BRIEF COMMUNICATION: Determining sensory panel traits which contribute to the overall liking of New Zealand lamb as assessed by a British sensory panel

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INTRODUCTION

New Zealand is the world's largest exporter of sheep meat with the United Kingdom being the single largest market (Meat & Wool New Zealand, 2009). Hence, the acceptance of sheep meat in international markets is an important economic issue (Prescott *et al.* 2001). For retail purchasers of meat in the United Kingdom the visual appearance, the eating experience, and their interaction will influence how much the consumer is willing to pay for the product (Savell *et al.*, 1989). To ensure repeat purchases of high quality New Zealand lamb by United Kingdom consumers, it is important that the consumer enjoys the overall eating experience of the product. Attributes of meat that will make it "enjoyable" vary between countries and ethnic backgrounds, particularly in countries where the product is already produced locally (Sanudo *et al.* 2000). This study used a United Kingdom-based sensory panel to assess the sensory and eating attributes that contributed most to a consumers overall liking of pasture-finished, New Zealand lamb using progeny from selected sires.

MATERIALS AND METHODS

Sensory panel data were collected over two consecutive years (n = 100 in 2008; n = 162 in 2009), from progeny test lambs from sires of a terminal composite breed described by (Johnson *et al.*, 2008). Lambs were "grown out" on pasture to approximately five months of age prior to being slaughtered through the same commercial plant. The carcasses were electrically stimulated and aged following accelerated conditioning and aging (AC & A) criteria (Chrystall *et al.*, 1989). Individual carcass weight was measured. The day following slaughter a *M. longissmus dorsi* (Loin) was collected from selected carcasses for sensory panel assessment.

The loin was chilled at -1°C and air freighted, with continual monitoring of temperature, to Bristol University in the United Kingdom. Sensory panel assessments were conducted approximately eight weeks post slaughter. At no point were the samples frozen prior to evaluation. On the morning of sensory analysis, the loin samples were cut into 2 cm steaks. A single steak was taken from the anterior end of the loin sample and the freshly cut surface bloomed for a minimum of 1 hour before being visually assessed on a white circular turntable placed on a table with a neutral grey background. Assessors had been previously screened for colour blindness using the Ishihara test and also been assessed for colour discrimination using the 100 Hue test. Assessments took place under "Northern Daylight" illumination and assessors used a paper ballot form to record their impression of raw appearance. Loin samples for tasting were cooked, turning every three minutes, under a domestic grill set at high, until the internal temperature of each sample reached 75°C as measured by a thermocouple probe, as described by Navajas *et al.* (2008). The samples were then removed from the grill and placed in an incubator at 60ºC prior to sampling. All extraneous residual fat and connective tissue were trimmed and the lean tissue wrapped in aluminium foil and placed in hot blocks in each sensory booth. Panellists evaluated a piece of the cooked loin no more than two square centimetres in size, evaluating no more than 25 samples in one day. The sensory panel consisted of ten people screened according to British Standards Institute methods for taste sensitivity who had also received special training in the assessment of meat. The loin samples were assessed using a scale of 1 (Undesirable) to 8 (Desirable) for raw appearance, cooked appearance, lamb odour intensity, abnormal odour intensity, texture, juiciness, lamb flavour, abnormal flavour, flavour liking and overall liking as described by Sañudo *et al.*(1998). Thus appearance was extremely pale to extremely dark, odour and flavour were extremely weak to extremely strong, texture was extremely tough to extremely tender, juiciness was extremely dry to extremely juicy and overall liking was dislike extremely to like extremely.

A stepwise regression analysis was carried out using SAS (SAS, 2004) fitting all sensory panel traits (Raw Appearance, Cooked Appearance, Lamb Odour, Abnormal Odour, Texture, Juiciness, Lamb Flavour and Abnormal Flavour) to determine the relative importance of traits in determining "Overall liking". The analysis was undertaken separately for the 2008 and 2009 datasets.

TABLE 1: Mean ± standard deviation and range for each of the sensory panel traits measured on pasture finished lambs in 2008 and 2009.

