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Beyond Bypass: The latest updated version of CPM Dairy has hit the streets. Here's how it's improved, plus how it affects your SoyPLUS calculations.

## PLAN NOW FOR NEXT SUMMER

The bad news: California preliminarily reports that eight counties this summer lost 20,552 cows worth \$48 million, 10,728 calves worth more than \$4 million and almost \$457 million worth of milk to the heat. The worse news: Any given summer costs all continental U.S. dairy producers \$897 million in similar heat-stress related losses, according to climate and production modeling by Ohio State's Normand St-Pierre, PhD.

Got your attention about the losses to heat stress in your dairies? Then now is the time to help plan for abatement next summer that's steady and incremental, not last-minute and panicked. Watch for these nutritional issues:

**STARCH IS NOT THE FIRST RESORT.** Dairies may jump to substituting concentrate for forage too quickly in the face of heat-related DMI drops. U.S. Dairy Forage Research Center's Mary Beth Hall, PhD, goes so far as to flatly label it a bad idea. "There is just not the research information to support it," she says. Many cows are borderline acidotic already, and then heat stress further predisposes them to acidosis. Cutting back on fiber going into panting, sorting, slug-feeding cows may only make it worse.

Instead, producers should manage for higher DMI before increasing energy density:

- Ensure the forage being used is the best quality. ADF should be at least 19 percent.
- Increase frequency of feedings and number of times you push feed up daily. Schedule feedings for night, evening and morning.
- Increase the TMR moisture content from a typical 35 percent or 40 percent to 45 percent or 50 percent.
- Adding yeast may help stimulate appetite.
- Consider calcium propionate or other TMR preservative to hold down heating.

Producers need to carefully monitor the amount of forage and concentrates during hot weather, says Georgia dairy specialist Joe West, PhD. He advises they don't exceed 55 percent to 60 percent concentrates in the diets. More importantly, monitor non-structural carbohydrates, keeping them in the range of 33 percent to 40 percent. Dietary NDF should be between 28 percent and 34 percent of dry matter; however, the amount of NDF needed depends on particle size. So, he advises, monitor the diet

closely to ensure adequate forage particle size.

**PAY ATTENTION TO PROTEIN COMPOSITION.** Similarly, dairies may be tempted to increase crude protein during heat stress,

Dr. West says. But there's a metabolic cost to that excess nitrogen, as well. Degradability especially becomes a critical issue. He cites 1995 work that fed heat-stressed cows diets whose crude protein consisted of either 31.2 percent or 39.2 percent rumen-undegradable protein. Although the bypass levels had no effect on intake, the cows given the better quality protein increased milk yield by more than 5 pounds a day, and their blood urea nitrogen level was 24 percent lower. Based on the work of Tal Huber, PhD, while he was at Arizona, cows in hot conditions should get no more than 61 percent of their crude protein in rumen-degradable form, and total protein should not exceed NRC by more than 100 grams of nitrogen per day. NRC guidelines and ration software can detail the metabolizable protein and amino acid needs for the cow, Dr. West says. That precision protein formulation can sustain milk yield and avoid energetic costs associated with metabolizing excess protein.

**DOUBLE CHECK WATER**

Work shows heat-stressed cows will need from 1.2 times to double their already massive 35- to 45-gallon daily water intake. Dairies may not be up to that, either in total or in peak capacity. Exits off parlors with less than 25 stalls per side can generally be serviced by an 8-foot trough. Drylotted cows need troughs at two locations, plus 30 feet of trough perimeter per 100 cows or 80 feet of trough perimeter per 200 cows. Freestalls need one waterer or 2 feet of tank perimeter for every 15 to 20 cows, ideally available at every crossover.

**FAT SOURCE MATTERS.** Supplemental fat in the range of 4 percent to 8 percent of the ration effectively increases the ration's energy density, but obviously the source is critical.

