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NUTRITION PLUS
Volume III, Issue III July 2006

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When the detective work begins next winter regarding the forages going into silos now, what tools will best help you troubleshoot?
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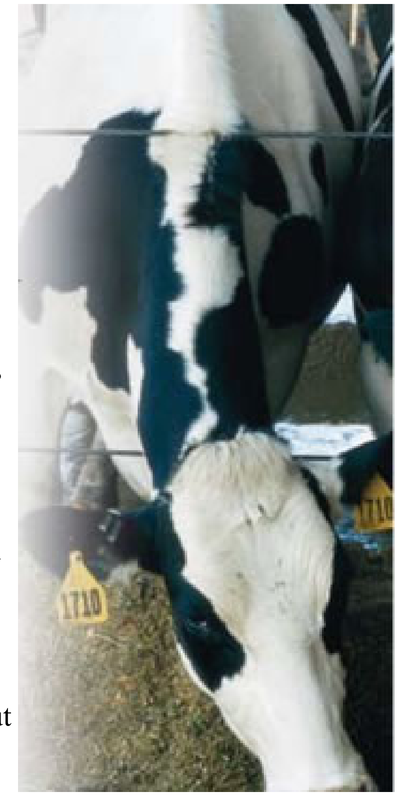
READING THE SILAGE NUMBERS

Too much information isn't always a good thing if it leads to analysis paralysis caused when the numbers open as many quetions as they answer. Such may be the situation with the new wealth of data labs can now generate to help troubleshoot and incorporate silage and forage. Here's an update on what's available, plus some suggestions:

IVNDFD. The relatively new *in vitro* NDF digestibility tests have helped get us past the biological paradox of managing rumen fi ll in concentrate-fed high-producing cows. But remember...

- IVNDFD is a *relative* rank of intake potential, says Michigan State dairy cattle nutrition professor Mike Allen, PhD. Its value comes in comparing forages and making forage allocations, not in adjusting energy concentration of forages. Ralph Ward, owner and manager of Cumberland Valley Analytical Services agrees. Even though labs now report out "adjusted" net energy lactation values based on NDF digestibility, he says, assigning an NEL value to a forage remains subjective at best. Ohio State animal scientist Bill Weiss, PhD, points out that some comparisons of corn silage samples with big differences in IVNDFD have found no subsequent difference in NEL.
  The best use for IVNDFDs, Ward suggests, is to use them to benchmark and track forages on



the same operation from cutting to cutting and year to year.

- Don't try to use IVNDFD across forage families, Dr. Allen cautions. Temperate grasses are more filling than legumes or corn silage.
- Where IVNDFD is most useful, Dr. Allen says, is in troubleshooting a suspected ration forage problem. If you're having a problem, sample the current forage before switching. Then, if production decreases, have both forages tested for IVNDFD.
- Where you're trying to make comparisons like that, IVNDFD tests should be scheduled in the same run whenever possible, Dr. Allen advises, to reduce confounding caused by biological variation across runs. Variation across labs runs even higher, says Cumberland Valley's Ward. He matched samples ran at his lab using high-group, TMR-fed cows' rumen fluid against a university lab's, using cows on a maintenance diet. On seven corn silages at 30-hour incubations, the university's results were below his by an average 15 percent; at 48-hour, by 5 percent.

  Such variation is one reason you shouldn't get too excited about small differences in IVNDFD, Dr. Weiss says. Even in the same runs, a 2.5 percentage point difference may not be significant, and between runs, you may need five or better to rise to statistical significance.
- Corn hybrids are now showing repeatable differences in IVNDFD that can make meaningful economic sense. Differences among alfalfas are smaller.

FERMENTATION PROFILES. Still an underused tool on dairies, silage fermentation analyses can help pinpoint process failures that underlie poor nutritional value and low feed intake. Here's what they can help tell you, according to Wisconsin professor and extension dairy nutritionist Randy Shaver, PhD:

- Silage pH. Legume silages testing higher than 4.6 to 4.8 should lead you to suspect ensiling was done at less than 30 percent dry matter or more than 45 percent to 50 percent. Corn above 3.8 to 4.2 usually results from overly mature or drought-stricken corn ensiled at higher than 42 percent dry matter. Other causes of poor fermentation might include cold weather during harvest, poor packing, dirt contamination — indicated by more than 15 percent ash content — high crude protein in legumes, too much ammonia or urea, clostridial silage, spoiled or moldy silage, or manure contamination. Accuracy requires waiting until fermentation has ended to sample.
- Ammonia. Wet, loose and slowly packed silages can show levels higher than 12 percent

THE BIG QUESTION: WHAT'S IT WORTH?

