USE OF RUMEN-PROTECTED LYSINE AND METHIONINE IN LACTATING GOATS: EFFECTS ON THE CHEMICAL AND AMINO ACID COMPOSITION IN THE MEAT OF KIDS.

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Backround

The possibility of using synthetic essential amino acids in ruminant feeding has widely been studied in dairy cows and ewes (Lynch et al., 1991; Armentano et al., 1993; Chiofalo V. et al., 1996). On the contrary, it has not sufficiently been studied in the caprine species. So, it deserves to be pointed out considering the important functions of amino acids on metabolism, in particular ones. Methionine, for example, is first-limiting amino acid; it is an important precursor in the synthesis of plasma lipoproteins, which are precursors for long-chain fatty acids in the milk; it exerts a specific function in linking the fat and protein part of the lipoproteins; it fulfills an important function in the synthesis and in the mobilization of fat tissue, as well as in the transportation of fat in the blood; it stimulates the synthesis of fat and protein in the mammary gland, allowing a reduction of crude protein level of the ration and therefore metabolic disorders, especially in young animals; it acts as a methyl group donor, e.g. for phospholipids (Heimbeck, 2000). As regards lysine, it plays an important role for the development of collagen and in ossification; it is a component of the nucleotides in the nucleus; it stimulates cell division (Haffner et al., 2000).

The use of amino acids, in all ruminants, requires a protection from the enzymatic or bacterial degradation in order to make them available in the small intestine. The rumen-protected amino acids could be obtained with different technics, i. e. using a matrix of Ca soaps and /or triglycerides that, involving amino acids, reduces considerably their rumen degradability (Haffner et al., 2000; Tateo et al., 1998).

In our previous experiences we have studied the milk yield, chemical composition and clotting parameters of Maltese goats, fed with supplementation of rumen-protected lysine and methionine (Chiofalo V. et al., 1999), and the performances in vitam and post mortem of Maltese kids nourished from goats feeding with rumen-protected lysine and methionine (Liotta et al., 2000). The positive effects observed on the daily mean gain and feed conversion index, in consequence of the intestinal availability of the limiting amino acids, stimulated us to point out the attention on the meat quality of the kids.

Objectives

The aim of this study was to evaluate the effects on the chemical and amino acid composition in the meat of Maltese kids nourished from goats feeding with rumen-protected lysine and methionine.

Methods

Twenty Maltese kids (10 males and 10 females), at birth, were divided into two homogeneous groups of ten each: 1) control and 2) Lys+Met, each group constitued of 5 males and 5 females. The kids were suckled from goats fed concentrate 0.8 kg/head/d (D.M. 88.45%; on a D.M. basis: CP 16.37%, EE 2.63%, CF 7.16%) and hay 1.6 kg/head/d (D.M. 85.08%; on a D.M. basis: CP 9.32%, EE 2.02%, CF 36.38%); the mothers of the kids of Lys+Met group received a supplementation of rumen-protected lysine (7 g/goat/d) and methionine (2 g/head/d) (Smartamine ML® Filozoo – Rhône Poulenc). Table 1 shows amino acid composition of the concentrate. Kids were slaughtered at the age of 35 days (previous 12 hours of fasting); carcasses were chilled at 4°C and jointed at 24 h *post mortem* according to A.S.P.A. (1991) recommendation. The *m. longissimus dorsi* were removed from the right half-carcasses, isolated and used to study the chemical composition (moisture, fat, protein, ash) using A.O.A.C. (1990) methods and amino acid profile by GC/MS (Gehrke and Leimer, 1971). The energetic value was measured using the method of Fidanza and Liguori (1988). Data were processed by statistical analysis. A model, including two factors, was used: tretament and sex, with the relative interaction. ANOVA (proc. GLM by SAS, 1999 – 2001) put in evidence that interaction were not statistically significant. Therefore, the following reduced model was considered: $y_{ijk} = \mu + \alpha_i + \beta_j + \varepsilon_{ijk}$, where μ = general mean, α_i = treatment (Control, Lys+Met), β_j = sex (male, female), ε_{ijk}= random error.

