



OPTIMIZING DAIRY PERFORMANCE WITH AMINO ACID BALANCING

■ A Dairy Cattle Conference Recap – Sponsored by Arm & Hammer Animal Nutrition

The following discussion took place during AgTelePanels sponsored by Arm & Hammer Animal Nutrition and produced by Beck Ag in the spring of 2011. Dairy nutritionists and producers from across the country discussed the benefits of more precisely delivering protein to the cow through the practice of amino acid balancing.

Not all proteins are created equal. While all proteins are composed of amino acids attached together in chains, some proteins are deficient in specific amino acids, which are required for efficient component and milk production. Amino acids are also important for growth, immune function, reproduction and body condition maintenance. In the past, diets have been overformulated with protein in hopes of making sure limiting amino acid levels, like lysine, are delivered adequately.

However, today's advanced ration formulation software and new bypass lysine sources allow nutritionists to more precisely balance rations for optimal levels of amino acids, recognizing a variety of benefits that ultimately impact the dairy operation's bottom line.

BENEFITS OF AMINO ACID BALANCING

- Increased milk and/or component production
- Reduced need for supplemental RUP
- Increased flexibility for alternative ingredients
- Improved nitrogen utilization, reduced nitrogen excretion
- Increased feed efficiency, decreased environmental impact
- More predictable changes in milk and component production in relation to changes in RUP supply

BOTTOM LINE: IMPROVED INCOME OVER FEED COST (IOFC)

WHY TAKE THIS STEP?

While economics and productivity have been key factors in driving precision feeding techniques in recent years, so have environmental pressures. "One of the key benefits of amino acid balancing is that producers can improve nitrogen utilization (protein efficiency) and reduce nitrogen excretion by the animal," commented Dr. Gabriella Varga, a Distinguished Professor of Animal Science at Penn State University.

"What we're trying to do now is feed closer to the cow's requirements," Varga stated. "This allows producers to reduce protein in the ration, which lowers feed costs. Plus, cows use the ration nutrients – specifically those within the protein feed source – more efficiently." Consequently, producers increase their income over feed costs, or IOFC.

Dr. Mike Van Amburgh, Associate Professor of Animal Science at Cornell University, concurred with Dr. Varga's comments on how amino acid balancing is a great environmental stewardship and IOFC-enhancing strategy. To make cows more efficient and ensure they are fed in an environmentally responsible manner, Van Amburgh said the industry has to figure out how to reduce feed nitrogen intake and fecal and urinary (nitrogen) excretion, while increasing milk protein output.

"Anything we can do to increase efficiency should result in increased income over feed costs," Van Amburgh remarked. "If you can reduce your crude protein significantly and still meet rumen ammonia requirements for carbohydrate fermentation, you now have a real opportunity to start bringing in some of these products – protected (bypass) amino acids – to supplement the cow in ways that are very directed and very efficient. The efficiency change isn't just on the protein side; the real efficiency change comes on the energy side. With that we can get more pounds of milk protein and more pounds of milk per unit of energy input."

Dr. Bob Corbett, a dairy nutritionist and veterinarian with Dairy Health Consultations in Utah, agrees that even herds with good performance currently can still see improved IOFC. "In my experience, even if the components were quite good, a full amino acid balancing program generates a positive response in butterfat and protein components."

For amino acid balancing to work, Varga said cows need to be fed a consistent source of nutrients in amino acids, such as those found in products like MEGAMINE-L® Rumen Bypass Lysine. "One of the real benefits of amino acid balancing is that we have much more predictable changes in milk and component production," Varga said. Bottom line: producers can improve IOFC, and it's been proven on-farm. Note the economic advantage of feeding MEGAMINE-L as shown in the graph below.

MEGAMINE-L ECONOMIC ADVANTAGE

Production Levels for MEGAMINE-L and Control Groups			
	Control	MEGAMINE-L	The MEGAMINE-L Difference
	Cow/Day		1,000-cow Herd/ 305-day lactation
Milk Production	107.74 lbs.	110.71 lbs.	905,850 lbs.
Fat Production	3.88%	3.93%	
Protein Production	2.87%	2.87%	
Fat, \$/cwt ¹ (fat % * fat price)	\$5.99	\$6.07	
Protein, \$/cwt ¹ (protein % * protein price)	\$8.25	\$8.25	
Other Solid Pricing ¹	\$1.18	\$1.18	
Milk Price/cwt ¹ (fat + protein + other)	\$15.42	\$15.50	
Milk Income ((\$/cwt)/100 * milk production)	\$16.62	\$17.16	
Additional Income with MEGAMINE-L		+\$0.54	\$164,700.00

WHAT IS MEGAMINE-L?