Relative Feed Value, Relative Forage Quality, Milk2000 (soon: Milk2006) and SESAME are all valuable advances in quantifying the value of better forage. But at the individual dairy, says Cargill dairy nutritionist Floyd Hoisington, nutritionists still face the question, "What can I afford to pay for it?" He suggests using ration-balancing software to run a parametrics analysis, locking in nutrition constraints based on production and health parameters and the current market prices for other ingredients. That can predict a moving-target curve of opportunity costs for different forages, either at a 100 percent dry-matter price or on an as-fed basis. Those actual-dollar values of forages in a real-life, farm-specific situation, according to Hoisington's analysis, are likely to differ in relative prioritization from the more generalized models.

(Source: Hoisington F. Variation in silage quality: Ways to evaluate the price. Proceedings 8th, Annual Intermountain Nutrition Conference 2006, Jan. 24-25, 2006, Salt Lake City; 75-84.)

to 15 percent of crude protein caused by a too-slow fall in pH or clostridial fermentation. High ammonia levels indicate the possible presence of amines, amides and other nitrogenous end products that will contribute to DMI reduction and milk depression.
- Lactic acid vs. acetic acid. Silage showing less than 65 percent to 70 percent of total acids as lactic acid and higher than 3 percent to 4 percent as acetic acid may indicate they were ensiled too wet — and thus under 30 percent dry matter — that the fermentation process was prolonged because of high buffering capacity of the crop, it was packed too loose and too slowly, ensiled during cold weather, sampled after open air degraded the lactic acid, and that energy and dry matter recovery are probably not going to be ideal. The Lactobacillus buchneri innoculants can also cause high acetic acid readings that don't indicate sub-par fermentation.
- Butyric acid. Levels higher than 0.5 percent of dry matter indicate clostridial fermentation, and probable resulting low nutritive value, higher ADF and NDF levels, and possible high levels of soluble proteins and amines.
- Ethanol. Levels above 1 percent to 2 percent of dry matter will signal tendency to spoil at the face.

CONSULTANT'S CORNER

SOME DIFFERENCES BETWEEN UGLY AND NOT

Ev Thomas, Vice President of Agricultural Programs, William H. Miner Agricultural Research Institute, Chazy, N.Y.

I've driven over a million miles and seen a lot of the world as official Crops Dude for the Miner Agricultural Research Insttute. It's given me occasion to see some plum ugly stuff when it comes to silage. Like one from near Darwin, Australia, that tested a biologically improbable, if not downright impossible, 1 percent crude protein. Or another recent one that, at 17.5 percent dry matter, had no lactic acid, a silage pH of 6.1, and more than half its nitrogen tied up in enough ammonia to have burned the cows' nostrils — assuming they could get past the dead-rat stink of an eye-popping 8 percent butyric acid.

Now, although few ever rise (sink?) to such a Pantheon of Pitiful Silages — those that make you utter, "Good heavens" or words to that effect — anyone who says he never has had any silage problems is kidding himself, or you. When we get into situations that are less ugly, I may differ with the stable of ERNs — that's "Eminent Ruminant Nutritionists" we invite to gripe about our silage in the interest of occasional comic relief — over what's safe to ignore when it comes to "forage quality." Nonetheless, here are a few hards and fasts you might pass along to dairies:

- **Right moisture, right maturity**. I don't know what more can be said about the importance of harvesting corn at the proper stage of maturity and moisture content: Higher dry-matter yields, better packing, little or no effl uent, and signifi cantly more milk per ton and per acre. Every percentage point of moisture you can squeeze out, up to the goal of at least 30 percent dry matter, might be the point that separates fair-to-middling silage from something your cows shouldn't eat
- **Chop height**. I find 12 inches is getting closer to normal than the so-called standard of 6 inches. It's driven by bigger harvest equipment, more custom harvest and less-than-perfect stone picking. High-chop — 18 inches or so — corn fits many situations, but it may require adjustments.
- **Process right.** These days, everyone likes processing, but there's still too much poorly processed corn out there. We need to quantitatively evaluate processing effectiveness better.
- **Pack well.** Corn silage density remains a serious problem, caused by the trend toward bigger silos

and faster delivery.

