



by Steve Martin

## Sorting out forage quality: NDFd and uNDF

LAST month I reminisced about judging a hay show at the Wyoming State Fair. In an effort not much different than placing a class of junior market lambs, I had to place the entries from best to worst. The look, feel and smell of the hay were aided by a lab analysis to help rank their quality and feedability.

I met a few of the growers who had entries in the contest. With the event being in August, there was much to talk about – hay prices, weather for that year's crop, and the like. There were also a few questions by the growers about the curious nature of their dairy customers. They mentioned it was always easier to sell hay to "beef guys."

From the discussion I learned there were maybe four values on a lab analysis that had meaning to the growers: crude protein (CP), relative feed value (RFV), milk per ton, and milk per acre. I took some effort to show them two new measures that were becoming more and more noteworthy to dairy producers, and especially their nutritionists: NDFd and uNDF. Having a grass hay class along with the alfalfa made for some good examples for these new measures.

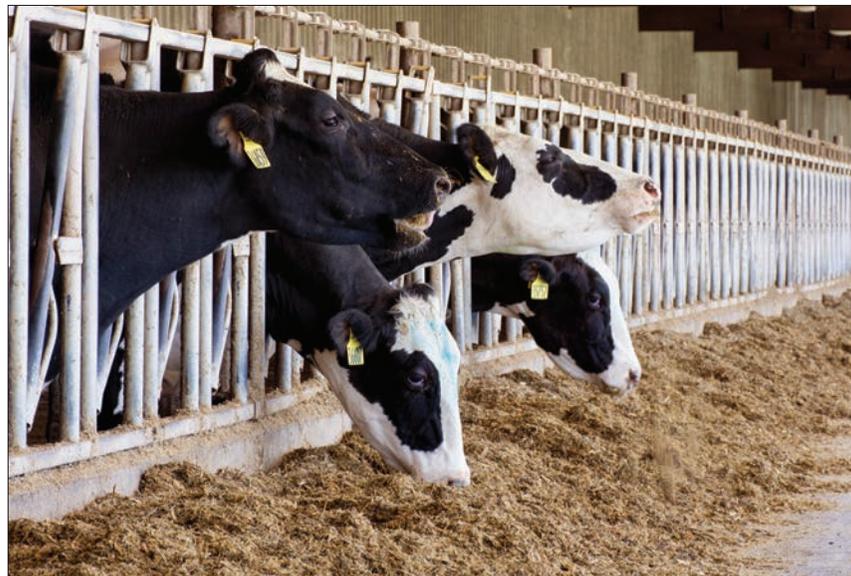
In last month's column I detailed how we use NDFd as a tool to help describe how much fiber in the plant will be available for cows to use as building blocks for milk. This concept is very straightforward and pretty much comes alongside most things we know about forage quality. It is a critical value and it was a frequent tie-breaker for me in the hay contest. This same approach can be used when deciding what hay to buy or how to predict milk potential from home-grown forage.

The other and less intuitive measure I showed them was uNDF. Undigested NDF is just that, NDF that is not digested. It represents the portion of potentially digestible fiber that, due to issues related mostly to plant maturity, remains undigested.

There are various time stamps at which undigestibility is measured, the longest one being 240 hours. If a hay sample has an uNDF240 of 15 percent it means that if you grind 100 grams of hay and put it in active rumen fluid for 10 days, 15 grams will remain undigested.

You might ask why 10 days? Surely we are not having forage we feed sit around in our cows' rumens for 10 days. This is a great time to make the

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point of why using NDFd by itself is limited when building rations, and why there are different time points for measuring.

Yes, the 30 hours point chosen for many NDFd measures is meant to approximate, with a little extra time added, how long an average forage particle may stay in the rumen. This part of the effort is all about feeding building blocks for making milk or beef. The uNDF, however, is more about building diets, keeping cows healthy, and managing for optimum feed conversion.

Just like a diet has a value for protein, calcium and fat, it also has a uNDF value – the uNDF content of each component of the diet in a weighted average format. Nearly all ingredients have some uNDF, with forages, of course, contributing the most. Although this unique measure is not like many others that describe things a cow can turn into milk, it is very useful to a formulator when building diets.

