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USA Lysine® vs. Blood Meal: Higher Production, Improved Efficiency and More Profit¹

Introduction

Previous research has demonstrated performance of lactating dairy cows can be enhanced by providing additional metabolizable lysine (MP Lys)^{2,3,4}. One of the common sources of MP Lys in lactating dairy diets is blood meal from the rendering industry. However, blood meal is a highly inconsistent source of MP Lys due to processing procedures⁵. Encapsulated lysine products that resist ruminal degradation and provide consistent amounts of MP Lys are available to the dairy market. USA Lysine® manufactured by Kemin Industries has been shown to have a high level (44%) of MP Lys⁶. The objective of the study was to determine the efficacy of USA Lysine versus blood meal as a source of MP Lys in lactating dairy diets fed from 1-90 days in milk (DIM). The results from this research demonstrate the benefits of feeding USA Lysine in place of blood meal.

Materials & Methods

Forty Holstein cows (10 primiparous and 30 multiparous) were blocked by expected calving date and either predicted transmitting ability (primiparous) or previous 305 day milk production (multiparous). Cows were randomly assigned into the blood meal (BM) or the USA Lysine (USA Lysine) treatment group and fed post fresh (1-30 DIM) and peak (31-90 DIM) period diets (Table 1, Appendix A, Appendix B). Dry matter intake (DMI) was determined for each cow on a daily basis. Cows were milked three times per day and milk yield was recorded daily. Milk composition samples were collected two times per week in the morning and analyzed for fat and true protein levels. Performance and DMI data from days 1-90 of lactation were used in the statistical analysis.

Table 1. Comparison of Treatment Diets

Treatment	Blood Meal (lb/h/d) – Calculated ¹		USA Lysine (lb/h/d) – Calculated ²		MP Lysine (g/h/d) – Calculated ³		MP Methionine (g/h/d) – Calculated ⁴	
	Post Fresh ⁵	Peak ⁶	Post Fresh	Peak	Post Fresh	Peak	Post Fresh	Peak
Blood Meal	0.27	0.36	0.00	0.00	131	182	44	62
USA Lysine	0.00	0.00	0.02	0.03	121	181	40	60

1. Blood meal as percent of dry matter x DMI
2. USA Lysine as percent of dry matter x DMI
3. MP Lysine as percent of dry matter x DMI
4. MP Methionine as percent of dry matter x DMI
5. Post Fresh Period (1-30 DIM)
6. Peak Period (31-90 DIM)

Results

During the post-fresh period (1-30 DIM), DMI was numerically lower in the USA Lysine treatment group. Additionally, the energy corrected milk (ECM) yield was numerically higher. This combination led to a statistically significant improvement in feed efficiency in the USA Lysine treatment group vs the blood meal group, 2.44 vs. 2.17 respectively (Figure 1).

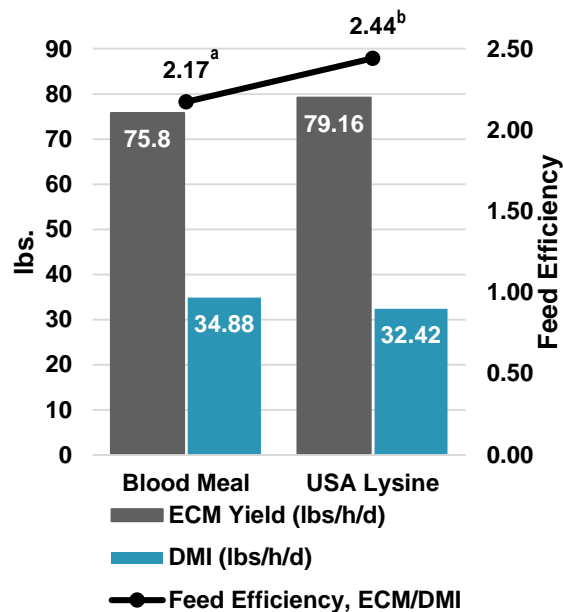
During the peak period (31-90 DIM), DMI was similar in the two treatment groups. ECM production was significantly greater in the USA Lysine treatment group. As seen in the post fresh period, this resulted in a statistically significant improvement in feed efficiency in the USA Lysine group vs. the blood meal group, 1.95 vs. 1.83 respectively (Figure 2).