Dr. West recommends no more than 30 percent to 40 percent of the total dietary fat come from unsaturated vegetable oil sources like whole cottonseed and roasted soybeans. More than that will begin to risk milkfat losses related to the biohydrogenation of their excess linoleic acids in the rumen. Tallow is an efficient and minimally rumen-digested energy source. It and other basal ingredient sources should constitute no more than about 40 percent to 45 percent of the dietary fat, Dr. West advises. Then, from 15 percent to 30 percent of the ration fat can come from manufactured rumen-protected fats. You need to watch the payback on those carefully, as they may not pay in herds under the 60-pound daily cow average mark.

**KEEP PERSPECTIVE.** Dr. Hall urges dairies to keep in mind heat-related production declines may do much shorter term harm to the bottom line than damage to the rumen caused by heat plus hot rations. Cool cows well and maintain the right quality diet, she counsels, and they'll be healthier and ready to bounce back when cool weather returns.



**IT'S FAST APPROACHING**

The most common mistake dairies make in managing heat, says Kansas State dairy specialist John

Smith, PhD, is to let it catch them unprepared. Northern states should be ready by April 1; central states, by March 1; southern states, Feb. 1. Failure to plan often leaves dairies without underlying support for last-minute measures — like water systems without capacity to supply new sprinklers. His priority list, in order, reads like this:

- Adequate drinking water
- Shade — housing and holding
- Shorter walk to parlors
- Less time in the holding area
- Better ventilation
- Holding area and exit lane cooling
- Close-up cow cooling
- Fresh/early-lactation cow cooling
- Mid- and late-lactation cow cooling

## FROM THE MATERNITY PEN

# ECONOMIC RETURN TO COOLING CLOSE-UP COWS

The dry pen may be a lower priority for cooling on the dairy, but it shouldn't be neglected entirely, suggests a study reported this summer.

The partial-budget analysis, led by University of California at Davis veterinarian Dale Moore, DVM, PhD, MPVM, compared the lactation performance of 236 drylotted close-up cows cooled with sprinklers over the bunk against 239 dry cows cooled using sprinklers, fans and shade. Researchers tested each group for at least two weeks before calving during the summer of 2002. The average daily environmental temperature in the sprinkler-only treatment was 79.5° and was 77.2° in the group cooled with shade, fans and sprinklers.

Although Dr. Moore's study found no significant improvement in condition score, retained placentas, metritis, milk fever, displaced abomasums or serum NEFA related to treatment, the additional cooling did add nearly 186 pounds more milk per cow during the first 60 days of lactation.

After accounting for a capitalized cost for the additional cooling equipment, the electricity to run the fans and the additional feed the cows would be expected to eat, the additional cooling added \$8.92 in profit for each cow, the study concluded.

### Costs for additional dry-cow cooling:

Fans, shade, cloth, frame and installation	\$7,040
Residual value of capital equipment after 5 years	\$1,500
Annual capital costs	\$1,456
Annual operating costs	\$777
> Maintenance and electricity	\$451
> Marginal feed for dry cows	\$326
<b>Total annual costs</b>	<b>\$2,233</b>

### Returns from additional milk production:

Additional milk over 60 DIN, lbs/day	3.1
Marginal price for additional milk	10.5 cents
Total annual benefit (milk returns)	\$4,364
Profit per year (based on milk only)	\$2,131
<b>Annual profit per cow</b>	<b>\$8.92</b>

Assume five-year capitalization period, seven fans used to cool 239 cows, 7 percent interest rate on capital, 10 percent cows culled in first 60 days at a median DIM of 25 day.

Source: Urdaz JH, Overton MW, Moore DA, Santos EP. Technical note: Effects of Adding Shade and Fans to a Feedbunk Sprinkler System for Preparturient Cows on Health and Performance. J Dairy Sci. 2006 Jun;89(6):200-6.

## HEAT STRESS AND DCAD

Hot cows sweat. But unlike humans, they sweat potassium rather than sodium. So much so that heat stressed early- or mid-lactation cows often up potassium-deficient. But that doesn't mean you can neglect DCAD balance in the pre-partum transition during periods of heat stress. Summer-calving cows should continue to improve their subsequent lactation performance when they're kept on negative-DCAD close-up rations.

