

Comparison of Optimal Lysine and Methionine Concentrations in Total Metabolizable Protein as Estimated by the NRC (2001), CPM (V.3.0.8) and CNCPS (V.6.1) Models

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Introduction

Amino acid (AA) balancing of dairy rations is of utmost importance to maximize milk production and composition and to ensure efficient use of nitrogen by the dairy cow. Three of the most commonly used programs to balance for AA are NRC (2001), CPM (v.3.0.8) and CNCPS (v.6.1). Each program, however, differs in the approach taken to estimate the supply of nutrients. Nevertheless, the appropriate formulation AA guidelines for each model can be determined using the indirect dose response first proposed by Rulquin et al. (1993), and subsequently adopted by NRC (2001). In the NRC (2001), this approach showed that the optimum concentration of protein in milk was attained with 7.24 Lysine (Lys) and 2.38 Methionine (Met) as a % of total digestible protein, corresponding to a Lys to Met ratio of 3.04 to 1.

Objectives:

The objective of this work was to use the same trial dataset used to elaborate the NRC (2001), Lys and Met recommendations to estimate the comparable values for Lys and Met through both CPM (v. 3.08) and CNCPS (v.6.1)

Materials and Methods

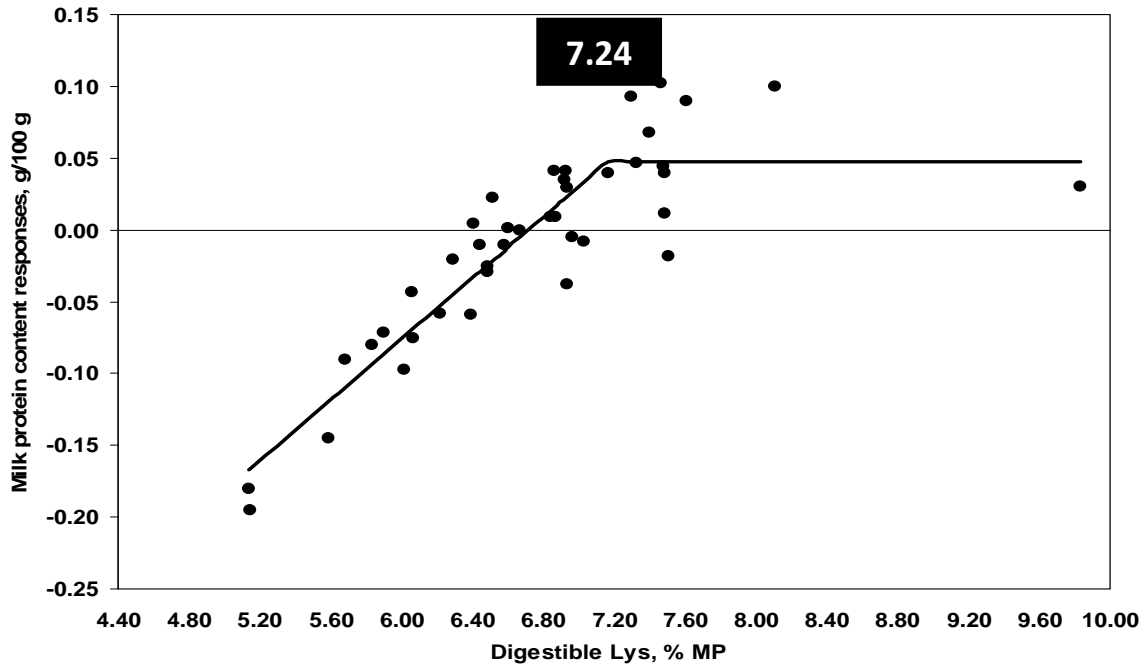
For this comparison of models the diets that were used to generate the graphs in the NRC (2001) were run through CPM-Dairy (version 3.0.8) and AMTS.Cattle (Version 1.1.0.3) to obtain Lys, Met and MP values from the models. The resulting dose response plots were generated as described in NRC (2001).

Conclusion:

