NON-DIETARY SOURCES OF VARIATION IN MILK UREA NITROGEN IN OHIO DAIRY HERDS

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Protein is an expensive component of dairy cow diet and excessive protein feeding has been associated with decreased fertility. Urea is the end product of protein metabolism in dairy cattle. Milk urea nitrogen (MUN) can be used to monitor the protein feeding efficiency and protein-energy ratio in dairy cow rations. The purpose of this study was to describe the non-dietary sources of variation in and the factors associated with MUN levels in Ohio dairy herds. The data came from 24 herds belonging to Ohio Dairy Herd Improvement Association. Half of the herds (12) were classified as low producing herds (rolling herd average (RHA) milk production <7,258 kg) and half (12) as high producing herds (RHA milk production >10,433 kg). MUN concentration was measured spectrophotometrically from monthly test day milk samples by an automated procedure with a Skalar Segmented Flow Analyzer.

We had observations from 12,939 test days, from 1681 cows. The data were analyzed using multilevel modelling technique in MLwiN®, separately for both production groups. Different levels of organization were herd, cow, and test day. Initially, a simple random intercept model containing only a constant was run. Explanatory variables previously identified being associated with MUN were added to the model as fixed effects and model was reduced until all variables were significant at ?=0.05 level.

The average MUN level from the simple intercept-only model was 14.1 mg/dl and 11.0 mg/dl in the high and low producing herds, respectively. The overall variation in MUN's was greater in low producing herds than in high producing herds. Also, the variance structure was quite different between these two groups. In low producing herds, 67.2% of the variation in MUN's was at the test day level, only 0.5% at cow level and 32.3% at herd level. In the high producing herds, however, highest proportion of variance (49.0%) was found at the herd level and 38.9% of the variation was at the test day level. Between-cow variability accounted for 12.1% of the variance in MUN's. With the independent variables in the model, variation was reduced in low production group (by 16%), but practically no change in magnitude took place in the high production group.

The results also indicated that measurements taken during the first month of lactation were significantly lower than ones taken later in the lactation. Also, the season of the test day was associated with MUN levels (summer or spring with highest levels). Cow's test day milk yield and fat-protein ratio in milk in high producing herds were also positively associated with MUN levels. In low producing herds, milk fat percentage was negatively associated with MUN levels.

The observed differences in the proportions of variance at the different levels between the production groups may be explained by management factors. Lower variability in MUN between test days in high producing herds probably indicates more consistent day-to-day feeding and management within a herd in this group.