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Alternative forages for the dry cow diet

Dairy operations large and small continue to be plagued by a high incidence of metabolic disorders and infectious diseases around calving. Turbulent transitions increase health care expenses, decrease milk production, impair reproductive performance, and result in premature culling or death. Farm profitability and animal well-being both suffer. Despite many years of research and field emphasis, practical management strategies to minimize health problems while still promoting high milk production have remained vague. Overall, research data fail to demonstrate that steam-up diets (high-energy diets solely based on corn silage) consistently improve production, body condition, reproduction, or health after calving. Is there a better way? We believe there is: controlled energy during the dry period.

In recent decades, our research group has investigated whether controlling energy intake during the dry period might lead to better transition success. Our solution to the problem of excess energy consumption is to formulate rations of relatively low energy density (0.59 – 0.63 Mcal NEL/lb DM) that cows can consume free choice without greatly exceeding their daily energy requirements. It is important to note that we are not proposing to limit energy intake to less than cows' requirements but rather to feed them a bulky diet that will only meet their requirements when cows consume all they can eat.

The strategy

Controlling energy with high-fiber rations seems to improve DMI after parturition, thereby avoiding excessive adipose tissue lipid mobilization (Douglas et al., 2006). Milk production is similar when compared with higher-energy close-up programs (Douglas et al., 2006; Janovick and Drackley, 2010; Mann et al., 2015). Additionally, the benefits of the controlled-energy diet prepartum seem to have a positive effect on cows' fertility (Cardoso

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et al., 2013, 2019). This dietary strategy aims to formulate and feed rations with relatively low energy density (0.59 – 0.63 Mcal NEL/lb DM) during the entire dry period. The incorporation of low-energy ingredients (straw or low-quality grass hays) allows cows to consume the diet ad libitum without exceeding their daily energy requirements (Janovick and Drackley, 2010).

Nutritionally balanced diets must be fed and the TMR must be physically processed appropriately so that cows do not sort the bulkier ingredients. Feeding bulky forage separately from a partial TMR, or improper forage processing (i.e., nonhomogeneous chop length of the forage) will lead to variable intake among cows, with some consuming too much energy and some too little (DeVries et al., 2005). Recently, researchers have reported that Holstein cows consuming a prepartum diet (29% wheat straw on a DM basis; 13.2% CP, 1.5 Mcal of NEL/kg) with wheat straw chopped shorter (short straw chopped) had greater TMR DMI (15.6 kg/d; SE = 0.16) in the dry period than cows consuming wheat straw chopped longer (long straw chopped; 15.0 kg/d; SE = 0.16) (Havekes et al., 2019). Wheat straw was chopped using a bale processor using a 2.54-cm screen for the short straw chopped and a 10.16-cm screen for the long straw chopped (Havekes et al., 2019). Additionally, cows consuming the longer chopped wheat straw had greater blood BHB in the wk 3 postcalving than cows consuming the shorter chopped wheat straw (1.3 ± 0.11 vs. 0.8 ± 0.10 mmol/L, respectively) (Havekes et al., 2019). It is still to be determined if particle size and sorting is even more relevant in moderate- to high-energy diets (0.68 Mcal of NEL/lb) when compared with CE diets (0.59 Mcal of NEL/lb) prepartum.

Underfeeding relative to requirements, where nutrient balance also is likely limiting, leads to increased incidence of retained placenta and metritis (Mulligan et al., 2006). Merely adding straw to a diet is not the key principle; rather, the diet must be formulated to limit energy intake (approximately 0.64 Mcal of NEL/lb of DM, to limit intake to about 15 to 16 Mcal/d for typical Holstein cows) and at the same time meet the requirements for protein, minerals, and vitamins.

Less is known about diet formulation for the immediate postpartum period to optimize transition success and subsequent reproduction. Proper dietary formulation during the dry period or close-up period will maintain or enable rumen adaptation to higher-grain diets after calving. Failure to do so may compromise early lactation productivity. For example, Silva-del-Rio et al. (2010) attempted to duplicate the dietary strategy of Dann et al. (2006) by feeding either a low-energy far-off diet for 5 wk followed by a higher-energy diet for the last 3 wk before parturition, or by feeding the higher-energy diet for the entire 8-wk dry period. The authors reported that cows fed the higher-energy diet for only 3 wk before parturition produced less milk than cows fed the diet for 8 wk (43.8 vs. 48.5 kg/d). However, the far-off dry period diet contained 55.1% alfalfa silage and 38.5% wheat straw but no corn silage. In comparison, the higher-energy dry period diet and the early lactation diet both contained 35% corn silage. It is likely that the degree of ruminal adaptation was insufficient for cows fed the higher-energy diet for only 3 weeks. Therefore, formulation and delivery of appropriate diets that limit total energy intake to requirements but also provide proper intakes of all other nutrients before calving can help lessen the extent of NEB after calving. Effects of such diets on indicators of metabolic health are generally positive, suggesting the potential to lessen effects of periparturient disease on fertility. Strategies for diet formulation to improve DMI and lessen NEB of fresh cows are less well researched, but the balance between adequate physically effective fiber and starch fermentability is critical.

What forage to use?

To accomplish the goal of controlled energy intake requires that some ingredient or ingredients of lower energy density be incorporated into diets containing higher-energy ingredients such as corn silage, good quality grass or legume silage, or high-quality hay. Cereal straws, particularly wheat straw, are well suited to dilute the energy density of these higher-energy feeds, especially when corn silage is the predominant forage source available. Therefore, wheat silage has the potential to be an alternative to wheat straw (Figure 1).

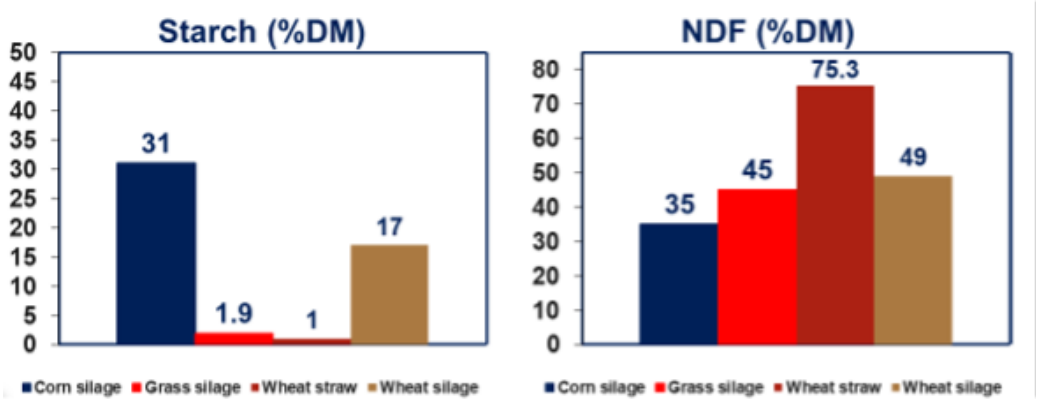

Figure 1. Chemical analysis of common forages used in dry cow diets.

Harvest should probably begin when the wheat just reaches the boot stage; if harvest proceeds quickly without interruptions from weather, etc., the last silage cut should be in the early head stage. Its greater crude protein (16% of DM) and moderate starch (21% of DM) contents may allow for savings in feeding corn and soybean meal in the dry cow diet. Usually, wheat silage is high in chloride (1.30% of DM), making it easier to balance for a negative dietary cation anion difference (DCAD).

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