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Effect of animal feeding system information on consumer expectation and acceptability of lamb meat

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SUMMARY – One hundred and seven people took part in a central location test, organised to evaluate the consumer expectations generated by information on animal feeding system and to assess the effect of this knowledge on the hedonic ratings of local lamb meat. Using a nine-point hedonic scale, first blind and then informed scores were collected on two types of Istrian Milk meat, from lambs fed either on suckled milk and pasture (P meat) or hay and concentrate (C meat). In the blind condition, a significant difference was found between samples, C receiving higher scores than P meat (6.9 *vs* 6.4 points; $p<0.05$). There was a significant difference between expected, E, and blind, B, evaluation for both types of meat: the disconfirmation was positive for C (-0.9; $p<0.01$), which was perceived to be better than expected, and negative for P meat (0.9; $p<0.01$). Informed liking scores (I) revealed no significant differences between the two types of lamb meat and did not significantly differ from the blind hedonic scores for C meat. On the contrary, providing information on the animal feeding system positively affected the liking of P meat (I-B= 0.5; $p<0.01$). However this assimilation was not complete (I-E= -0.4; $p<0.01$), implying that both extrinsic and intrinsic characteristics have an impact on the informed liking of pasture-produced lamb meat.

Keywords: Lamb meat, feeding regime, labelling information, consumer expectations, acceptability.

RESUME – *"Effet des informations concernant le régime alimentaire sur les attentes du consommateur et l'acceptabilité de la viande d'agneau". Cent sept personnes ont participé à un test hédonique en salle organisé en vue d'évaluer les attentes du consommateur suscitées par des informations relatives au système d'alimentation des animaux et d'en refléter les résultats sur l'échelle hédonique de la viande d'agneau locale. Un essai en aveugle puis un test informé, portant sur deux types de viande d'agneau de race Istrienne à lait, l'une provenant d'agneaux nourris au lait sous la mère et élevés à l'herbe (viande P) et l'autre provenant d'agneaux nourris avec des fourrages complétés par des aliments concentrés (viande C), ont été effectués et les résultats ont été reportés sur une échelle hédonique à neuf points. L'essai en aveugle a mis en évidence une différence significative entre les échantillons ; la viande C ayant reçu de meilleurs points que la viande P (6,9 points contre 6,4 points; P<0,05). Une différence significative entre le plaisir attendu, E, et l'évaluation en aveugle, A, s'est révélée pour les deux types de viande : une infirmation positive pour la viande C (-0,9; P<0,01) perçue comme meilleure que ce qui était attendu et une infirmation négative pour la viande P (0,9; P<0,01). Les résultats obtenus à la suite du test informé (I) n'ont pas révélé de différence significative entre les deux types de viande d'agneau et, pour la viande C, ne diffèrent pas des résultats obtenus à la suite du test hédonique en aveugle. En revanche, le fait de fournir des informations sur le système d'alimentation des animaux a influencé positivement le jugement hédonique de la viande P (I-A= 0,5; P<0,01). Toutefois, cette assimilation n'était pas complète (I-E=-0,4; P<0,01), ce qui suppose que tant les caractéristiques extrinsèques qu'intrinsèques ont un impact sur l'acceptabilité de la viande d'agneau à l'herbe.*

Mots-clés : *Viande d'agneau, régime alimentaire, étiquetage, attentes du consommateur, acceptabilité.*

Introduction

Recent research has shown that information on the animal production system, in particular animal feeding, is highly relevant for many European consumers of lamb meat (Bernués *et al.*, 2003). Thus, lamb labels with information on the production process may generate positive consumer expectations, improving the perception of meat quality, even before tasting. However, if these expectations are not subsequently met by the sensory value of meat, consumer disconfirmation may occur, risking failure.

The objectives of the study were to evaluate consumer expectations generated by information on animal feeding system and to assess the effect of this knowledge on the hedonic ratings of lamb meat from the Istrian Milk (locally called *Istriana*) breed.

