# Milk Urea Nitrogen Measurements from a Field Study

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**Milk Urea Nitrogen (MUN)**

As dairy farming has moved into the next millenium, there will be an increasing number of management "tools" available to farmers. One such "tool" to help monitor the nutritional and environmental aspects of dairy farming is the interpretation of milk urea nitrogen (MUN) data. For an additional charge to producers, this information can be recorded monthly on DHIA sheets. The analysis obtained can be valuable in helping a farmer, a nutritionist or a veterinarian determine if the protein being fed to the herd is appropriate. Previous research determined that an acceptable range for MUN should be between 10 to 18 mg/dl. Earlier this year, more conclusive research was published indicating that an acceptable range for MUN should be between 10 to 16 mg/dl (3).

What does this range tell us about the protein being fed? Very simply, if a MUN value is greater than the typical range, animals are consuming an excess amount of protein. Likewise, if MUN is below the normal range, animals are not consuming enough protein. However, before any ration reformulation occurs, the specific cause(s) of either a high or low MUN value needs to be established. Common causes of increased MUN levels (above 16 mg/dl) include but are not limited to:

- Excess protein being consumed relative to the individual's needs.
- The diet may be balanced for an unachievable level of production.
- There may be excess rumen degradable protein (RDP) as compared to rumen undegradable protein (RUP) and vice versa.
- Dietary carbohydrate and protein may not be balanced.
- Improper mixing of TMRs (e.g. too much soybean meal as compared to ground corn).

There are several causes for decreased MUN levels as well, and they include but are not limited to:

- Underfeeding protein.
- Some herds have very efficient cows that produce abundant amounts of milk from low protein diets.

If it is determined there is a problem with the MUN levels being too low, the addition of protein in the ration may lead to an increase in milk production (2).

Another question to be answered is how does protein consumed end up as MUN? After protein is ingested, the body fulfills its protein requirement. Excesses in absorbed N are excreted in the blood as blood urea nitrogen (BUN), which is eventually released in

the milk as milk urea nitrogen (MUN) and in urine (3). Recalling from an earlier paragraph, it was mentioned that MUN is a good indicator of not only nutritional aspects, but also environmental aspects of dairy farming. This is because MUN concentration is highly correlated to N excretion. A study performed last year indicated a strong linear increase in urinary nitrogen excretion as MUN increases (2). To put this into perspective, overfeeding N by 10% compared to NRC requirements results in a 13% increase in MUN (1). Not only does this increase feed expenses, but also, the risk of N loading to ground and surface waters. Once again, high MUN levels are directly proportional to high N excretion (2).

**Field Study**

Currently, MUN is collected from ten cooperator farms as part of a larger applied research and field study. This study is being conducted to evaluate and demonstrate the effect of dietary N and P on milk yield, reproductive efficiency and nutrient losses. The farms are located in the Shenandoah Valley, specifically within the counties of Rockingham, Augusta and Shenandoah, because of large animal populations and possible nutrient losses that could end up in the Chesapeake Bay. Representatives visit the farms on a quarterly basis over a two-year period. During these visits, fecal and blood samples are taken from a minimum of 21 cows. Forage samples are taken on a monthly basis. Milk yield, reproductive data and MUN are also collected on a monthly basis and reported through PCDart.

The goals of this project are to:

- Form Farm Advisory Teams.
- Review current rations and decrease P and N levels if needed to hopefully reduce the potential for nutrient pollution.
- Monitor milk yield and reproductive performance after implementing ration changes.
- Form nutrient budgeting spreadsheets for each farm to indicate any surplus of N and P on cooperator farms.

**Field Study Measurements**

Every feces sample will be measured for P and N. Blood serum will be analyzed for blood urea nitrogen (BUN), P and Mg. DHIA will analyze the milk for fat, protein and MUN. Forage samples will have a normal analysis performed, with the exception of P. Once the sample has been obtained by the forage testing lab, a representative will receive a dry/ground sample and a separate and more accurate P measurement will be taken at a later time. All of these measurements are crucial in measuring the effects of the ration on cow performance and the potential for nutrient losses into nearby streams and rivers.