Dr. Elliot Block, Senior Manager, Technology with Arm & Hammer Animal Nutrition, explained that MEGAMINE-L is a rumen bypass lysine source. It delivers optimal levels of lysine to the small intestine in a very consistent manner, removing the guesswork associated with amino acid balancing. It is a very unique formulation, which includes ARM & HAMMER® calcium salts of fatty acids technology.

“I think the easy thing about MEGAMINE-L is that it’s in a form that the industry has been used to using for quite a long time,” Van Amburgh commented. “A protein-encapsulated fat is a good deal and makes this an easy product to include in rations. Based on ARM & HAMMER’s work, we know the adaptability is going to be good. It looks like MEGAMINE-L addresses some of the issues we wrestle with in terms of variation and intestinal digestibility.”

COMMERICAL ON-FARM RESULTS

After having a positive experience feeding ARM & HAMMER’s MEGALAC® Rumen Bypass Fat, Bill Kilby, a dairy producer from Maryland, shared that he and his nutritionist began to focus on precision feeding in 2007 when he began feeding methionine in the herd’s ration. “This change allowed me to reduce crude protein by a point and saved about 80,000 pounds of nitrogen,” he claimed. “I’m able to control the level of crude protein by monitoring milk urea nitrogen (MUN) and adjusting protein levels accordingly. I can vary what I feed to make MUN come out the way I want and make the amino acids work as efficiently as possible.”

Once MEGAMINE-L was included in their diet, Kilby’s 570 cows responded with a point increase (3% to 3.1%) in protein. Butterfat is also more consistent and a little higher. “The lysine in MEGAMINE-L replaced the bloodmeal I was feeding and yielded more consistent results in the bulk tank,” Kilby said.

“Bottom line – the improvement in components, primarily protein, netted us about \$6 per cow a month,” Kilby added.

Kilby’s nutritionist, Rick Lawrence of Interactive Consulting LLC in New Windsor, Maryland, concurred that the Maryland dairy herd is producing consistent components. “This has had a significant payback over a period of time,” he stated.

A PROFITABLE DECISION

On the other side of the country, Clark Bown, a third-generation dairy producer from Fayette, Utah, didn’t like the component levels his 1,000 cows were producing. “We were a little skeptical of amino balancing and MEGAMINE-L, but this has been a really good experience for us. It’s been very beneficial in increasing our butterfat and protein.”

Admittedly, Bown said it’s not a cheap decision to add MEGAMINE-L to the ration. “It seemed expensive and that was scary for us. But it’s been a very profitable decision.”

Bown described his experience. “When we switched, it cost us \$0.55 a pound more for our mineral mix. But we didn’t have to feed as much mineral mix. So actually, our additional cost was about \$0.44 per cow per day. We were a little worried about that; that’s a big jump. However, our butterfat went from 3.2% to 3.6% and our protein went from 2.74% to 2.93%. We’ve seen a significant improvement economically; our (additional) net return (IOFC) per cow per day was \$0.55.”

Corbett concurred that cost can scare producers away from amino acid balancing. “I think the top reason that the dairy producer is

concerned about balancing for amino acids is the initial cost. But they shouldn’t shy away from this tool. We’ve been able to show producers that income over feed cost from that initial investment offers a very high return.”

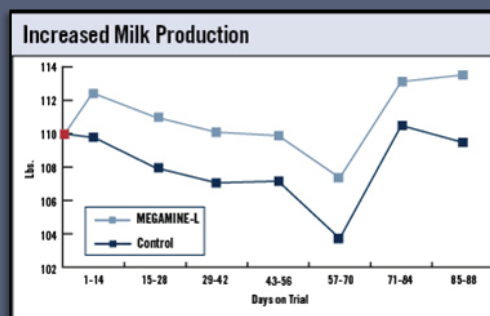
ALMOST IMMEDIATE RESULTS

Amino acid balancing typically produces an improvement in components fairly soon after it is implemented, making this a low risk proposition for producers. “In our field trials, we saw changes as early as three to four days after initiating the change,” Corbett commented.

