

Potential for 20 % improvement in efficiency of protein use for milk production by amino acid balancing

Research conducted at the US Dairy Forage Research Center in Madison (WI) has shown the potential for improving milk nitrogen (N) efficiency by more than 20 % through balancing amino acids and reducing crude protein levels fed. Milk nitrogen efficiency is a measure of how much of the protein (hence nitrogen) fed appears in milk versus being wasted and posing environmental challenges.

Experimental Design

The forage base consisted of alfalfa silage (21 % of DM) and corn silage (28 % of DM). Rolled high moisture (HM) corn was the sole grain and protein supplementation was from soybean meal (SBM) and roasted whole soybeans. Soy hulls (5.8 % of DM) were fed in all treatments to avoid excessive starch intake and potential acidosis problems. Treatments with 24 cows were 18.6, 17.3, 16.1 and 14.8 % crude protein (CP). The highest CP diet had no supplemental methionine, but as CP was reduced in the other diets by replacing SBM with HM corn, Mepron® was fed to maintain methionine supply.

Effects on Nitrogen Use

As shown in the Table below, nitrogen and therefore crude protein was used more efficiently as diet protein declined. This occurred as a consequence of lower N intake, higher milk yield and higher milk protein yield for the 17.3 and 16.1 % CP diets. The lowest CP did not support adequate production and therefore cannot be recommended for commercial use.

The 17.3 and 16.1 % CP diets not only supported higher production but substantially reduced N excreted as urinary urea. Nitrogen in this form is the most likely to volatilize and to contribute to air pollution.

Moving from an 18.6 % CP ration to 17.3 or 16.1 % CP improved the efficiency of capture of dietary N in milk by 14 and 21 %, respectively. These changes also reduced the N lost as urea in urine by 28 and 44 %, respectively. This represents a substantial opportunity for dairies to be more environmentally responsible without paying a production penalty.

Results from this experiment indicate that Mepron® plus HM corn can be used to replace part of the CP that is normally fed as soybean meal. By supplementation with Mepron®, it was possible to reduce dietary CP from 18.6 to as little as 16.1 % CP without losing production of milk and milk components. Reducing dietary CP to 14.8 % depressed milk production and resulted in mobilization of body protein, which could not be compensated for by Mepron® supplementation.

Table 1

Item	CP %	18.6	17.3	16.1	14.8	SEM	P > F
	Mepron®, g/d	0	8	17	25		
MUN (mg/dL)		14.5 ^a	11.8 ^b	9.5 ^c	7.9 ^d	0.4	< 0.01
Milk-N/NI, %		26.2 ^c	29.9 ^b	31.7 ^b	34.0 ^a	0.9	< 0.01
Excretion, g/d							
Urinary Urea-N		205 ^a	148 ^b	115 ^c	80 ^d	6	< 0.01
Total urinary N		260 ^a	207 ^b	188 ^c	150 ^d	8	< 0.01
Fecal N		250	246	259	237	9	0.20
Total manure N		510 ^a	453 ^b	447 ^b	387 ^c	13	< 0.01
Estimated N balance		28	25	14	-7	9	0.01

Change in N utilization by replacing SBM with HM corn and Mepron®

Bottom Line

Amino acid balancing of dairy rations represents a viable approach to meet the challenges of environmental sustainability and production economics. The highest N efficiency, with no loss in performance, was observed in the Mepron®-supplemented diet containing 16.1 % CP.

References:

Broderick GA, Stevenson MJ, Patton RA, Lobos NE, Olmos Colmenero JJ (2008): Effect of supplementing rumen-protected methionine on production and nitrogen excretion in lactating dairy cows. J Dairy Sci 91: 1092-1102

This information and any recommendations, technical or otherwise, are presented in good faith and believed to be correct as of the date prepared. Recipients of this information and recommendations must make their own determination as to its suitability for their purposes. In no event shall Evonik assume liability for damages or losses of any kind or nature that result from the use of or reliance upon this information and recommendations. EVONIK EXPRESSLY DISCLAIMS ANY REPRESENTATIONS AND WARRANTIES OF ANY KIND, WHETHER EXPRESS OR IMPLIED, AS TO THE ACCURACY, COMPLETENESS, NON-INFRINGEMENT, MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE (EVEN IF EVONIK IS AWARE OF SUCH PURPOSE) WITH RESPECT TO ANY INFORMATION AND RECOMMENDATIONS PROVIDED. Reference to any trade names used by other companies is neither a recommendation nor an endorsement of the corresponding product and does not imply that similar products could not be used. Evonik reserves the right to make any changes to the information and/or recommendations at any time, without prior or subsequent notice.

Evonik Operations GmbH
Nutrition & Care
Animal Nutrition Business Line

animal-nutrition@evonik.com
www.mepron.com