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Changes in Milk Urea Nitrogen During Early Lactation in Holstein Cows

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Story in Brief

Milk urea nitrogen is a relatively new test developed to assess dietary needs of lactating dairy cows. This study was designed to evaluate the effect of week postpartum on milk urea nitrogen (MUN) values. Pluriparous Holstein cows (n=19) were milked twice daily and milk samples were collected twice a week for analysis. Milk urea nitrogen significantly increased between wk 1 and 3 of lactation. After 3 wk of lactation, MUN did not change and varied between 20 and 22 mg/dL. We conclude that week of lactation should be considered when interpreting MUN values.

Key Words: Milk Urea Nitrogen, Dairy Cows, Lactation

Introduction

Many high producing dairy cows are unable to consume enough feed to meet energy demands during early lactation. Therefore, they rely on their ability to mobilize body energy reserves to meet energy requirements, and subsequently enter a state of energy balance deficiency. Energy balance is quantified using measures of milk production, dietary intake, and body weight (Spicer et al., 1990). Lactating dairy cows in positive energy balance have greater reproductive function than cows in negative energy balance (Spicer et al., 1990). Because energy balance is impractical to measure, other factors have been measured to relate nutritional status and reproductive function. One of these factors is MUN (Eicher et al., 1999). It has been suggested that excess dietary protein can be easily diagnosed and corrected using MUN analyses (Eicher et al., 1999). Plasma urea nitrogen and MUN levels measured in the same cows do not differ and are highly correlated (Butler et al., 1996). Other evidence has indicated that pregnancy rates decrease as MUN concentrations increase (Butler et al., 1996; Melendez et al., 2000). However, little work has been conducted to evaluate normal changes in MUN levels during early lactation. The objective of this study was to determine the changes in MUN concentrations during early lactation in Holstein cows.

Materials and Methods

Fall calving pluriparous Hostein cows (n=19) maintained at the Oklahoma State University Dairy Cattle Center were fed a total mixed ration consisting of concentrates, sorghum silage, alfalfa hay and cottonseed. Energy concentration of the diet was formulated to support daily milk production of 100 lb. Daily feed intake was recorded and the diet was sampled weekly and composited by month for analyses.

Cows were milked twice daily (3:00 a.m. and 3:00 p.m.) and milk yield was recorded. From wk 1 to 12 of lactation, milk samples were collected weekly during successive a.m. and p.m. milkings and analyzed for milk fat, protein, lactose, solid non-fat, somatic cell count and urea nitrogen content at the Heart of America DHIA (Manhattan, KS). Body weights were recorded weekly and body condition score (5-point scale, 1=very thin to 5=excessively fat) was performed for each cow on wk 4 and 10 postpartum. Data were analyzed using PROC MIXED with sources of variation including cow and week

postpartum. Data are presented as least squares means ± SEM.

Results and Discussion

Weekly average body weights decreased (P<.05) from wk 1 to 3 but did not change between wk 5 and 12 of lactation (data not shown). Average body condition score (BCS) increased (P<.01) between wk 4 (BCS=2.5) and 10 (BCS=2.9). Dry matter intake gradually increased (P<.05) between wk 1 and 8 (data not shown).

Percentage milk fat increased (P<.05) between wk 1 and 3 of lactation and gradually decreased between wk 3 and 12 (data not shown). Milk protein and solids non-fat levels decreased (P<.05) between wk 1 and 3 postpartum and remained constant between wk 4 and 12 postpartum (data not shown). Percentage milk lactose increased (P<.001) between wk 1 and 4, plateaued from wk 5 to 8 and decreased (P<.05) thereafter (data not shown). Weekly somatic cell cows did not change (P>.10) between wk 1 and 12 of lactation and averaged 430,000 ± 157,000.

Milk urea nitrogen concentrations increased (P<.05) during early lactation, plateauing after wk 3 (Figure 1). It has been suggested that overfeeding of rumen soluble protein can be easily diagnosed and corrected using MUN analyses (Eicher et al., 1999). High (> 17 mg/dL) levels of MUN have been associated with lower pregnancy rates (Butler et al., 1996; Melendez et al., 2000). As determined in the present study, average MUN ranged between 20 to 22 mg/dL between wk 3 and 12 postpartum. Although pregnancy rates were not measured in the present study, ovarian function, as measured by plasma progesterone levels, appeared normal in these cows. We conclude that week of lactation should be considered when interpreting MUN values.

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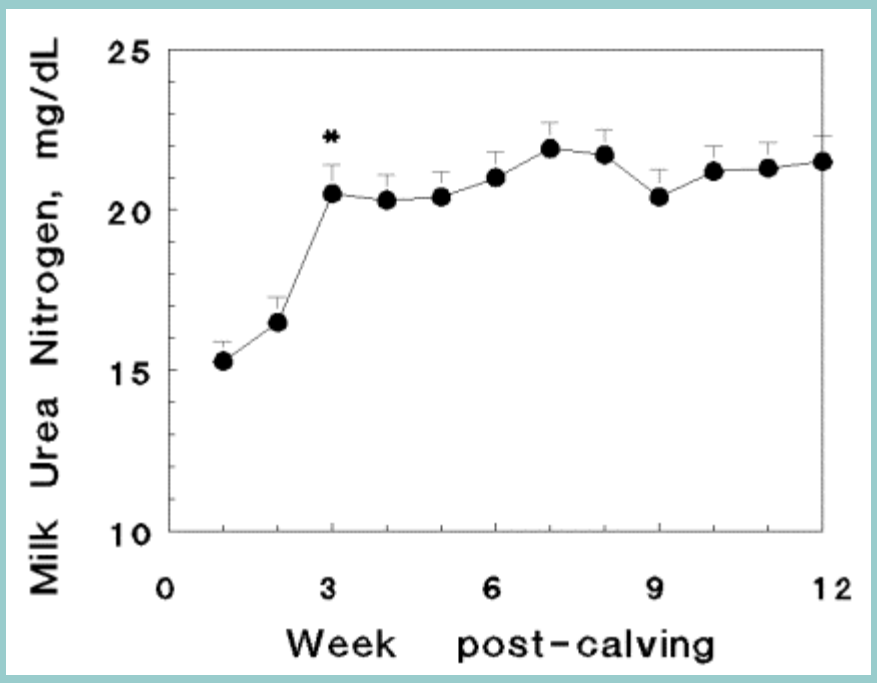

Figure 1. Relationship between average weekly MUN concentrations and week of lactation in Holstein cows.

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