The balance between packing tractor weight, forage delivery rate, forage layer thickness and silage depth is always strained during the haste of harvest, but with many moderate-sized farms stuck with a set bunker size and delivering at more than double the ideal 30 tons per hour, they're left with the ability to affect only two of those four factors: One, add a second tractor for packing — assuming, that is, both operators are alert enough that they won't run over each another. But at 60 tons per hour and a 10- to 12-foot foot bunker silo height, even if you do a great job of spreading out the forage in 6-inch layers, a 30,000-pound tractor would have to be on the pile every minute you're filling. Two: Thin out the layers. Farmers are often surprised at the effect layer thickness has on density. In the above example, doubling the thickness to 12 inches from 6 inches makes the difference between needing one tractor or two.

Duals are a good idea on the packing tractor. They neither help nor hurt packing density, but they do help cover every inch of surface, they add weight if solu-tion-filled, and they help reduce the blood pressure of the guy on the packing tractor when sides get high and steep.

- **Check TLC**. A 0.75-inch theoretical length of cut (with processor) has become the compromise standard. Chopping at over 0.75-inch TLC results in a higher power requirement, plugged rollers, and accelerated processor, shaft and bearings wear.

FROM THE MATERNITY PEN

START RATIONS WITH LOW DCAD FORAGES

Because the major culprit causing hypocalcemia in transition cows is the high potassium that enters the ration from forages, says USDA Ag Research Service supervisory vet medical officer Jesse Goff, DVM, PhD, a close-up DCAD program should always start with buying or growing low-potassium forages. Where possible, rely on corn silage first, and limit potash and manure applications. If corn isn't available, consider beet pulp without molasses, brewers grains and corn gluten feed, all of which are low in potassium.

Research has also demonstrated it's possible to affect the DCAD balance from the anion side of the equation, by growing forages with higher levels of chloride. Therefore, Dr. Goff says, it is possible to find low-potassium, high-chloride for ages that are ideal for use in the dry-cow ration.

One caution, he notes: Be aware that chloride analyses are not done well by every laboratory. And don't trust potassium values that have been determined by NIR analysis. Potassium — and most minerals, for that matter — require analy sis by wet chemistry to be accurate.

And remember, of ourse, that once cows start lactating, high-DCAD forages are a good thing in that they increase milk.

CAN YOU FERTILIZE IN ANIONS?

Work by Canadian research agronomist Gaëtan Tremblay, PhD, found that applying from 70 to 111 pounds of chlothe ride per acre as fertilizer to timothy — 60 percent in spring and 40 percent after first harvest — increased the chloride concentration and lowered DCAD in the resulting forage to nearly zero, depending on soil potassium content. Other work by Dr. Tremblay suggests the economically optimal rate for spring growth is 90 pounds per acre. Even in the absence of fertilization, timothy is the most dry-cow friendly among orchardgrass, tall fescue, meadow bromegrass and smooth bromegrass.

(Source: Tremblay GF, et. al. Dietary cation-anion difference of forage grasses as affected by species and chlorine fertilization. Abstract T67. J Dairy Sci. 2005 July;88(Supp. 1):147. Tremblay GF, et. al. Dietary Cation Anion Difference of Five Cool-Season Grasses. Agron J. 2006 Mar;98(2):339–348.)

BEYOND BYPASS

ON THE FRONTIER OF CARBOHYDRATE

SCIENCE

The industry has traveled far in understanding the role of ration carbohydrates. But a lot of unexplored country remains beyond our current frontier of knowledge, says US Dairy Forage Research Center Dairy Scientist Mary Beth Hall, PhD.

One of Dr. Hall's master's students at University of Florida, Colleen Casey Larson, designed a study to mimic the experience when dairies must evaluate and balance out byproduct commodities, which differ in NFC. Larson individually fed cows the same basal roughage, whole cottonseed and mineral, and then used different amounts of ground corn, citrus pulp, molasses and sucrose to vary the NFC treatment by starch, soluble fiber plus sugar, or sugar. Atop those treatments, she altered bypass protein levels by using either 48 percent bean meal or bean meal in combination with SoyPLUS.®

> **SUGARS IN SOYPLUS®**
>
> As nutritionists look to ration sugar levels to increase milk and components, sources of those sugars can be rare and expensive. SoyPLUS contains 12.78 percent sugar, 2.66 percent starch and 26.62 percent NFC (CPM Method) on a dry-matter basis. The sugar and starch values were determined at Dairy One, a New York information-technology cooperative created by Dairylea and the Northeast DHIA. For more information, you can find its testing procedure at www.dairyone.com. SoyPLUS provides a reliable source of RUP, in combination with the sugar and carbs needed to maximize microbial yield.

