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Evaluation of beef eating quality by Irish consumers

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ABSTRACT

A consumer's decision to purchase beef is strongly linked to its sensory properties and consistent eating quality is one of the most important attributes. Consumer taste panels were held according to the Meat Standards Australia guidelines and consumers scored beef according to its palatability attributes and completed a socio-demographic questionnaire. Consumers were able to distinguish between beef quality on a scale from unsatisfactory to premium with high accuracy. Premium cuts of beef scored significantly higher on all of the scales compared to poorer quality cuts. Men rated grilled beef higher on juiciness and flavour scales compared to women. Being the main purchaser of beef had no impact on rating scores. Overall the results show that consumers can judge eating quality with high accuracy. Further research is needed to determine how best to communicate inherent benefits that are not visible into extrinsic eating quality indicators, to provide the consumer with consistent indications of quality at the point of purchase.

1. Introduction

In Europe consumer confidence in beef and beef products has been affected by health scares and safety scares and more recently due to climate change considerations. This, taken alongside increasing globalisation and increased competitiveness, means that an evidence based and refined strategic vision for the future of the beef industry is needed to maintain and grow this vital industry. The Irish beef industry is export orientated with beef exports for 2015 valued at €2.4 billion, an increase on previous years (Bord Bia, 2017). Meeting consumer expectations and ensuring consistent eating quality will play a pivotal role not only in ensuring the continued success and growth of this export market for Ireland, but also in increasing confidence in all international beef markets.

To secure this continued success, efforts should focus on maintaining consumer confidence in and demand for beef. Food quality is considered to be an important factor in determining food choice such as beef and consumer choice is framed in terms of their perceived quality expectations at point of purchase and actual quality experience after consumption. These quality attributes not only encourage the consumer to purchase the food but also serve to reinforce their choice depending on the experience, after the purchase/consumption of the food (Grunert, 2002; Henchion, McCarthy, Resconi, & Troy, 2014).

Consumers use both intrinsic and extrinsic cues to determine meat quality. Intrinsic cues are the physical internal characteristics of the meat. Some of these cues are not evident to the consumer at the point of purchase, such as eating quality. Other intrinsic cues for beef include

colour and fat and many consumers currently select beef according to its colour, preferring bright red (Banović, Chrysochou, Grunert, Rosa, & Gamito, 2016; Mannion, Cowan, & Gannon, 2000), although colour is a poor indicator of palatability (Grunert, 1997; Henchion et al., 2014) while fat, which has a negative impact on quality expectations actually has a positive effect on palatability and is perceived differently by men and women (Steenkamp & Van Trijp, 1996; Banović et al., 2016).

Extrinsic cues such as brand name, labels, presentation and price are related to the product but are not physically part of it (Grunert, Larsen, Madsen, & Baadsgaard, 1996). Price has a positive effect on perceived quality, with higher price perceived as better quality which is not always the case (Acebrón & Dopico, 2000). Although meat is mainly sold unbranded, a brand has been shown to have potential as a cue for both eating quality and health (Bredahl, 2004). Therefore the labelling of beef may act as a beneficial extrinsic cue as it has potential to relay and communicate positive intrinsic information in a consumer friendly manner. Such an intrinsic cue would enable consumers to form accurate expectations, which would improve consumer satisfaction as it would reduce the difference between expected quality and experienced quality. Steenkamp and Van Trijp (1996) emphasised the importance of providing information at the place of purchase on expected quality. These palatability cues must be consistently accurate in order to reduce perceived risk and gain consumer confidence.

However, to win consumer confidence, eating quality needs to be consistent and of high quality. This is a challenging task due to the nature of beef itself. Beef is biochemically dynamic, hence it is naturally

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susceptible to variation in palatability which is evident in the market place. This variation in palatability stems from a wide range of factors along the supply chain from farm to fork. For example breed, sex, age at slaughter, the use or not of intervention techniques post-slaughter such as electrical stimulation, hanging techniques and the chilling regime all influence palatability. The selection of beef cut by consumers at point of purchase combined with cooking method also has an effect on variation in palatability and consumer evaluation of the product. Research by Maher, Mullen, Moloney, Buckely, and Kerry (2004) found variation in eating quality traits of randomly selected Irish beef. Furthermore, surveys in the USA have shown that consumers have difficulty in selecting beef because they are unsure of its quality (Miller, Carr, Ramsey, Crockett, & Hoover, 2001). Controlling this variation is a complex task. Predicting eating quality before consumption would be beneficial as it would allow for beef to be classified according to quality, hence reducing overall variation.

Currently in Europe beef carcasses are classified according to the Official EU scheme (EC 1208/1981) for conformation and fat cover. These visually assessed characteristics are related to the value of the carcass through their effects on saleable yield and are not related to eating quality (Bonny et al., 2016). In order to improve the consistency of beef eating quality there is a need for a revised grading system which takes into account the palatability of each cut. A system like this has the potential to communicate the beef eating quality as a front of pack type extrinsic cue thereby increasing consumer satisfaction through the reduction in the differences between before and after consumption evaluations (Grunert, Bredahl, & Brunso, 2004).