Trait[1]	2008 (n = 100)		2009 (n = 162)	
	Mean	Range	Mean	Range
Raw appearance	5.5 ± 0.61	4.4 - 6.9	5.2 ± 0.74	3.1 - 7.4
Cooked appearance	4.5 ± 0.39	3.4 - 5.8	4.6 ± 0.50	3.4 - 5.8
Intensity lamb odour	4.5 ± 0.42	3.8 - 5.4	4.7 ± 0.43	3.3 - 5.6
Intensity abnormal odour	2.2 ± 0.40	1.6 - 3.8	2.2 ± 0.44	1.3 - 3.1
Texture	5.5 ± 0.51	4.0 - 6.8	5.1 ± 0.46	4.1 - 6.7
Juiciness	4.9 ± 0.47	3.6 - 6.1	4.7 ± 0.39	3.6 - 5.6
Lamb flavour	4.7 ± 0.38	3.8 - 5.6	4.6 ± 0.40	3.7 - 5.6
Abnormal flavour	2.3 ± 0.43	1.6 - 3.8	2.4 ± 0.49	1.4 - 4.1
Flavour liking	5.2 ± 0.45	3.8 - 6.4	5.1 ± 0.44	3.6 - 6.1
Overall liking	5.1 ± 0.47	3.8 - 6.3	5.0 ± 0.41	3.7 - 6.1

[1]Scale of 1 (Undesirable) to 8 (Desirable). Appearance: Extremely pale to Extremely dark; Odour and Flavour: Extremely weak to Extremely strong; Texture: Extremely tough to Extremely tender: Juiciness: Extremely dry to Extremely juicy and Overall liking: Dislike extremely to Like extremely

TABLE 2: Proportion of variation in "Overall liking" sensory panel score explained by other sensory panel traits measured on pasture finished lambs in 2008 and 2009. Sensory panel scores assessed on a scale of 1 (Undesirable) to 8 (Desirable).

Trait	2008 (n = 100)		2009 (n = 162)	
	% explained variation	Cumulative R^2	% explained variation	Cumulative R^2
Lamb flavour	48.3	48.3	49.7	49.7
Abnormal flavour	15.3	63.6	16.2	65.8
Juiciness	4.6	68.2		
Texture	1.2	69.3	2.8	68.6
Abnormal odour	1.3	70.7		
Lamb odour	0.8	71.4		

RESULTS AND DISCUSSION

The average carcass weights were 16.6 ± 0.93 kg and 19.0 ± 0.56 kg for the two years respectively. The averages for the sensory panel traits in each year are given in Table 1. Overall the means and ranges for each trait were similar between years. The percent variation in overall liking explained by each of the sensory panel traits is given in Table 2. Lamb Flavour contributed the most in explaining variation in overall liking in both years (48 to 50%). Abnormal flavour explained the next highest amount of variation (15 to 16%). No other attribute explained more than 5% of the variation.

In order for New Zealand lamb to be received as a premium product in overseas markets it needs to meet the visual and eating expectations of the consumers. An understanding of the attributes associated with eating satisfaction in individual markets must be known before meat eating quality can be tailored for a particular market. The expectations of consumers vary in different markets and are based on past eating experiences (Sañudo *et al.*, 2000; Prescott *et al.*, 2001). This research has identified lamb flavour as the attribute most associated with eating satisfaction as assessed by a United Kingdom sensory panel.

Future analysis and research should investigate the relationship between lamb flavour and other measurements made on the lambs, such as carcass weight, meat yield and pH, and the impact of different finishing systems on these traits. This will assist New Zealand lamb producers to maximise the "lambiness" of the product that they produce for the United Kingdom market, without negatively increasing the amount of "pastoral" flavours that may contribute to the "abnormal flavours" detected by the sensory panel. Lamb flavour can be assessed subjectively via sensory panels or objectively through measuring certain medium-length branched-chain fatty acids, particularly 4-methyloctanoic, 4-

methylnonanoic and 4-ethyl analogues, which occur as triglycerides in the fat (Wong *et al.*, 1975). These are known to be associated with lamb flavour.

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