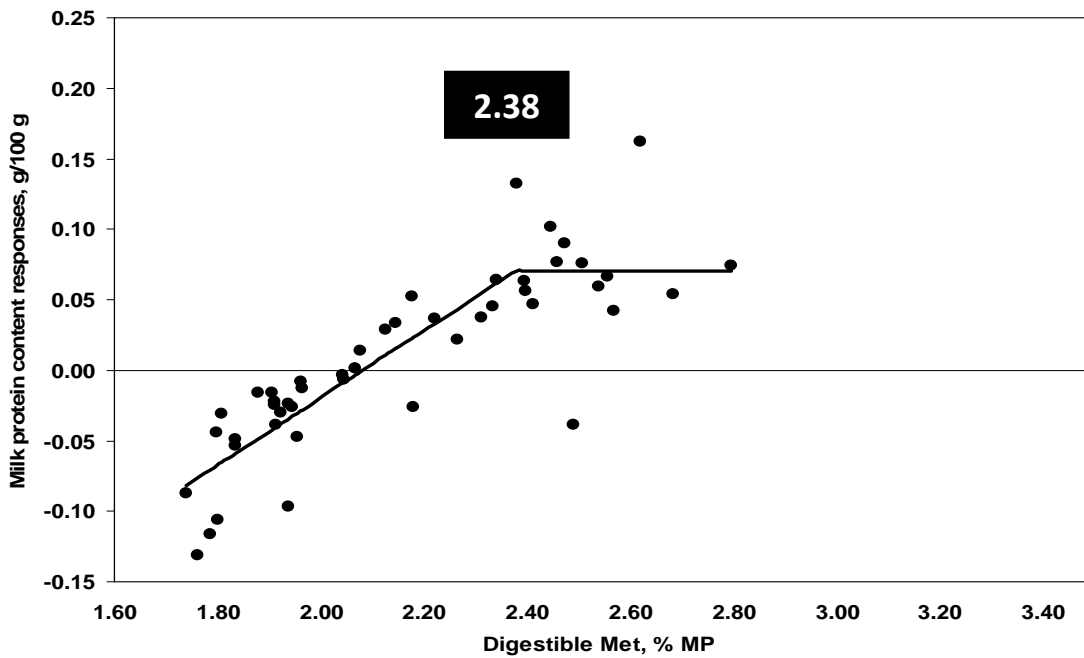
- The optimal and practical concentration levels for Lys in MP for the NRC, CPM and CNCPS models are 7.24, 7.46 and 6.68, and 6.66, 6.86 and 6.14%, respectively.
- The optimal and practical concentration levels for Met in MP for the NRC, CPM and CNCPS models are 2.38, 2.58 and 2.42 and 2.19, 2.37 and 2.21%, respectively.
- The recommended Lys:Met ratio for the NRC, CPM and CNCPS models are: 3.04:1, 2.89:1 and 2.77:1 respectively.

NRC

Milk Protein Responses



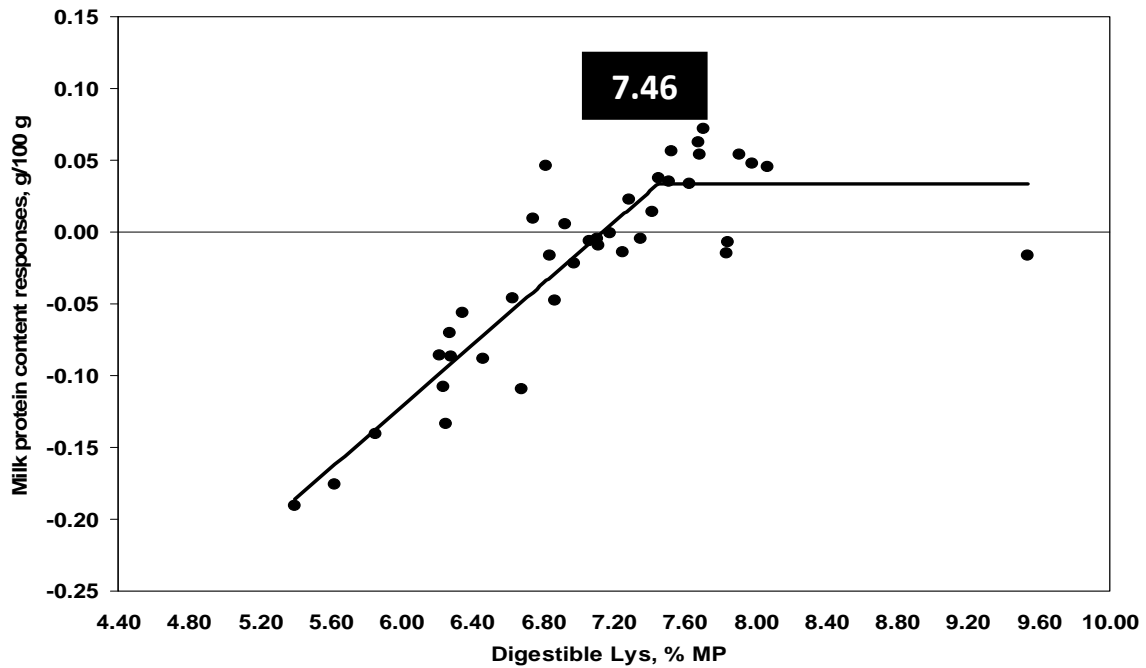
Regression analysis for Lys was limited to data where Met was 1.95 % or greater of MP. For the linear part of the model, $y = -0.712 + 0.106x$ and for the plateau, $y = -0.712 + 0.106 \times 7.24$. The reference value used to determine the relative response was 6.67. (n=41)



