by Steve Martin

Risks and rewards of adjusting MUNs

LAST month I reviewed managing milk urea nitrogen (MUN), a topic of frequent conversation with our clients. I would suggest that the use of MUN values as a metric in dairy production is bit "spooky". Why? If this is all science-based modelling, shouldn't we just "dial it in"?

Although my formulation model does include a MUN prediction value, experience has told me that working with real-life MUN values is not quite that straightforward.

I also reviewed the principles that impact MUN levels in milk. For a quick summary, MUN is really a proxy for our interest in BUN (blood urea nitrogen). The amount of urea moving around inside the cow's bloodstream, and eventually leaving its body primarily in urine, is a measure of lost opportunity.

The preferred pathway for nitrogen in the urea molecule would have been to end up as milk protein. It is nitrogen that was paid for as part of the dairy's feed cost, and the preferred way to earn a return on that investment is to sell it as milk protein. With recent increases in milk protein value, the lost opportunity for the ill-fated nitrogen is a pretty big deal.

I was recently doing year-over-year comparisons for some clients and was taken a little by surprise when I noticed the change in milk protein value in January 2016 versus January 2017. The more recent value was just about double the previous year!

I'm no expert on what drives milk component pricing, but I know that protein in milk is tied closely to the cheese market. I also know that whole milk powder is having more and more impact on exports and, along with the value of the dollar, takes pressure off pizza sales to support the price per pound of milk protein.

Lost opportunity

As I looked across the page on my client's monthly report, I couldn't help but see his moderately high MUN as a lost opportunity to have sold more pounds of milk protein at twice the price of a year ago. That scenario reminded me of my responsibility to be not only a biologist/animal scientist, but also a competent economist.

That line of thinking revolves around the loss of potential income. But is that the only chance we have to improve dairy margins by managing MUN? For sure no. In fact, it may not even be the first thing to consider.

There are at least two ways to use MUN to improve margins per cow. First, we can adjust details in the formulation modelling to increase the efficiency of converting feed protein into marketable milk protein. This step might result in an increase in feed cost inputs.

The second approach is to consider lowering ration protein levels to better match the current conversion rate that is already in place. This option represents on opportunity to actually reduce feed input cost by lowering protein level in the diet.

Simple economics tells us that in order to increase margins, income needs to go up, costs need to go down, or some combination of the two. If the goal is to decrease MUN in an effort to increase milk protein, then some rumen fine-tuning may be in order.

A good example of this would be to consider a dairy that is geographically situated to be a high-end user of alfalfa, and the preferred method of feeding this high protein forage is through greenchop. In this case the high protein and rapidly available nitrogen in this diet will be a risk for high MUN – and for poor efficiency of alfalfa protein conversion to milk protein. Lowering protein in this diet may reduce cost and MUN, but it may not be the best way to improve the milk protein.

In school we were taught that the interaction between protein and carbohydrates in the rumen is like a dance, maybe a middle school dance. Maximum dancing might occur with a nice, even ratio of boys and girls. In reality, though, the ratio in that gym is most likely more girls than boys – and thus less dancing.

In the rumen, if the ratio of available carbons from starch, sugar and fiber is correct for the amount of nitrogen from ration crude protein, then lots of microbial protein (dancing) can occur. The result is more microbial protein leaving the rumen headed for the milk tank.

By working with the diet formulation, fine-tuning the timing and amount of carbs to go along with the high protein in fresh alfalfa greenchop, we have less risk of losing the valuable nitrogen molecules that can drive up MUN and represent lost milk income.

Fast protein, like that in fresh alfalfa, might like a fast carbohydrate like flaked corn instead of ground corn. Or, maybe adding sugar to the diet could help, since sugar is usually a faster and a more completely available carbohydrate in the rumen compared to starch.

Purchased protein ingredients may be a small part of this ration, but selecting ingredients that have a slower protein availability in the rumen would be better than those whose protein availability curve mimics that of the fresh alfalfa forage. Feed cost would not necessarily go up with these approaches to better balance the diet with high amounts of alfalfa greenchop.

A high corn silage diet may be a good example of the other end of the spectrum. If this silage has been in the pit for the appropriate amount of time post-harvest and kernel processing was good, there is an abundance of rapidly fermentable carbs at the dance that need partners. In this situation there are abundant options to add correctly timed protein ingredients to best compliment the corn in the silage and the other carbs in the rest of the diet.

The good news here is that these protein sources are also not necessarily the most expensive. In fact, the process would be to model the timing of the starch availability by lab analysis, experience, intuition and observation, and then meet the majority of the protein needs to match the starch timing with the cheapest protein sources available. A strong dynamic nutrition modeling system is needed to do this correctly.

Different proteins needed

In most cases, the biggest portion of this well-timed protein supply can be achieved with either soybean meal or canola meal. Chances are, though, that to really have the best ratio of dancing partners we will need to add some faster and some slower protein. Two really good sources of faster proteins are, conveniently, well-priced.

The cheapest source is almost always urea, and up to 0.20 pound per cow of this manufactured "protein-like" feed ingredient is very fast in the rumen and can be very well timed with the very fastest of the carbs in the diet. Another source of fast protein that is often a bargain is corn gluten feed. The other end of the spectrum might be a byproduct with some heat treatment to slow its availability to the rumen bugs.

Each protein ingredient has a "release curve" and matching them to the rate of carbohydrate fermentation is the formulation goal. Due to a variety of protein price points, this step also may not be a big mover of feed cost.

There is a more costly way to manage MUNs and increase milk protein, but it comes only after the two steps above are completed. If, by using the principles in the steps above, we have maximized what the rumen can do for us, we can then consider a multitude of options related to including protein ingredients that "bypass" the processes in the rumen.

The advantage with this approach is that through good modelling of the amino acid supply with these ingredients we should be able to positively impact milk protein production via higher milk protein percent, or more pounds of flow with the same milk protein percent.

There is quite a range of these feed ingredients, from heat-treated soybean meal all the way to synthetic amino acids that are inert in the rumen. In all cases the goal is to have the well-formulated proteins pass through the rumen untouched and arrive at the small intestine for absorption. If these proteins are well balanced they will increase milk protein yield and not increase MUN.

As you can see, this is a complicated topic. It is focused upon feed cost, formulation, and milk income. Investing in feed cost to increase milk protein output, along with a reduction in MUN, is always fun to model. The risk, though, is that the investment won't result in the expected increase in milk revenue due to some other complicating factor in the ration or at the dairy.

It is also a nice task to model a feed cost reduction motivated by a higher than desired MUN. But remember, that step always has some risk for milk flow: your highest milking cows may be benefiting from higher than needed protein level in the diet.

I must say that even though I have great faith in my model, the risk of milk flow loss with high MUN-motivated ration adjustments always makes me nervous. But a high MUN should not be ignored; just proceed with caution. Different cow grouping strategies based upon the stage of lactation can reduce this risk. It should also be noted that extremely high MUN results can pose a risk to reproduction success.

Understanding basic nutrition is necessary to really grasp what your co-op's report says about MUN levels in your milk. There is information there that relates to potentials for increasing milk income and reducing feed cost. Careful formulation, along with frequent forage and ingredient testing to best balance those two opportunities, will insure that you are feeding for the bottom line. *WEST*

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