**Figure 1. Range of MUN's for Each Farm**

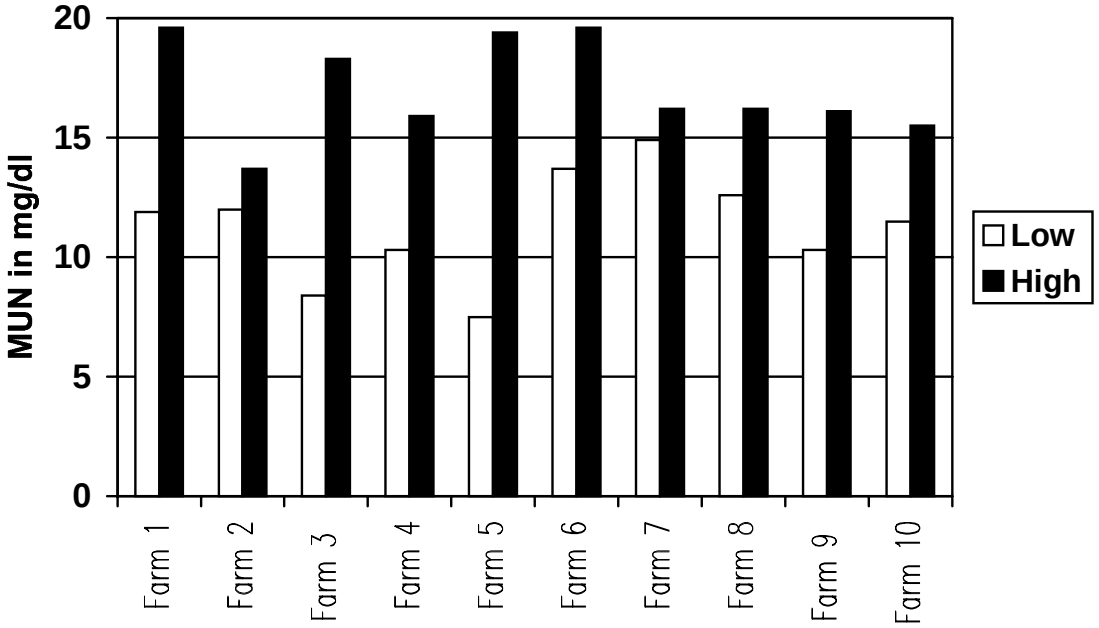



**Figure 2. Minimum, Maximum and Herd Average MUN**

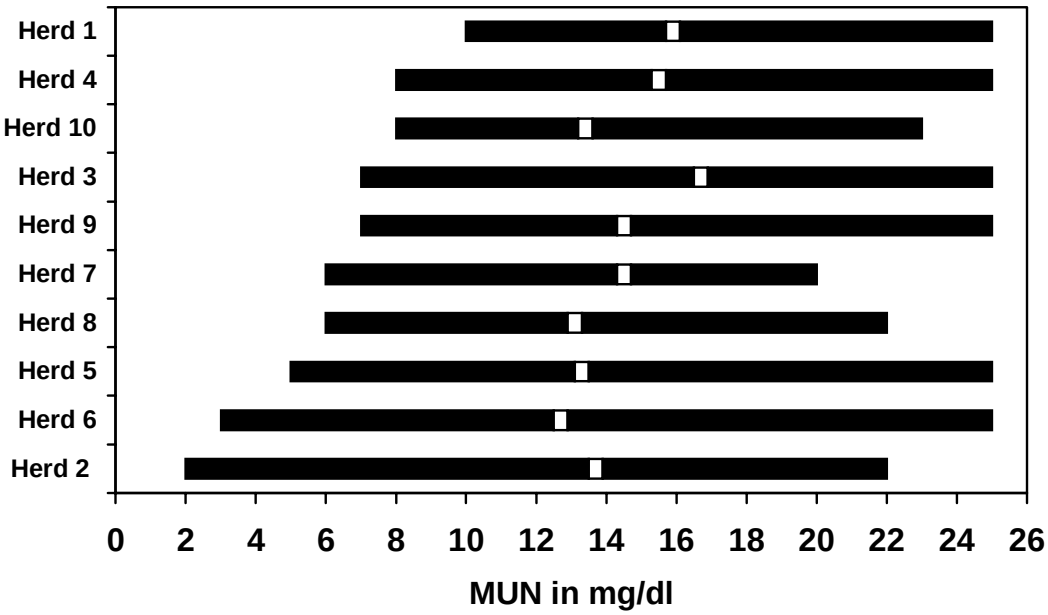
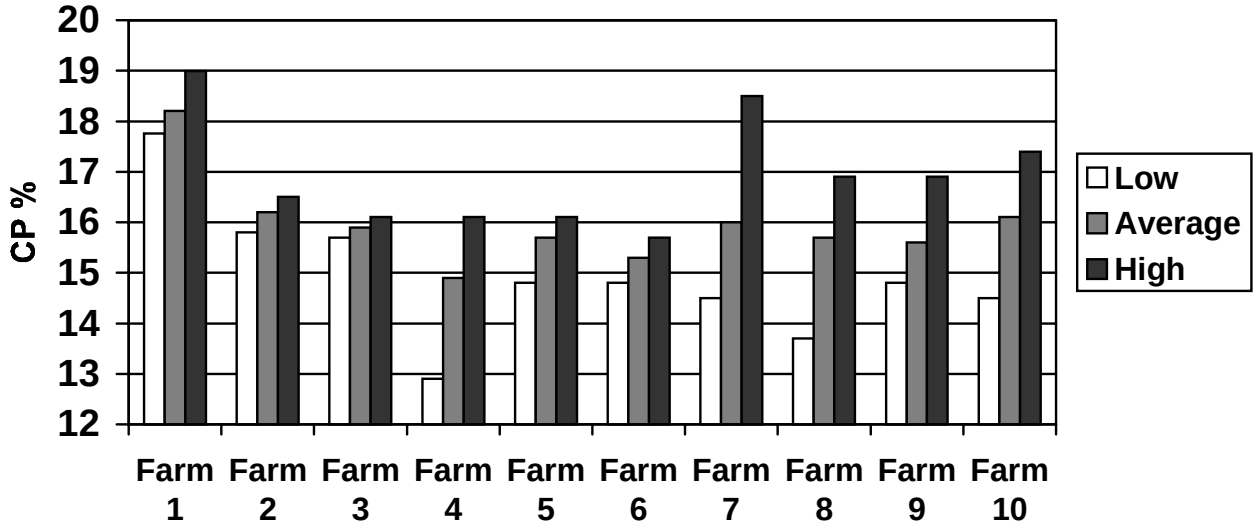