Dairies should continue their regular urine-PH monitoring through periods of heat stress, to monitor for potential over-inclusion of SoyChlor (R) in the face of lost potassium. And remember that post-calving, sodium should go 0.3 percent to 0.5 percent of ration dry matter, potassium should go to 1.2 percent to 1.5 percent of dry matter, and magnesium should be from 0.3 percent to 0.35 percent of ration dry matter, for a positive DCAD of more than 250.

## CONSULTANT'S CORNER

# SHIFTING DAIRIES INTO HEAT-STRESS FEEDING MODE



*David I. Byers, DVM, Dairy Production Consultation, Galax, Va.*

If you've been to Disney World in July, you know the southeastern United States is the toughest place in the country to feed dairy cows. We plan on five to six months of heat stress annually.

We know the physiological effects of heat stress on dairy cows. They have been well documented. During the hot, humid months, our feeding strategy shifts to a "protective mode" that is geared towards survival rather than maximizing milk. The

objective is to "do thy patient no harm."

Summertime feeding must respect the parameters of normal rumen function. We feed to reduce the deleterious effects of rumen acidosis—problems like diarrhea, irregular DMI, "roller coaster" milk production, depressed fat test and laminitis.

I formulate for 32 percent to 34 percent NDF — effective NDF — and once those requirements are met then liberally feed glucose precursors to drive production. I then balance first for degradable protein based on the formula  $NFC \text{ (in pounds)}/3.3$ , targeting -0.30 to -0.50 pounds daily. The negative balance permits diets lower in crude protein. Then, I formulate for lysine at a balance of 4.0 to 8.0 grams per day, and finally formulate for methionine at -2.0 to -4.0 grams per day. I try to feed no more than 3 percent to 4 percent fat, and hold the ash level below 7 percent to create ration space for extra fermentable carbs.

If we can maintain healthy cattle during the hot, humid months, they respond quickly when heat stress abates and seem to react compensatorily. In contrast, if we ignore or abuse rumen physiology, cows respond poorly to cooler weather, and there seems to be a carryover effect.

## WEST CENTRAL HAPPENINGS

# GOLD STANDARD AGAIN

West Central launched a new look and ad campaign this month for its SoyPLUS<sup>®</sup> and SoyChlor<sup>®</sup> products. The launch took place at the 2006 World Dairy Expo in Madison, Wis.

The new ad campaign, titled "The Gold Standard Again," is a return to the roots for both products.

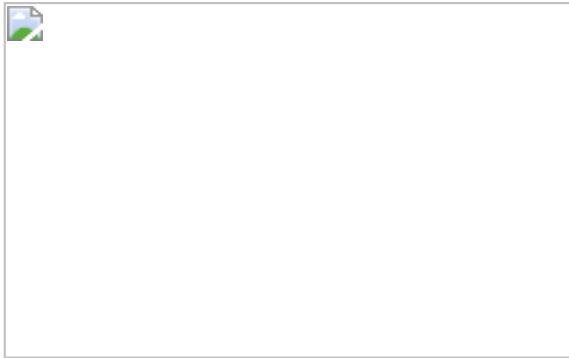
When these products were originally launched, they were branded as the industry's gold standard, a product to be measured against or compared to.

"We've always maintained our high production standards to ensure a consistent quality product. Repeated testing over the last several years confirms our product's consistency. Additionally, we have found SoyPLUS to be a product that meets the total nutritional needs of the dairy cow when considering amino acids and rumen inert fat (bypass fat)," explains Milan Kucerak, Executive Vice President of Soy Processing and Nutrition.

## BEYOND BYPASS

# FINALIZED DAIRY CPM MODEL NOW AVAILABLE

After some four years in public beta testing, the new version 3.0 of the CPM Dairy ration formulation software is available. The new release of this cooperative venture between Cornell, Pennsylvania and the Miner Institute brings nutrition consultants several improvements, according to one of the originators, Charlie Sniffen, PhD.