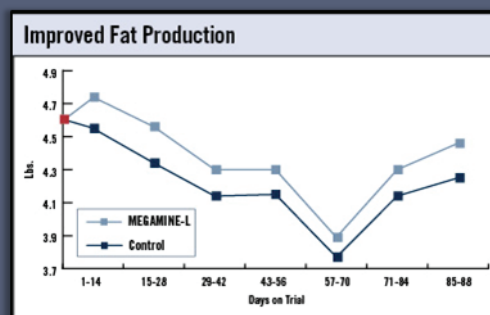
MIDWEST ON FARM TRIAL: RESULTS

- Large, 3,200-cow commercial Midwest dairy²
- 800 fresh cows in two groups, 400 per group
- Milk samples taken every two weeks by local DHIA
- Study took place over 88 days
- Control diet: Balanced for 110 lbs. of milk at 3.6 % fat and 3% true protein. Treatment diet: same as control except fat was replaced with an average of 0.35 lbs. of MEGAMINE-L to bring lysine to 7.25 % of MP

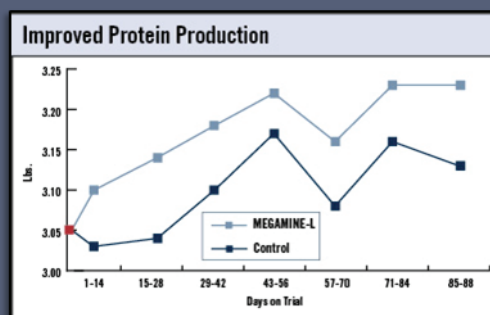
[†] P < 0.05



2.97 lbs. jump in milk production per cow per day



0.18 lbs. boost in milk fat yield per cow per day



0.18 lbs. boost in milk fat yield per cow per day

Bown and Kilby also saw positive results in just a few days. “The production response was almost immediate for us,” said Bown. “We saw a difference within 10 days.” Kilby added that he saw results in three weeks.

A recent Midwest on-farm trial also supports the producers’ claims. Cows fed MEGAMINE-L showed an increase in component and milk production, as outlined on the previous page. This all occurred within the first two weeks.

ALL HERDS RESPONDED POSITIVELY

In nine feeding trials across key dairy states, 100% of the dairies responded positively in solids-corrected milk (SCM) produced. The response was independent of initial milk production level or farm size. Additionally, 78% —or seven out of the nine dairies — showed a favorable IOFC. Efficiency and amount of metabolizable protein (MP) must be considered to maximize the IOFC response to MEGAMINE-L. The two dairies with negative IOFC overfed MP to both the control and MEGAMINE-L groups. The collective trials demonstrated that an average milk value of \$7/cwt SCM results in a break-even IOFC.

Dr. Bill Prokop, an independent nutrition and veterinarian consultant based in Butler, Indiana noted that some dairy nutritionists and producers use MilkPay.com, a spreadsheet that can be accessed online, to calculate the economic impact of balancing amino acids. Users can put in various production levels to compare a control group with a treatment group. If there’s no control group, users can compare before and after results. “What this does not account for is there are probably benefits to amino acid balancing from a physiological perspective that we don’t recognize because we don’t measure them real time.”

MEGAMINE-L ECONOMIC BENEFIT IS REALIZED EVEN AT LOW MILK PRICES

TABLE 1 Greater Income Over Feed Cost with MEGAMINE-L ³						
State	Control SCM lbs/cow/day	Treatment SCM lbs/cow/day	Income Improvement	Difference in Ration Cost	IOFC \$/cow/day	Breakeven Milk Price
Utah	80.70	93.56	\$2.136	\$0.54	\$1.60	\$4.23
Texas	92.51	100.26	\$1.382	\$0.35	\$1.03	\$4.50
Ohio	70.85	76.33	\$0.944	\$0.18	\$0.76	\$3.49
Wisconsin	81.09	86.85	\$0.927	\$0.35	\$0.58	\$6.06
Wisconsin	110.41	114.25	\$0.619	\$0.23	\$0.39	\$5.93
Utah	82.38	87.67	\$0.878	\$0.54	\$0.34	\$10.50
Iowa	75.58	77.31	\$0.278	\$0.10	\$0.18	\$5.73
Pennsylvania	68.4	68.7	\$0.01	\$0.45	(-\$0.44)	
Washington	84.96	86.33	\$0.228	\$0.75	(-\$0.52)	

³All results from farms were first converted to equalized solids corrected milk (SCM), which corrects milk volume based on 3.5% fat and 3.2% protein.