**Figure 3. Range and Average CP % for Each Farm**




MUN information has been collected over the past four months for each of the ten cooperator farms. Figures 1, 2 and 3 represent the information that is available from these four months of collection. Due to the fact that this project is in the first stages, the MUN information is rather limited and at this time is not very extensive. However, Figure 1 visually expresses the different ranges of each farm throughout the collection period. Obviously some farms have larger ranges than others do. Figure 2 illustrates the MUN ranges for each farm as well, but it also indicates each farm's MUN average. It is interesting to note that while every farm differs in MUN range, the MUN averages tend to remain fairly constant around 14.5 mg/dl. Figure 3 represents the average and range of crude protein percents (CP %) that are calculated for each farm ration. As with the MUN ranges, the CP % is variable between farms. This variability could be due to different on farm feeding programs and differences in forage quality.

**Conclusions**

As mentioned earlier, a "tool" to help monitor the nutritional and environmental aspects of dairy farming is the interpretation of MUN data. When interpreting the MUN data, a range has been established to help farmers decide whether or not they are overfeeding or underfeeding protein to their dairy animals. The average range has been set between 10 and 16 mg/dl. A value received outside of this "normal" range is an indicator of either too much protein or too little protein. However, before any addition or subtraction of protein takes place in the ration, the specific cause(s) of the high or low MUN values needs to be specified. Along with increased feed expenses, increased MUN levels directly correlate with an increase in urinary nitrogen output. The increase in

urinary output can eventually lead to environmental problems in the form of nitrogen pollution to ground and surface waters. Current measurements of MUN indicate a wide range between farms, but the average MUN for all herds is about 14.5 mg/dl. As the project progresses more information and data will be collected.

**References**


1. Hof, G., M. D. Vervoorn, P. J. Lenaers, and S. Tamminga. 1997. Milk Urea Nitrogen as a Tool to Monitor the Protein Nutrition of Dairy Cows. J. Dairy Sci. 80:3333-3340.

2. Jonker, J. S., R. A. Kohn, and R. A. Erdman. 1998. Using Milk Urea Nitrogen to Predict Nitrogen Excretion and Utilization Efficiency in Lactating Dairy Cows. J. Dairy Sci. 81:2681-2692.

3. Jonker, J. S., R. A. Kohn, and R. A. Erdman. 1999. Milk Urea Nitrogen Target Concentrations for Lactating Dairy Cows Fed According to National Research Council Recommendations. J. Dairy Sci. 82:1261-1273.