Materials and methods

Lamb meat

The research was carried out on meat obtained from two groups of Italian Istrian Milk lambs, locally known as *Istriana*, born in late winter in a flock fed only on forage: hay supplied during winter in the stable or fresh herbage grazed during the other seasons. The first group (pasture, P) was formed by eight lambs always kept with their dams and with free access to the forage supplied to the ewes. The second group (concentrate, C) comprised eight lambs reared with the others until weaning, at six weeks of age, and then stabled and fed hay *ad libitum* and concentrate (soybean meal 33%, wheat bran 30%, crushed maize 20%, barley grain 15%, mineral and vitamin supplement 2%) at a daily rate of 750 g/head. Both groups were slaughtered at approximately 30 kg live weight, at an EU-licensed abattoir, using conventional trade procedures. After chilling at 4°C for 24 hours, the carcasses were weighed and scored for conformation and fatness, following the EUROP standardised classification. The left-side pelvic limb and the loin (6^{th} thoracic vertebra to 6^{th} lumbar vertebra) were then removed, and the latter cut in the lumbar (muscle *longissimus lumborum*, LL) and thoracic (m. *l. thoracis*, LT) part, to assess meat quality.

At 24 h *post mortem* meat ultimate pH (pHu) was measured three times, on the LT cutting section, by a glass piercing electrode (Crison 52-32) connected to a pH-meter. Cooking losses and Warner-Bratzler shear force (WBSF) were measured on the LL, after a 7-day ageing period at 4°C, as previously described (Piasentier *et al.*, 2002). Meat proximate analysis and total lipid (intramuscular fat) fatty acid composition were assessed on two samples of LT, obtained from the complete cross-section of the muscle freed of epimysium and adhering adipose tissue (Piasentier *et al.*, 2002). After a 7-day ageing period at 4°C, the pelvic limb was vacuum frozen and stored at -20°C for an average of five months prior to the consumer test.

Consumer test

A central location, quantitative affective test was carried out to measure to what extent information on the animal production process can influence the level of consumer acceptability of lamb meat. The test was organised in two sessions carried out in the dining rooms of two different farms, an agritourism and a public country park, both rearing *Istriana* sheep. It was preceded by the distribution of a questionnaire, which contained demographic questions (gender, age, employment, etc.) and questions on meat consumption. The consumers were assisted during the form-filling and then instructed on the use of the hedonic scales. During the test every untrained respondent made, in different experimental conditions, consecutive evaluations of lamb meat by scoring the overall liking on an intensity scale, with values ranging from 1 (very bad) to 9 (excellent).

In the first evaluation, each person was asked to score his/her liking for two samples of meat, which were presented in a blind test. The two samples, prepared from the pelvic limb, one for each type of lamb (P or C meat), were served and consumed on the same plate, and the respondents were asked to taste them in a pre-ordinate order, indicated on the ballot and provided to allow a balanced design (half of the consumers started with the first type; the other with the second). Pelvic limbs were thawed at 4°C overnight 24 h before cooking, then roasted using local cooking methods and served immediately.

In the second evaluation, the consumers were requested to score their liking expectation for lamb meat (i.e. the assessors did not have a real product in front of him) when given the following information on animal production processes: (1) *meat from pasture-reared Istriana lambs*: 30 kg lamb, born to sheep reared on the Karst open land; grown with its dam, suckling milk and grazing natural pastures; (2) *meat from Istriana lambs finished in the stable on hay and concentrate*: 30 kg lamb, born to sheep reared on the Karst open land; grown with its dam, suckling milk and grazing natural pastures until weaning at six weeks. After weaning, stabled for three months and fed on hay *ad libitum* and concentrate composed of soybean meal, wheat bran, maize and barley grain.

