Improving the quality of pork – global trends part one

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The term 'pork quality' is defined and interpreted differently by pork producers, processors, retailers and ultimately the consumer. Hammond's definition 'Quality can best be defined as that which the public likes best and for which they are prepared to pay more than average prices' only takes the aspects of the consumer need and profitability into account and only represents the degree of goodness rather than the objective characterisation of quality.

A suitable definition for pork quality must encompass all the different factors involved from the producer to the final consumer.

Pork quality can thus be defined as 'the totality of all properties and characteristics of pork that are important to its nutritional value, acceptability, human health and the processing of pork'.

Hofmann classified pork quality characteristics into four main quality groups:

- Technological characteristics include those factors that determine the suitability of pork for preparation and packaging for distribution, as well as for cooking and processing into various products and for storage.
- Hygienic characteristics are concerned with the presence (or ideally) absence of micro-organisms, drugs and pesticides.
- Nutritional characteristics deal with the chemical composition and nutritional properties of the pork.
- Organoleptic characteristics include the appearance (colour, marbling, external fat and exudate) and the sensory quality (aroma, tenderness, juiciness, and flavour).

Based on these characteristics, pork quality can thus be defined as 'the sum of the technological, nutritional, hygienic and organoleptic properties of pork', or 'pork quality is the sum of all the quality factors'.

Understanding the consumer

There is intense competition in the food industry to attract and retain consumers and it is this that has driven the meat industries to produce what the consumer requires, rather than what we think might be required. But, is that the case with pork? Do pork producers, processors and the retailer truly understand the consumers' needs and preferences when it comes to pork quality?

Based on Hofmann's definition most pig production systems are heavily focused on the technological, nutritional and hygienic properties of pork, whilst little attention has been paid to the enhancement of organoleptic characteristics of pork.

Most pig production systems still mainly use technological quality parameters such as lean meat as the main basis of payment.

Whilst technological, nutritional, hygienic characteristics of pork are very important, especially in light of some of the recent negative press related to the animal industries, the organoleptic characteristics such as the sensory quality of the product are the main factors that influence the consumer to repurchase that pork product.

The consumption of pork varies widely, from an annual per capita consumption of less than 3kg in South Africa to over 60kg in Austria, Denmark and Spain. Pork in some European countries is seen as an ordinary meat which is not expensive, but equally not suitable for special occasions.

However, in Asia this is certainly a different story. China, for example, will increase its per capita pork consumption from approximately 50kg to approximately 70kg over the next 15-20 years. Hence the challenge is to ensure that the pork industry consistently delivers a high quality pork product that meets the consumers' needs.

Consumer perception of pork quality has traditionally been based largely on intrinsic cues like the colour of the meat, the visible fat and the cut. This is not mainly because consumers have been very competent in determining quality from these cues but because fresh pork is a largely unbranded product, and there are few extrinsic cues available. However, the use of extrinsic cues to 'assess' pork quality are increasing and this trend will continue.

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Fig. 1. Understanding and importance of 22 extrinsic pork cues (Grunert et al, 2002).

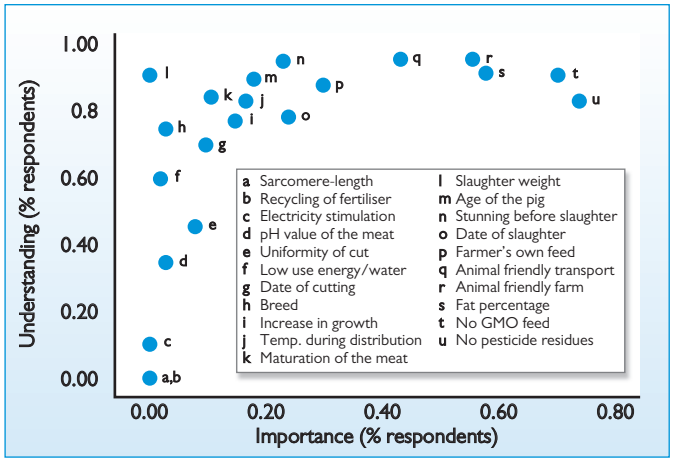
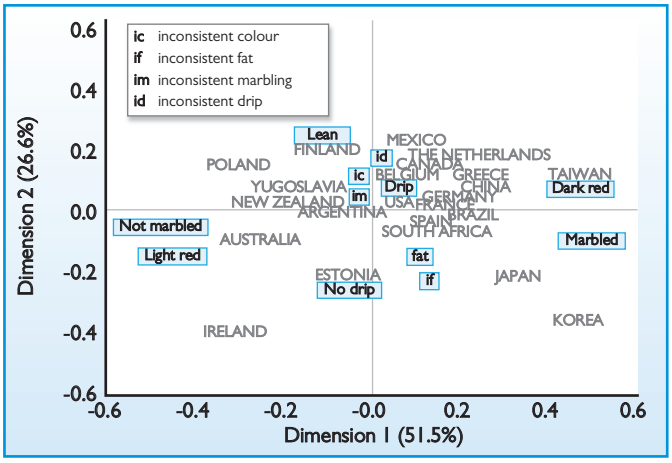


