CHANGES IN KID GOAT GROWTH, TISSUE COMPOSITION AND FAT DEPOSIT FATTY ACID COMPOSITION IN RESPONSE TO MATERNAL INTAKE OF A PROTECTED FAT RICH IN POLYUNSATURATED FATTY ACIDS

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Background

In Spain and several other Mediterranean countries kid goats are slaughtered before weaning when they weigh between 10 and 12 kg at which time the meat is judged to be of a better quality. Although these animals can be satisfactorily raised on a milk replacer, those maintained under natural rearing are considered more valuable being in both cases the body composition of these pre-ruminant animals determined by the corresponding liquid diet composition Fickova et al., 1998).
Goat milk like that from any ruminant species contains a relatively high proportion of saturated fatty acids which is a risk factor related to cardiovascular diseases (Ney, 1991). At the same time, it is also known that polyunsaturated fatty acids (PUFAs) which have been associated with a decrease in the risk of heart disease (Albert et al., 1988; Daviglus et al., 1997) are low in milk fat. Many attempts have been made therefore, to alter the fatty acid composition of milk fat to improve its nutritional value for humans. Sanz Sampelayo et al. (2000) obtained goat milk with healthier fat composition using in the diet a marine fat particularly rich in PUFAs that was suitably protected from rumen metabolism.

Objectives

According to that indicated above the present report was conducted to study the growth and body composition of milk-fed kid goats maintained under natural rearing being their dams fed on a diet supplemented or not supplemented with the protected fat rich in PUFAs used by Sanz Sampelayo et al. (2000).

Material and methods

Two lots of twelve goats of the Malagueña breed were maintained under semi-extensive breeding conditions being indoor during lactation, fed with a concentrate supplemented (Lot 1) or not supplemented (Lot 2) with 5 % of a protected fat (Ca salts of the corresponding fatty acids), rich in PUFAs (35%). Kid goats were milk-fed under natural rearing from birth until 45 days of age, being six animals from each goat lot slaughtered on day 46. Animals were weighed at birth and before slaughtered. After slaughter, the skin, feet, all internal organs less kidneys, and the head were removed. The warm carcass was split into two sides. These were cooled at 4ºC for 12 h. The leg from the left side of the carcass was obtained and was separated by physical dissection into muscle, cover fat, intermuscular fat, bone and waste (tendons, ganglions, nerves, blood vessels and other unidentified tissues). Muscle was dried by lyophilization and the intramuscular fat was obtained by extraction with chloroform-methanol (2:1, v/v).The fat content of the milk and the fatty acid composition of the milk fat from goats fed the supplemented and not supplemented concentrate were determined all along the experimental period. In the same way, the fatty acid composition of the cover, intermuscular and intramuscular fat samples were also determined. The fat content of the milk was measured by the Gerber method and the fatty acid composition of the different samples, milk and fat deposits, was performed by gas chromatography.
The model accounted for variation caused by the type of concentrate used. The results were submitted to an ANOVA in accordance with the general linear model procedure of SAS. Tables report mean values, residual standard deviations and the level of significance.

Results and discussion

Fat content of milk from goats supplemented with the protected fat was higher than that from the unsupplemented one (45.9 vs. 39.6 g/kg). However, the difference was not statistically significant ($P>0.05$). The fatty acid composition of milk fat depended on the type of concentrate used. The total amount of PUFAs was higher ($P<0.05$) in the milk obtained from goats fed the supplemented concentrate (6.64 vs. 3.75%). Mean body-weight of kids at birth was equal to 3.2±0.11 kg. Table 1 shows growth rates of the kids together with the tissular composition of the leg and intramuscular fat contents. Table 2 shows the fatty acid composition of the different fat deposits.
Although milk fat content was detected as not different, mean value for milk from goats fed the supplemented concentrate tended to be higher than that value observed for milk from goats fed the unsupplemented concentrate, showing that milk at the same time, a higher PUFAs concentration. According to this and taking into account the results here obtained, it is necessary first, to indicate that it is now well known that during growth an increase in the amount of any fat in the diet leads to a better utilisation of protein together with a higher protein retention. This is the so-called protein-sparing effect of fats which was demonstrated in the pre-ruminant kid goats (Sanz Sampelayo et al., 1997). In the second place, it is also well known that dietary PUFAs are basically oxidised as fuel source to meet the energy requirements for both maintenance and protein retention. So, animals fed diets containing PUFAs show significantly higher lean body mass gain than those fed diets containing saturated fatty acids (Su and Jones, 1993). Besides this, and although the intake of a diet rich in PUFAs does not give rise to a higher fat deposition, since it is basically oxidised as fuel source, this intake may determine the fatty acid composition of any fat deposit (Fickova et al., 1998). Our results agree with the above comments. The intake of milk with a higher concentration of fat and PUFAs gave rise in the milk fed kids to both a higher growth rate and leg muscle proportion together with a higher proportion of PUFAs in the different fat deposits.

Conclusions

Kid goats fed under natural rearing on a goat milk with a high PUFAs concentration in the fat, show a better growth and development together with healthier fat deposits.

Pertinent literature

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Table 1. Effect of type of concentrate consumed by the goats on growth and on tissular composition and intramuscular fat content in the leg of the milk-fed kids

	CONCENTRATE[1]			
	1	2	RSD[2]	Level of significance
Growth rate (g/day)	155.9	137.9	11.4	*
Tissular composition				
Muscle (%)	64.89	62.86	1.38	*
Cover fat (%)	4.96	4.65	0.87	NS
Intermuscular fat (%)	4.78	5.15	0.49	NS
Total fat (%)	9.74	9.80	1.10	NS
Bone (%)	22.37	25.01	1.29	*
Muscle/Bone	2.91	2.52	0.19	*
Intramuscular fat (% DM)	16.10	16.23	1.08	NS

[1]Concentrate supplemented (1) or not supplemented (2) with 5 % of a protected fat rich in PUFAs
[2]Residual standard deviations
NS: Not significant (P>0.05); * P<0.05

Table 2. Effect of type of concentrate consumed by the goats on fatty acid composition (%) of different fat deposits in the leg of the milk-fed kids

	CONCENTRATE[1]			
	1	2	RSD[2]	Level of significance
Cover fat				
Saturated	46.92	46.50	3.52	NS
Monounsaturated	46.43	48.75	3.35	NS
PUFAs: C18:2 - C22:6	6.66	4.75	0.63	***
Intermuscular fat				
Saturated	48.32	47.74	3.82	NS
Monounsaturated	45.51	47.83	3.74	NS
PUFAs: C18:2 - C22:6	6.17	4.43	0.68	**
Intramuscular fat				
Saturated	41.67	40.72	1.68	NS
Monounsaturated	36.92	42.92	4.24	*
PUFAs: C18:2 - C22:6	21.41	16.36	3.05	*

[1]Concentrate supplemented (1) or not supplemented (2) with 5 % of a protected fat rich in PUFAs
[2]Residual standard deviations
NS: Not significant (P>0.05); * P<0.05; ** P<0.01; *** P<0.001