).
7. Supply extra trace minerals such as Cu, Mn and Zn to account for a decline DMI.
8. Maximize the appetite (to increase DMI) of the cow at and after calving.

suggested that cows fed more energy during transition will decrease intake more and will take longer to get on feed after transition. Since nutrient density is increased gradually from the diets fed to far-off dry cows compared to diets fed for close-up and fresh cows, fat supplementation is of interest.

VandeHaar et al, (1999) fed close-up diets with energy densities of 0.59, 0.68, and 0.73 Mcal/lb to cows during the last 28 days before calving. While prepartum DMI tended ( $P < 0.11$ ) to be about 0.71 pound greater for cows fed the highest energy diet compared with cows fed the lowest energy density, there was no difference in postpartum DMI, milk production, energy balance, or loss in body condition. However, other studies have shown no differences in postpartum responses to widely differing nutrient intakes during the close-up period (Dewhurst et al 2000; Holcomb et al

2001; Agenas et al., 2003).

More research is needed to identify the effects of fat supplementation in the dry period.

### Stress Considerations

In addition to the metabolic challenges and potential for nutritional stress if transition nutrition is less than optimal, transition cows may face additional environmental stressors (Grant and Albright, 1995). These may include heat stress, overcrowding, infectious challenge, poor ventilation, poor footing, uncomfortable stalls, poor grouping and cow movement management, and rough handling.

Every cow needs to have a comfortable stall to lie in and adequate bunk space for eating. Feed should be kept fresh, with feed alleys cleaned daily to prevent buildup of spoiled or moldy feed. This is especially important in hot climates where feed quickly goes out of condition.

The cumulative effects of multiple stressors are additive and may not show up immediately. For example, factors contributing to milk fever or a retained placenta postpartum occur two weeks prior to calving and the problem cannot be corrected right away. Rather it must be prevented by proper nutrition and management during the transition period.

Deficiencies in management that individually would not have major impact on dairy cow health and productivity (i.e., "subclinical stressors") may sum to result in pronounced negative effects. It is well-known that overconditioned cows (>4.0 on a 5-point scale) are at greater risk for development of metabolic problems (Morrow, 1976; Fronk et al, 1980; Van Den Top, et al 1995). Overconditioned cows have poorer DMI after calving (Bines and Morant, 1983; Fronk, et al 1980) and readily break down their large stores of body fat. Obesity increases susceptibility to the complex of metabolic disorders and infectious diseases known as the "fat cow syndrome" (Morrow 1976).

### Summary

When setting goals for the dry cow program, remember that no single program will fit all cows or all dairies. Regardless of forage quality, a properly formulated and delivered close-up diet to cows during late gestation provides the foundation for a successful transition. Dairies should feed a ration that delivers a consistent and highly palatable source of balanced nutrition, provides the nutrients needed to support basic functions of the cow, and reduces "nutritional stress".

Even a well-formulated close-up diet, however, likely cannot overcome or prevent the cumulative stresses of poor management (overcrowding, poor sanitation, improper grouping or cow movement, bad footing, uncomfortable stalls, etc.) and climatic stressors (excessive heat and humidity, heavy rains and mud, etc.). This concept likely explains why "outbreaks" of metabolic disorders often follow a period of excessive rain and mud, or are more frequent during summer heat.

The impact of forage quality on the transition diet is of considerable interest. Currently, there is limited data available that show a clear advantage of high-quality forage over lower-quality forages fed in a well-formulated diet. The overall impact of forage quality in the transition diet will depend on other feed stuffs available and their costs formulated

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