The Australian beef industry has pioneered a key initiative called Meat Standards Australia (MSA). This programme adopted consumer testing as a measure by which to evaluate the effectiveness of a grading system and as a tool to develop a detailed understanding of factors which interact to determine the eating quality of individual beef cuts. This system takes a total quality management approach which was suggested as a means of controlling the factors which contribute to the incidence of poor beef quality (Thompson, 2002). Large-scale consumer taste panels were undertaken by MSA to give a detailed understanding of factors which lead to variation in palatability. These factors were labelled ‘critical control points’ (CCPs) which were then used to predict the palatability of beef cuts using multiple regression analysis. This approach has been labelled ‘Palatability Assured Critical Control Points (PACCP)’. The objective of PACCP is to identify and carefully control production and processing factors which have the largest effect on palatability so that it is possible to accurately predict the quality of the final product (Polkinghorne et al., 1999). Consumer feedback should guide industry to tease out those parameters which result in inconsistent beef palatability. The PACCP system also leaves scope for the improvement of meat quality rather than prevention of poor meat quality alone. This may lead to increased production of premium quality beef which could be consistently labelled as such. The potential for this type of system was positively evaluated for implementation in Europe (Hocquette et al., 2014).

The aim of this research was to apply the PACCP grading system which was developed in Australia to Irish beef in order to determine if Irish consumers could accurately identify good eating quality beef when presented with samples of differing quality. The willingness to pay for guaranteed eating quality was also assessed and consideration was given to developing an extrinsic cue to communicate eating quality.

2. Methods

Consumer taste panels were conducted on sample of 1739 Irish adults. At the outset of each session, consumers were informed of the study and what participation entailed in. Consumers were free to leave the taste panel at any stage of the session if they no longer wished to participate. Consumers were recruited through clubs, societies and charity groups. Suitable candidates had to be ‘beef eaters’ aged 20 to

60 years. In groups of twenty, consumers ($n = 1739$ final sample) were invited to a central location to participate in the taste panels.

2.1. Sample preparation

The Irish samples were sourced from 20 Irish heifers, either Limousin crosses or Charolais crosses, with an average carcass weight of 304 kg (range 257–336 kg). These were slaughtered in a single commercial abattoir with minimal electrical stimulation and Achilles tendon hanging. The Australian samples were sourced from 20 steer of mixed breeds with an average carcass weight of 299 kg (range 283–318 kg). These were slaughtered in a single commercial abattoir with minimal electrical stimulation and Achilles tendon hanging. Relatively homogenous carcasses were selected to minimise variation between samples of the same cut. Six primal cuts (tenderloin, striploin, topside, rump, outside round and blade), selected to provide a range of good to poor quality, were removed from both sets of carcasses and aged for 14 days. Frozen beef samples were prepared for Irish consumers according to the MSA protocols (Polkinghorne, 2006; Watson, Gee, Polkinghorne, & Porter, 2008; Watson, Polkinghorne, & Thompson, 2008). Homogenous carcasses were selected to minimise variation between samples of the same cut. Beef cuts (tenderloin, striploin, topside, outside round, rump and blade) were cooked to medium using two different cooking methods. The first method was grilling, where a clam shell type cooker was used for cooking steak pieces. The second cooking method was yakiniku, which involved cooking small strips of beef on a Korean style cooker resembling a domed hot-plate. The grill method was selected as it was used for cooking steak-like pieces familiar to Irish consumers. The yakiniku cooking method was selected as a method for cooking thin beef strips which may differ in quality attributes to steak-like pieces. These two methods are both included in the MSA cooking protocols.

2.2. Sensory evaluation

Consumers were presented with seven small uniform pieces of beef of varying quality (i.e. from different cuts) for evaluation. The first sample was used as wash-out/control. Consumers were blinded to the quality of the meat cuts and rated each sample on a scale of 1 to 100 for the following palatability attributes; tenderness, juiciness, flavour and overall liking. They were also asked to rank the beef just consumed as one of the following: unsatisfactory, good everyday eating quality, better than everyday eating quality or premium quality. A questionnaire was also completed which obtained information on socio-demographic factors and beef eating preferences.

2.3. Meat quality score calculation

The Irish meat quality score (IMQ) was calculated, using linear discriminant analysis, as a linear function of the scores for the three palatability attributes (tenderness, juiciness, and flavour) and overall liking measured at the taste panels. This was done to see whether the optimised weightings would differ from those used for the Australian Meat Quality score (AMQ). The result showed that Irish consumers gave a lower weighting to tenderness and a higher weighting to flavour liking than Australian consumers.

$$\text{IMQ} = 0.2 * \text{tenderness score} + 0.1 * \text{juiciness score} + 0.4 * \text{flavour liking score} + 0.3 * \text{overall liking score}$$
 This differed from the meat quality score optimised for Australian consumer responses (AMQ) which was:

$$\text{AMQ} = 0.4 * \text{tenderness score} + 0.1 * \text{juiciness score} + 0.2 * \text{flavour liking score} + 0.3 * \text{overall liking score}$$

2.4. Statistics

All statistical analyses were carried out using SPSS Version 18

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