Fig. 2. Preferences for four pork characteristics from surveys conducted in 23 countries (Ngapo et al, 2007).



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Grunert et al. conducted a study with German consumers in a focus group discussing parameters that influence pork quality. The consumers were confident that they could judge the sensory quality of pork themselves. The consumers were then presented with 22 cues and asked to:

- Indicate whether the consumers understood what the cue was all about.
- Rank order the cues by perceived importance for pork quality.

The results however indicate that of the top five cues as measured by both knowledge and importance, none of them are related to sensory quality but are, instead, related to technological, nutritional, and hygienic quality of pork. Ngapo et al. have conducted one of the few global consumer preference studies and have identified and compared the most important characteristics of fresh pork that determined consumer choice in 23 countries from all five continents.

Briefly, photographs of 16 commercial pork chops were computer modified to give two levels of each of the characteristics:

- Fat cover (averages of 8 or 17% chop surface area for lean or fat chops, respectively).
- Colour (average CIELAB L* of 64 or 56, and a* of 18 or 24 for light and dark red chops, respectively).
- Marbling (absent or about 1.5% of the muscle area).
- Drip (absent or 5.5% of the chop area).

Each double page contained 16 different chop shapes and each chop shape represented one of the combinations of the four characteristics studied. Therefore, every double page contained a complete set of all 16 combinations of the two levels of each of the four characteristics.

Both the order of representation of the characteristics with respect to the chop shape and the position of the chops in a double page were randomised. Consumers were pork eaters older than 15 years of age and chosen at random. Consumers were surveyed at a range of sites, including agricultural shows, supermarkets and at their workplaces. In total 12,590 consumers completed the survey.

Importance of colour

Ngapo et al. reported that across all countries, colour was the most consistently chosen characteristic, followed by fat cover, marbling and drip loss characteristics.

The Australian consumers were by far the most consistent with 84% giving consistent choices in contrast to only half of the Yugoslavian consumers.

Over all countries, similar numbers chose the dark as chose the light red pork. Australian (73%), Irish (67%) and Polish (63%) consumers showed the strongest preference for the light red pork, whilst the Taiwanese consumers (66%) showed a strong preference for the dark red pork.

Although the largest differences were found between countries, there was little evidence that ethnic origins were strong, except for the similarities of the Asian (Taiwan, Japan and Korea) countries which were different from the other countries.

However, these countries were also very different from one another. Irish and Polish consumers clearly had quite different preferences and both had different preferences to those of the other European countries in this survey.

The studies by Grunert et al. and Ngapo et al. certainly provide an understanding of some of the consumer preferences for fresh pork. However, are there demographic differences when it comes to the eating experience or sensory quality of pork? A feasibility study conducted in Australia indicated that the Australian pork consumer preferred pork that was 'tender, juicy and free from unpleasant odours or flavours'.

Is the sensory preference for tender, juicy and unpleasant odour/flavour free pork applicable to Australia alone or does it reflect the pork eating quality needs of the global pork consumer? Whilst, no global pork sensory evaluations have been conducted to date, mainly due to the cost of such testing, a global consumer study is underway for beef.

