INTRODUCTION

It is well documented that Lys and Met are usually the first two limiting AA for lactating dairy cattle (NRC, 2001). To help achieve optimal concentrations of Lys in MP, a number of rumen-protected Lys (RP-Lys) supplements have been introduced to the market. Some that are available in the United States are Megamin-L® (Arm and Hammer), LysiPEARL® (Kemin), Lysi35® (Jefo), AjiPro-L (Ajinomoto Heartland, Inc.) and USA Lysine® (Land O’ Lakes). These products are a welcome addition to dairy cattle nutrition with the expectation that they can be used to partially or, at least a partial substitution, for high Lys protein supplements like blood, fish, and soya proteins. However, fundamental to their use is having reliable estimates of Lys bioavailability.

MATERIALS AND METHODS

The plasma free Lys response method is an appropriate approach for obtaining estimates of Lys bioavailability of RP-Lys supplements because it has been shown that plasma Lys concentrations and infusion of Lys are linearly related to Lys requirements of lactating dairy cows (NRC, 2001). To help achieve optimal concentrations of Lys for these products, the database from similar experiments which gave linear insight about how the products compare in efficacy and cost-effectiveness.

Using the protected L-arginine (HPArg) procedure (Nocek et al., 2010; Robinson et al., 2011), AjiPro-L has shown in previous studies a 40% bioavailability. AjiPro-L consists of a matrix core of L-Lys monohydrochloride and hydroxyapatite coated with a protective layer of vegetable fat.

OBJECTIVE

To further verify if the plasma free Lys dose-response could reflect the ability to determine Lys bioavailability of RP-Lys products, the objective of this experiment was to use the method to obtain an estimate of the bioavailability of Lys in AjiPro-L using fasted Holstein cows.

RESULTS

The observed linear relationship between infused amounts of Lys and plasma free Lys concentrations is consistent with previous research (Kong et al., 1991; Guinard and Rulquin, 1994; McLoughlin, 2002; Rulquin and Kowalsky, 2005; Castro et al., 2008; Hanigan et al., 2009; Whitehouse et al., unpublished). In these experiments, the number of infusion treatments varied from four to seven and daily dosages varied from 0 to 40, 0 to 63, 0 to 66, 0 to 75, 0 to 84 and 0 to 180 g/cow per day. The linearity of response has been observed in cows fed both Lys-deficient diets (King et al., 1991; Guinard and Rulquin, 1994; Guinard et al., 2009; Whitehouse et al., unpublished). In these experiments, the number of infusion treatments varied from four to seven and daily dosages varied from 0 to 40, 0 to 63, 0 to 66, 0 to 75, 0 to 84 and 0 to 180 g/cow per day. The linearity of response has been observed in cows fed both Lys-deficient diets (King et al., 1991; Guinard and Rulquin, 1994; Guinard et al., 2009; Whitehouse et al., unpublished). In these experiments, the number of infusion treatments varied from four to seven and daily dosages varied from 0 to 40, 0 to 63, 0 to 66, 0 to 75, 0 to 84 and 0 to 180 g/cow per day. The linearity of response has been observed in cows fed both Lys-deficient diets (King et al., 1991; Guinard and Rulquin, 1994; Guinard et al., 2009; Whitehouse et al., unpublished). In these experiments, the number of infusion treatments varied from four to seven and daily dosages varied from 0 to 40, 0 to 63, 0 to 66, 0 to 75, 0 to 84 and 0 to 180 g/cow per day. The linearity of response has been observed in cows fed both Lys-deficient diets (King et al., 1991; Guinard and Rulquin, 1994; Guinard et al., 2009; Whitehouse et al., unpublished). In these experiments, the number of infusion treatments varied from four to seven and daily dosages varied from 0 to 40, 0 to 63, 0 to 66, 0 to 75, 0 to 84 and 0 to 180 g/cow per day. The linearity of response has been observed in cows fed both Lys-deficient diets (King et al., 1991; Guinard and Rulquin, 1994; Guinard et al., 2009; Whitehouse et al., unpublished).

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Exploiting plasma Lys concentrations as ng/ml, prior to expression as a % of TAA, yielded a Lys bioavailability estimate of 35% for AjiPro-L. Expressing plasma Lys concentrations as % TAA relative to that of AjiPro-L, yielded a Lys bioavailability estimate of 55%. Both values are comparable to Ajinomoto stated bioavailability of 40% and within the experimental error of determination.

CONCLUSION

We conclude that the HPArg procedure, as described by Nocek et al. (2010) and Robinson et al. (2011), and plasma free Lys dose response approach provide similar estimates of bioavailability of Lys from RP-Lys supplements.