

## Lamb and sheep meat eating quality — industry and scientific issues and the need for integrated research

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**Abstract.** This paper provides an introduction to the special edition of the *Australian Journal of Experimental Agriculture* dedicated to an integrated research program aimed at understanding the critical control points which determine the consumer defined eating quality of Australian lamb and sheep meat. The reasons for a general approach in the research is outlined.

### Introduction

The Australian Lamb and Sheep Meat Industry has placed a high priority on investigation of methods to consistently deliver lamb, hogget and mutton products of high eating quality to consumers through the Sheep Industry Strategic Plan. There are a number of imperatives driving the need for clear definition and improvement of eating quality in lamb and sheep meat: (i) decreased consumption of lamb and mutton within the Australian domestic market during the 1990s (from 14.9 kg per capita in 1988 to 10.9 kg per capita in 1998), (ii) competition from other protein and food sources continues to be strong and will increase, (iii) indications from recent research that one measure of eating quality (specifically Warner-Braztler tenderness) is significantly variable for lamb loins (Safari *et al.* 2002), (iv) increased consumer expectations of premium quality and value for money, (v) further pressure on lamb sales through implementation of quality assurance systems such as the Meat Standards Australia scheme for underpinning beef quality, (vi) industry concern about mutton substitution for lamb, and (vii) an opportunity and desire within the sheep industry to add value to hogget and mutton products.

One mechanism available to the lamb and sheep meat industry to regain its competitive advantage over other products would be the implementation of eating quality assurance schemes. Such schemes would have 2 main objectives: (i) to describe and guarantee to consumers the eating quality of lamb and other sheep meat products, and (ii) to enable continuous improvement of product quality by all sectors of the industry, with appropriate feedback throughout.

There are few products that consumers can buy from supermarkets and other retail outlets these days that are not of consistent and predictable quality or that come without a

guarantee of customer satisfaction. However, lamb is one such product.

The research papers in this special edition describe the research that has been undertaken to define the critical control points for the eating quality of lamb and sheep meats.

### Previous research on lamb and sheep meat eating quality

Some issues related to the eating quality of lamb have been researched in recent years. Consumer surveys undertaken in the 1990s by the Australian Lamb Industry (AMLC 1997; Bennett 1997; Yann *et al.* 1994) show that attitudes towards lamb as a product were mixed. Only 40% of consumers agreed that lamb was tender, juicy and delicious, and 33% had difficulty in buying lamb of consistent and preferred quality. Encouragingly, 75% of consumers indicated that they would purchase more lamb if they had access to tender and tasty product. A concerning contradiction identified by the research was a poor correlation between the visual appearance of meat and its eating quality. While consumer satisfaction with the product (and propensity to re-purchase) is determined by the eating quality, selection decisions at retail are driven by the visual appearance of the meat (mainly visual fat content). Consequently, consumers often select meat that does not satisfy them in terms of eating quality. Eating quality (65–68%) and price (25–28%) dominate the decision by consumers to repurchase meat.

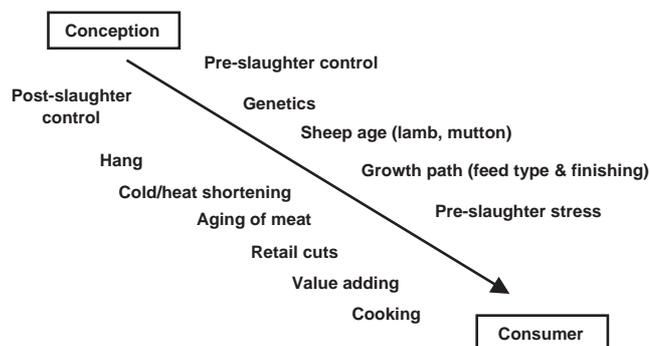
More recently, Meat and Livestock Australia commissioned a survey to examine variation in the tenderness of lamb in retail outlets around Australia (Safari *et al.* 2002). Lamb was purchased randomly from 390 retail butchers and supermarkets in Sydney, Canberra, Melbourne and Perth, and also from 2 branded lamb alliances. In all,

