



ASSESSING THE BIOAVAILABILITY OF LYSINE IN DAIRY COWS

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Introduction

- Lysine (Lys) is a first limiting amino acid (AA) for dairy cattle that is essential for efficiently synthesizing large amounts of milk protein and improving reproductive performance.
- Since microbes readily require and utilize amino acids first, Lys can be supplemented in rumen-protected (RP) forms.
- The bioavailability of an AA refers to the amount that escapes microbial degradation in the cow's rumen and can be absorbed by the intestines.
- The area under the curve (AUC) technique is an *in vivo* method for quantitatively determining the amount of free AA in circulating blood from RP-AA products.
- The plasma dose response (PDR) method is a technique used to determine the bioavailability of RP-Lys supplements.

Materials and Methods

- The objective was to determine the bioavailability of RP-Lys supplements using plasma Lys concentrations for analysis via the AUC and PDR methods.
- Lactating Holsteins, fitted with rumen cannulas, were used in two experiments, through which they received varying forms of Lys.
- Blood samples were collected, and plasma concentration was measured for each cow. Feed intake, milk yield, and milk components were observed.
- Data was analyzed to determine average milk yield and dry matter intake, and AUC and PDR statistical analyses were performed to measure the bioavailability of each treatment.

Results

Table 1. Lysine concentration, area-under-the-curve, and bioavailability for Holstein cows fed a diet supplemented with RP-Lys supplements.

Treatment	Lys, μM		AUC	SEM	Bioavailability
	μM	SEM			
Infusion	244.93 ^a	12.324	2027.19 ^a	172.18	-
USALysine	122.59 ^b	12.324	1380.95 ^b	159.88	68.12
Prototype IL	100.64 ^b	12.324	917.96 ^b	156.85	45.28
Prototype II HPO	113.81 ^b	12.324	1101.41 ^b	163.04	54.33

Table 2. Metabolizable lysine for the RP-Lys supplements determined via the plasma dose response method.

	Lys, %	Bioavailability, %	Metabolizable Lys, g/kg
Prototype II HPO	63.76	35.5	226.3
Prototype 1L	63.36	49.0	310.5

Figure 1. Area-under-the-curve for Holstein cows fed a diet supplemented with RP-Lys supplements.

