Milk Urea Nitrogen (MUN)

by George Cudoc

Analyzing Milk Urea Nitrogen routinely during monthly milk testing has now been around for more than 10 years. Understanding how to use this tool to evaluate dietary protein utilization can lead to improvements of the following.

- feed costs
- milk production
- reproductive performance
- reduction of nitrogen waste to the environment
- milk production
- body condition
- cheese yield

Background Information

Urea is formed in a cow's system through a natural process that is shown in Figure 1. Large parts of the dietary Crude Protein are broken down into ammonia in the rumen of a cow. Any unused ammonia must then be converted to urea in the liver. Urea is then excreted from the body in urine.

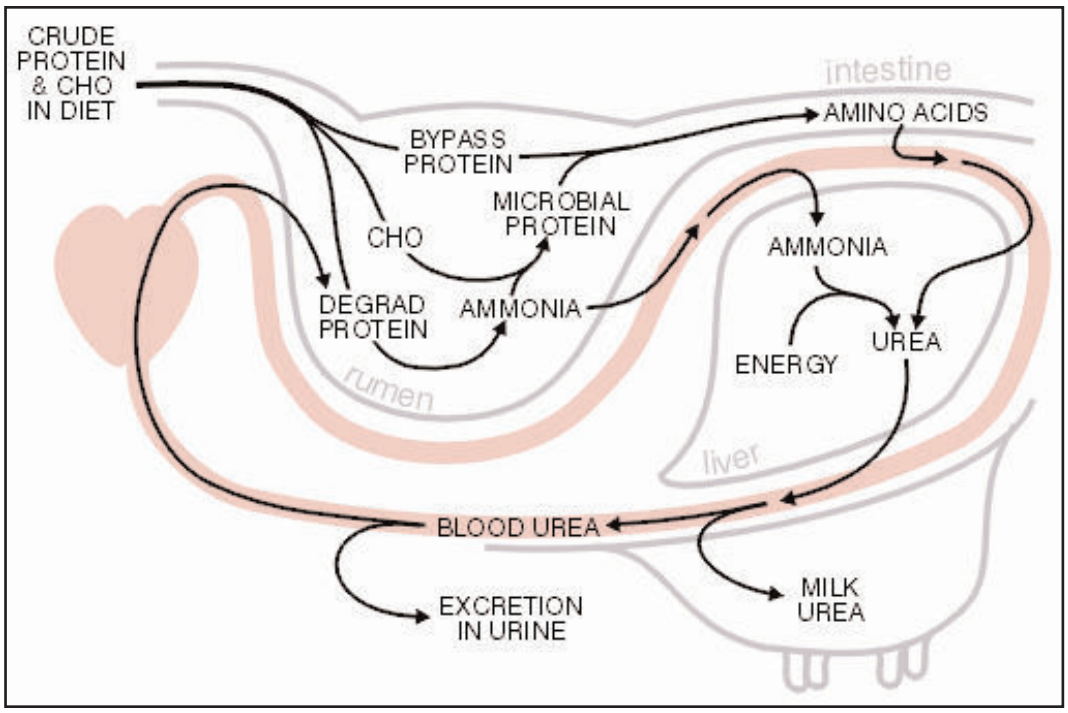
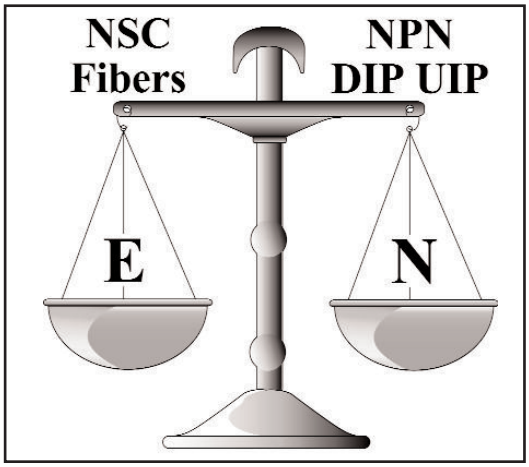


Figure 1.

Urea, being water-soluble, diffuses readily into body tissue. Urea also readily diffuses from blood into milk, making urea a normal constituent of milk and comprises part of the non-protein nitrogen normally found in milk. From the standpoint of cheese making, this type of nitrogen reduces the cheese yield as an unusable portion of the milk protein. Increased liver urea synthesis can result from excess dietary degradable or undegradable protein or a relative deficiency of fermentable carbohydrate (CHO) required by the rumen microbes to capture ammonia.

