

Milk Urea Nitrogen Evaluation in Louisiana Dairy Herds

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Dietary protein has long been recognized as a key nutrient for high milk production in dairy cows, but determining how much protein a cow consumes and how well it is utilized is a difficult undertaking, particularly at the farm level. Interest in the use of milk urea nitrogen (MUN) concentrations as a practical indicator of dietary protein status in dairy cows has grown considerably in recent years. Excess protein is converted to ammonia in the rumen of the cow which is absorbed into the bloodstream and ultimately detoxified as urea by the liver. The levels of urea in the blood equilibrate with milk concentrations of the N product leading to an increase in MUN. Normal levels of MUN range from 12 to 18 mg/dl with values below 12 mg indicating insufficient dietary protein intake for maximum milk yield, and concentrations above 18 mg/dl indicating excess crude protein intake, and or soluble protein in the diet. Feeding excess dietary protein is costly and recent research at the Southeast Research Station has shown a detrimental effect on reproduction in dairy cows. Yet, little is known about urea concentrations in the milk from Louisiana dairy herds and how they relate to season, feeding systems employed, and animal performance.

To answer some of these questions, monthly bulk-tank milk samples were collected from twenty-six Louisiana dairy farms from March through August of 1998. All herds in the study employed artificial insemination and were using the Louisiana Dairy Herd Improvement

Association record keeping system which provided information on feeding practices, lactation performance and reproduction. Milk urea nitrogen concentrations were determined via colorimetric methods.

Seasonal Effects on MUN Concentrations

Average MUN levels peaked in April at 17.9 mg/dl and declined to 14.2 mg/dl in August (Figure 1). Although these averages seem fairly moderate, some herds experienced monthly concentrations as low as 9 mg/dl while others contained MUN levels as high 26 mg/dl, well outside the recommended range of 12 to 18 mg/dl. In fact, 58% of the herds evaluated had one bulk-tank MUN sample above 18 mg/dl during the spring months of March through May, but only 29% of the herds exhibited elevated MUN during summer months. During the spring, 85% of the herds used ryegrass pasture in their forage systems. Young ryegrass pasture often contains 30%, or more, crude protein of which as much as 45% may be present in the soluble form. These high concentrations of ryegrass protein, coupled with a relatively high protein concentration in grain supplements (80% of grain supplements contained 18% or more protein on an air dry basis), likely provided more dietary protein than required by the lactating dairy cow. As previously mentioned, excess dietary protein is converted to ammonia by microorganisms in the rumen of the cow, and is quickly absorbed into the bloodstream and converted to the less toxic urea by the liver. The levels of urea in the blood equilibrate with milk concentrations of the N product leading to an increase in MUN.

At the other end of the spectrum, only 15% of milk samples tested had MUN concentrations below 12 mg/dl, indicating that dietary protein shortage was not common among the herds evaluated.

Variations in MUN with Feeding System

An examination of feeding systems used on the dairies revealed that in the spring about 20% used pasture (ryegrass) alone, 35% used pasture plus some form of ensiled forage, 20% used pasture and hay, 15% used pasture supplemented with wet brewer's grains and less than 10% employed total mixed rations (TMR; grain and forage mixed). In summer months, pasture (bahiagrass, bermudagrass, or crabgrass) usage was similar to that recorded in spring months, but the proportion of herds using a TMR increased to nearly 20% of the total.

Milk samples from herds that relied on pasture and hay or a TMR to meet forage needs generally had acceptable MUN concentrations (Figure 1). In contrast, bulk tank MUN samples from herds that received only pasture or pasture supplemented with wet brewer's grains were high, averaging between 18.3 and 19.5 mg/dl. A few herds receiving ensiled forages experienced MUN concentrations below the recommended threshold of 12 mg/dl, suggesting that protein shortages may have occurred. Most of the silage used in the dairy herd feeding systems was made from whole-plant corn, a low protein forage.