In the third assessment, respondents were asked to score their actual liking for P and C meat, cooked as in the first tasting, served on the same plate, identified by a code (P or C) and accompanied by the label information on animal feeding system used in the second evaluation. As in

the blind-tasting the respondents were asked to test the two samples in a balanced pre-ordinate order, indicated on the ballot.

The 107 consumers involved in the sensory evaluation were adults (44.0% women and 56.0% men), mainly between 25 and 65 (87.9%) years of age, who came from Friuli Venezia Giulia, the north-eastern Italian region comprising the Karst landscape where the Istrian Milk sheep originated and is still raised. They were recruited on the basis of interest and availability and they were unaccustomed to the sensory analysis of meat. 68.2% had a high school certificate or university degree and they belonged to three employment categories: teacher, employee or worker (41.1%); entrepreneur, manager or freelance professional (29.0%); pensioner, housewife or student (29.9%). All were meat eaters, and a large proportion (78.5% of cases) consumed meat more than once a week. They bought mainly retailed meat (75.5%) from butcher's shops or supermarkets; however a significant proportion (38.7%) regularly bought meat directly from the producer. The kinds of meat commonly eaten were, in decreasing order: beef, cured meat and salami, poultry and pork. Lamb meat was eaten occasionally by two-thirds of the respondents (71 people), while the others (36 people) declared they were not in the habit of eating lamb. The consumers were thus classified in two categories: lamb meat eaters (EAT) and not eaters (NOT).

Statistical analysis

Univariate analyses of variance were performed in order to test the effect of feeding regime (P *vs* C) on the carcass quality and physical and chemical attributes of the meat.

Repeated measures analysis of variance were carried out on the liking scores to test the significance of the differences between the levels of the within-subject factors - type of meat (P *vs* C) or tasting-condition (blind, B *vs* expected, E *vs* informed, I) - and the between-subject factor, consumer category (EAT *vs* NOT).

Results and discussion

Table 1 summarises the main carcass characteristics and physical and chemical properties of meat from lambs produced at pasture or finished on concentrates. As expected, both carcass and meat quality varied (Piasentier *et al*., 2002) under the effect of the feeding regime. Pre-slaughter live weight was no different between the two lamb types but, because of a lower stomach weight in the pasture suckling lambs, their carcasses were heavier than the C ones, which, in turn, were fatter. The pHu changed within the normal range accepted for commercial meats and was slightly higher in P lambs, probably as a consequence of a variation in muscle glycogen content, due to the protection effect against glycogen-depleting stressors of the concentrate, high-energy diet. Shear force values were also influenced by feeding system, with C meat resulting as more tender than P. In accordance with their less fat carcass, P lambs produced leaner meat than concentrate-finished lambs, with a different intramuscular lipids composition. C meat had higher percentages of C18:0 and C18:1, while P meat was very rich in polyunsaturated fatty acids and in particular in linolenic acid and its long chain n-3 derivatives, with a more favourable n-3/n-6 ratio for human health than C meat. The observed differences between feeding systems were in agreement with those reported in the literature and expected to affect the sensory properties of meats (Coulon and Priolo, 2002; Piasentier *et al.*, 2003; Wood *et al*., 2003).

The blind acceptability of the two types of meats differed, C meat receiving higher hedonic scores than P meat (Fig. 1, on the left) by both EAT and NOT respondents (on average 6.4 *vs* 6.9 points, for P and C meat respectively; $p<0.05$). The difference between lamb meat types elicited by feeding regime information was the opposite and greater than that elicited by sensory assessment. Indeed, the highest expectation was generated by P meat (on average 7.3 *vs* 6.0 points; $p<0.01$), the scores of which were also affected by the interviewed consumer's background: lamb meat eaters exhibited higher expectations than not eaters for the grazing production system (Fig. 1, on the right). Informed liking revealed no differences between meats, without interaction with consumer category.

The scores of expected liking were probably generated by an association between pasture production system and extrinsic attributes of meat, such as animal feeding assurance,

environmentally-friendly production and respect for animal welfare, which assume increasing importance in the perception process of red meat quality by consumers (Bernués *et al.*, 2003).