Conclusion

During the post fresh period, rapid changes in milk production made it difficult to identify the impact on milk yield. While there were no significant differences in ECM yield or DMI, the combination of the differences did lead to a significant improvement in milk efficiency in the USA Lysine group. This improvement resulted in maintaining milk production at a lower cost.

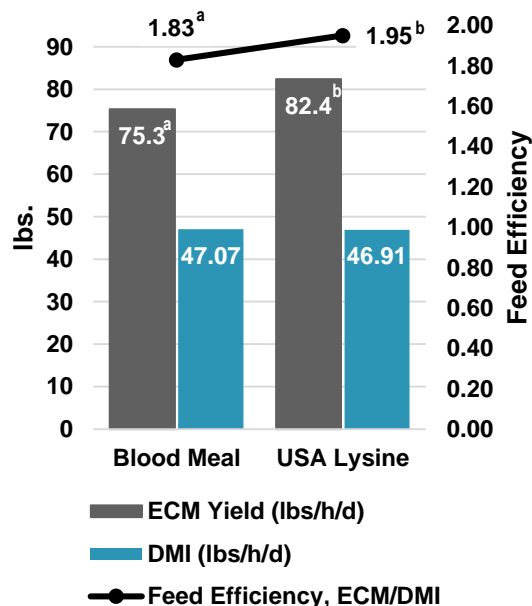
During the peak period, dietary impacts on milk yield were more observable. While the DMI was similar between treatment groups, the significant improvement in ECM yield resulted in a significant improvement in feed efficiency in the USA Lysine group. In this study, feed costs were similar, but greater milk yields resulted in even greater profits to the producer.

The differences observed between the treatment groups may be due to the quality of the blood meal fed. The diets were designed so each treatment (blood meal and USA Lysine) received equal levels of MP Lys. Since MP Lys levels were similar across treatments, the USA Lysine production response indicates the lysine in USA Lysine was more available than the lysine in blood meal. The digestibility of blood meal lysine has been illustrated as a major problem with this feedstuff⁵.



Differing superscripts indicate significant difference, $P \leq 0.05$

Figure 1. Effect of BM or USA Lysine as the major MP Lysine source on production performance of primiparous and multiparous cows 1-30 DIM



Differing superscripts indicate significant difference, $P \leq 0.05$

Figure 2. Effect of BM or USA Lysine as the major MP Lysine source on production performance of primiparous and multiparous cows 31-90 DIM

References

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Appendix A. Ingredient Composition of the Formulated Diets¹

Ingredient	Diets				
	Pre-Fresh	Post-Fresh		Peak	
		Blood Meal	USA Lysine	Blood Meal	USA Lysine
	----- Percent of Diet Dry Matter -----				

Corn Silage	40.49	35.64	35.64	32.69	32.69
Alfalfa Hay	---	16.83	16.83	16.34	16.34
Grass Hay	16.56	---	---	---	---
Ground Corn	5.61	12.03	12.03	11.68	11.68
Soybean Hulls	13.43	5.93	5.93	5.77	5.77
Soybean Meal	11.04	3.96	3.96	3.85	3.85
Dried Distillers Grains	1.84	3.96	3.96	3.85	3.85
Propel [®] Energy Nugget ²	---	2.08	2.08	2.02	2.02
Sodium Sesquicarbonate	---	1.19	1.19	1.15	1.15
Calcium Carbonate	1.58	1.09	1.09	1.06	1.06
Vitamin/Mineral Mix	2.07	2.23	2.23	2.16	2.16
Pre-Fresh Grain Mix ³	7.36	---	---	---	---
Post-Fresh Control Grain Mix ⁴	---	14.26	---	---	---
Post-Fresh USA-L Grain Mix ⁵	---	---	14.98	---	---
Peak Control Grain Mix ⁶	---	---	---	16.26	---
Peak USA-L Grain Mix ⁷	---	---	---	---	16.92
Blood Meal	---	0.79	---	0.77	
USA Lysine	---	---	0.069	---	0.067