MAXIMIZING EFFICIENCY OF PROTEIN UTILIZATION

If producers or nutritionists simply look at the amount of crude protein in a ration, they may wonder why cows are not producing to their genetic potential. There’s a good chance that lysine may be the broken link in the amino acid chain. Computer ration balancing programs can help adjust the ration for this deficient essential amino acid.

According to Corbett, protein efficiency for lactating dairy cows averages 64% but can vary from 58% to 72%. “Variability of the

amino acid profile can lead to production variations – from 66 to 106 pounds of milk per day and 2 to 2.6 pounds of milk protein per day.”

What does it take to be better than average? Balance for amino acids and increase protein efficiency to as high as 70%. “If producers can increase the efficiency of converting crude protein into milk protein, this allows them to feed less protein and lower the ration cost,” Corbett remarked.

MINIMIZING VARIABILITY

Whether it’s the milking routine or the ration, dairy cattle thrive on consistency. Not so long ago (and even still today), producers and nutritionists turned to bloodmeal as an ingredient to boost lysine in rations. Unfortunately, bloodmeal can limit productivity as its lysine content can vary considerably from one batch to another. Based on 265 bloodmeal samples, lysine content ranged from 3.4 to 41.9 grams per pound of bloodmeal⁴. “Just think, you might be getting as little as 10% of the desired lysine (in bloodmeal) or you might be getting 120%,” commented Prokop.

“The more nutritionists can use ingredients that consistently deliver what is represented by the supplier, the easier it becomes for cows to produce the results that nutritionists are predicting to clients,” Prokop added. “The variation in digestibility can be so extreme that you may get all of what you expect, more than you expect, and very often none of what you expect. MEGAMINE-L delivers what it says it delivers.”

Barry Crosby of Advanced Dairy Nutrition in Utah, echoed some of Prokop’s comments. With a few years of experience doing amino acid balancing, he initially used bloodmeal as the lysine source. “I looked for just a few grams of quality lysine, but I had no idea if I got it on a load or not.” He found that very frustrating.

“To have a product that is reliable, available and consistent – like MEGAMINE-L – that’s a key item,” Crosby remarked. “We’ve needed a lysine source like this for a long time. It’s great not having to spend so much time doing a ration and then take a wild, shotgun approach on the lysine. With MEGAMINE-L, I can be very targeted and help eliminate that problem.”

BOOSTING CATTLE HEALTH, REPRODUCTION

It’s not unusual for early-lactation cows to go into negative protein balance. “Anything we can do in ration formulation to speed up delivery – especially amino acids – is going to enhance the animal’s ability to increase efficiency and use less energy to process nutrients. This translates into healthier animals,” Corbett added.

Negative energy balance generally causes a loss in body condition score. Corbett noted that as he monitored a herd feeding MEGAMINE-L, he noticed a surprising response. The 6,000-cow herd averaged 80 pounds (36 kg) (and more) of milk per cow per day. After three to four months of amino acid balancing, cows around 100 to 120 days in milk – the stage where they always struggled at keeping good body condition – had about one-half a point of body condition score more than in the past.

“This allowed us to reduce the added fat level, at that point in their lactation, to avoid them becoming overconditioned later. The only thing I can attribute this to is a huge improvement in feed efficiency.”

Van Amburgh listed improved reproductive efficiency as another added benefit of amino acid balancing. “As energetic efficiency goes up, especially in high-producing cows in the earlier part of the lactation, theoretically that should help us with reproductive efficiency. That cow should be able to utilize energy more efficiently.”

Dairy producer Kilby echoed some of Van Amburgh’s herd health comments. “You may increase herd health and better reproduction because the cow’s energy level stays higher. Producers can feed more forage and I think that also helps improve herd health. Precision feeding is obviously the way things are going – not strictly because of costs, but also for herd health, which also reduces costs.”

