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The Catalyst

WHAT YOUR MUN VALUES MAY BE TELLING YOU

Finding the optimum MUN levels for your herd helps you hit the balance between good milk and component levels and not overfeeding protein sources.

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Milk plants and DHIs provide many of you with milk urea nitrogen (MUN) values on bulk milk and individual milk samples. MUN can be a useful tool that can allow you and your nutritionists to monitor feeding and rumen environment changes in their herds. Here are some questions and answers that may help you to interpret your herd's MUN test results.

What is the source of MUN?

Milk urea nitrogen is the fraction of milk protein that is derived from blood urea nitrogen (BUN). MUN normally represents about 0.19 percentage point of the total 3.2 percent total protein in Holstein milk. MUN does not contain casein or whey proteins that contribute amino acids for human use. MUN values will range from 8 to 14 milligrams per deciliter (normally reported as a whole number such as 12).

When cows consume feed containing protein, part of the protein is degraded to ammonia by rumen microbes (rumen-degraded protein or RDP). If bacteria cannot capture the ammonia converting it over to microbial protein, the excess ammonia is absorbed across the rumen wall. Because ammonia can shift blood pH, the liver converts ammonia to BUN to be excreted or recycled. Because milk is synthesized from blood and if BUN values are elevated, MUN values can be higher. If MUN values are too high, your herd possibly is wasting feed protein. If MUN values are too low, the rumen bacteria yield will be reduced limiting milk production and milk protein yield.

What feeding factors impact MUN?

- Feeding too much total crude protein in the ration results in excessive ammonia being wasted.
- Feeding excessive rumen degraded protein (RDP), soluble protein, or both can raise MUN even if the total crude protein level in the ration was normal.
- If rumen acidosis occurs, microbial protein growth will be slowed and ammonia will not be captured.
- Rations low in fermentable carbohydrate (such as starch, sugar, digestible fiber, or all three) can reduce microbial growth leading to higher MUN values.

What should my MUN target value be?

Every herd will have a different optimal level depending on time of feeding relative to milking time, whether it is a total mixed ration (TMR) or component-fed herds, cow eating patterns, and other factors that change BUN values.

The power in herd MUN tests is to find the "optimal" MUN value for your herd. In Illinois, the

optimal MUN value can range from 9 to 15. (Attempts to shift this value result in less milk or higher protein feed costs.)

What is normal variation in MUN values?

When your farm baseline changes by more than 3 MUN points up or down, look for changes in your herd feeding and handling that caused this MUN shift.

A weekly MUN bulk tank average may reflect trends and changes more accurately as there can be a lot of daily variation. DHI and milk plant MUN values can vary due to machine standards and sampling differences.

At the University of Illinois, our milk processing plant MUN values typically are 2 units lower than DHI MUN values. DHI processing centers may provide MUN group averages summarized by lactation number, days in milk, and milk production to look at these variables that can impact MUN.

Pennsylvania workers recommend using a minimum of 8 to 10 cows per group to calculate an unbiased group MUN value. Cows with higher somatic cell counts, fresh cows, and cows with abnormal milk components may have abnormal MUN values. (Interpret these values carefully.)

What are the feed and cow-care changes that can lead to higher MUN values?

- New crop corn silage may not have the same level of fermentable carbohydrate (less available starch). Expect lower MUN value after three months of storage. (A plus.)
- Feeding lush pasture can raise total protein and rumen-degradable protein intake.
- Shifting to hay silage that is wetter, higher in crude protein, or both can elevate MUNs.
- Grinding your corn or other grain coarser reduces the rate of starch fermentation in the rumen.
- Shifting from processed corn silage to unprocessed or poorly processed corn silage lowers fermentable starch.
- Shifting to a more degradable protein source can have an effect. (Shifting from heat-treated soybeans to raw soybeans, for example.)

What should I consider if MUN values are less than 10?

The key point is you must never slow microbial growth and yield which will reduce amino acid and energy sources needed by high-producing cows.

New York workers suggest that dividing MUN values by two can reflect ammonia levels in the rumen (a MUN of 10 represents 5 mg/dl in the rumen).

If the MUN is less than 7, microbial growth can be impacted negatively. Evaluate the following factors along with herd or group MUN values. (Lower values are desirable for the right answers.)

- Check ration computer summaries to see if the crude protein is too low (less than 16 percent for example) or too high (over 18 percent crude protein).
- Review the level of rumen degraded protein or RDP (65 percent of the total crude protein) and soluble protein or SP (30 percent of the total crude protein).
- Check rumen fermentable starch levels (22 to 26 percent of the ration dry matter) and ration sugar levels (4 to 6 percent of the total ration dry matter).
- Compare true milk protein test to milkfat test. For Holsteins, the ratio of milk true protein to milk fat is 82 percent (for example, 3.0 percent true milk protein and 3.7 percent milkfat). A low MUN could result in a true milk protein to milkfat ratio of less than 75 percent.
- Evaluate manure consistency. Low MUN could result in firm manure (manure score over 3.5) compared to looser manure with higher MUN values (manure score value under 2.5).

Washing manure also can reveal more fiber passage with low MUN values (negative impact on rumen fiber digesting bacteria).

What can be the economic impact of MUN values?

Wisconsin workers developed an equation to predict the loss of nitrogen based on body weight and MUN values. Other equations are also available and can be used.

Urinary excretion of nitrogen=Body weight x 0.0129 x MUN (mg/dl)

Here, I've calculated two examples using a low (10 mg/dl) and average (14 mg/dl) MUN value.

- 1,500-pound Holstein cow x 14 MUN x 0.0129 = 271 grams of urinary nitrogen
- 1,500-pound Holstein cow x 10 MUN x 0.0129 = 194 grams of urinary nitrogen

The difference of 77 grams of nitrogen represents a loss of 1 pound of dietary protein or 2.2 pounds of soybean meal equivalence plus the added environment risks of disposing of the excessive nitrogen. New York researchers report an optimal MUN can improve protein efficiency from 28 percent to 36 percent nitrogen capture of dietary protein as milk protein while reducing urinary nitrogen excretion.

Take-home messages . . .

- **MUN values can monitor rumen nitrogen efficiency and lower environmental nitrogen losses.**
- **MUN values will vary from herd to herd. The key comparisons are changes within a herd or groups of cows in a herd.**
- **If MUN levels are outside optimal normal ranges, look at ration balancing results, milk components, and nutrient balance.**

Building or renovating a parlour? Please consider meter height!

Individual cow milk sample collection can be a challenge when meter and sampler height is low.

With unusually low meters, sample collection over several hours of milking can result in health and safety issues for family members, farm employees or DHI staff. In many cases, meters can be mounted at a higher level at the time of installation, therefore avoiding costly retrofitting at a later date. **Please consider the location and height of your meters and discuss this with your equipment supplier to ensure it is included in the design of your parlour.**

Even if you do not expect to install sampling devices initially, your design should consider their future installation. This will help ensure safe and cost effective sample collection at your farm.