



# Assessment of Lysine Released from Rumen-Protected Lysine Products Exposed to High and Low Moisture TMR over 24 Hours

P. Ji\*, C. S. Ballard, R. E. Clark, B. M. Sweeney, C. Kokko  
William H. Miner Agricultural Research Institute, Chazy, NY



www.whminer.org/adsa2012.html

## INTRODUCTION

- Lysine (Lys) is the first limiting amino acid for lactating dairy cows fed a corn grain-based diet.
- Rumen-protected Lys (RPL) products are commercially available.
- Ruminal bypass rate and intestinal digestion has been studied.
- Little information available regarding potential pre-ingestional Lys loss from RPL products during routine feeding management.

## OBJECTIVE

To determine the potential Lys loss of RPL products induced by physical contact with TMR diet varying in moisture content after feed delivery.

## MATERIALS AND METHODS

### Experimental Design

- Six commercial RPL products:

Table 1. Major composition of RPL products.

RPL	Lys compound	Major coating material	Lys, % as fed
AminoShure-L	Lys-HCl	Vegetable oil	53.6
LysiPEARL	Lys-HCl	Vegetable oil	38.2
MEGAMINE-L	Lys-HCl	Ca salt from vegetable oil	19.4
MetaboLys	Lys-H <sub>2</sub> SO <sub>4</sub>	Vegetable oil	28.5
USA Lysine	Lys-HCl	Vegetable oil	53.6
AjiPro-L	Lys-HCl	Vegetable oil	40.4

- A split-plot arrangement of treatments in a completely randomized design based on each RPL product.
- Moisture content of TMR is main plot treatment effect (Trt): TMR of 42% DM (LD) and 52% of DM (HD).
- Time of RPL mixed with TMR ingredients is subplot treatment effect (Time): 0, 6, 18, 24 h.

### Experimental Procedures

- Three loads of LD and HD diet (350 kg/load) were formulated using the same DM-based proportion of ingredients and mixed in Super Data Ranger.
- 200 ± 1 g of TMR transferred to Ziploc bag and mixed with or without 2 ± 0.05 g RPL product.
- Bags were stored unsealed at 21°C for 0, 6, 18, and 24 h to simulate feedbunk exposure.



- At each time point, content of bags were transferred into strainer bag (< 1.5 mm porosity), soaked in 1 L 500 mg/L L-Arginine solution to solubilize the free Lys (Arginine used as internal control to adjust for addition of TMR-derived water in solution)
- Subsample of filtrate through 0.45-µm filter, diluted and derivatized using AccQ Tag Ultra reagent (Waters Corporation, Milford, MA)
- Lys concentration analyzed by ACQUITY UPLC® system
  - Lys analysis performed by Ajinomoto Bio-Fine Research Laboratories with all samples blindly labeled.
- Lys release calculated as:  $TMR_{with\ RPL} - TMR_{without\ RPL}$  at each timepoint



### Statistical Analysis

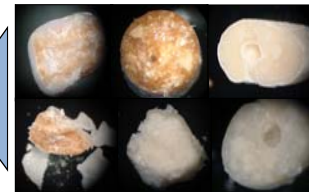
- MIXED procedure of SAS (v. 9.2) with TMR moisture content, mixing time and their interaction as fixed effect and sample in each Ziploc bag as random term.
- PDIF option was used for mean separation.
- Significance was declared at  $P \leq 0.05$ .

## RESULTS

AminoShure-L	MEGAMINE-L	AjiPro-L
MetaboLys	USA Lysine	LysiPEARL



2 g samples of RPL products



Microscopic cross section image of RPL products (15x)

Table 2. Composition and characteristics of TMR diets

Ingredient	LD	HD
	As fed, %	As fed, %
BMR	31	38.0
Haylage	26.9	32.8
Corn meal	4.9	5.9
Grain Mix	19.1	23.3
Water	17.9	0.0
DM, %	40.5	51.8
pH	4.8	4.8

Table 3. Total amount of Lys released from control TMR sample (without RPL) at 0, 6, 18, and 24 h

Time, h	Lysine release, mg		SEM	P-value
	LD	HD		
0	41.89	26.98 <sup>a</sup>	2.02	< 0.001
6	43.25	41.24 <sup>a</sup>	2.02	0.99
18	47.57	41.38 <sup>b</sup>	2.02	0.39
24	49.23	41.04 <sup>b</sup>	2.02	0.13

<sup>a,b</sup> Least squares means within a column with different superscripts differ ( $P \leq 0.05$ )

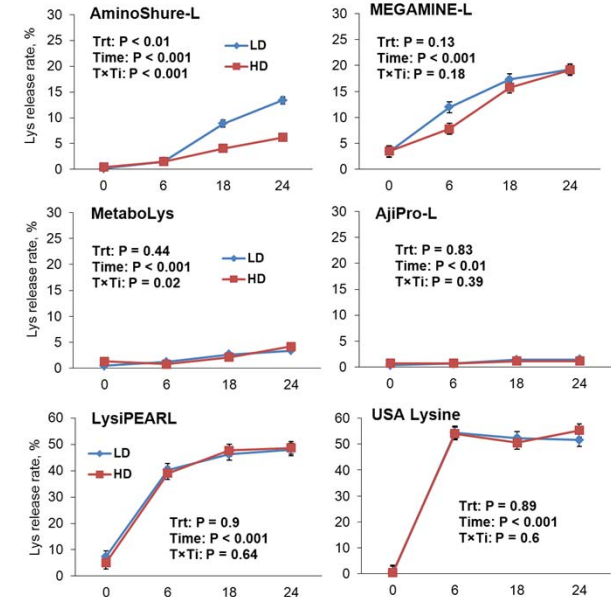


Figure 1. Lys release rate of RPL products in response to physical contact with TMR ingredients during a 24-h period

## CONCLUSIONS

- Physical contact with TMR ingredients caused Lys loss from all RPL products at different magnitudes during a 24-h period.
- Increased moisture content of TMR increased AminoShure-L Lys release rate at 18 and 24 h.
- Feeding frequency should be considered to maximize value of RPL products.