IMPROVED IOFC INCOME OVER FEED COSTS

TABLE 2 Improved IOFC			
	Additional Income	Change in ration cost with MEGAMINE-L	Increased IOFC Potential
Cow/Day	+ \$0.54	(\$0.23)	+\$0.31
1,000-cow Herd/305-day lactation	\$164,700.00	(\$70,150.00)	\$94,550.00

Bown added that amino acid balancing is worthwhile because it saves money. “This is certainly a great tool to use; the health benefits, as well as the financial benefits, are well worth it.”

BE AWARE OF REGIONAL DIFFERENCES

While feedstuffs vary across the country, Varga said amino acid balancing and rumen bypass lysine can enhance fine-tuned rations – whether the cows are in Pennsylvania, Texas, Wisconsin or Utah. “In the Northeast, where we feed more corn and corn silage compared to the West, where you might have corn silage, higher haylage and alfalfa hay feeding scenarios, there are going to be differences in the efficiency of amino acids – depending on the type of forage used.”

For example, it becomes more difficult to formulate rations when there are really good quality forage sources coming from alfalfa because alfalfa tends to be higher in soluble undegradable protein. “However, that doesn’t mean we can’t do a good job in the end providing sources of amino acids, such as MEGAMINE-L, to make the cows more efficient in utilizing protein. This product allows us to actually reduce total protein in the ration. Again, this benefits producers by reducing the overall cost.”

Van Amburgh noted that in areas where there’s a high alfalfa base in the ration, it is a little bit more difficult to balance the ration because the diet tends to run higher in crude protein. “I think we’re struggling a bit to differentiate between rumen available nitrogen and post-ruminal amino acids. What I’m learning from some of the western data is that we’re blaming the alfalfa and I don’t think it’s the alfalfa. This is where I think there’s a benefit to feeding protected amino acids. It appears that it’s the digestibility of the escape protein or the RUP?”

The Cornell University associate professor added, “I think some of the RUP sources we buy as commodities may not be as digestible in the intestine as we have in some of our feed libraries. That creates problems and we’re not very sensitive at predicting that. Bringing in some higher quality protected amino acid sources, such as MEGAMINE-L, gives us tighter control over supplying those MP amino acids.”

Corbett noted that there is tremendous variability in protein sources being fed, particularly with distillers grains. “Since that product is less expensive than a lot of other protein sources, a lot of dairy producers like to use that product. But because it is low in lysine, it ends up causing a lysine deficiency for those animals.”

MORE THAN A PRODUCTION-ENHANCEMENT TOOL

Nutritionists and producers alike agreed that more precision feeding methods are the way of the future, and balancing for amino acids can positively affect milk and component production in a short time. Feeding MEGAMINE-L consistently optimizes protein metabolism, which can also fulfill maintenance needs, lower crude protein requirements, increase feed and reproductive efficiency, and reduce nitrogen excretion, as well as enhance feed quality and digestibility.

“The science is there to support amino acid balancing,” Lawrence summarized. “It’s a matter of us out in the field getting comfortable implementing it. My suggestion is to take a little bit of risk, take a good client and have a discussion with that client, and give MEGAMINE-L a try. I think you’ll be surprised and impressed with what happens; and then, you just need to repeat it.”

“Amino balancing is the future. One, it reduces dairy cows’ environmental impact; and two, it enhances dairy producers’ return on investment – at least from a nutritional perspective,” Van Amburgh concluded.

¹ Source: www.milkpay.com

² Midwest on-farm trial, 2009. Data on file.

³ The milk value for SCM was calculated for each farm using MilkPay.com on 9/21/2010 (value/cwt of milk at 3.5% fat and 3.2% protein). Using MilkPay.com, milk value was reduced until the IOFC equaled zero (\$0). The assumption is that the SCM response for each farm and the increase in ration cost remain the same.

⁴ Boucher, S.E. Challenges of Predicting Metabolizable Lysine Content of Ingredients, in Proceedings. Cornell Nutrition Conference for Feed Manufacturers 2009:16-27

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*U.S. Patent application number 11/473880 Ruminant Feedstock Dietary Supplement

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