



by John Goeser

## The physical side of fiber

**F**IBER in a dairy herd's diet is like hardwood. Before you drop this month's column and move on, understand I'm not talking about fiber digestibility this time. Instead, the metaphor speaks to the structural component within fiber that is imperative for dairy cow health and performance.

Just like the maple or oak tree's physical trunk strength keeps the tree upright and healthy, dietary neutral detergent fiber provides added structure in the diet. The physical fiber leads to cud chewing, which produces saliva for buffering, and also stimulates the rumen wall to contract, mix, and churn.

Fiber's physical characteristics also relate to dry matter intake and feed conversion efficiency. On this note, dairy specialist Stacy Nichols has shared recent high output herd survey insights with me. Our industry continues to have momentous opportunities in feed conversion efficiency, even amongst the highest producing herds. Stay tuned for a future Feeding Fundamentals column discussing the survey's outcome and realization that herds shipping 6.8 to 7 pounds of components are ranging 10 or more pounds in dry matter intake!

### Pioneers in this space

Getting back to fiber, physically effective fiber, or peNDF, is the nutritionist term for the topic at hand. This is a somewhat loosely defined term in our dairy nutrition world. Years ago, I reviewed a paper on the topic and remember the review process being eye opening.

The manuscript's authors discussed various terms and potential interpretations. Ultimately, peNDF can be determined in different ways, but the core is a sieving analysis.

Dave Mertens, Jud Heinrichs,

and Rick Grant have been pioneers in this space in different ways. Mertens led the charge by first developing the approach based upon a dried feed sieving analysis, and fiber longer than 1.18 millimeters (mm) was qualified as peNDF.

Later, Jud Heinrichs and numerous Penn State researchers brought forth the Penn State shaker box protocol. This continues to be a bedrock in dairy nutrition. There are both three and four sieve techniques, but each offers insights into the forage or diet physical characteristics.

Later yet, Rick Grant and his Miner Institute team found that undigestible fiber (uNDF) interacts with peNDF in affecting dry matter intake. This last innovation is a focal point for our column this month.

### Look at undigestible fiber

Five to 10 years ago, undigestible fiber came into focus for dairy researchers and nutritionists. Think of uNDF like lignin and the rebar in concrete. It's completely indigestible and has zero energy value but does contribute to feed remaining in the rumen a bit longer.

The uNDF measure became a more commonly understood term and metric to judge both forages and diets. For example, forage levels above 10% to 11% of dry matter (DM) in corn silage are less desirable. With a total mixed ration (TMR), Grant has observed intakes at the Miner Institute trailing off when TMR uNDF eclipsed this same 10% to 11% of DM threshold.

To me, monitoring uNDF within a herd makes sense. When benchmarking across herds, the uNDF concept alone is less conclusive. For example, experience has shown that uNDF240 explained little variance in dry matter intake across herds. Further, in referencing the Rock



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River Laboratory's Nutrition History app here, one can quickly survey thousands of TMR analyses and determine the average TMR uNDF is around 10% of DM. This isn't a threshold value; it's the average. So if uNDF is tough to benchmark across dairies, what other fiber factors need to be considered relating to intakes?

### Combining fiber factors

Here's where we can boomerang back to physically effective fiber and combine it with uNDF. Grant has proposed that these two be multiplied together to assess physically effective uNDF, or pe-uNDF. Grant's team has found that pe-uNDF240 is better related to dry matter intake (DMI) than either uNDF or peNDF, and my experience and thoughts are in line with those at the Miner Institute.

Hence, ensure your dairy is tracking pe-uNDF as a key performance indicator. Admittedly, adding pe-uNDF will take some effort. To benchmark within a herd or across peer group dairies, we need both TMR analysis and Penn State

shaker box assessments.

The math behind pe-uNDF240 is peNDF (% of NDF) x uNDF (% of DM). Then, to help your dairy begin understanding this number, unpublished data from dairies surveyed several years ago found that pe-uNDF ranges from 3% to 9% of dry matter. Miner Institute research ranged pe-uNDF240 from roughly 5% to 7% and observed a sizable impact upon dry matter intake across this range.

In closing, I believe pe-uNDF benchmarking will help explain the 10-plus pound range in dry matter intake found across dairies shipping 6.8 to 7 pounds combined fat and protein documented by Nichols' team. Trust that we'll expand upon this 2023 survey outcome in future articles and further discuss factors that are contributing toward the best performance. 🐄

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