I have mentioned before that my first 7 to 10 years working in the nutrition field was spent in central Texas building diets with alfalfa hay feeding rates north of 20 pounds per cow. As I recall, those diets contained perhaps 42 percent forage.

I later broadened my geographical reach and saw dairies feeding less hay and a lot of corn silage. That began to challenge my ideas about what forage percent was correct for a milk cow ration. This realization led to using NDF from forage to sort out the fact that corn silage was actually only around 50 to 60 percent forage.

Move forward 20 years and we now have uNDF. This does an even better job of not only sorting out a grain-containing forage like corn silage, but also in better describing NDF in different qualities of alfalfa and how

they compare to grasses, both warm and cool season.

### NDF qualities differ

We know that wheat silage, alfalfa hay, Bermuda grass hay, and corn silage all have different qualities of NDF. By using uNDF240 we can best describe how the rumen will handle those differences. (The principles at work here probably don't interest many dairy producers and they involve what are called "pools." In the rumen, nutrients from the ration are classified into these pools that mostly describe how fast and to what extent they will be digested.)

Researchers have discovered how the mass of undigested material behaves in the rumen. Most importantly, cows maintain about the same amount of uNDF in the rumen. That is a key point.

Researchers have also studied how much intake is needed to build and maintain it, how it exits the rumen, and how all of this impacts appetite, feed intake, feeding behavior, etc. It gives some numbers to what we loosely call rumen fill. This is where it does connect to something the average dairy producer is very aware of: that when cows are fed better forage, they eat more.

By using uNDF as a formulation tool we can give the formulator an opportunity to take this well-known principle and do math. Instead of simply adding "some" straw to a diet in which you know alfalfa hay is really good, we can use the uNDF of both the alfalfa hay and straw to know exactly how much straw to add.

Likewise, the opposite is true. In a year like we are having now in the Southwest, there will likely be a shortage of number 1 alfalfa hay, but plenty of number 3. By using the uNDF value of the lower quality,

more mature, and maybe twice-raked hay, we can dial back its inclusion rate to supply the correct amount of uNDF and back-fill the diet with a byproduct like corn gluten or soy hulls. This is awesome!

We must be careful, though, when feeding number 3 alfalfa hay. At times, number 3 hay is classified number 3 because of mold, weeds and other perils of the challenging hay making process. If it is clean hay and simply has more fiber with a lower digestibility, we use uNDF as a tool to know how much less to feed. Also, back-filling the space in the diet that is freed up by lower hay feed rates must be well thought out and it probably shouldn't simply be more corn.

I should note the value of using uNDF as we feed both BMR corn and sorghum silages, as well as reduced lignin alfalfa hay. These higher digestible varieties have less uNDF as part of their magic. If we don't respect that and use uNDF to be sure, and to supply adequate roughage to the cows, we will lose cow health and feed conversion.

No matter whether a ration needs more intake or less intake, or if things are perfect and there is a required forage change, uNDF is the equalizer. It is the "knob" to turn up or down a few clicks if intake needs to be less or more. It is also the one nutrient that needs to stay the same through a big forage change if keeping the status quo is the goal.

I need to mention one more thing about uNDF. It is described by this example: uNDF in oat hull pellets is not the same as uNDF in wheat straw. The things we know about particle length and rumen activity are still the same. This is one reason we differentiate uNDF from forage and non-forage sources.

Competent use of a shaker box and calculating peNDF will iron out those differences. And with most things related to the relationship between the amount of fiber and the particle size of fiber, the shorter the ration the higher the fiber measure likely needs to be. The opposite is also true.

Using NDFd30 and uNDF240 helps me as I build diets. As with most efforts in formulation, nothing holds true all the time. These two detailed fiber measures help a lot with the science side of formulation, but the art of feeding cows still stands.

Take some time to look at these two lines on your forage analysis and add them to your current approach of evaluating and feeding forage. Doing so will help as you work hard to feed for the bottom line.