Some of the most interesting results of this study, which Dr. Hall reported at last year's Virginia Tech Feed and Nutritional Management Cow College conference, came with the interaction between NFC and protein. Compared to diets without added bypass protein, increasing the RUP level caused milk yield, 3.5 percent fat- and pro-tein-corrected milk yield, milk-fat yield and feed efficiency to decline on the starchy diets — but to increase or stay roughly the same on the citrus and sugar diets.

Larson also used a subset of cows that were cannulated and looked at 30-hour *in situ* NDF disappearance. Again, she noted an interaction of NFC and RUP. When more bypass protein was added, NDF disappearance increased on the starch and sugar diets, but decreased on the citrus diet.

Ruminal pH across diets did not differ; however, the sugar diet without RUP gave a numerically lower pH across most sampling hours. Rumen acetate was higher for sugar than citrus, propionate didn't differ, butyrate was lowest with starch and highest with sugar, and branched-chain fatty acids were the reverse of the butyrate pattern. Rumen ammonia differed between protein treatments in the first three hours of the fermentation, but not among NFC treatments — even though MUN levels did.

Larson's and other NFC studies bring up carbohydrate questions we still can't fully explain with our current knowledge, Dr. Hall says. Does NFC source lead to different amounts of absorbed protein being broken down to yield more urea nitrogen? Does protein supplementation need to vary by NFC source because of differences in microbial protein yield? What are the dose responses to different NFCs as protein, fiber and other fractions in the rations are varied? There's a lot of "Terra Incognita" yet to explore, she says.

QUALITY CORNER

WHY ARE YOUR NDF VALUES REPORTED SOMETIMES WITH SULFITE AND SOMETIMES WITHOUT?

The 2001 Dairy NRC uses NDF values determined with methodology using sulfite; the CPM and CNCPS models, without. NRC's model uses sodium sulfite to remove contaminating protein from NDF, while CPM and CNCPS use protein bound to NDF in calculating the protein pools. In samples analyzed at the Miner Institute to specify the nutrient composition of SoyPLUS®, NDF with sulfite was 16.04 percent, while NDF without sulfite was 19.24 percent. So for SoyPLUS, NDF with sulfite is about 17 percent less than NDF without sulfite.

We continuously monitor using an in-house NIR, and we send check sam-ples to Woodson-Tenent Labs, in Des Moines. Samples are also analyzed for bypass protein at Cumberland Valley Analytical Services, in Hagerstown, Md., using an *insitu method.* Results from January through March 2006 (CV) and March through April 2006 (WT) include:

Nutrient	Percent	Standard Deviation
Dry Matter (WT) (N=18)	89.08	1.01
Dry Matter (CV) (N=49)	88.25	0.31
Crude Protein (WT) (N=18)	42.90	1.09
Crude Protein (CV) (N=49)	42.55	0.47
Crude Fat (WT) (N=44)	6.22	0.44
Crude Fat (CV) (N=49)	7.41	0.43
ADF (CV) (N=49)	8.16	0.72
NDF (CV) (N=49)	16.71	0.73
ADFIP (CV) (N=49)	0.97	0.14
NDFIP (CV) (N=49)	6.14	0.74
Urease (CV) (N=49)	0.03	0.01
RUDM (CV) (N=49)	36.53	2.13
RUP % CP (CV) (N=49)	52.85	2.76

WT: Woodson-Tenent tests CV: Cumberland Valley tests NDF is without sulfite

In order to ensure a constant chloride level in SoyChlor® samples are tested hourly with a digital chloridometer. Results for April and May 2006 are:

	Percent	Standard Deviation
Chloride (N=156)	9.37%	0.33

WEST COAST HAPPENINGS

ANNUAL MEETING A SUCCESS

West Central's successful 73rd Annual Membership Meeting on June 22 at the Hilton Coliseum in Ames, Iowa, drew about 1,000 attendees.

Members took part in a variety of afternoon activities, including an industry trade show, educational breakout sessions, and an informal social time and reception. During his corporate presentation, Chief Executive Officer Jeff Stroburg outlined the state of the cooperative and discussed his views for the upcoming year.

The evening concluded with an entertaining appearance by seasoned and famed agricultural broadcaster Orion Samuelson.

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