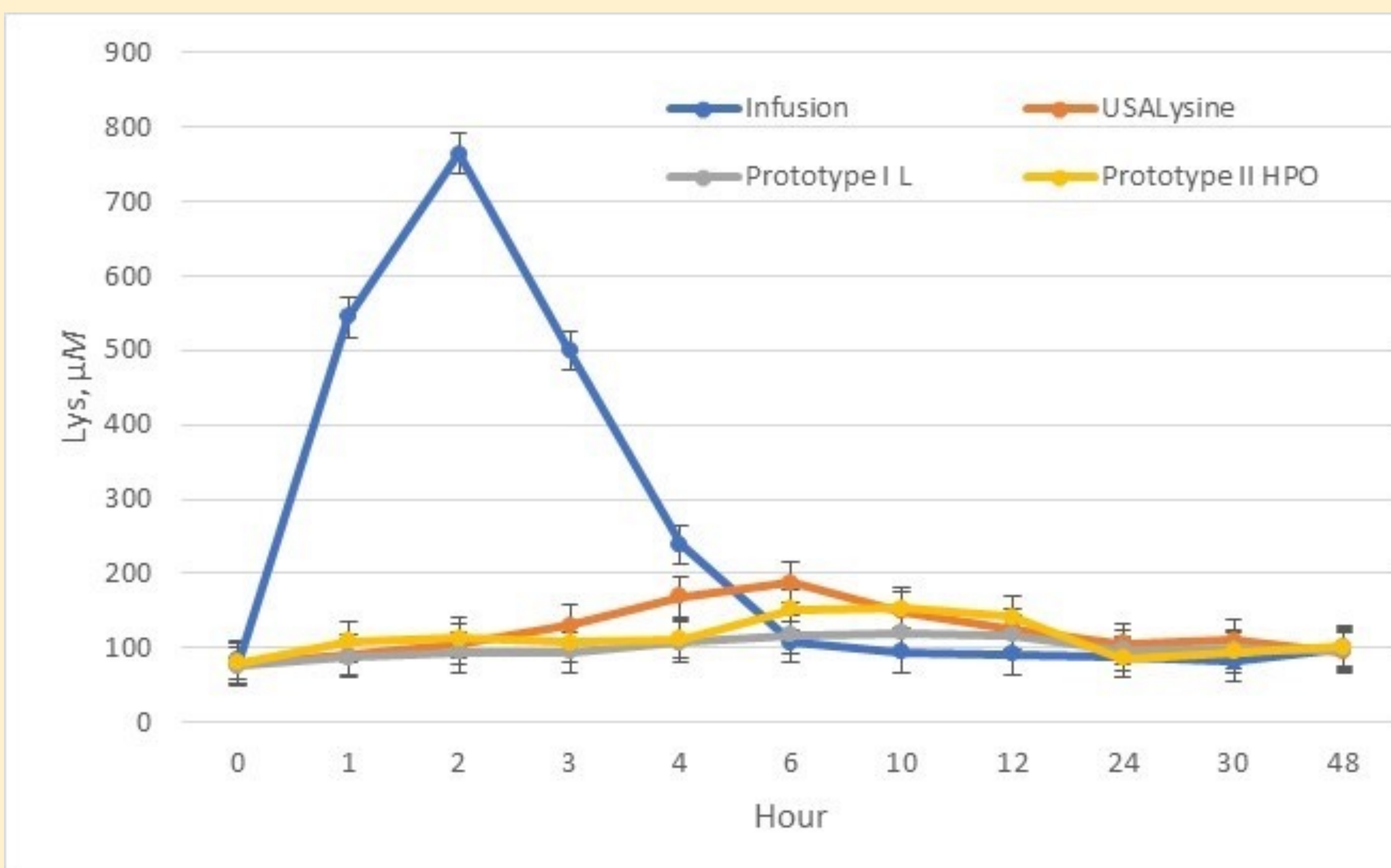
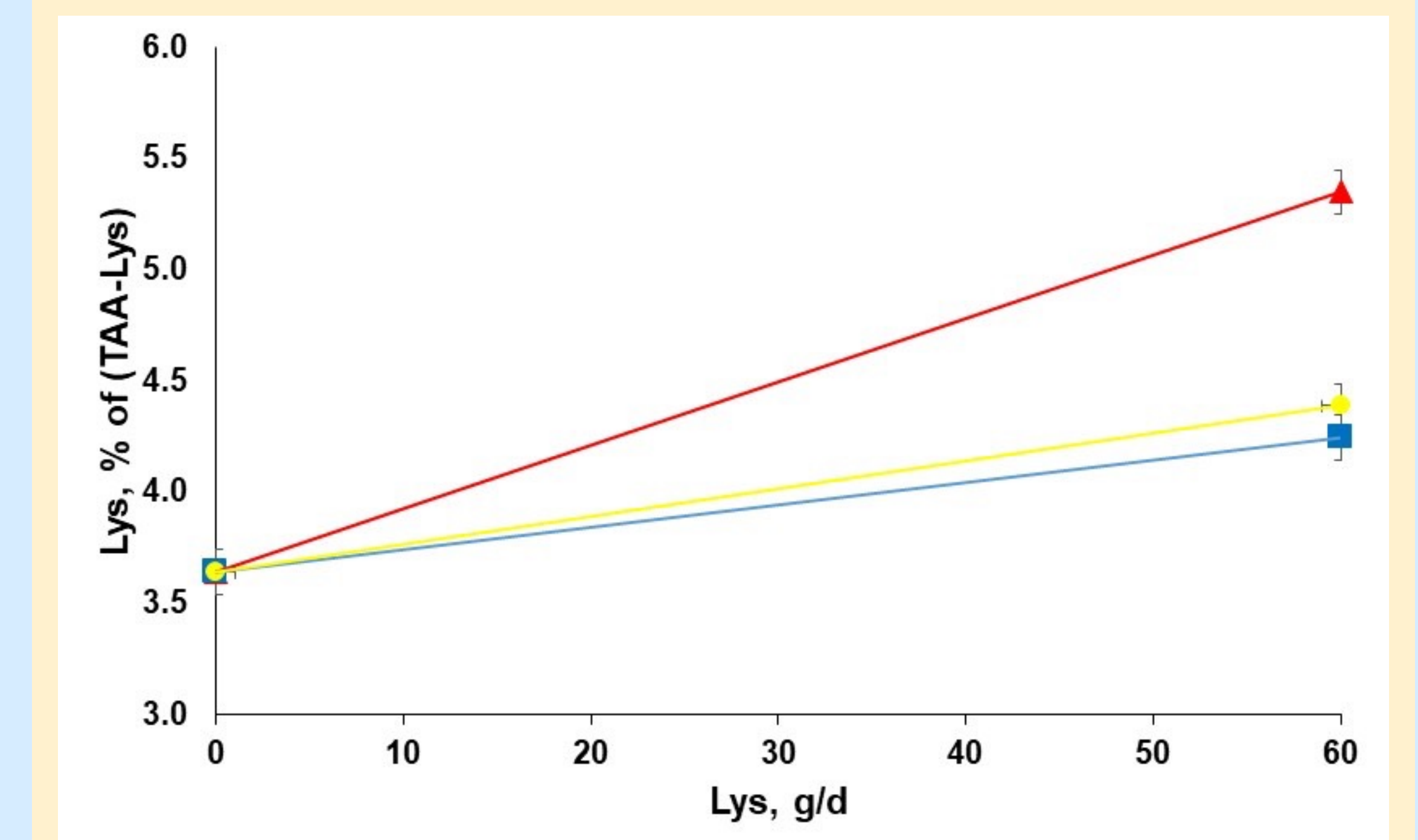


Figure 2. The relationship between Infusion (\blacktriangle), IL (\bullet), and II HPO (\blacksquare) in lactating dairy cows using commercial Lys content.



CONCLUSIONS

- While no statistical significance was seen among the Lys prototypes, Prototype II exhibited a higher bioavailability via the AUC method, while Prototype IL exhibited a higher bioavailability via the PDR method.
- Ultimately, both techniques are effective, but the PDR method appears to be more accurate in determining the bioavailability of Lys.
- The high bioavailability yielded by these RP-Lys products indicate that supplementing the diets of dairy cows, specifically those high in corn and corn byproducts, with encapsulated forms of this essential AA, can serve as an economically effective method for reaching the requirements of this limiting AA, without exceeding them.

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