Table 1. Carcass and meat quality

		Pasture	Concentrate	p.s.d.	p
Live weight	kg	30.9	30.4	2.31	0.683
Carcass quality					
Cold carcass weight	kg	15.22	13.52	1.453	0.049
Conformation	points	3.25	3.25	0.228	0.924
Fatness	"	2.25	2.75	0.360	0.009
Meat quality					
pHu		5.61	5.48	0.073	0.003
Cooking loss	%	32.6	33.1	1.76	0.628
WBSF	N	43.2	29.2	10.33	0.017
Water	%	75.2	73.7	1.30	0.097
Ash	"	1.16	1.01	0.031	0.000
Protein	"	20.3	17.5	0.78	0.000
Fat	"	2.77	6.98	1.55	0.000
Fatty acid composition of intramuscular fat					
C16:0	% FA	23.5	24.2	1.68	0.474
C18:0	"	15.2	21.3	1.79	0.000
C18:1 w9	"	31.8	36.9	1.75	0.000
C18:2 w6	"	5.60	4.80	0.72	0.045
C18:3 w3	"	2.02	0.57	0.19	0.000
C20:4 w6	"	2.07	1.48	0.42	0.016
PUFA w6	"	8.99	7.04	1.40	0.015
PUFA w3	"	4.25	1.56	0.39	0.000
PUFA w3/w6	"	0.48	0.23	0.08	0.000
SFA	"	45.7	48.5	2.32	0.031
MUFA	"	36.5	40.0	1.82	0.002
PUFA	"	17.8	11.5	1.69	0.000

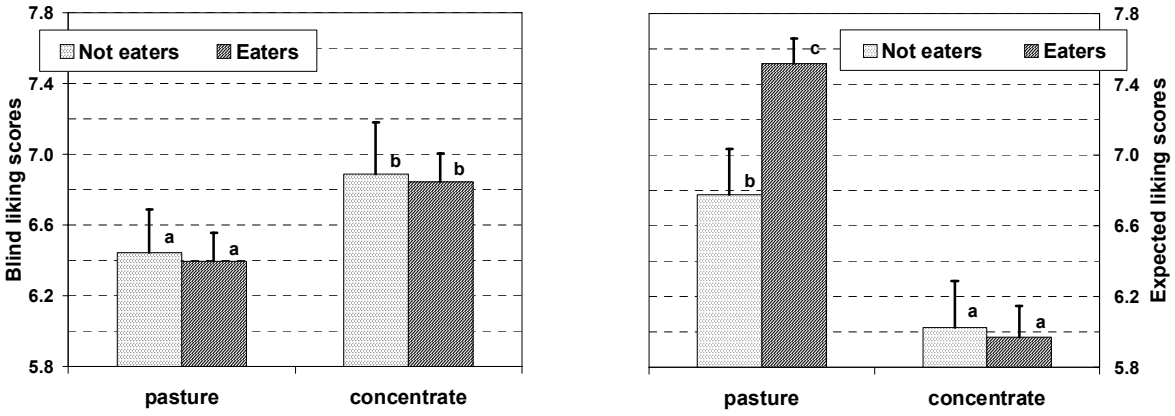

Fig. 1. Blind (on the left) and expected (on the right) mean and s.e. of liking scores for the two types of lamb meat (pasture and concentrate produced) expressed by respondents eaters or not eaters of lamb meat. Within condition, blind or expected, means with a different letter are significantly different ($p<0.05$).

The differences between hedonic scores in different conditions were analysed (Table 2) in order to better understand the effect of animal feeding information on consumer expectation and acceptability. The effect of consumer category was not considered because it was not significant. Disconfirmation is the difference between expected, i.e. based purely on product information, and blind, i.e. before being affected by expectations, acceptability. When the difference (E - B) is significantly different from zero it means that a disconfirmation has occurred; if the product is better than expected (E-B <0), the disconfirmation is positive, but if the product is worse than expected (E-B >0), the disconfirmation is negative. Expectation disconfirmation occurred for both types of meat; it was positive for C (-0.9; $p<0.01$), which was judged to be better than expected and negative for P meat (0.9; $p<0.01$).

