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Milk urea nitrogen: a nutritional management tool

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Abstract

Milk urea nitrogen (MUN) analyses can be used to evaluate the nutritional status of dairy herds and for fine tuning the feeding program. MUN values >18 mg/100 ml indicate that dietary protein is being wasted and feed costs could be reduced with ration adjustments. Higher than desired MUN values also indicate the need for additional undegradable intake protein (UIP; bypass protein) in the ration. High MUN values can also indicate the need for more nonstructural carbohydrates (NSC) in the diet. MUN readings <14 mg>/100 ml indicate dietary crude protein deficiencies or too much UIP in the ration. Reduced milk production or low milk protein tests can occur when feeding rations that produce low MUN tests. Poor reproductive performance may be the result of feeding rations that produce high MUN measurements. Conception rates may be reduced as much as 20 percentage points when MUN is >18 mg/100 ml.; Dairy Day, 1996, Kansas State University, Manhattan, KS, 1996;

Keywords

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MILK UREA NITROGEN: A NUTRITIONAL MANAGEMENT TOOL

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Summary

Milk urea nitrogen (MUN) analyses can be used to evaluate the nutritional status of dairy herds and for fine tuning the feeding program. MUN values >18 mg/100 ml indicate that dietary protein is being wasted and feed costs could be reduced with ration adjustments. Higher than desired MUN values also indicate the need for additional undegradable intake protein (UIP; bypass protein) in the ration. High MUN values can also indicate the need for more nonstructural carbohydrates (NSC) in the diet. MUN readings <14 mg/100 ml indicate dietary crude protein deficiencies or too much UIP in the ration. Reduced milk production or low milk protein tests can occur when feeding rations that produce low MUN tests. Poor reproductive performance may be the result of feeding rations that produce high MUN measurements. Conception rates may be reduced as much as 20 percentage points when MUN is >18 mg/100 ml.

(Key Words: Milk Urea Nitrogen, Nutrition Management, Conception Rates, Protein.)

Introduction

A new technology, milk urea nitrogen (MUN) testing, is available to dairy farmers to help manage the nutrition program. Until recently, blood samples had to be tested for blood urea nitrogen (BUN) for a similar evaluation. Now, through the DHI testing program, milk samples can be tested for MUN much more conveniently and at less expense.

Concentrations of MUN and BUN tend to be in equilibrium with each other. Thus, an analysis for MUN provides a good evaluation of the concentration of urea in blood.

The main source of urea in blood is from microbial protein digestion in the rumen. Ruminal microbes produce ammonia from digestion of degradable intake protein (DIP). This ammonia is used by the microbes to synthesize amino acids for their growth. If too much DIP is available, the concentration of ammonia will increase and be ruminal absorbed into the blood stream. Ammonia in the blood is converted to urea by the liver, causing BUN to increase. Urea is removed from the blood stream by the kidneys and is excreted in the urine. Hence, protein from the ration can be wasted if too much ammonia is released in the rumen. Some of the urea also re-enters the rumen via saliva.

Ammonia can increase in the rumen if the NSC content of the diet is too low. The ruminal microbes require a readily available source of energy, NSC, in order to grow, reproduce, and utilize ammonia. Thus, rations containing relatively low NSC will increase ruminal ammonia and MUN.

Research has shown that conception rates have increased as much as 20 percentage points when MUN was lower than 19 mg/100 ml. Apparently, the uterine environment is less than desirable for implantation of the embryo when MUN is high.

Low MUN concentrations usually indicate a protein-deficient ration. In addition, rations too high in undegradable intake protein (UIP) can cause low MUN readings. In either situation, the amount of DIP is too low and protein digestion in the rumen is depressed, resulting in less dry matter intake and milk production. Depressed milk protein tests usually are associated with low MUN values, low NSC intake, and(or) excess UIP in the ration.

Testing DHI milk samples for MUN can lead to more precisely balanced rations, higher milk protein tests, and improved reproductive efficiency.

When to Test for MUN

Most herds will not need to be tested for MUN every month. The best time to test the herd would be after significant ration changes, such as using different ingredients in the grain mix or different forages. An initial test is needed to determine normal or typical ranges in MUN values. Variation will be observed among cows, so averages for groups of cows or the herd will be the most meaningful. Using the EBS or PCDART program, cows should be grouped and averaged by stage of lactation. Cows in milk less than 50 days, 50 to 100 days, 101 to 200 days, and over 200 days would be one method to group MUN values.

Knowing the MUN concentration of cows in milk less than 50 days seems to be important for determining if protein feeding is adequate during the establishment of peak milk production. Cows in milk 50 to 100 days should be scrutinized to avoid MUN problems associated with poor conception rate. The MUN content for cows in milk 101 to 200 days is important for determining that dietary protein intake is not limiting production. High MUN readings indicate that cows in milk more than 200 days may be wasting protein.

Because MUN values are closely related to the ammonia concentration in the rumen, variation between the MUN readings of the morning and evening milkings can occur. This will depend somewhat on the feeding schedule. If a considerable difference occurs between morning and evening MUN, feeding more than once per day is recommended. Using the DHI-AP testing schedule will indicate the difference between milkings.

Interpreting MUN Tests

Group MUN averages will be more meaningful than evaluating individual cows, because considerable variation exists among cows. The desired range for average MUN is 14 to 18 mg/100 ml. Careful evaluation of test results should be made. If MUN tests are out of the normal range, ration reformulation is indicated. To be assured that dietary protein is not limiting production, however, MUN tests should be in the upper part of the normal range.

Interpretation of MUN test results and recommendations are given in Table 1.

Conclusions

MUN testing through the DHI program provides dairy farmers with the latest technology for nutritional management of dairy herds. MUN test results can be used as a guide for making ration changes to:

- ✓ reduce dietary protein wastage,
- ✓ detect dietary protein deficiencies,
- ✓ improve conception rates, and
- ✓ improve protein content of milk.

Although MUN testing will increase the cost of DHI testing, the benefits will outweigh the cost when it is used to adjust rations properly.

Table 1. Interpreting MUN Averages for Groups of Cows

Average MUN (mg/100 ml)	Interpretation	Suggested remedy
14 to 18	Ideal range. If average is in lower part of range, cows may benefit from more protein in the diet.	Consider increasing protein intake, if early fresh cows average in lower part (<50 days in milk) of range.
>18	Higher than desired. Dietary protein may be wasted and(or) conception rate reduced.	Consider reducing protein content of ration. Evaluate UIP content of ration. UIP should range between 35 to 40%. NSC content of ration may be too low. Replacing some byproduct feeds or milo with corn or wheat will increase NSC.
<14	Lower than desired. Expect milk production and(or) milk protein test to be depressed.	Increase protein in ration. Evaluate UIP content of ration. The UIP should be in the 35 to 40% range.