- Diets formulated with Dynamic Nutrition System model (Purina Animal Nutrition, Gray Summit, MO).
- Propel[®] Energy Nugget Purina Animal Nutrition, Gray Summit, MO.
- Contained 40.1% Wheat Midds, 30.6% Soybean Hulls, 24.1% SurePro[®] bypass soybean meal (Purina Animal Nutrition, Gray Summit, MO), 4.3% fat, 1.0% Calcium carbonate.
- Contained 34.7% HI-VAP[™] bypass protein (Purina Animal Nutrition, Gray Summit, MO), 27.8% Ground corn, 13.9% Soybean Meal, 11.8% Soybean Hulls, 8.3% Wheat Midds, 1.4% Calcium carbonate, 1.4% DCAD Plus[™] (Church & Dwight, Inc., Princeton, NJ), 0.7% RP-Methionine Source.
- Contained 33.0% HI-VAP[™] bypass protein, 26.4% Ground corn, 20.1% Soybean Meal, 9.2% Soybean Hulls, 7.9% Wheat Midds, 1.3% Calcium carbonate, 1.3% DCAD Plus[™], 0.7% RP-Methionine Source.
- Contained 31.9% HI-VAP[™] by-pass protein, 29.6% Ground corn, 15.4% Soybean Meal, 13.6% Soybean Hulls, 6.5% Wheat Midds, 1.2% Calcium carbonate, 1.2% DCAD Plus[™], 0.6% RP-Methionine Source.
- Contained 30.7% HI-VAP[™] by-pass protein, 28.4% Ground corn, 21.6% Soybean Meal, 10.3% Soybean Hulls, 6.2% Wheat Midds, 1.1% Calcium carbonate, 1.1% DCAD Plus[™], 0.6% RP-Methionine Source.

Appendix B. Formulated Nutrient Composition of the Diets

Nutrient	Unit	Pre-Fresh	Diets			
			Post-Fresh		Peak	
			CON	USA Lysine	CON	USA Lysine
Dry Matter (DM), %	%	52.79	55.57	55.56	57.45	57.44
Forage DM	% of DM	57.05	52.48	52.48	49.04	49.04
Net Energy for Lactation (NE _L)	Mcal/lbs.	0.74	0.79	0.79	0.81	0.82
Crude Protein (CP)	% of DM	15.54	16.66	16.47	16.96	16.83
Rumen Undegradable Protein (RUP)	% of CP	26.35	37.80	35.39	38.71	36.39
Rumen Degradable Protein (RDP)	% of CP	73.65	62.20	64.61	61.29	63.61
Soluble Protein (SP)	% of CP	29.33	26.52	27.00	25.73	26.17
Metabolizable Lysine (MP Lys)	g/d	90.06	189.74	188.21	201.09	200.01
Metabolizable Methionine (MP Met)	g/d	28.76	63.94	62.41	68.01	66.65
MP Lys	% of MP	6.69	6.85	7.00	6.87	7.02
MP Met	% of MP	2.14	2.31	2.32	2.32	2.34
MP Lys/MP Met Ratio		3.13	2.97	3.02	2.96	3.00
Acid Detergent Fiber (ADF)	% of DM	25.48	19.86	19.77	19.24	19.09
Neutral Detergent Fiber (NDF)	% of DM	40.11	31.20	31.09	30.21	30.02
Forage NDF	% of DM	26.35	21.28	21.28	19.90	19.90
Fat	% of DM	2.77	4.09	4.09	5.22	5.22
Non-fibrous Carbohydrate (NFC)	% of DM	34.90	40.27	40.53	39.95	40.22
Non-structural Carbohydrate (NSC)	% of DM	35.85	40.45	40.71	40.07	40.33
Starch	% of DM	17.98	23.62	23.63	23.64	23.65
Sugar	% of DM	4.65	2.96	3.08	3.01	3.13
Total Starch & Sugar	% of DM	22.63	26.58	26.71	26.65	26.78