**The new CPM Dairy software includes newly validated master feed dictionaries, as well as improved ease in importing and exporting sessions to facilitate information sharing. For information, go to [www.epmdairy.com](http://www.epmdairy.com).**

- Its lipid sub-modeling allows nutritionists better predictive control over fatty acids which goes far beyond simple ether extract. That's particularly important, Dr. Sniffen notes, as the industry continues to make more use of high- and soluble-fat commodities like distiller's grains.
- CPM Dairy calculates amino-acid requirements by a factorial method and by an ideal protein method, to optimize ration protein so it, first, feeds the rumen microbial population and, second, incorporates the necessary bypass sources to optimize production and component response. Being able to take that complex modeling of rumen protein biology and put it to work in the field, says Wayland, Mich., dairy consultant Rob Davis, DVM, gives nutritionists frequent opportunity to lower total protein levels, in the process reducing nitrogen waste, lowering MUN levels and cutting overall ration costs. It will prove even more valuable as we better predict the metabolizable protein and amino-acid profiles of feedstuffs and as we move toward a wider selection of rumen-protected forms of specific amino acids.
- CPM allows sophisticated calculation of carbohydrate subfractions, permitting prediction of how individual starches, sugars and some soluble and insoluble (NDF) fibers break down in the rumen. Carbohydrate control helps maximize rumen efficiency without acidosis, Dr. Sniffen says. Dr. Davis, who operates Progressive Dairy Management, agrees on the value of this modeling aspect. High production starts by maximizing rumen fermentation, and models like CPM help us better predict rumen function. While quality forage is still the cornerstone of high production, digestibility of forage fiber is a new parameter we can now measure and use to predict performance in the cow. CPM Dairy's sophisticated feed-optimizer program, by removing amount constraints, can suggest the most profitable forage ratios for an individual herd and guide that operations' yearly forage planning. Trying to learn any new computer software "isn't for the faint of heart," Dr. Davis says, and you can't replace human observation and informed intuition with a machine. However, a tool as ambitious and complex as CPM Dairy can often function as a second set of eyes, helping the nutritionist see aspects of the feeding program in a different light. "I have been surprised a number

of times as to what can constitute a least-cost ration,” he says.

That may be a good analogy for the nearly 30-year history of the CPM’s modeling approach, says Dr. Sniffen. During extensive worldwide testing, it has sparked much debate about equations, assay methodology and predictions.

“That’s what we intended when we started in 1978,” he says. “We hope it will continue, spurring even more excellent research that will end up at the bottom line: the continued increase in efficiency.”

## SOYPLUS® CPM DAIRY ASSUMPTIONS

How were SoyPLUS values determined?

- Most chemical tests were done at either Miner Institute or Dairy One.
- NDF and NDFIP were determined without sulfite.
- The amino acids were determined on the borate buffer residue by Degussa.
- The 15 percent value for the SoyPLUS lipolysis rate comes from published studies. The model predicts significant linolenic acid absorbed and very little trans fatty acids produced in the rumen.
- Protein fraction pool sized come directly from chemical analyses. CPM Dairy breaks proteins into five fractions: A, B1, B2, B3 and C. The degradation rate of the A fraction — the NPN fraction of soluble protein — is considered rumen-indigestible, so all feeds are set at zero. The B1 fraction — the NPN fraction of the soluble protein pool — for SoyPLUS is just 3.85 percent of dry matter, rated to degrade at fairly fast, typical 150 percent per hour. Thus, the model is insensitive to B1. So, the B3 fraction — the protein bound to NDF minus that bound to ADF — and the B2 — the rest of the pool — become the most important values for determining metabolizable protein from bypass protein.

Two peer-reviewed in vitro studies determine that B2 and B3 degradation rates. They reported rates of 2.8 percent and 2.9 percent for the total B pool. The CPM model's rates of 150 percent per hour for B1, 3.35 percent per hour for B2, and 0.18 percent per hour for B3 correspond to a 2.85 percent combined B-pool rate. In typical CMP diets these valued lead to bypass protein values for SoyPLUS in the range of 57 percent for low producers to 67 percent for very high producers.



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