UNITED STATES AND NEW ZEALAND CONSUMER PREFERENCES FOR BEEF FROM GRASS-FED ANIMALS.

Bickerstaffe, R ; Bekhit, A ; Chandraratne, M and Roberts, N

Molecular Biotechnology Group, Animal and Food Sciences Division, Lincoln University, Canterbury, New Zealand

Keywords: Beef. Grass-fed. Consumer preferences. Country differences. Tenderness. Intramusular marbling.

Background

The world is a global market place for meat products. There is a perception, however, that there are national consumer preferences for specific quality attributes and that within a country, ethnic groups require their own meat quality specifications. The issue is: 'Do specific groups of consumers expect specific meat quality attributes and can their expectations be delivered by traditional cuts of meat?' This concept of marketing meat to identifiable groups of consumers relies on obtaining information on the requirements of specific groups of consumers and translating their requirements into measurable meat quality attributes. In New Zealand there is a lack of information linking measurable meat quality attributes of grass-fed beef to the eating quality requirements of identifiable groups of consumers. This information is particularly important for a country which relies on exporting meat products to match the requirements of overseas consumers.

Objective

To identify whether consumers from different countries can perceive differences in the quality of mid-loin beef steaks as assessed by visual and sensory attributes.

Method

Beef mid-loin steaks (20mm thick) from two striploins, A and B, were barbecued between medium and well done on a heavy gas heated cast iron plate. Steaks were cooked on one side until moisture pools appeared on the top surface at which time the steaks were turned over and cooking continued until moisture appeared again. The shear force was determined on a sub-sample by removing 8 to 10 pieces of meat parallel to the muscle fibres using a double-bladed scalpel with blades set 10mm apart. The pieces of meat (25 x 10 x 10mm) were placed separately in the MIRINZ tenderometer (Chrstall & Devine, 1991) and the shear force (kg F) known as a 'bite' to cut across each piece was determined. The mean shear force is the mean of 8 to 10 'bite' measurements.

The remainder of the meat was cut into portions without any gristle or outside fat cover and evaluated by two groups of students. Group A consisted of American students (n=30) who had been in New Zealand for 2 weeks. Group B consisted of New Zealand students (n=26). Each student was asked to scale the tenderness of the two steaks on a 5 point scale. The scale was 1: 'very tender'; 2: 'tender'; 3: 'acceptable'; 4: 'tough' and 5: ' very tough'. The students were also asked which steak they would purchase based on visual appearance at a supermarket.

Each stiploin was photographed by a 3CCD digital camera at a mid-loin section and the percentage of intramusular marbling calculated using Image Pro 4 Software. The percentage of marbling is marbling relative to marbling plus lean and excludes the external fat layer.

Results

Visual Responses:

All students, aged 15-25 years, were shown 2 pieces of steak on a white platter and asked which they would purchase at the supermarket. The majority (83%) selected the steaks from stiploin B, which were bright red.

Sensory Responses:

The tenderness of the steaks determined by eating were scored on a 5 point scale. A steak with tenderness score of 3 or below is considered acceptable. The closer to 1 the more desirable the steak is to the consumer. As a guideline, a steak with a mean score of 2 is highly acceptable and desirable to consumers. The mean instrumental shear force values for steaks from striploins A and B were 2.45 and 4.1 kgF respectively which are well below 6.5 kgF ; a shear force associated with tender meat (Bickerstaffe *et al*, 2001)

The tenderness perception of the US and NZ students to the barbecued steaks from stiploins A and B are in histogram form in Figure 1. The mean tenderness score for striploins A and B, as judged by the US consumers were 2.3 and 3.0 respectively and by the NZ consumers, were 2.07 and 2.5 respectively. The result for striploin B were significantly different (Table 1) illustrating the US consumers judged steaks from striploin B as unacceptable. These differences in opinion are reflected in Figure 1, which shows only 15% of the surveyed US consumers ranked striploin B in the desirable tenderness categories 1 and 2 whilst 50% of NZ consumers ranked the same striploin in categories 1 and 2. Clearly, the Americans were more critical than the New Zealanders about the tenderness attributes of the meat and seemed to be able to distinguish meat with only a 0.65 kgF shear force difference. The question is 'Is the perceived tenderness differences due to shear force only or are there other contributing factors?' To evaluate whether intramusular marbling was a contributing factor the end of the striploin was photographed with a 3 CCD digital camcorder and intramusular marbling calculated form the digital images. Stiploin A had a higher % of intramusular marbling (5%) than striploin B (3.2%).

We believe this level of intramusular fat is a contributing factor which the American consumer can detect as reflected in their comments on the juiciness of steaks from striploin A.

Conclusion

Other studies have shown that some consumers prefer highly marbled to low marbled meat and vice versa (Miller *et al*, 2001; Numberger *et al*, 2001). In this report on the preferences of young consumers from two countries the results were consistent in that both sets of consumers preferred the bright red steaks from striploin B confirming that colour is an important selection criteria at the retail point of sale. However, after tasting the steaks, all the consumers preferred steaks from striploin A irrespective of their country of origin. The Americans were more critical then the New Zealanders as illustrated by their ability to distinguish between striploins A and B, which only had 0.65 kgF difference. The ability to differentiate is attributed to the Americans being sensitive to the level of intramusular fat which was low in striploin B compared to striploin A.

The results indicate that both shear force and intramusular fat levels must be optimised for specific consumers. It is, therefore, recommended that researchers identify the range of shear forces and intramusular fat levels that are required to satisfy specific groups of consumers. This information will enable the meat industry to produce products which match the visual and sensory requirements of consumers. This ability to match products to the sensory and visual expectations of consumers and the market will ensure future profitability for the industry and loyalty from tomorrow's consumers who expect consistent high quality products.

Table 1. Ability of consumers from different countries to discriminate between steaks from different striploins.

	Tenderness Score.		Sig.
	US	NZ	
Striploin A	2.31 ± 1.00	2.07 ± 0.7	p = 0.36
Striploin B	3.03 ± 0.68	2.50 ± 0.5	p = 0.007

Table 2. Ability of consumers from the same country to discriminate between steaks from different striploins.

	Tenderness Score.		Sig.
	Striploin A.	Striploin B.	
US.	2.31 ± 1.00	3.03 ± 0.68	p = 0.002
NZ.	2.07 ± 0.7	2.50 ± 0.50	p = 0.07

References

- Chrystall, N.B & Devine, C.E (1991). Quality assurances for Tenderness. Meat Industries Research Institute of New Zealand Publication. No. 872.
- Miller, R.K; Moeller, S.J; Goodwin, R.N; Lorenzen, C.L & Savell, J.W (2000) Consistency in Meat Quality. 46th ICoMST, Buenos Aires, Argentina, pg.566-580
- Umberger, W.J; Feuz, D.M; Calkins, C.R & Killinger, K.M (2001) U.S Consumer Preferences for Domestic Corn-fed versus International Grass-fed Beef. Paper at International Agricultural Trade. Auckland, New Zealand.
- Bickerstaffe, R; Bekhit, A.E, Robertson, L.J; Roberts, N & Geesink, G.H (2001) Impact of introducing specifications on the tenderness of retail meat. Meat Science. In Press.

Figure 1. Tenderness Profile of Steaks by Consumers from the USA and New Zealand.