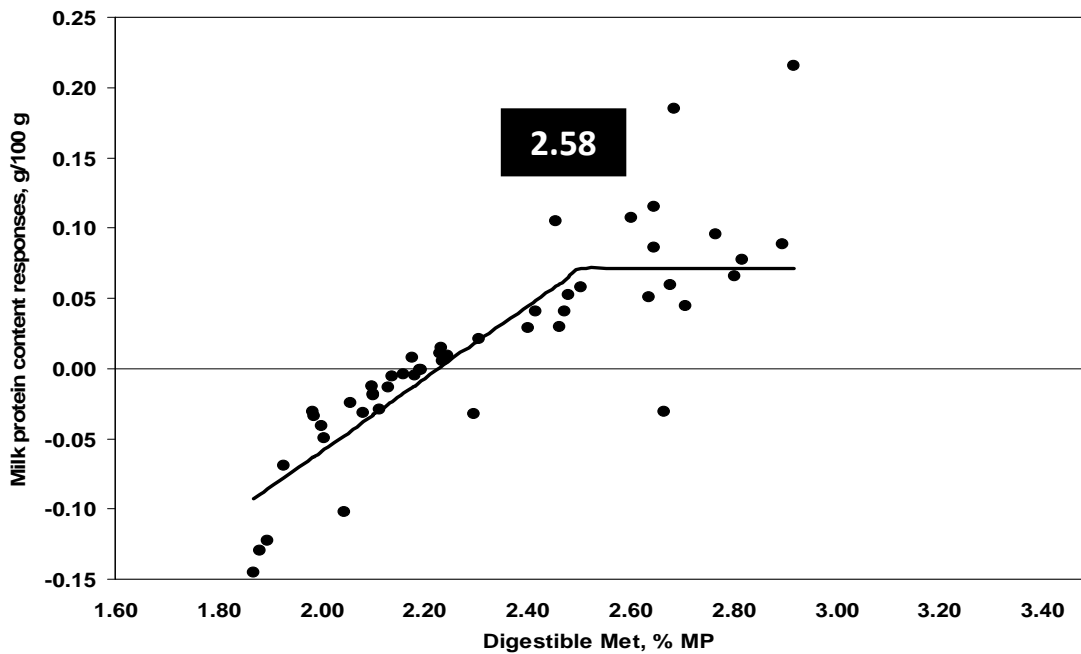
Regression analysis for Met was limited to data where Lys was 6.50 % or greater of MP. For the linear part of the model, $y = -0.496 + 0.238x$ and for the plateau, $y = -0.496 + 0.238 \times 2.38$. The reference value used to determine the relative response was 2.06. (n=48)

CPM

Milk Protein Responses



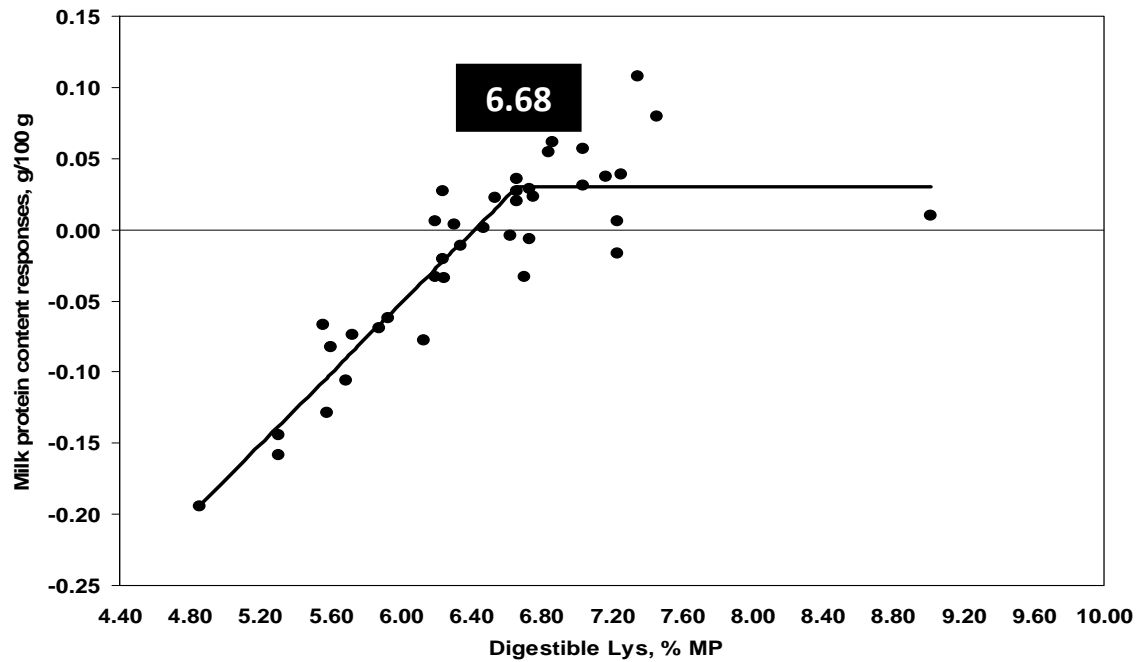
Regression analysis for Lys was limited to data where Met was 2.17 % or greater of MP. For the linear part of the model, $y = -0.763 + 0.107x$ and for the plateau, $y = -0.763 + 0.107 X 7.46$. The reference value used to determine the relative response was 7.15. (n=39)