Measuring the amount of blood or milk urea nitrogen thus aids us in evaluating how efficiently we use protein from the diet. We may estimate the concentration of blood urea by measuring milk urea. The same factors which change blood urea will change milk urea. This includes rumen degradable protein intake, undegradable protein intake, energy intake, water intake, liver function, and urinary output. Since milk is produced throughout the day and is stored in the udder, milk urea concentrations may damper some of the changes we might observe when measuring blood urea. If

milk is sampled after we empty the udder, milk urea measurements are very close to blood urea measurements at that time. Since milk is an easy fluid to collect and is done at least twice a day on most farms, measuring milk urea is a useful estimate of blood urea levels.



Parts of the Puzzle

There needs to be balances between ration components as well as correct amounts of individual parts.

Both Non-structural Carbohydrates (NSC) and digestible Fibers are the main contributors to the Energy needed by the cow. Non-protein nitrogen (NPN), degradable protein (DIP), and un-degradable (UIP) make up the nitrogen (N) needed in balance with energy for milk, components and body tissue production.

Too much N in the system from any of the sources must be eliminated and this requires energy. There now becomes a two-fold loss, one from using needed energy to dispel this excess N, and the other from the cost of supplying that N from ration protein that could not be used. These losses may total as much as $.50 per cow per day.

Not enough N in the system starves the rumen micro flora and less ability to digest energy sources is seen. This usually means lower intakes resulting in lower production.

The energy-protein ratio is critical to efficient production. When this ratio balances to the energy side we typically see lower MUN. Heavy N levels from over feeding protein typically raises MUN levels.

What should MUN values be?

MUN values in healthy cows fed at optimal dry matter intake typically fall in the range of 10-14 mg/dl. The range of MUN concentrations for individual cows consuming the same diet are +6 or - 6 from the average of the group. That is if a group of cows averaged 12 MUN mg/dl, 95% of the group would fall between the values of 6 -18 mg/dl MUN. Caution is warranted concerning herd average MUN information alone. You could theoretically feed in such a manner that the average is okay but all cows are fed incorrectly. You would be able to feed one group a diet very deficient in protein that generated a MUN average of 6. A second group could be overfed protein in their diet generating an average MUN of 18. Just looking at the herd average MUN value would be 12 indicating proper diet balances. This same kind of mistake could be made just using bulk tank MUN values.

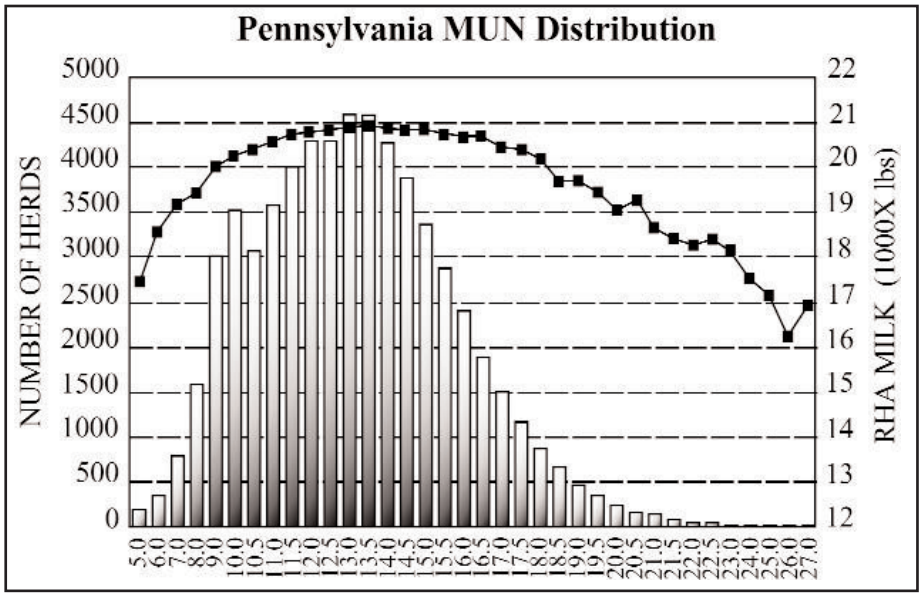


Chart 1.

Often we use statistics to develop benchmarks for measurements based upon what the mass of herds may be doing. Among Charts 1 & 2, look at the average MUN value for herds tested at various times.

In Chart 1, it was calculated using MUN data some years back. These were primarily Pennsylvania herds and it is interesting that while the bulk of the herds average 8-16 MUN, the most frequent MUN values were 13. And 13.5. Also note the changes in Rolling Herd Average as MUN values changed.