900 lamb mid loins were objectively measured for tenderness using Warner-Bratzler shear force as the principal measure. The key finding was that 20% of lamb purchased had a Warner-Bratzler shear force value of greater than 5 kg, which is a nominal and somewhat arbitrary estimate of the cut-off level for consumer acceptability (Shorthose *et al.* 1986). That is, 1 in 5 samples of lamb purchased as part of this study were likely to have been unacceptably tough to consumers. Similar research undertaken in New Zealand (Bickerstaffe *et al.* 2001) showed only 3–5% of lamb loins were unacceptably tough. Reasons for the different failure rates of lamb loins between the between the New Zealand and Australian are not clear and may relate to differences in methodology. However, the differences may relate to the New Zealand ‘Beef and Lamb Quality Mark’ program (Chrystall and Devine 1991; Frazer 1997), which aims to optimise animal handling, processing variables, aging times and ultimate pH of lamb.

The limitations of the studies cited above are important and should be noted. First, Warner-Bratzler shear force measurements are only an estimate of consumer eating quality. The correlation with consumer perceptions of tenderness are extremely variable and do not account for factors such as taste or juiciness. The flavour associated with sheep meats is known to be an important component of consumer acceptance (Prescott *et al.* 2001). Second, the studies have little information on the underlying reasons for the variation in lamb tenderness that has been observed.

### The Meat and Livestock Australia Lamb and Sheep Meat Eating Quality Program

In response to the Australian Sheep Meat Industry Strategic Plan, Meat and Livestock Australia undertook the research program reported on in this issue. The first step of the research was to undertake an industry and scientific consultation process involving producers, processors, wholesalers, retailers, food service and scientists. This process was used to develop a number of critical control points that might determine consumer acceptability of sheep meat (Fig. 1).



**Figure 1.** Critical control points for the consumer acceptance of sheep meat.

The next step was to establish a set of eating quality measurement protocols. Assessment of eating quality means different things to different people. For some, it is meat colour, pH decline, chilling, ultimate pH, for others, it is measures of tenderness such as Warner-Bratzler shear force, or, finally, the use of trained or untrained taste panels. All of these mechanisms are measures of meat quality that attempt to estimate the satisfaction of consumers. The ultimate way of measuring consumer perceptions of lamb and sheep meat eating quality is to use consumers. Untrained consumer taste panels are the closest we have to ‘the real thing’ in terms of assessing the quality of lamb and sheep meat products. The measurement of eating quality in this program has been based on untrained consumer taste panels very much along the lines of the research used to underpin the Meat Standards Australia beef grading scheme (Meat Standards Australia 2002) and is described in the ‘Methodology and Statistics’ section of this special edition. This methodology is unique and it is important that the readers understand the rigorous nature of the design of the consumer taste panels that can be found in Thompson *et al.* (2005a, 2005b). Across all the research, about 5600 consumers were used, such that each cut of meat was tested by 10 consumers who scored it for tenderness, juiciness, flavour liking and overall liking (0–100). In addition, each consumer was asked to rate the meat by marking it as one of awful, unsatisfactory, good everyday, better than everyday, or premium. Any consumer who ticked the awful or unsatisfactory box was deemed to have failed the product. The modelling paper of Pleasants *et al.* (2005) is important as it allows an understanding of the relationship between the consumer scores (tenderness, juiciness, flavour liking and overall liking) with how the meat was finally rated by consumers (unsatisfactory, good everyday and so on).

Once the eating quality protocols were established and validated, a range of integrated experiments were then designed and implemented. This represents the remaining subjects of this special edition. The papers have been grouped into animal, pre-slaughter and post-slaughter factors that contribute to the critical control points of lamb and sheep meat eating quality.

The outcomes of the results presented in this special edition are currently being used to allow the Australian Lamb and Sheep meat Industry to: (i) better meet the requirements of consumers by describing and underwriting the eating quality of lamb and other sheep meat products; and (ii) enable continuous improvement of product quality by all sectors of the industry, with appropriate feedback throughout.

The ultimate outcome will be the implementation of commercial eating quality assurance programs, which will use the critical control points approach to identify key management practices along the sheep meat production and processing pathways that most strongly influence sheep meat eating quality.

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