Table 2. Expectation effect on lamb meat acceptability

Lamb meat type	E – B[†]	I – B[†]	I – E[†]
Pasture	0.9** Disconfirmation –	0.5** Assimilation	-0.4**
Concentrate	-0.9** Disconfirmation +	-0.2 Not significant	

[†]E=expected; B=blind; I=informed acceptability mean scores.
**Differences from zero: $p<0.01$.

These discrepancies between expectations and actual meat performance can affect the acceptability of meat quality during informed consumption, when expected and experienced quality are integrated. The difference between the informed liking of the meat and the baseline (I-B) allowed us to evaluate the effect of the resulting disconfirmation. As reported by Lange *et al.* (1999), it can be assumed that significant differences arise because of the influence of product information upon actual liking of the product. The liking of C meat after exposure to information did not significantly differ from blind hedonic scores (I-B= -0.2; n.s.). On the contrary, providing information on animal feeding system positively affected the acceptability of pasture-produced lamb meat (I-B= 0.5; $p<0.01$): the informed liking of the meat moved in the expectation direction, indicating that an assimilation effect of the information had occurred [(E-B) / (I- B) > 0]. However this assimilation towards expectations was not complete (I-E= -0.4; $P<0.01$), implying that both extrinsic (information on production system) and intrinsic (sensory properties) characteristics had an impact on the informed liking of pasture-produced lamb meat and were important in determining its perceived quality. Studies on other products (e.g. Caporale and Monteleone, 2004) have demonstrated asymmetrical assimilation effects of positive and negative disconfirmation, indicating that, as in the case of lamb meat, there was higher assimilation when the product was worse than expected.

Conclusions

In the consumer acceptability of lamb meat the experienced sensory quality plays a determinant role, even if, particularly for pasture-produced, the expectation of meat quality, based on clues of information regarding extrinsic attributes such as production system, is in itself important.

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References

Bernués, A., Olaizola, A. and Corcoranc, K. (2003). Extrinsic attributes of red meat as indicators of quality in Europe: An application for market segmentation. *Food Quality Pref.*, 14: 265-276.

Caporale, G. and Monteleone, E. (2004). Influence of information about manufacturing process beer acceptability. *Food Quality Pref.*, 15: 271-278.

Coulon, J-B. and Priolo, A. (2002). La qualité sensorielle des produits laitiers et de la viande dépend des fourrages consommés par les animaux. *INRA Prod. Anim.*, 15: 333-342.

Lange, C., Rousseau, F. and Issanchou, S. (1999). Expectation, liking and purchase behaviour under economical constraint. *Food Quality Pref.*, 10: 31-39.

Piasentier, E., Valusso, R., Leonarduzzi, R., Pittia, P. and Kompan, D. (2002). Quality of Italian Istrian Milk lamb meat. Influence of carcass weight and feeding system. *Italian J. Animal Sci.*, 1: 59-71.

Piasentier, E., Morgante, M., Valusso, R. and Volpelli, L.A. (2003). Sensory quality of Italian Istrian Milk lamb meat as affected by feeding system. In: *Sustainable grazing, nutritional utilization and quality of sheep and goat products*, 1st Joint Seminar of the Sub-Networks FAO-CIHEAM on Sheep and Goat Nutrition and on Mountain and Mediterranean Pastures, Granada (Spain), 2-4 October 2003.

Wood, J.D., Richardson, R.I., Nute, G.R., Fisher, A.V., Campo, M.M., Kasapidou, E., Sheard, P.R. and Enser, M. (2003). Effects of fatty acids on meat quality: A review. *Meat Sci.,* 66: 21-32.