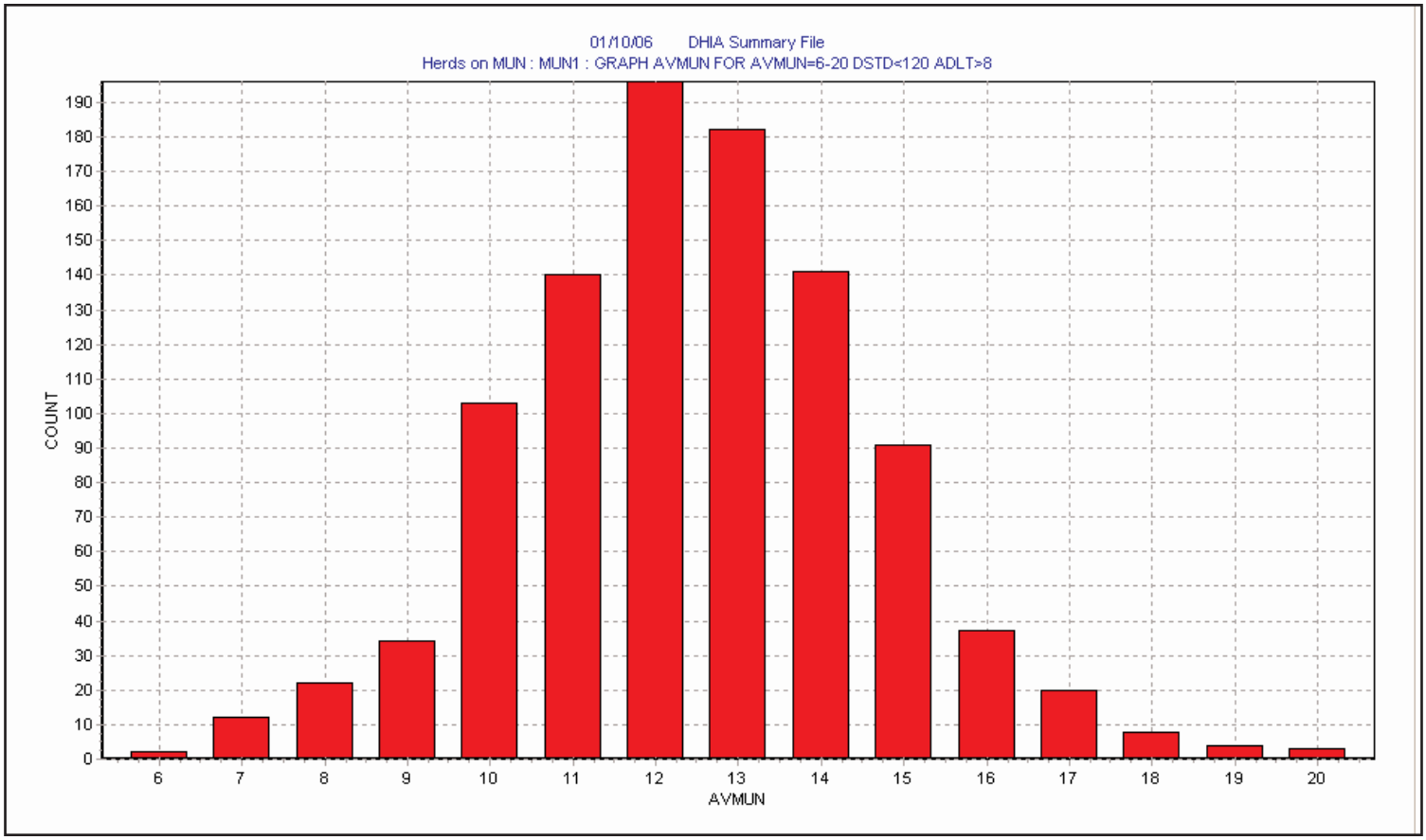


Chart 2.

Chart 2 looks at more contemporary numbers from Dairy One. The most frequent MUN value we see is 12 and the overall average for these 996 herds that had at least 8 cows and tested in the past 120 days was 12.5.

MUN Usage

Dairy One has the ability to test MUN at three laboratories in Ithaca New York, Hagerstown Maryland, and State College, Pennsylvania. Approximately 1 in 5 herds or cows test MUN at any given time. MUN results can be retrieved in several ways. Herds using software can download laboratory results directly into their software. Traditional, processing herds can have paper reports prepared and mailed for them. All herds using a Dairy One laboratory can have MUN results faxed, mailed, or e-mailed straight from the lab after analysis.

Look for further information concerning MUN testing and data interpretation in upcoming months.