The initial sensory evaluations indicate that there were no differences between consumers in Japan, Korea, Australia and Ireland

Brand	Generic pork	Select Pork (Stage 1)	Select Pork (Stage 1 & 2)	l.s.d	Significance
Aroma[1]	55	63	57	6.54	0.002
Flavour[1]	54	66	76	6.11	<0.001
Juiciness[1]	43	58	75	6.85	<0.001
Tenderness[1]	41	59	75	7.40	<0.001
Overall acceptability[1]	48	64	76	6.67	<0.001
Quality grade[2]	2.9	3.5	4.0	0.279	<0.001

[1]Acceptability score (line scale); 0 = dislike extremely and 100 = like extremely
[2]Quality grade; 1 = unsatisfactory, 2 = below average, 3 = average, 4 = above average, 5 = premium.

Table 1. The effect of the Select Pork eating quality pathway on the sensory quality of the Longissimus thoracis muscle (D'Souza et al, 2003).

when assessing the eating quality of beef as defined by the Meat Standards Australia (MSA) eating quality system.

Over the last decade, pork retailers, processors and producers have recognised that they must collectively provide a product that meets clearly defined consumer specifications that maximise consumer's purchase and re-purchase intentions. A range of factors affect pork quality (objective and sensory) and a number of strategies have been shown to enhance pork quality.

However, it is just not economically viable to implement all the strategies that enhance pork quality. In addition, the pork industry needs to take into account some of the consumer preferences such as leanness of pork that are clearly at odds with the consumers' requirement for tender and juicy pork.

As a consequence, a number of countries have researched and developed pork eating quality systems that incorporate a number of key strategies to produce a high quality pork product that is consistently acceptable to the consumer.

Blueprint for lean pork

The UK Meat and Livestock Commission, has developed the 'blueprint for lean and tender pork.' The key elements of the standard specifications include:

- Ad libitum feeding of pigs from 30kg to slaughter.
- Careful live animal handling.
- Minimum fatness at P2 site of 8mm.
- Considerate chilling (deep muscle temperature above 10°C in first three hours).
- No PSE carcases.
- Pelvic suspension within one hour for 12 hours.
- Ageing (four days – legs, seven days – loins).
- Dietary constraints (maximum 2.5% fishmeal and 10% peas). For the premium standard, MLC have added a genetic component, pig breeds used must contain 50-75% Duroc.

In Denmark, processors define the feed, genetics and production specifications of pigs that are required and producers are then bound to adhere to these specifications. Items addressed in the specifications include lean meat percentage, PSE, slaughter weight, intramuscular fat content, colour and pH values. The Swiss have included intramuscular fat into the selection indices, whilst in Germany, the Westfleisch group includes no growth promotants in feed after 40kg liveweight and two specific genotypes.

The above examples are 'generic' in their application and have been designed to suit a wide range of production, processing and retail environments. However, a number of companies have developed more specific eating quality pathways to produce a high quality pork product required by the consumer.

'Select Pork' is one such example of an eating quality pathway that was implemented by a consumer focused alliance in Western Australia. The Select Pork Alliance was formed between a group of producers, a processor and a retailer (35 outlets).

The eating quality pathway used by the Select Pork Alliance involved eating quality interventions at the producer and processor level and was implemented in two stages.

The Stage 1 eating quality pathway stipulated halothane free pigs, pigs with a minimum of 50% Duroc sire lines and no entire males (pork from immunological castrates, surgical castrates and females only).

Stage 2 involved moisture enhancement of fresh pork.

The results from a benchmarking study indicate that the branded pork from Select Pork (Stage 1) and Select Pork (Stage 1 and 2) were considered by consumers to have better eating quality compared to generic pork. Select Pork (Stage 1) was considered to have better odour compared to generic and Select Pork (Stage 1 and 2).

However, Select Pork (Stage 1 and 2) was considered to have the best flavour, juiciness, tenderness, overall acceptability and quality grade followed by Select Pork (Stage 1) and then generic pork.

In addition, the incidence of consumers rating the pork as being below average or the pork eating quality 'fail rate' was 30, 15 and 3% for generic pork, Select Pork (Stage 1) and Select Pork (Stage 1 and 2) respectively.

An effective eating quality pathway should implement strategies that significantly enhance the eating quality of the end product, with each eating quality intervention having an additive effect. More importantly however, all eating quality intervention strategies should improve the consistency of the eating experience. ■