

The influence of different nutritional planes in the dry period on immunoglobulin G concentration of bovine colostrum

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Introduction

High-quality colostrum is important for successful rearing of calves. Parity and length of dry period have been discussed as factors influencing the quality of colostrum. However, the role of the nutritional plane of the cow during the dry period and its effect on the colostral immunoglobulin G (IgG) concentration remains unclear. Results from studies carried out in sheep suggest that colostrum volume as well as composition can be affected by different energy levels prepartum. Furthermore, recent publications in the field of human medicine have found lower concentrations of IgG in colostrum from women suffering from an altered insulin response. Because dry cows on a high-energy diet are at increased risk to develop insulin resistance, and their colostrum volume and IgG concentration might be affected in a similar manner as that in other species, the objective of this study was to evaluate the effect of different nutritional planes during the dry period on colostrum composition.

Materials and Methods

The study had a randomized blocked design. Cows were dried off 57 days before expected calving and randomly assigned to 1 of 3 treatments (low [14.3% crude protein (CP), 46.2% neutral detergent fiber (NDF), 13% starch], intermediate [12.7% CP, 42.4% NDF, 18.1% starch], or high [11.1% CP, 38.7% NDF, 23.2% starch] energy diets). Cows in the low and high treatment groups were fed the assigned ration for the duration of the dry period, whereas the cows in the low treatment group were fed the low-energy ration for 28 days and then switched to an intermediate-energy ration for the remainder of the dry period. Cows were milked within 60 minutes after calving and the total colostrum was weighed. Composite samples were collected and refrigerated until analysis. For each colostrum sample, the IgG concentration was determined via radial immunodiffusion performed by the Animal Health Diagnostic Center.

Mean colostrum IgG concentration and weight were compared among the 3 treatment groups by use

of multivariable ANOVA with posthoc Tukey's HSD. Explanatory variables evaluated included colostrum weight at first milking, parity, calf birth weight, number of days dry, and treatment group.

Results

Study cows were dry for a mean of 55 days; 39 cows were in their second parity and 24 were in their third or greater parity. The mean birth weight of calves was 96.8 lb (44 kg). The mean colostral IgG concentration for the low treatment group (99 g/L) was significantly ($P = 0.03$) higher than that for the high treatment group (74.1 g/L), whereas the mean colostral IgG concentration for the intermediate treatment group (88.1 g/L) did not differ significantly from that for the low ($P = 0.53$) or high ($P = 0.31$) treatment groups. Parity, number of days dry, and calf birth weight were not significantly associated with IgG concentration. The weight of colostrum produced was 12.4 lb, 14.0 lb, and 17.0 lb (5.6 kg, 6.4 kg, and 7.7 kg) for cows in the low, intermediate, and high treatment groups, respectively, and did not vary significantly among the groups.

Significance

For the cows of this study, the colostral IgG concentration was greater than the industry recommended levels (50 to 60 g/L) for all 3 treatment groups. For herds in which the mean colostrum IgG concentration is lower than that observed in this study, the lower IgG concentration associated with the high-energy diet might be problematic, especially if other factors associated with a decreased colostral IgG concentration, such as increased time to first milking, are present. Although the amount of colostrum was lowest for cows in the low treatment group, this group had the highest colostral IgG concentration, which was sufficient to provide 3 to 4 L of colostrum with the recommended concentration of IgG (100 to 200 g/L) for the first feeding of newborn calves.