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Effects of moderating forage and energy intake in dry cows on periparturient performance and health

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Introduction

Research focusing on dry cow nutrition and management has intensified over the past 10 years. It is generally accepted that nutritional management in the dry period affects metabolic status in the subsequent lactation. Feeding strategies that avoid excess consumption of energy during the dry period and minimize body fat mobilization after calving will likely optimize success in transition cows.

A dry cow requires about 15.5 Mcal NE_L/day to meet energy demands for maintenance and pregnancy. Nutritionists are challenged with packaging balanced diets that can be consumed at an ad libitum rate without greatly exceeding energy requirements. This challenge is further compounded by today's dairy cow's intense drive for feed intake and continued agronomic improvements and forage digestibility. Moderate energy diets fed during the dry period show promise in reducing postpartum metabolic disorders such as ketosis, fatty liver and displaced abomasum (Beever, 2006; Dann et al., 2006; Douglas et al., 2006). These moderate energy diets contain low energy forages, such as wheat straw, to dilute the dietary energy density and prevent overconsumption of energy (Drackley and Janovick Guretzky, 2007). Wheat straw has been successfully used in this regard, but cost and availability may make alternative forages more attractive in some regions of the United States.

Previous research conducted at the University of Illinois showed success with feeding wheat straw diets and feeding higher energy diets with restricted intake (Dann et al., 2006). Research combining both wheat straw with restricted intake has not yet been conducted. Evaluation of dry cow diets containing wheat straw or grass hay has not been published.

Materials and Methods

Forty Holstein and Cross-bred multiparous dairy cows were placed on one of four dietary treatments (N=10) for a 45 day dry period; 1) 30% wheat straw TMR fed ad libitum (WSA), 2) 30% Orchard-grass TMR fed ad libitum (OGA), 3) Wheat straw TMR (1) fed restricted (WSR); 4) Orchard grass TMR (2) fed restricted (OGR) to meet NRC, 2001 recommendations for energy intake based on body weight at dry-off. Diets were formulated to be isocaloric and isonitrogenous and fed in amounts to ensure all nutrient requirements were met (NRC, 2001). After calving, cows were placed on a common lactation diet. Cows were monitored from day -45 before calving until +30 days after calving. Feed intake and milk yield (lactation phase) were recorded weekly. Milk samples were collected weekly from one AM and one PM milking. Liver biopsies were collected on d -30, -14, +1, +14, and +28. Days on treatment averaged 43.1, 38.8, 41.3, and 39.4 for treatments WSA, OGA, WSR, and OGR respectively. Three cows assigned to OGA gave birth to twins.

Results

As planned, pre-partum dry matter (DMI) and energy intake were lower ($P < 0.05$) for WSR and OGR compared with WSA and OGA. Least square means for prepartum energy intake were 24.7, 23.0, 19.2 and 15.2 Mcal/d for WSA, OGA, WSR, and OGR. Cows fed WSA consumed 160% and OGA consumed 148% of recommended (NRC, 2001) energy intake. Prepartum body weight, body weight change, and body condition score were not different among treatments. Restricted fed cows were in slightly positive energy balance until two weeks prior to calving. Postpartum, negative energy balance was greater for cows fed WSR and OGR compared with WSA and OGA. Milk yield, fat corrected milk yield, percent milk fat, percent milk protein, milk protein produced, fat to protein ratio, and percent lactose were not different among treatments. Yield of milk fat tended ($P = 0.06$) to be higher for OGR compared with all other treatments. Liver total lipid amount was not different among treatments. Dairy efficiency tended ($P = 0.06$) to be lowest for GHA.

Significance

When fed at an ad-libitum rate, cows fed high forage diets containing either 30% chopped wheat straw or 30% chopped orchard grass hay consumed excessive amounts of energy. Restricted feeding wheat straw or grass hay during the dry period resulted in a tendency for decreased postpartum DMI, energy intake and energy balance but did not reduce milk or milk component yield. Data from this study suggests that diets balanced to be equal in nutrient composition containing either 30% chopped wheat straw or grass hay resulted in similar performance.

Acknowledgements

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