MUN Concentrations and Herd Performance

In this study, milk production, i.e. average test day milk yield, was not closely correlated with bulk tank MUN concentration; however, average milk fat and protein percentages tended to be lower when MUN was greater than 18 mg/dl. A poor correlation between MUN and milk yield may be due to the fact that most herds with MUN concentrations outside the range indicative of optimum protein nutrition were high, suggesting that more than enough protein was available for maximum milk production.

Although the number of breedings per herd per month was not different due to milk urea

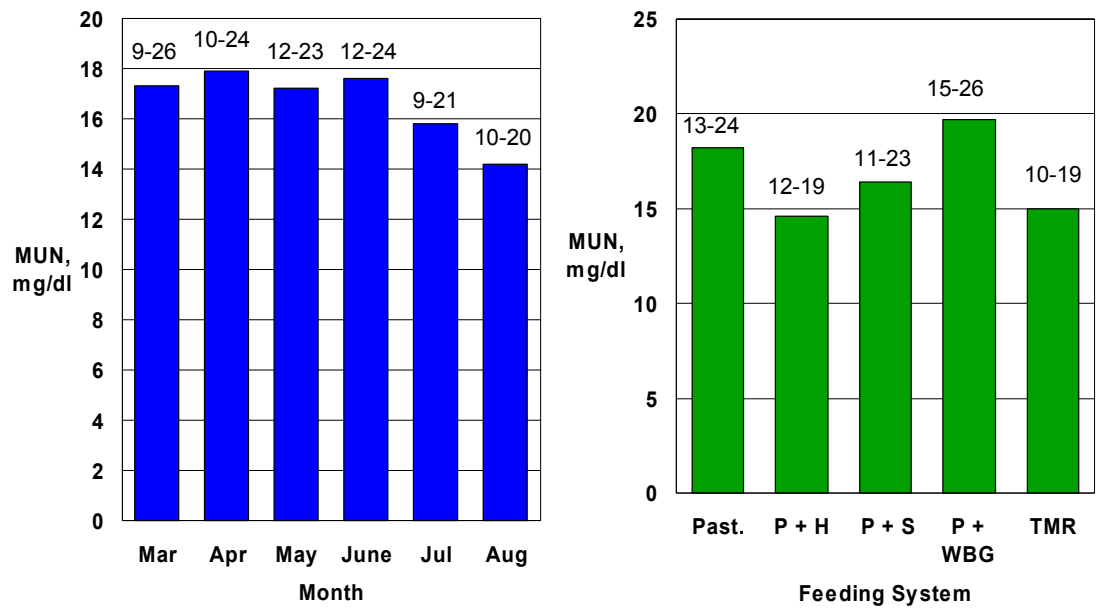
nitrogen concentration, the number of services per pregnancy and the number of cows diagnosed pregnant tended to be higher when MUN was lower than 18 mg/dl. This supports recent research at the Southeast Research Station where dairy cows within the recommended range of urea N in milk and plasma experienced 29% higher pregnancy rates than those cows with high urea (25.0 mg/dl).

Implications for Dairy Producers

The results of this study show that bulk tank milk urea N can be used as an indicator of dietary protein excess or deficiency in dairy cattle. Since Louisiana dairy herds showed a higher concentration of milk urea N in spring months when most cows were grazing ryegrass, some herds may benefit from lowering the protein content in grain supplements, particularly when ryegrass is immature and abundant. Producers may be able to use bulk tank MUN to monitor dairy herds after a ration change, when cows change pasture, or when a new forage is used. Bulk tank samples are useful for monitoring protein nutrition on a herd level, but individual cows or cow groups may need to be sampled in order to diagnose where a particular problem is occurring.

It appears that MUN analysis offers dairymen another tool to help fine tune nutritional needs of cows which may potentially improve profitability by reducing protein costs, improving milk yield, and lowering reproductive costs. Commercial laboratories are available that will measure MUN concentrations for a nominal fee.

Figure 1. Effect of Season and Forage System on Bulk Tank MUN Concentrations in Louisiana Dairy Herds.



Note: MUN = milk urea nitrogen, numbers above bars indicate minimum and maximum values for each category. Past. = pasture only, P + H = pasture and hay, P + S = pasture and silage, P + WBG = pasture and wet brewers grains, and TMR = silage-based total mixed ration.