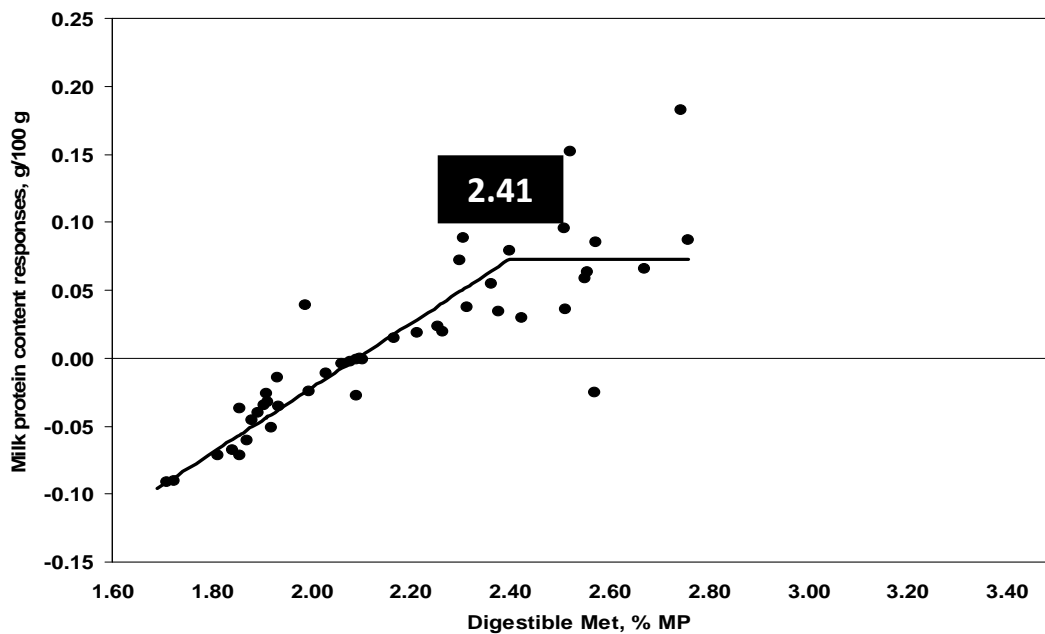
Regression analysis for Met was limited to data where Lys was 6.65 % or greater of MP. For the linear part of the model, $y = -0.575 + 0.258x$ and for the plateau, $y = -0.575 + 0.258 X 2.58$. The reference value used to determine the relative response was 2.20. (n = 48)

CNCPS

Milk Protein Responses



Regression analysis for Lys was limited to data where Met was 1.94 % or greater of MP. For the linear part of the model, $y = -0.795 + 0.124x$ and for the plateau, $y = -0.795 + 0.124 \times 6.68$. The reference value used to determine the relative response was 6.45. (n=39).



Regression analysis for Met was limited to data where Lys was 6.09 % or greater of MP. For the linear part of the model, $y = -0.499 + 0.238x$ and for the plateau, $y = -0.499 + 0.253 \times 2.41$. The reference value used to determine the relative response was 2.10. (n=46)

**Metabolizable Protein (MP) fractions from the Combined Methionine and Lysine datasets
estimated by the NRC, CPM and CNCPS models**

		Feed MP		Microbial MP		Endogenous MP		Total MP
		grams	%	grams	%	grams	%	grams
Combined Methionine & Lysine Datasets	NRC	1016	46%	1085	49%	101	5%	2203
	CPM	930	41%	1275	59%			2205
	CNCPS	1146	50%	1099	50%			2244

**Optimal and practical recommendations for digestible Lys and
Met using the NRC, CPM and CNCPS models**

		Optimal	r ²	Practical*	Optimal Lys:Met
NRC	Lys	7.24%	.85	6.66%	3.04
	Met	2.38%	.76	2.19%	
CPM	Lys	7.46%	.83	6.86%	2.89
	Met	2.58%	.73	2.37%	
CNCPS	Lys	6.68%	.83	6.14%	2.77
	Met	2.41%	.76	2.21%	