Result and discussion

Table 2 shows the chemical composition and the energetic value (mean ± SE) of the *m. longissimus dorsi* in both groups (Control *vs* Lys+Met). No significant differences were observed in meat characteristics of the experimental groups, though in the Lys+Met group dry matter levels were slightly higher than Control group. Probably, it was due to a slight increase of the protein and fat content, as Tateo et al. (1998) observed on fattening lambs fed with a supplementation of lysine and methionine by-pass, and Sarraseca et al. (1999) on Aragonese growing lambs which received a venous administration of six amino acids solution. The results of this study, considering what has been previously reported about the performances *in vitam* e *post mortem* of the same kids (Liotta et al., 2000), indicate the validity of this feeding method. The use of rumen-protected lysine and methionine, stimulating the protein synthesis thanks to a better availability of the essential and limiting amino acids in the intestine, improved the productive performances of kids. Probably, it was in relation to the quali-quantitative improvement of the milk characteristics observed in goats fed with the limiting amino acids (Chiofalo V. et al., 1999) which, at the same time, kept unchanged the quality of meat (Tateo et al., 1998). Moreover, this fact shows that the chemism of meat, in particular for the proteic fraction, in spite of the amino acid supplementation, is not easily alterable since it is due more to the genetic type than to the diet (Centoducati e Tateo, 1998).

A similar amino acid content was determined in the *m logissimus dorsi* of the experimental groups (the table 3). In fact no significant differences were observed in the meat of the Lys+Met kids in comparison with Control kids.

However, in consideration of the interest of this subjec, it would be important to study it more duply.

Pertinent literature

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Table 1. Amino acid composition of the concentrate (% D.M.)

Amino acid	mean
Alanine	0.75
Valine	0.73
Leucine	1.17
Isoleucine	0.57
Glycine	0.71
Serine	0.77
Threonine	0.58
Methionine	0.26
Aspartic acid	1.47
Histidine	0.46
Proline	0.94
Glutamic acid	2.78
Lysine	0.77
Tyrosine	0.48
Phenylalanine	0.73
Arginine	1.04

Table 2. Chemical composition and energetic value of the *m. longissimus dorsi* (g per 100 g of edible part)

Analytical fraction	Control		Lys+Met		*P*
	mean	SE	mean	SE	
Moisture	74.03	0.76	72.40	0.77	0.151
Lipid	3.68	0.23	3.73	0.24	0.876
Protein	21.09	0.73	22.67	0.74	0.180
Ash	1.20	0.03	1.20	0.03	0.959
Energetic value (kcal)	124.29	3.34	130.60	3.38	0.202

Table 3. Amino acid composition of the *m. longissimus dorsi* (g per 100 g of edible part)

Amino acid	Control		Lys+Met		*P*
	mean	SE	mean	SE	
Alanine	1.659	0.145	1.439	0.145	0.299
Valine	0.415	0.035	0.363	0.035	0.306
Leucine	1.570	0.131	1.322	0.131	0.200
Isoleucine	0.692	0.069	0.646	0.069	0.643
Glycine	0.363	0.082	0.364	0.069	0.995
Serine	1.173	0.103	0.982	0.103	0.209
Threonine	0.933	0.106	0.704	0.106	0.147
Methionine	0.644	0.089	0.561	0.155	0.675
Aspartic acid	2.488	0.200	2.068	0.200	0.158
Hydroxyproline	0.234	0.034	0.147	0.044	0.137
Creatinine	trace	-	trace	-	-
Proline	2.149	0.374	1.759	0.374	0.474
Glutamic acid	2.854	0.253	2.419	0.253	0.242
Lysine	1.632	0.239	1.316	0.239	0.367
Tyrosine	2.081	0.400	2.215	0.474	0.836
Phenylalanine	0.829	0.103	0.703	0.091	0.378
Cysteine	trace	-	trace	-	-